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Repayment Behavior under Joint Liability Loan Contracts in a Competitive Environment

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Abstract

In this paper we empirically examine the impact of competition between Microfinance Institutions (MFIs) on the efficacy of loan contracts when the MFIs make use of joint liability loan contracts. More specifically, we aim to find out whether competition will reduce the power of the self-selection process between the groups of borrowers, whether the peer measures within the groups of borrowers are different in an environment of competing MFIs and to what extent changes in the intra group behaviour have an impact on the repayment performance of the borrowers. We show that in a competing environment borrowers do not match anymore in groups of homogenous risks. We further show that the missing self-selection is compensated by a more intense and effective monitoring process and by a higher willingness of the group to repay the loans of delinquent borrowers. We conclude that the main advantage of competition between MFIs – namely lower direct borrowing cost due to lower interest rates – may be overcompensated by higher indirect costs which specifically arise when using joint liability contracts.

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I. Introduction

As the United Nations declared 2005 the International Year of Microcredit, micro-lending approaches have become a matter of course almost everywhere in the world. These approaches mostly aim at improving the self-employment opportunities of poor people by lending them small or even very small amounts of capital. In particular in the past decade - after the first Micro-Credit Summit has been taken place in Washington – thousands of Microfinance Institutions (MFIs) mushroomed out of every corner, first and foremost in the developing countries in Asia, Africa and South America and in the transition economies of Eastern Europe.

As the number of MFIs is sharply increasing, some pioneers of the Microfinance approach started to complain that the sector has turned into a multi-billion dollar industry which is destroying the social component of the initial movement. Many MFIs formerly acting in a kind of regional monopoly – being in competition only with the local money-lenders - all of a sudden were facing client competition. In the first place, from the clients' perspective competition seems of course to be a positive development, also in a market segment being originally started by non-profit-organizations which were guided by other targets than profit maximization, like for instance providing poor people with access to credit. Competition, on the other hand, usually drives prices down and enhances products, also when these are served by NGOs. In this case the market of microfinance is expected to improve in terms of efficiency and product quality.

However, it is also a well known fact that in credit markets information asymmetries may produce inefficient outcomes if competition is unregulated. The most obvious problem in an unregulated environment is that MFIs may be confronted with a decline in their repayment performance if their clients are able to simultaneously borrow from second sources (cf. Hoff and Stiglitz [1990]). McIntosh et al. [2004, p. 3] find for example in Uganda that rising competition between the MFIs 'lead to a gradual deterioration in repayment performance and to a drop in savings', because the MFIs had 'no formal information sharing mechanism about clients' credit histories'. They conclude that institutional innovations have to be developed for information sharing on client indebtedness levels if the major negative impact of increasing competition – namely declining repayment rates – should be avoided.

A majority of MFIs still uses some sort of joint-liability loan contracts and it seems that there is a kind of common sense among many practitioners of Microfinance that joint-liability contracts do better than individual lending schemes when an MFI is facing increasing competition. Since the MFI's screening, monitoring and enforcement cost of clients ought to be smaller under joint-liability - part of these duties are transferred under joint-liability contracts to the borrowers - MFI practitioners may expect to be better able to offer the lowest interest rates if they use joint-liability instead of individual loan contracts.

As in several theoretical approaches was shown (for a thorough overview, cf. Morduch [1999]), MFIs using joint liability loan contracts may look ahead to high repayment rates: Firstly, joint

liability sets free strong incentives among the borrowers to self-select into homogenous groups of low risks before they sign the loan contracts. Secondly, if, after the loan disbursement, any group member intends to reject loan repayment, joint liability induces different kind of peer measures within the group, mostly with the consequence that all loans are repaid on time even if some group members intended to reject compliance.

Recent empirical research (see for instance Kritikos and Vigenina [2005]) indicated that behavior of credit groups who signed joint-liability loan contracts may meet these expectations raised by the theoretical literature. However, these results were found under the condition that the respective MFI does **not** face client competition. A central clue of joint-liability lies in the advantage that the effective fees (interest rates plus the cost of joint liability) are lower for groups of low risk borrowers than for groups of high risk borrowers because low risk borrowers will have to be jointly reliable within their group with lower probability. Because of this cost advantage for groups of low risks, MFIs may expect that only groups consisting of low-risk borrowers will apply for a joint-liability loan.

In the present paper, we will now empirically analyze the impact of competition on groups of borrowers who (co-)signed joint-liability approaches. We aim to find out whether competition will reduce the power of the self-selection process, whether the peer measures within the group of borrowers are different in an environment of competing MFIs and to what extent changes in the intra group behavior have an impact on the repayment performance or the total lending cost of the borrowers. In order to answer these questions, we developed a questionnaire which was used in two different MFIs with very similar joint liability approaches. The first MFIs is Constanta situated in Georgia where – at least during our survey – there was only very low and indirect competition between this MFI and a second MFI named Microfinance Bank Georgia which was offering only individual loans with higher loan volumes (for details see Vigenina and Kritikos [2004]). The second MFI we surveyed was FORA in Russia which – in contrast to Constanta – faced direct competition for potential or existing clients.

The rest of the paper is organized as follows. In section II we provide a short overview of the theoretical and empirical literature on group lending to the extent that is relevant for the present research. In section III we describe the group lending methodologies used by the MFIs Constanta and FORA and we shortly compare the two approaches with respect to the question whether FORA – working in a competitive environment - is offering ‘better’ or ‘cheaper’ products than Constanta. In section IV, the empirical results are presented, showing that in FORA the groups are randomly put together while in Constanta borrowers are self-selected in groups of homogenous risks. We further show that the clients of FORA compensate the missing self-selection by a more intense and effective monitoring process and by a higher willingness of the group to repay the loans of delinquent partners. Section V concludes and discusses whether the main advantage of competition between MFIs might be overcompensated by higher indirect cost which may specifically arise when using joint liability contracts.

II. Approaches in the Literature

Theoretical literature provides a comprehensive overview about the mechanism of joint liability, in particular how it alleviates the difficulties of adverse selection, moral hazard, and repayment enforcement, problems which have to be solved in any loan contract. We may differentiate between three stages during the process of employing joint-liability contracts, where this contract design might influence borrowers' behavior. At the first stage borrowers have to form groups before they sign the contract. After contracts have been signed and loans are disbursed, borrowers may choose at the second stage between several peer activities and at the third stage they jointly have to decide about the repayments of the loans.

Thus, starting backwards, at the final stage borrowers are confronted with joint liability in combination with the termination threat (as a sanction) if they fail to repay all loans of a group and they receive the perspective to get access to higher loan volumes (as a positive incentive) if they repay on time. Under joint liability the whole credit group is considered as being in default loosing access to subsequent loans, if only one borrower rejects to repay a small share of his loan. The other borrowers of the same group have then to decide whether they will repay for their delinquent partner. If they need to keep access to further and larger loans and if the utility of keeping access to these loans of the same MFI is larger then the cost of (temporarily) repaying the loan of a delinquent group member in addition to the own loan, these other borrowers of the same group will make the additional loan repayment for the delinquent borrower (cf. Besley and Coate [1995], Armendariz de Aghion [1999], Kritikos [1999]).

Anticipating the possibility of increased repayment costs (or alternatively of potential exclusion from access to further loans) might induce borrowers, to start acting already at the previous (the second) stage of this repayment process: In order to keep the probability of exclusion from further loans or the necessity to repay for a delinquent peer at a minimum, borrowers might start either to monitor their partners of the same group, to put pressure on their peers or to support their peers (cf. Stiglitz [1990], Varian [1990], Banerjee et al. [1994], Besley and Coate [1995], Hulme and Mosley [1996], Armendariz de Aghion [1999], Kritikos [1999], Morduch [1999]).

Applying peer monitoring means that borrowers make sure that each borrower undertakes investments leading to income streams which enable loan repayments with maximum probability. Under peer pressure, it is understood that the group of borrowers exerts social pressure on delinquent borrowers to repay their loans if these reject repayment in the first place. Peer pressure is expected to be particularly used if the rest of the group has the information that a delinquent borrower is responsible for the repayment problems. In contrast to this, peer support is expected to be applied if a borrower faces repayment problems which where induced through external factors. Peer support might have different meanings like financial support, support at the working place, transfer of information etc. Thus, with respect to the second stage of this "repayment game" we may conclude that borrowers of a group might increase efforts like

monitoring or supporting their peers or putting their peers under pressure to repay their loans on time in order to decrease the probability of being responsible for the repayment of their peers at the final stage.

Since borrowers are also interested in keeping the efforts for these peer activities at a minimum, the joint-liability approach unfolds a further incentive, namely on the matching of the borrowers before they sign contracts. In several theoretical papers it has been shown that similar risk types may group together (see e.g. Varian [1990], Ghatak [1999], Kritikos [1999], Morduch [1999], Van Tassel [1999], Laffont and N´Guessan [2000]) if they possess sufficient information to recognize each others' risk types (see Hoff and Stiglitz [1990] and Khandker [1998]). As a result of the matching procedure safe types are expected to team with safe types, and risky types are left with other risky types. More importantly, these approaches explain that a low risk type will reject a matching with a high risk type. The crucial point of this kind of assortative matching is that low-risk borrowers, as they have to make repayments for delinquent peers with lower probability, face considerably lower borrowing costs when they match with another low-risk borrower instead of a high risk type.

As a consequence, if the MFI has sufficiently designed its incentive system (interest payments and joint liability), we may observe the following outcome: 1) High risk borrowers do not apply for this loan type, because the borrowing cost are to high for them if they are only able to match with other high risk borrowers. 2) Low risk borrowers face lower borrowing cost in comparison to a matching with high risk borrowers if they realized a homogenous matching with respect to their risk types. 3) The MFI can almost be sure that it is lending his financial capital only to low risk types and has thus solved the adverse selection problem.

Concluding this short review of theoretical approaches, we may keep in mind that joint liability contracts create three stages of potential decision making processes where the joint liability contract might unfold activities on all three stages - depending on the ex ante information of the borrowers about their future partners.

A number of empirical studies provide various tests on these theoretical approaches just presented. These studies illustrate that the key components of the group-lending mechanism do not have an unambiguous impact on the borrowers' repayment performance. Their influence varies from country to country probably depending on how the joint-liability contract was designed and processed and also on the local conditions and cultural peculiarities. With respect to the question on assortative matching, Sadoulet and Carpenter [1999] report in their surveys of certain MFIs in Guatemala and Eritrea that most borrowers group randomly in these MFIs and use group lending mainly as a form of insurance. In contrast to this, Wenner [1995] and Sharma and Zeller [1997] find some indirect hints in their surveys of Costa Rica and Bangladesh for assortative matching. Kritikos and Vigenina [2005] were the first to discover that in an MFI in Georgia assortative matching with respect to the repayment risk is existent and had a significant

impact on the repayment behavior of the groups where the groups with the lowest risks had fewer problems with delinquency than groups with relatively higher risks.

For the behavior of borrowers after the loan disbursement, for instance Wydick [1999] and Kritikos and Vigenina [2005] analyzed to what extent peer measures were applied within the groups of borrowers. Wydick [1999] found that the intensity with which the borrowers employed various internal rules within their groups strongly depends on the environment: groups in urban areas enforce prompt repayment via peer monitoring, whereas in rural areas potential repayment problems are reduced mainly through the willingness to exert social pressure on delinquent peers. Peer pressure had also in the empirical analysis of Kritikos and Vigenina [2005] a significant impact on the repayment behavior within the groups, while peer monitoring was observed only ex post, when a borrower had run into a repayment problem. More importantly, borrowers of that MFI were willing to provide peer support, in particular financial support, when the group had experienced together more than three loan terms.

This overview over the empirical research reveals that it is possible to observe borrowers of some MFIs who behave to certain extend as theoretically predicted. The main aim of the present paper is therefore to study the impact of those components of the joint-liability contract which proved to be crucial in previous research. We make use of the data of two MFIs which employ the same incentive structures and which work in similar cultural environments. The main difference between the two MFIs we chose is that one MFI (FORA in Russia) is exposed to direct competition and the second one (Constanta in Georgia, a former member of the Soviet Republic) is not. By comparing the borrowers' behavior in these two MFIs, this approach allows us to identify what factors might work in the same way (irrespective of the competitive environment) and on what factors of the joint liability approach competition might have an impact.

More specifically, in a first step, we will analyze the screening process between prospective clients, in particular whether groups match homogeneously with respect to the repayment risk or whether there is random matching. Since we found out that at the FMI Constanta there is incidence for assortative matching and at FORA it is not, we will also be able to analyze to what extent assortative matching is a necessary condition for the success of joint-liability contract. In a second step after the loan disbursement, we study whether the differing self-selection processes affect the use of peer measures.

Before we will present the sampling design in section IV, we will provide in section III an overview over the group lending mechanisms employed by the two MFIs to the extent that is relevant for the present study.

III. Description of the Lending Technologies of FORA and Constanta

The Lending Methodology: The two studied MFIs – FORA (Russia) and Constanta (Georgia) – are NGOs founded by international development organizations in the late nineties. Their mission is to provide quality loan services to entrepreneurs who are striving to develop their businesses but lack collateral. The majority of the clients are traders who need to increase the working capital in order to maintain or expand the business. Both MFIs have a high share of female clients, who constitute around 70 to 80 percent of the portfolios. The applied lending technology consists of gradually increasing repeated loans given to solidarity groups. Group members guarantee each others' loans, and the entire group debt must be repaid in order to have access to subsequent loans. Loans are disbursed and collected simultaneously for all group members.

In Constanta, the loans have a maximum term of four months and are required to be repaid in weekly installments. The group size varies from 4 to 15 borrowers. The initial loan size is between 50 and 150 Euro. Loans may increase in each cycle by not more than 50% if the previous loan amounts were repaid on time. The MFI charges an interest rate of 4% per month and an administrative fee of 1% of the disbursed amount. The inflation rate at the relevant year was about 4% per year.

In FORA, the groups are little smaller, consisting of 3 to 9 borrowers. Different from Constanta, the loan terms and the repayment schedules are flexible, varying with the borrowers' needs and the income stream of their businesses. The initial loan size is on average about 200 Euro. The interest rate is calculated depending on the type of the loan, the loan cycle, the size of the group, and on the region in which the branch is situated, and is fixed on a monthly rate of 3% to 5%. As a rule the price of the loan declines with the loan cycle and the number of the group members. In addition, if a client attracts a new borrower in the group the interest rate on his loan is decreased. The inflation rate at the relevant year was 13%.

The Lending Procedure: With one small but important exception the lending procedure of the two MFIs is identical. Potential clients (interested into getting access to loans by making use of group contracts) are asked by the loan officers of the MFIs to freely self-select in credit groups. The loan officers themselves do not undertake any supportive activities with respect to the group building. However, they carefully screen the newly formed groups by imposing some restrictions: Loan contracts are denied i) to groups consisting predominantly of entrepreneurs whose income is too low to cover missing installments of delinquent peers; ii) to groups with more than one high-risk member (entrepreneurs with bad reputation or people without permanent residence in the region of borrowing). Moreover, the loan size is decreased for applicants who proved to have low weekly turnovers. Members of the same family household are not allowed to enter the same group.

The important difference is the following: At the MFI Constanta, the screening process takes around **two weeks**. During this period perspective group members meet with a loan officer and

attend five training meetings. At FORA, the members of the newly formed groups do not go through any training sessions. The loans are disbursed within **3 to 5 days** which gives the institution a high competitive advantage and considerably increases the value of the loans. At the same time, however, the simplified screening procedure reduces the amount of communication between future group members. The consequences of this difference are discussed in the next section.

In both MFIs the loan officers use the period before the actual loan disbursement for visiting the applicants' businesses and evaluating their financial situation. After the loan disbursement no official meetings with borrowers are scheduled. Nevertheless, loan officers try to stay in contact with their clients by paying them random and, as a rule, unexpected visits. If arrears occur, loan officers pay a visit to all members of the group and exert high pressure on them until the complete installment is collected. Payments are considered delinquent if one currency unit is not repaid on time. In this case, the delinquent member has to pay a fine for the late repayment and the increases of loan sizes in the next cycle are reduced for all group members.

In the history of both MFIs there were only few cases of groups completely refusing to pay for a delinquent peer. These groups were immediately excluded from the lending program and some of them sued. The experience was up to now that if only one defaulting group in a certain region is sentenced, the information about the process spreads immediately among all clients. Mostly, groups with arrears repay then their loans very promptly.

Direct Impact of Competition: When comparing the mere characteristics of the products of FORA with Constanta, it is obvious that the loan product of FORA has been developed in a more competitive environment with the expected results. The product is designed in a more flexible way with respect to the cost of the product (interest rates vary with respect to several variables), the arranged repayment schedules, incentives for the clients to acquire further borrowers, incentives for the clients to stay for more than one period with the MFI FORA and in particular with respect to the elapsed time between the first loan proposal by the borrower and the final approval of the loan through FORA. As mentioned in the introduction, as a consequence of the higher competitive environment of FORA its loan product appears to be of higher quality and – at least with increasing loan cycles – also less expensive.

IV. Determinants of the Group Dynamics in Joint-Liability Contracts

This section addresses our research question of the impact of competition on the repayment behavior of groups of borrowers by investigating and comparing the group dynamics in the two studied MFIs. We analyze data obtained through a survey of 241 randomly selected credit groups of the MFIs FORA and Constanta. The questionnaire studies the borrowers' socio-economic characteristics, the process of group formation, the group structure, and the intensity of the intra-group activities. All survey questions were close-ended, enabling the borrowers to give precise

and unambiguous responses. To exclude correlated answers, only one randomly selected member of each group was questioned. Since the interviews were personally conducted, no serious problems with missing values occurred.

With respect to Constanta, 108 borrowers from the City of Batumi were interviewed. With respect to FORA 133 borrowers were surveyed from four randomly selected cities: Lipetsk, Borisogletsk, Saratov, and Novgorod. The methodology used to test the hypotheses is similar to Kritikos and Vigenina [2005]). To study the group-lending mechanism we constructed a multi-stage econometric model in the way that it replicates the three-stage nature of the principal-agent game: the stage of screening the borrowers before signing the loan contract, the stage of internal monitoring within the group of borrowers, and the stage of enforcing repayments. The model is separately applied to the data collected from 133 groups of FORA and 108 groups of Constanta.

IV.1 Assortative Matching

Most theoretical research of micro-lending approaches assigns a central role to the hypothesis of assortative matching according to which borrowers with low repayment risks will group only with borrowers with similarly low repayment risks and where borrowers with high repayment risks might not be able to build stable borrower groups even if they found other high-risk borrowers to match with.

As shown in section II, there are diverging empirical results with respect to this variable. In some MFIs borrowers proved to have build homogeneous groups and in others not. However, these approaches enable no conclusion why such differing behavior appears. In the present analysis we will therefore compare the matching behavior of the borrowers of FORA where due to the competitive environment borrowing groups are formed in less than five days and do not participate in any training, with the behavior of the borrowers of Constanta where the matching procedures takes up to two weeks and where it is possible due to the low competitive pressure to ask borrowers to participate in several training sessions. By doing so, the present data set allows to get first evidence whether competition may have an impact on the process of group formation.

We start testing whether the borrowers self select in groups being homogenous with respect to the variable repayment risk. To do so the interviewed borrowers were asked (in the questionnaire) how they would evaluate the aggregated repayment risk of all members of their group (excluding their own risk characteristics) at the time the group was formed, (labeled as *Group quality (GQ)*). This variable is used in the subsequent analysis as dependent variable (see equation 1).

In a second step, in order to evaluate the risk profile of the interviewed borrower (labeled as *Borrower's Risk Type (RT)*) we computed *RT* as a cluster analysis score (derived by the Wald´s method) where the following three indicators were used: the borrower's average monthly business income, the dynamics of his income flows and his own assessment of the stability of his

business project. The surveyed clients of both MFIs were classified into three clusters with a mean value for each indicator as shown in Table 1. The clusters are most clearly separated by the borrowers' income level, which determines the ability of the entrepreneur to cover his installments, thus lowering the financial risk for the lending institution. Therefore we label the borrowers belonging to cluster 1 as "low risk", these from cluster 2 as "intermediate risk", and the rest (cluster 3) as "higher risk".

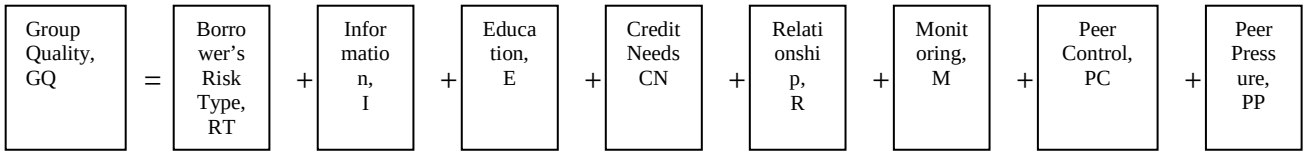
- insert Table 1 about here -

According to the theoretical literature the quality of self-selection depends also on how well the borrowers know their perspective peers and the business projects they run. The assumption is tested (in equation 1) by the second independent variable, *information (I)* – a scale ranging from 1 if borrowers had no information about their future partners, to 5 if they had detailed information. Tests of significance on the variables *education (E), credit needs (CN),* and *relationship (R)* are used to check whether certain personal characteristics help the applicants enter certain groups. *E* shows the borrower's level of education. It can take three possible values: 1- school, 2- college, and 3- university. *CN* indicates how much money the interviewed client would have borrowed assuming that there were no constraints on the loan size. It is an interval ranging from 1-"up to 250 USD" to 5- "more than 1.000 USD" for Constanta and from 1-"up to 650 USD" to 5- "more than 2.500 USD" for FORA. We expect that agents who claim larger financial needs run businesses with higher potential for development. *R* is a categorical variable with a value of 1 if the borrower has relatives among the group members, 2- if the borrower has close friends among the group members, 3- if the group members are business partners, and 4- if the group members are just cosigners. It is used to check whether kinship or friendship give the applicants any advantages in the selection process.

The last two variables *peer monitoring (PM)* and *peer pressure (PP),* test whether the internal rules in the low-risk groups substantially differ from the rules followed by the borrowers of the higher-risk groups. *PP* measures the group members' willingness to sanction delinquent partners. It is a latent variable extracted by means of the factor analysis using the following variables: (1) pressure the group (would) exert(s) on a delinquent member (answers rating from 1- "no pressure" to 5- "extremely strong pressure"), (2) sanctions the group (would) impose(s) on a delinquent member (from 1- "no sanctions" to 5- "immediate exclusion from the group"), and (3) sanctions the MFI (would) impose(s) on a defaulting group (from 1- "the group receives further loans but their size does not increase with time" to 5- "all group members are immediately excluded from the lending program"). The phenomenon of peer monitoring is presented by three variables indicating: 1) how often peers meet each other (1- "once a month" to 5- "every day"), 2) how often they discuss their business problems within the group (1- "never" to 5- "on a regular basis"), and 3) how well they know each other's business outcome (1-"no information" to 5- "very detailed information"). In FORA's dataset the variables are highly correlated and load on a single latent factor, called *peer monitoring*. In case of Constanta, however, the first two

variables proved to be uncorrelated and therefore enter equation (1) as two independent variables, called *monitoring (M)* and *peer control (PC)*.

Information about the borrowers' matching behavior can be obtained by analyzing the results of equation 1. An ordered logit model was specified to obtain the coefficient estimates. *Group quality (GQ)*, was defined as dependent variable.



$$\ln\left[\frac{\sum_{k=1}^{J} P(GQ=j)}{1-\sum_{k=1}^{J} P(GQ=J)}\right] = \alpha^{j} + \beta_1 RT + \beta_2 I + \beta_3 E + \beta_3 CN + \beta_4 R + \beta_5 M + \beta_6 PC + \beta_7 PP \quad (1)$$

where j = 1, 2, …, J indicates the *ordered* categories in the dependent variable.

The significance of the explanatory variables is estimated by the likelihood ratio test. It is a joint test on all coefficients associated with each independent variable. It is assumed that a variable has no effect on Y only if all parameters associated with it are simultaneously 0. The model is calculated with and without the variable being tested. The direction of the particular variable's impact is determined by examining the results of the separate logistic regressions where the borrowers' clusters are compared in pairs (see Table 3) where also the results from the applied multinomial logit models are summarized.

- insert Tables 2 and 3 about here -

For Constanta's groups the model is well specified (see Table 2): The test of joint significance of all independent variables has a *p*-value of .05. *Self-selection* is the only significant variable (at 99% confidence level), confirming the assortative matching through group lending. The insignificance of all other independent factors shows that these do not contribute to the separation of the clusters and thus cannot be used by the loan officers to differentiate between borrowers' risk types.

In FORA's groups, however, we could not find evidence of homogeneous matching (see Table 2). The high *p*-value (.417) of the provided test of overall model fit indicates the bad explanatory power of the whole set of independent factors. The heterogeneity of the groups could be partly explained by the short self-selection process, as a result of which only a relatively small amount of initial information about the perspective peers is accumulated.

Whether the assumption of assortative matching holds depends not only on the endogenous process of group formation, but also on the screening policy of the MFI - whether it makes

perspective borrowers attend training sessions during the selection process or use short straightforward screening procedure, thus stressing on the speedy disbursement of loans. Except the freedom to choose their partners independently the borrowers also need sufficient time and even encouragement by the loan officers to gather the necessary information about the future partners and subsequently to self-select in homogeneous in respect to the investment risk groups.

Result 1: At the MFI Constanta the group formation is influenced by the variable *Borrower's risk type*. We found that lower risk borrowers indeed team up with lower risk borrowers and vice versa. For the borrowing groups of the MFI FORA we found no evidence of assortative matching with respect to the risk attitudes of the borrowers.

IV.2 Testing the efficiency of the applied incentive mechanisms

Once loans are disbursed, the lender's success depends on the repayment behavior of both the groups and (indirectly) the individual borrowers. The second stage of the principal-agent game is presented by a system of two equations. Equation (2) tests the factors which may motivate the individual borrowers to promptly fulfill their repayment obligations, i.e. choose safe projects or do not divert means for consumption purposes. It accounts for the repayment performance inside the group. Equation (3) reveals the determinants of the repayment behavior of the entire group.

Both dependent factors are dichotomous variables taking a value of 1 if there were no cases of internal or external delinquency in the group and 0 otherwise. To consider the effect of the independent factors binary logit models are specified.

Internal Repayment Performance, Y_2	=	Peer Monitoring, PM	+	Peer Pressure, PP	+	Peer Support, PS	+	Dyn. Incentives, DI	+	Borrower's Risk Type, Y_1	+	Staff Pressure, SP	+	Business Correlation, CORR	+	Social Ties, ST

$$\ln\left[\frac{P(Y_2=1)}{1-P(Y_2=1)}\right] = \alpha + \gamma_1 PM + \gamma_2 PP + \gamma_3 PS + \gamma_4 DI + \gamma_5 Y_1 + \gamma_6 SP + \gamma_7 CORR + \gamma_8 ST \quad (2)$$

where $Y_2 = 1$ if in the credit group there was no incidence of internal delinquency.

External Repayment Performance, Y_3	=	Peer Monitoring, PM	+	Peer Pressure, PP	+	Peer Support, PS	+	Dyn. Incentives, DI	+	Self-Selection S	+	Staff Pressure, SP	+	Business Correlation, CORR	+	Social Ties, ST

$$\ln\left[\frac{P(Y_3=1)}{1-P(Y_3=1)}\right] = \alpha + \delta_1 PM + \delta_2 PP + \delta_3 PS + \delta_4 DI + \delta_5 S + \delta_6 SP + \delta_7 CORR + \delta_8 ST \quad (3)$$

where $Y_3 = 1$ if in the credit group there was no incidence of external delinquency.

The use of two equations allows not only to better address the complexity of the group-lending repayment system, but also helps to better understand how the incentive mechanisms work: e.g. if they prevent the occurrence of repayment failures, thus mitigating the moral hazard problem, or serve as corrective measures, tackling the enforcement problem only.

The explanatory factors in both equations are identical. Some of them reflect the special features of the lending mechanism; others account for the lender's characteristics or reflect specific socioeconomic conditions. To the first group belong *peer support*, *peer monitoring*, *peer pressure*, and *dynamic incentives.* The *borrower's risk type* (in equation (2)) and the *self-selection* (in equation (3)) are used as a measure of the quality of the clients' portfolio: The repayment performance of the borrowers is influenced by their individual characteristics, whereas the repayment performance of the complete group depends on characteristics that are common for all group members.

Business correlation reflects the degree of positive correlation across borrowers' projects' returns. *Social ties* measures the homogeneity of the groups in terms of age, gender, income, etc. *Staff pressure* indicates the impact of the loan officers' monitoring efforts. The last factor, *loan term* to maturity, is thought to be an effective monitoring tool that helps the MFIs discipline the clients and gives the loan officers early warning about emerging problems.

To estimate the coefficients of the independent variables we apply the method of maximum likelihood. The parameter significance is evaluated by the Wald statistics, which equals the square of the ratio of the coefficient divided by its standard error and asymptotically follows a chi-square distribution: $W_k^2 = \left(\frac{b_k}{s_{b_k}} \right)^2 \sim \chi^2$. The interpretation is similar to the *t* values used for the significance testing of linear regression coefficients.

The instruments for managing the credit risk used by the studied MFIs are with some small exceptions identical. The impact of these instruments on the borrowers' behavior, however, proved to differ most probably due to the revealed differences in the group formation and structure. In the following, we highlight the role of the incentive mechanisms created by the joint-liability contract in solving the delinquency problems. Our aim is to show what motivates the clients to both invest the borrowed capital into safe projects and avoid strategic defaults.

We start with analyzing the factors that lead to the improvement of the repayment performance of individual borrowers. The empirical results from the specified binary logit model (equation (2)) are presented in Table 4. The only variable that proved to be positive and statistically significant in both samples of borrowers is *peer support*. It measures the group members' willingness for mutual support. The belief of the borrowers that they will be helped in case of an

external shock makes them perceive the group as a reliable source of insurance, thus implicitly increasing the value of the group loan.

- insert Table 4 about here -

Further we investigate how the strength of the peer support changes with time when the differences among the group members are expected to grow bigger, causing serious mismatching problems. The set of independent variables is regressed on the internal repayment performance of both the "new" borrowers (with three or less loans) and the "old" borrowers (with more than three loans).

In Constanta, *peer support* is significant only in the sub-sample of "old" borrowers, evidencing that group support grows stronger in the course of time. Contrary to the prior expectations, the cooperation among borrowers improves the longer they stay in the group. It shows that using the group-lending technology Constanta will be very likely to generate high repayments over a relatively long period of time. FORA's empirical results show the reverse tendency. In this case *peer support* is significant only in the sub-sample consisting of new borrowers, evidencing that the belief in the group willingness to provide mutual help improves the repayment rate only during the first loan cycles and significantly diminishes afterwards.

Result 2: In both MFIs the variable peer support turned out to be a crucial intra-group variable helping to solve repayment problems. However, at FORA peer support is effective during the first three loan cycles when borrowers barely know each other. At Constanta, peer support is only provided in groups who were together for more than three loan cycles. The result indicates that borrowers of FORA offered peer support until they stopped trusting each other, while borrowers of Constanta started to trust each other after they created a group relationship.

The repayment rate of FORA could be expected to decrease constantly with time. According to the official financial analysis, however, it has significantly improved for the last five years. Apparently, there are other incentive mechanisms, which help the MFI mitigate the moral hazard problem. One such mechanism proved to be *peer monitoring*. It is computed as a factor analysis score indicating 1) how often peers meet each other, 2) how often they discuss their business problems within the group, and 3) how well they know each other's business outcome. The variable is highly significant and positive, evidencing that the more intensively the peers monitor each other the less likely the internal delinquency is. FORA's clients effectively use the meetings to control their partners and reassure that the latter do not misallocate the borrowed capital.

In case of Constanta the phenomenon of *peer monitoring* is presented by two variables called *monitoring* and *controlling* (see also Table 4). M*onitoring* shows the frequency of meeting between the peers and is, thus, a proxy for the borrower's ex ante peer-monitoring efforts. *Controlling* indicates how often the borrowers discuss their business problems within the group. Our initial expectations were that the two variables would load on a single factor as in the case of

FORA but they proved to be statistically uncorrelated and were included into the model as two independent variables. *Controlling* is highly significant (at 99% confidence level) but surprisingly has a negative coefficient. This can be explained by the fact that in the more problematic groups the intra-group communication is intensified, showing that peers try to verify the real state of the projects only if some of them fail to repay.

The next factor to be discussed is *social ties* (an index measuring the homogeneity of the groups with respect to age, gender, income, etc.). It is believed that the strength of the social ties between the group members strongly affects their behavior as well as their exposure to various problems. According to the theory, the repayment performance of a group should be better when the social ties between the members are strong since the latter increase the mutual trust and at the same time strengthen the impact of the imposed social sanctions.

Our results contradict this assumption by showing that *social ties* have no (Constanta) or rather a negative (FORA) effect on borrower's repayment behavior. In FORA, the variable negatively influences the willingness (or ability) of both individual borrowers and groups to repay the loan: It is statistically significant with a negative coefficient in equation (2) as well as equation (3). To explain this phenomenon we assert that in socially homogenous groups the clients stronger rely on peers' unconditional support and are thus more likely to free ride.

In FORA's groups, the willingness for mutual financial support (*peer support* significantly improves both internal and external repayment performance) substantially increases the chances of a delinquent borrower to be refinanced by the lender despite his repayment failure. However, as the empirical results show, borrowers not only explicitly express their intention to support their peers but also effectively monitor them (*peer monitoring* is statistically significant at 95% confidence level), sufficiently raising the probability of discovering the real reason for the default. Thus, free riding, being very likely to be discovered, often creates tension and mistrust among the group members, resulting in a group refusal to cover the debt of the fraud (explaining the negative sign of *social ties* in Table 4).

Except joint liability, the majority of the group-lending MFIs also use other mechanisms that are expected to discipline the borrowers and improve the repayment performance. One of them is the shorter term to maturity. It is thought to be an effective monitoring tool, especially in the first loan cycles. Longer loans are considered to be riskier since they have more chances to fall into arrears and lead to greater delinquency rates.

To examine the role of the loan duration we slightly extend the econometric model by adding a new variable called *loan term.* The modified model is applied only to FORA's database since Constanta offers to all of its clients only one type of loan contract, where the time to maturity is fixed at exactly 4 months. FORA's lending procedure is more flexible in the sense that it allows the loan duration to vary from client to client in accordance to the cash flows. It ranges from 4 to 12 months. Table 3 shows that *loan term* is statistically significant (at 95% confidence level)

and, as expected, displays a negative sign. The longer the term to maturity, the more difficult it is for the borrowers to meet the repayment obligations.

Result 3: (1) For the MFI FORA we found out that group members effectively monitor each other to keep the probability of repayment failure at a low level. In contrast to this, borrowers of Constanta start monitoring each only when a repayment problem already occurred. (2) Social ties have no (Constanta) or rather a negative (FORA) effect on borrower's repayment behavior. (3) The flexible loan terms, developed at FORA, have a negative impact on repayment behavior.

Despite all precautious measures some borrowers fail to fulfill their repayment obligations on time. Repayment problems occur as a result of both external uncontrollable shocks and clients' carelessness. Notwithstanding the reason, the credit groups are expected to always repair the individual's failure either by covering the delinquent person's part of the loan or by imposing (social) sanctions, thus forcing them to repay. In this sub-section we attempt to reveal the variables mostly influencing the repayment performance of the credit groups of the two MFIs. Whether the groups repair the repayment failures of individual borrowers, and what kind of peer measures they use is investigated by regressing the *external repayment performance* on the previously specified set of independent variables.

- insert Table 5 about here -

Table 5 reveals substantial differences between FORA and Constanta in terms of the intra-group behavior of their clients. One crucial variable seems to be *peer pressure* which is statistically significant in both samples of borrowers but the coefficient takes different signs. In Constanta, *peer pressure* proved to positively influence the repayment decisions of group members, indicating that the probability of default for groups whose members impose (or express their intention to impose) social sanctions is significantly smaller. The fact that the variable improves only the external repayment rate and does not affect the internal repayment performance allows for the interpretation that the majority of Constanta's borrowers exert ex post pressure. They start acting after an internal problem has occurred. The negative sign of the c*ontrolling* variable (significant at 95% confidence level) can be seen as a further conformation of this explanation.

Much different is the behavioral pattern of FORA's borrowers. In FORA, *peer pressure* is also significant but has a negative coefficient. We assert that only clients who belong to groups who have already been at least once in arrears are willing to sanction a delinquent member. These are mainly groups where the tension between the peers is high as they have not successfully managed to solve their internal problems. The clients of FORA, different from those of Constanta, rarely use peer pressure for inducing repayments. They apparently employ it at a later stage - after they have paid for the delinquent partner - in order to get compensated for the payments they made for their delinquent peers in the group.

Instead, the most efficient incentive mechanism for tackling the enforcement problems in FORA turned out to be *peer support*. It is the only statistically significant and positive variable in equation (3). The group serves as a secondary repayment source for the clients and thus preserves the lender from suffering losses due to repayment failures.

Another factor with different implications on the borrowers of the two MFIs is *self-selection* (see also Table 5). It is of no surprise that the factor does not influence the repayment performance of FORA's groups taking into account the fact that no evidence of homogeneous matching has been found. In contrast to this, for Constanta the quality of the selection process is important for its successful financial development. We have shown that the individual characteristics, measured by the *borrower's risk type*, are insignificant for the improvement of the internal repayment performance. It means that for instance middle risk borrowers do not default more often within their groups than low risk clients. The significance of *self-selection*, however, indicates that groups consisting of higher risk borrowers are more likely to be delinquent than groups formed by clients with low risk characteristics.

The last point to be discussed is the negative impact of the correlation across the group members' businesses. Constanta and FORA serve predominantly traders. As a result most of the groups are homogeneous with respect to economic activities or risk exposure. The degree of such homogeneity is measured by the variable *business correlation.* The borrowers were asked if they were involved in mutual trading activities, had common clientele or common supplier. The a priori expectations about this variable are ambiguous. On the one hand, high business correlation is associated with bad risk diversification in the group and increases the probability of failure. On the other hand, however, the higher degree of positive correlation increases the borrowers' incentives to monitor each other and thus raises the probability of success of all projects (Beatriz Armendariz de Aghion [1999]). In order to check the validity of the latter statement we regress *business correlation* on *monitoring*. The coefficients are highly insignificant (Constanta: *p*-value = 0.870; FORA: *p*-value = 0.411) showing that peers with correlated businesses do not excessively intensify their monitoring efforts in order to avoid paying the debts of their partners. However, in both MFIs, *business correlation* proved to be significant with a negative coefficient. Business dependence across group members substantially weakens the peers' ability to mutually insure each other when external shocks arise, thus increasing the likelihood of a group default.

Result 4: (1) Among the borrowers of Constanta, the variable *peer pressure* significantly improves the external repayment indicating that borrowers exert peer pressure if a repayment problem has occurred. Moreover, the self-selection process has a positive impact on repayment when low-risk borrowers grouped together. (2) Among the borrowers of FORA, peer pressure is only used by borrowers who paid for delinquent co-signers and who aim to get compensated from these delinquent peers. (3) Business correlation within a group of borrowers increases in both MFIs the probability of repayment failure.

5. Conclusion

This paper studies the group dynamics of two leading MFIs in Russia and Georgia which provide access to micro-loans by making use of joint-liability contracts. The main aim of the paper is to find out whether competition between suppliers of micro-loans has an impact on these group dynamics. Therefore, we compared the observed behavior in the loan groups of the MFI Constanta which had no serious competitor in the field with the behavior of borrowers of FORA in Russia which faced competition from local banks. Due to the competitive environment, the applicants of FORA had also access to loans with lower interest rates (in comparison to Constanta) and with more flexibility, such as longer term of maturity. As most other variables as well as the cultural setting in the two MFIs are similar, we are able to make such a comparison.

Our results indicate that competition has a significant impact on the intra-group behavior of borrowers. Although we revealed that the group-lending mechanism proved to be effective in inducing on-time repayments in both institutions, we detected substantial differences in the way it works. We had structured the complete joint-liability contract into three different stages, the first stage being the group matching, the second being the internal behavior within the group after contracts were signed, and the third stage being the time of due loan repayment.

Starting with the process of group formation we found that giving the applicants the ability to independently self and co-select does not automatically lead to assortative matching. A careful matching occurs only if the clients have the option (and probably also are encouraged by the loan officers) to gather detailed information about their peers. According to the empirical results such an approach – applied in Constanta – helps the lender to alleviate the adverse selection problem but requires a selection period of about 2 weeks. In a competitive environment the slow screening procedure is known to impede the growth of the credit institutions as it makes them less attractive for the entrepreneurs. As a consequence, we found out that the applicants of Constanta had matched together to groups of homogenous risk types, while the applicants of FORA had not.

In the next steps, we were able to observe the consequences of the differing group matchings. The analysis shows that in case of FORA, borrowers compensate for the lack of sufficient initial intra-group information by carefully monitoring their peers during the entire lending period. They not only regularly meet their peers but also control their business outcomes. Constanta's borrowers, on the contrary, know their future peers already, rely on their screening efforts and do not monitor each others' business activities as long as there are no signals of repayment failures. When a problem occurs they intensify their peer monitoring by auditing the defaulter's work.

This means that the cost of information which the borrowers of Constanta had already "invested" during the screening process, were not "saved" by the borrowers of FORA. They simply had to do this investment later on and we cannot exclude that the monitoring efforts had been higher among the borrowers of FORA when compared to Constanta because instead of a one time

screening process (over two weeks) a constant monitoring might have been necessary as borrowers with different risk levels were grouped together.

Besides peer monitoring, we also found out that another important precondition for the success of group lending is in both MFIs the ex ante willingness for peer support. It signals the borrowers' readiness for intra-group cooperation. The strong belief in the mutual support considerably increases the value of the group loan and leads to mitigation of the moral hazard problem. However, as we showed in the comparison of Constanta with FORA, there exist different ways of peer support conditional on the quality of the selection process. The biggest difference between the MFIs is that in Constanta the feeling of group solidarity grows stronger in the course of time. In these groups persons can be relatively sure that the payments for the next installments of their peers will be returned by the delinquent borrowers as soon as possible. In FORA group solidarity starts diminishing after the first three loan cycles. A possible reason for the growing mistrust among FORA's clients could be the fact that even though the most group members stay in close relationships, they typically lack prior experience in financial matters with one another. Only about 4 percent of the interviewed borrowers describe their peers as business associates, while 44 percent define them just as cosigners and over 50 percent as friends. As the loan officers report, many borrowers falsely believe that people who proved to be good friends will be good business partners as well. When the expectations are not met, mistrust destroys the work of the group as their delinquent peers for whom they provided financial support obviously refused to repay. To compare, in Constanta 47 percent of the groups are formed by business associates, around 21 percent by distant relatives, 30 percent by friend, and only 2 percent by cosigners. Thus, the missing screening efforts also have a costly impact on peer support.

In Constanta, also peer pressure proved to be an additional effective instrument to enforce repayments. Similar to peer monitoring, peer pressure is used by the borrowers only as a corrective measure. Worth noting is the fact that in Constanta the willingness of the group to pay for a delinquent member is highly correlated with the willingness to exert pressure on him. We assume that the motivation of Constanta's clients to pay for their partners is not simply the willingness to support them but rather the willingness to promptly fulfill the repayment obligations. In contrast to this, among borrowers of FORA peer pressure took place within the groups only to get compensated for the payments they made for their delinquent peers. Accordingly, peer pressure was also not used to enforce repayments within the group when the next installment was due.

Last but not least, social cohesion and business correlation are the only two variables whose impact on the borrowers' behavior does not vary between the two MFIs. According to the empirical analysis, the probability of default in highly cohesive groups is significantly higher than in groups with no social cohesion. Apparently, in such groups borrowers stronger rely on the peers' unconditional support and are thus more likely to free ride. Moreover, in both MFIs it appeared that the probability of default within a group was significantly higher when the

businesses were correlated. This observation shows that it is an important task for the loan officers to accept only groups of borrowers where the businesses are sufficiently diversified.

Putting all observations of the group dynamics in the studied MFIs together, we conclude that the self-selection process is a crucial activity between borrowers. The quality of self-selection determines the intensity of all further peer measures. Moreover, the empirical results show that the main factors driving the high repayment rate are the peer activities induced by the principle of joint liability. In this context, the finding, that the group-lending mechanism induces prompt loan repayments even if borrowers group randomly (FORA), is of importance, as well. It makes clear that for a certain – certainly rather short - time period groups may work in the intended way of joint-liability even if the members of the groups were not able to realize an assortative matching.

However, this positive result that joint liability works even if groups matched randomly because of a competitive environment comes at significant cost. It is necessary to highlight in particular three negative impacts of competition on joint-liability contracts. The first disadvantage is the lower stability of randomly matched groups. Most of them do not survive more than three loan cycles (while in the MFI Constanta groups started after three loan cycles to work together even in a better way). Because of the negative experiences with delinquent peers, members of these groups have a decreasing motivation to stay in good terms with their peers. FORA found a solution which enables them neither to loose these borrowers nor to face increasing repayment problems; they offer to the clients the option to switch to an individual lending contract after few loan cycles. The second disadvantage of joint liability contracts under competition is that the efforts which these borrowers safe during the self-selection process of the groups (and which are invested by the borrowers of Constanta) might be over-compensated by the later efforts of additional peer monitoring and peer pressure. The third disadvantage is that borrowers who signed a joint liability contract in a competitive environment and who grouped randomly face higher cost when they decide to provide delinquent peers with financial support for which they are not necessarily compensated.

We conclude therefore that competition may reduce the direct costs (for interest payments) of loans which were given under joint liability. However, these lower direct costs are most probably overcompensated by additional efforts of peer monitoring and peer pressure, as well as by the additional costs when group members provide peer support to delinquent members. Our results indicate therefore that joint-liability loan contracts might be less stable and more expensive in a competitive environment although interest rates are lower.

References

Armendariz de Aghion, B.: On the Design of a Credit Agreement with Peer Monitoring, *Journal of Development Economics* 60, 79-104 (1999).

Banerjee, A.; Besley; T. Guinnane, T.: Thy Neighbor´s Keeper: The Design of a Credit Cooperative, *Quarterly Journal of Economics* 109, 491-515 (1994).

Besley, T.; Coate, S.: Group Lending, Repayment Incentives and Social Collateral, *Journal of Development Economics* 46, 1-18 (1995).

Ghatak, M.: Group Lending, Local Information and Peer Selection, *Journal of Development Economics* 60, 27-50 (1999).

Hoff, K.; Stiglitz, J.: Imperfect Information and Rural Credit Markets – Puzzles and Policy Perspectives. *The World Bank Economic Review* 4, 235-250 (1990).

Hulme, D.; Mosley, P.: *Finance Against Poverty*. London: Routledge (1996).

Khandker, S.: *Fighting Poverty with Microcredit: Experience in Bangladesh*. New York: Oxford U. Press for the World Bank (1998).

Kritikos, A.S.: Micro-credits with incentive-guided solidarity action, *Kredit und Kapital* 32, 393-425 (1999).

Kritikos, A.S.; Vigenina, D.: Key Factors of Joint-Liability Loan Contracts, *Kyklos* 58, 213-238 (2005).

Laffont, J.-J.; N´Guessan, T.: Group Lending with Adverse Selection, *European Economic Review* 44, 773-784 (2000)

McIntosh, C.; de Janvry, A.; Sadoulet, E.: How Rising Competition Among Microfinance Institutions Affects Incumbent Lenders, Disc. Paper, San Diego (2004).

Morduch, J.: The Microfincance Promise, *Journal of Economic Literature* 37, 1569-1614 (1999).

Sadoulet, L.; Carpenter, S.: Risk-Matching in Credit Groups: Evidence from Guatemala. *ECARES, Free University of Brussels*, (1999).

Sharma, M.; Zeller, M.: Repayment Performance in Group-Based Credit Programs in Bangladesh: An Empirical Analysis. *World Development* 25, (1997).

Stiglitz, J.E.: Peer Monitoring and Credit Markets, *The World Bank Economic Review* 4, 351-366 (1990).

Van Tassel, E.: Group Lending Under Asymmetric Information, *Journal of Development Economics* 60, 3-25 (1999).

Varian, H.R.: Monitoring Agents with Other Agents. *Journal of Institutional and Theoretical Economics* 146, 153-174 (1990).

Vigenina, D; Kritikos, A.S.: The Individual Micro-Lending Contract: Is it a Better Design than Joint-Liability? *Economic Systems* 28, 155-176 (2004).

Wenner, M.D.: Group Credit: A Means to Improve Information Transfer and Loan Repayment Performance. *Journal of Development Studies* 32, 263-281 (1995).

Wydick, B.: Can Social Cohesion be Harnessed to Repair Market Failure? Evidence from Group Lending in Guatemala. *Economic Journal* 109, 463-475 (1999).

Table 1: Cluster indicators

	FORA			Constanta		
	Cluster 1	Cluster 2	Cluster 3	Cluster 1	Cluster 2	Cluster 3
Average monthly income	5.00 (0.000)	3.93 (0.107)	1.94 (0.099)	4.64 (0.49)	2.71 (0.554)	1.5 (0.509)
Changes in the monthly income since the first loan disbursement	4.39 (0.104)	4.05 (0.13)	4.15 (0.068)	4.08 (0.49)	4.45 (0.504)	3.97 (0.186)
Stability of the business project	4.17 (0.081)	3.54 (0.079)	3.34 (0.076)	3.64 (0.7)	3.88 (0.593)	3.43 (0.504)

Table 2: Constanta and FORA: Multinomial Logit Model of Borrowers' Probability of success

Likelihood Ratio Tests:								
Dependent variable: Borrowers' Risk Type: Cluster Score								
	FORA				**Constanta**			
Explanatory Variables	*-2Log Likelihood of Reduced Model*	*Chi-square*	*df*	*Sig*	*-2Log Likelihood of Reduced Model*	*Chi-square*	*df*	*Sig*
Intercept	129.791	0.000	0	.	104.600	0.000	0	.
Credit Needs	131.170	1.379	2	0.502	105.635	1.035	2	0.596
Self-selection	132.919	3.128	2	0.209	**114.864**	**10.264**	**2**	**0.006**
Education	134.113	4.321	4	0.364	109.080	4.480	4	0.345
Nr. of borrowers in cluster 1				36				22
Nr. of borrowers in cluster 2				52				40
Nr. of borrowers in cluster 3				21				29
Pseudo R^2 =				.083				.178
Model significance (test the joint significance of all independent variables): *Chi-Square value =* *df =* *P-value =*				 8.172 8 .417				 15.512 8 .050

Notes: This table presents the results from the likelihood ratio tests of hypothesis 1. The likelihood ratio test is a joint test on all coefficients associated with each exogenous variable. The model is calculated with and without the variable being tested. The first column of the table lists the exogenous variables. The second column contains the –2LL values of the reduced model. The latter is formed by omitting a variable from the final model. The null hypothesis is that all parameters of that variable are 0. The third column presents the chi square statistic: the difference in –2 log-likelihoods between the final model and a reduced model. Degree of freedom (df) is the difference in the number of parameters in the final model and the reduced model.

Table 3. Constanta: Multinomial Logit Model of Borrowers' matching behavior. Separate Logistic Regressions with Pairwise Comparisons

Outcome Variables:	**Cluster 1 vs. Cluster 3**	**Cluster 2 vs. Cluster 3**	**Cluster 1 vs. Cluster 2**
Explanatory Variables:	*Coefficient (Wald Statistic)*	*Coefficient (Wald Statistic)*	*Coefficient (Wald Statistic)*
Intercept	-9.990*** (9.051)	-4.937*** (3.133)	-5.054* (3.534)
Credit Needs	0.000 (0.456)	0.000 (0.023)	-0.000 (0.911)
Self-Selection	2.195*** (8.224)	1.271*** (3.591)	0.924 (2.466)
Education (1)	21.427*** (236.739)	19.684 (.)	1.743 (1.566)
Education (2)	0.403 (0.260)	0.124 (0.041)	0.279 (0.149)
Education (3)	0.000[a] (.)	0.000[a] (.)	0.000[a] (.)

**** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.*

[a] This parameter is set to zero because it is redundant.

Notes: The table presents the parameter estimates from the separate logistic regressions of the multinomial logit model used for testing equation 1. We compare, in succession, 1) the low risk borrowers (cluster 1) with higher risk borrowers (cluster 3), 2) intermediate risk borrowers (cluster 2) with higher risk borrowers (cluster 3), and 3) low risk borrowers (cluster 1) with intermediate risk borrowers (cluster 2). The statistical significance of the individual coefficients is evaluated by the Wald test. The Wald statistic for the test of a single coefficient is contained in parentheses. It equals the square of the ratio of the coefficient divided by its standard error and asymptotically follows a chi-square distribution: $W_k^2 = \left(\frac{b_k}{s_{b_k}} \right)^2 \sim \chi^2$.

Table 4. Constanta and FORA: Binary Logit Model of Group Internal Repayment Performance

	Dependent Variable: Internal Repayment Performance					
	FORA			***Constanta***		
Explanatory Variables:	*Coefficient B (Standard Error)*	*Wald Statistics*	*Exp(B)*	*Coefficient B (Standard Error)*	*Wald Statistics*	*Exp(B)*
Peer Support	**0.508* (0.285)**	**3.165**	**1.661**	**2,649** (1,159)**	**5,227**	**14,14**
Dynamic Incentives	0.493 (0.415)	1.408	1.637	-0,091 (0,369)	0,061	0,913
Borrower's Risk Type		1.089			1,773	
Borrower's Risk Type	0.968 (0.928)	1.087	2.632	-0,914 (0,844)	1,173	0,401
Borrower's Risk Type	0.687 (0.888)	0.599	1.988	0,025 (0,76)	0,001	1,025
Peer Pressure	-0.366 (0.383)	0.917	0.693	0,472 (0,393)	1,446	1,603
Monitoring	**0.743** (0.366)**	**4.135**	**2.103**	0,068 (0,355)	0,037	1,071
Controlling				**-0,748*** (0,246)**	**9,236**	**0,473**
Staff Pressure	0.075 (0.296)	0.063	1.078	-0,399 (0,266)	2,257	0,671
Business Correlation	-0.152 (0.272)	0.313	0.859	-0,007 (0,27)	0,001	0,993
Social Ties	**-0.574*** (0.206)**	**7.768**	**0.563**	-0,03 (0,286)	0,011	0,971
Loan Term	**-0.715** (0.297)**	**5.795**	**0.489**			
Intercept	**4.076* (2.078)**	**3.847**	**58.934**	**4,071* (2,203)**	**3,416**	**58,596**
Groups with internal repayment problems = 0			*24*			*21*
Groups without internal repayment problems = 1			*53*			*66*
Pseudo R^2 =			*.340*			*.374*
Model significance (*test the joint significance of all independent variables*)*:*						
Chi-Square =			*21.294*			*25.057*
df =			*10*			*10*
P-value =			*.019*			*.005*

****Significance at the 1% level; **Significance at the 5% level*

Notes: The table presents the results from a binary logit model of group internal repayment performance (equation 2). The coefficients (column 2) are maximum likelihood estimates. The statistical significance of the individual coefficients is evaluated by the Wald test. The Wald statistic for a test of a single coefficient (column 3) equals the square of the ratio of the coefficient divided by its standard error and asymptotically follows a chi-square distribution: $W_k^2 = \left(\frac{b_k}{s_{b_k}}\right)^2 \sim \chi^2$ *. Column 4 lists the odd ratios (Exp B).*

Table 5. Constanta and FORA: Binary Logit Model of Group External Repayment Performance

	Dependent Variable: External Repayment Performance					
	FORA			***Constanta***		
Explanatory Variables:	*Coefficient B (Standard Error)*	*Wald Statistics*	*Exp(B)*	*Coefficient B (Standard Error)*	*Wald Statistics*	*Exp(B)*
Peer Support	**0.620* (0.336)**	**3.414**	**1.860**	16,023 (58,11)	0,076	9096945
Dynamic Incentives	0.646 (0.489)	1.746	1.908	-0,826 (0,985)	0,702	0,438
Self-Selection	0.601 (0.708)	0.721	1.825	**8,583** (3,983)**	**4,643**	**5341,925**
Peer Pressure	**-0.972** (0.471)**	**4.264**	**0.378**	**3,585** (1,749)**	**4,204**	**36,065**
Monitoring	0.338 (0.420)	0.649	1.403	-0,231 (0,884)	0,068	0,794
Controlling				**-2,611** (1,214)**	**4,623**	**0,073**
Staff Pressure	0.040 (0.359)	0.013	1.041	1,032 (0,664)	2,411	2,806
Business Correlation	**-0.526* (0.319)**	**2.720**	**0.591**	**-2,263* (1,295)**	**3,054**	**0,104**
Social Ties	**-0.717*** (0.237)**	**9.195**	**0.488**	-1,227 (0,863)	2,023	0,293
Loan Term	**-1.051*** (0.364)**	**8.329**	**0.350**			
Intercept	5.396 (3.525)	2.343	220.438	-13,13 (12,183)	1,162	0
Groups with internal repayment problems = 0			*22*			*8*
Groups without internal repayment problems = 1			*49*			*78*
Pseudo R^2 =			*.463*			*.770*
Model significance (*test the joint significance of all independent variables*)*:*						
Chi-Square =			*28.302*			*37.786*
df =			*9*			*9*
P-value =			*.001*			*.000*

****Significance at the 1% level; **Significance at the 5% level; *Significance at the 10% level*

Notes: The table presents the results from a binary logit model of group external repayment performance (equation 3). The coefficients (column 2) are maximum likelihood estimates. The statistical significance of the individual coefficients is evaluated by the Wald test. The Wald statistic for a test of a single coefficient (column 3) equals the square of the ratio of the coefficient divided by its standard error and asymptotically follows a chi-square distribution: $W_k^2 = \left(\frac{b_k}{s_{b_k}}\right)^2 \sim \chi^2$ *. Column 4 lists the odd ratios (Exp B).*