



Key Factors of Joint-Liability Loan Contracts an Empirical Analysis

Alexander Kritikos

Denitsa Vigenina

European University Viadrina Frankfurt (Oder)
Department of Business Administration and Economics

Discussion Paper No. 231

2005

ISSN 1860 0921

KEY FACTORS OF JOINT-LIABILITY LOAN CONTRACTS

AN EMPIRICAL ANALYSIS

Alexander S. Kritikos* and Denitsa Vigenina*¹

Dept. of Economics, European University Viadrina, Frankfurt (Oder)

Revised version: September 2004

JEL Abstract:

We empirically examine the efficacy of various incentives of microlending contracts such as joint-liability or group access to future loans. We find that joint liability induces a group formation of low risk borrowers. Furthermore, the incentive system leads to peer measures between the borrowers, helping the lender to address the moral hazard and enforcement problem. We also demonstrate that the mechanism realizes high repayment rates, if the loan officers fulfill their complementary duties in the screening and enforcement process. Finally, we show that dynamic incentives have to be restricted if the two problems of joint-liability are to be tackled notably.

JEL classification: D82, G21, O22

*Mailing address:

Alexander S. Kritikos, Denitsa Vigenina
Fakultät für Wirtschaftswissenschaften
Große Scharnstr. 59
Europa-Universität Viadrina
15230 Frankfurt (Oder)
Germany
Email: kritikos@euv-frankfurt-o.de
vigenina@euv-frankfurt-o.de

1. We are very grateful for the comments and suggestions of Martin Bohl, Friedel Bolle, Yves Breitmoser, Marco Caliendo, Jan Krahn, Dieter Nautz, Magdalena Swiniarska, Sophie Schlondorff, and two anonymous referees, as well as of the Seminar participants in Athens, Berlin, Frankfurt (Main), Frankfurt (Oder), Leipzig and of the Sozialwissenschaftlicher Ausschuss des Vereins für Socialpolitik in Graz, 2004. We would further like to thank Giorgi Nadareishvili for the support in the field as well as the team and the borrowers of Constanta who agreed to participate in the questionnaire and who were helpful in many ways, when we designed and conducted the empirical research. Vigenina also thanks for the financial support of Deutsche Bank Stiftung.

I. INTRODUCTION

Until recently, poor persons demanding micro loans which they need to make small investments for their self-employment opportunities, were mostly excluded from the access to credit market. As a consequence, they were either unable to be self-employed, or, if they had started their own business, suffered from under-financing and were not able to expand their business. On a macro-level, the lack of financial capital for small and micro businesses has been a major obstacle to the small-scale private sector not only in developing, but also in transition and, to a smaller extent, in industrialized economies.

The reasons of exclusion contain a risk and a cost component: 1) All persons without collateral are unable to signal their creditworthiness so that banks which secure loans by collateral, are incapable to assess their risk. 2) Given that persons running a micro-business mostly ask for small loan sizes, it is not feasible in the usual banking system to substitute the additional screening and monitoring efforts for collateral. The added cost then surpasses the potential revenues and, thus, most institutional lenders using conventional financial technologies consider the disbursement of micro credits highly inefficient.

During the last three decades, major progress in this sector has been made. The proponents of the so-called micro-finance paradigm showed that the problems can be addressed by creating and implementing new micro-lending technologies. These proved to work quite efficiently in many countries, by giving access to credit to those persons who now became able to signal their creditworthiness at lower cost. The main progress of the Micro Finance Institutions (MFIs) is that they have developed mechanisms where borrowers form groups which jointly share liability for loan delinquencies or default. The incentives set by such contracts enable the lender to reduce *his* cost of screening, monitoring and enforcement.² In the meantime, many variations based on the peer group mechanism have been developed drawing on each country's institutional setting.³ Nevertheless, all mechanisms have in common that there is not one single variable (such as collateral) but a combined set of incentives, as the limited or unlimited liability of each borrower for all other borrowers of the group, the repeated (group) access to further loans if previous ones have been repaid by all group members and the dynamic incentives of increasing loans.

Recent theoretical research (for an overview, cf. Morduch [1999a]) has explained that high repayment rates are likely because the combined mechanism induces borrowers to self-select in homogenous groups of low risks before the loan contract is concluded and it induces

2. Besides the group lending schemes there is a second type of contract also used by MFIs, namely the individual micro-lending contract (cf. Armendariz and Morduch [2000]) which combines the traditional "collateral-based" technology with new elements. The present paper will deal only with group contracts. (For an empirical discussion of the key factors of individual lending schemes, see Vigenina and Kritikos [2004].)

3. In particular, the extent to which a certain kind of liability between the members of a peer group can be enforced by the lender depends on the legal setting and the degree of legal enforcement.

several peer measures within in the group of borrowers if anybody defaults. However, doubts have been raised whether the mechanism is functioning as advertised in these models. Jain [1996, 2003] asserts that factors not considered in the models, like the enforcement process of the loan officers, might be the true reason for the MFIs' success.

Evidence from the field shows that group contracts may work perfectly leading to repayment rates of slightly less than 100%. At times repayment rates dropped to less than 30%, leading to a breakdown of the corresponding MFI. Positive examples were demonstrated at Fundusz Micro (Poland), at BancoSol (Bolivia), at Constanta (Georgia) and last but not least at the trend setting Grameen Bank (Bangladesh),⁴ even though there is lot of discussion regarding the repayment rates of the latter institution (see Morduch [1999b] and Woolcock [1999]). Negative examples were observed in Albania, Malaysia, India and several African countries. The experience from the breakdowns revealed that several *prerequisites* have to be fulfilled to induce high repayment rates: a) the focus on the target group - mostly borrowers who have no access to the regular banking system should be accepted, otherwise the non-refinancing threat will not be meaningful; b) the deliberate grouping by its eventual members and not by the loan officers to ensure mutual responsibility for the joint-liability; c) the restriction of the group size; and d) the enforcement of the group liability mechanism - exclusion from access to further loans must be made real to the complete group if it fails to repay all loans.⁵

There is less evidence which incentives induce loan repayment when these prerequisites are met. Therefore, this paper examines what factors improve and what factors have no measurable or even a counterproductive effect on loan repayment. Furthermore, the paper analyzes to what extent the theoretically predicted multi-stage process between borrowers takes place, and to what extent other actions of the loan officers secure the loan repayment. The data for our tests was obtained through questionnaires and was completed in cooperation with the MFI "Constanta" in Georgia during the winter term of 2001/2002.

The rest of the paper is organized as follows. Section two describes the group-lending methodology of Constanta. In section three, a brief review is given of the group-lending mechanism to the extent that is relevant for the present research. In section four, the empirical results are presented, showing which factors influence the repayment behavior. Section five concludes and derives some policy recommendations, unfolding that the main problems of the joint-liability approach, the mismatching problem and the domino effect, can be addressed by sufficiently restricting the long-term dynamic incentives.

4. For a description of the lending schemes of the Grameen Bank, see Hashemi and Schuler [1997], for BancoSol, see Navajas et al. [2000], for Fundusz Micro, see Nagarajan [2000]. The Microlending organization "Constanta" will be described in the present paper. An overview over most existing institutions is provided by the Micro Credit Summit [2002].

5. cf. Gibbons and Kasim [1990], Krahn and Schmidt [1994], Sharma and Zeller [1997], Kritikos [1999], Ghatak and Guinnane [1999], and Woolcock [1999] for a discussion of these four prerequisites.

II. GROUP LENDING AT THE MFI CONSTANTA IN GEORGIA

The Lending Methodology: Since October 1997, Constanta provides micro-loans to groups with no collateral requirements, targeting mostly poor micro-entrepreneurs. The lending technology consists of repeated loans with a term of 4 months which have to be repaid in weekly installments. Loans are granted to groups of 7 to 15 clients. Group members guarantee each others' loans, and all of the group's loans must be repaid on time to have access to subsequent loans. The initial loan size is 100 to 200 Georgian Lari (GEL) (i.e. 50 – 100 Euro). Loans increase in each cycle by not more than 50% of the previous loan amount. The MFI charges an interest rate of 4% (flat) per *month*. For a loan of 100 GEL, with a loan term of 4 months, and an interest rate of 4 percent per month the total interest payment is 16 GEL. The total amount of 116 GEL should be repaid in weekly installments of 7.25 GEL each. Eligible to borrow from Constanta are persons who are over 18 years old, have started their business and possess at least six months of working experience.⁶

The Lending Procedure and Enforcement Measures: Clients form their groups deliberately. No family members are allowed, since earlier experience showed that close relatives were not willing to impose social sanctions. Loan officers do not intervene in the process of group building. When a group has been formed, members meet with a loan officer and attend five training meetings and the loan officer visits each group member's business to evaluate the his financial situation. The process between first meeting and loan disbursement takes about 2 weeks. After the loan disbursement, there are no further official meetings. To show their presence, loan officers make random visits to their borrowers. Further loans are disbursed (based on a highly standardized procedure) when the entire group has paid back its previous loans and presented its actual financial results.

Payments are considered delinquent if one currency unit is not repaid on time. In this case, the delinquent member has to pay 1% of the late installment as a fine. In addition, after the first late payment, group members are allowed to increase their maximum loan size by only GEL 25 (instead of 50%) in the next cycle. The second late payment reduces the increase to GEL 15. After more than two late payments, the loan size will not increase at all. If arrears occur, loan officers become permanently present in the group and exert high pressure on all members of the delinquent group until the complete installment has been collected. In fact, at the branch of Batumi where the questionnaire was conducted, only two groups refused to pay for a delinquent borrower. These groups were excluded from access to further loans and sued. In this context it should be emphasized that the borrowers are also allowed to exclude single members of their group if these proved to be defaulters.

6. One special setting of Georgia needs to be emphasized. After a complete breakdown of the financial system, borrowers are reluctant to deposit savings in any kind of banking organization. Therefore, Constanta abandoned the use of the mandatory savings component which is a usual incentive instrument of MFIs.

Branch Performance: Constanta operates in the urban areas of Tbilisi, Gori, Batumi, and Marneuli. The visited branch of Batumi has more than 2.000 clients and was in 2002 operationally self-sufficient. The number of clients reached by Constanta's loan officers is approximately 400 per officer which corresponds to the international standards (cf. Woller and Schreiner [2002]). The loan officers are offered a performance-based wage comprising a fixed amount and a bonus contingent on individual performance, calculated by a formula that combines stock, flow indicators and strategic ratios, and which may not exceed 3/5 of the fixed amount. One success measure of each lending organization is its repayment rate. The repayment rates at the Batumi Branch for the year of 2001, defined as the collection on current amounts due divided by the total current amounts due, was between 98.91% and 99.95%. By the end of 2001 only 1.9% of all active borrowers were delinquent.

III. PREVIOUS RESEARCH

III.1 Theoretical Models

The theoretical literature on micro-lending addresses the central problem of designing mechanisms in a way that borrowers have an incentive to repay their loans. This research has analyzed how the typical problems of a loan contract can be solved by the joint-liability approach as used by Constanta and other MFIs.

Before contracting, lending organizations are confronted with the problem of attracting high risks. Theoretical papers (see Varian [1990], Ghatak [1999], Kritikos [1999], Van Tassel [1999], Armendariz and Gollier [2000], Laffont and N'Guessan [2000]) show that the incentives derived from the joint-liability mechanism induce similar risk types to group together if the borrowers have sufficient information about each other.⁷ The reason: any risk type of borrower who aims to maximize his utility will try to keep the probability of default within the group as low as possible. Therefore a low risk type will reject a matching with a high risk type. As a first result, low risk types are teamed with low risk types and high risk types with high risk types – an outcome which is subsequently called 'assortative matching'.

High risk types will face higher borrowing cost than low risk types although all groups have the same charges. Since they are more likely to fail, successful high risk types (being in a group with a failed partner) are more likely to have joint-liability payments. Consequently, due to more failures the additional borrowing cost in the group might become so high, that the expected total return is negative for high risk borrowers. It is, then, a second result of the mechanism that only low-risk types will apply for loans with joint-liability. The problem of adverse selection is reduced by a self-selection process.

7. Hoff and Stiglitz [1990] and Khandker [1998] provide evidence supporting the assumption that borrowers may generate sufficient information about each other and about the structure of the local markets.

Having signed the contract, moral hazard and negative repayment behavior are the main problems of lending money. The analysis of group contracts show that an access to higher loans (dynamic incentives) induces peer monitoring, peer support and peer pressure among the borrowers when access is made dependent on the repayment of all borrowers in the group (cf. Stiglitz [1990], Varian [1990], Banerjee et al. [1994], Besley and Coate [1995], Hulme and Mosley [1996], Kritikos [1999], Armendariz and Morduch [2003]). Threatened with exclusion from further loans if one (or more) of its members is not able to repay (a failure burdening the rest of the group with additional payments), each person will monitor the other members so that investments are undertaken in a profitable way. Further, each person will support the other group members if they face repayment problems they are not responsible for, and each borrower will be put under pressure if he misuses his loan. As a result, the probability of moral hazard is reduced because, by introducing joint-liability contracts, a considerable part of the risk is transferred from the lender to the borrowers.

Similar reasoning holds for the problem of strategic default when borrowers are able but unwilling to meet their obligations. The lender's enforcement capacity is created through the termination threat (cf. Besley and Coate [1995], Armendariz [1999], Kritikos [1999]). With joint-liability, if a borrower rejects to repay his share of the loan, the whole credit group is considered as being in default losing access to subsequent loans. This induces the group either to repay for the delinquent partner, or to exert social pressure on him. As a consequence of these incentives, lenders are able to achieve the repayment of all loans with high probability, if the prerequisites a)-d) mentioned in section 1 are met.

The main problem of the joint-liability mechanism arises from the termination threat. If a group, not able to repay the loan of one defaulting member, is excluded from further loans, we may observe a domino effect. In this case, the group members' best strategy is not to repay their loans either because all members will be excluded irrespective of their individual ability to repay their own loan (cf. Besley and Coate [1995], Paxton [1996], Kritikos [1999], Rai and Sjöström [2004]). This outcome is disadvantageous for the MFI because all other group members except the defaulter could have repaid their loans.

From a theoretical point of view, the probability of group defection can be reduced if the contract is designed in a way that it pays only for low-risk borrowers to apply for a joint-liability loan (as shown earlier in this subsection). In these groups, the probability is low that more than one borrower will be unable to repay, provided that the business correlation of the borrowers is not too high (cf. Kritikos [1999]). In the case of one defaulter the MFI can be almost sure that the rest of the group will be able to cover his installments.⁸

8. Field experience shows that MFIs focus on this problem. Loan officers evaluate the ability of a group to cover a defecting member's installment. Repayment schedules are designed in a way that each borrower, assuming his business develops as planned, is able to cover his own rates and (partly) those of his peers.

III.2 The Research Agenda

The empirical literature has only partly examined to what extent the incentive components are effective in improving loan repayment. In particular, we examine to what extent all kind of group processes as self-selection and peer measures are observed in reality and influence the repayment behavior. With respect to the group selection process before loan contracts are signed, there are the following issues at stake: First, to what extent is the group, if self-selected, homogeneous with respect to risk-taking behavior and with respect to other characteristics? Secondly, do social ties between the members of a group have any impact on their behavior? Third, do only low-risk borrowers team up to groups?

After the loan disbursement, we address the following questions. Is the set of incentives sufficient to make the loan repayment an *individually* rational choice where no peer components need to be activated, or is it foremost the group mechanism which induces peer monitoring, peer pressure and peer support, then leading to high repayment rates. If the group is active, what are the intentions of the group members when they exert their peer measures. To what extent are further factors beyond the joint-liability mechanism, such as dynamic incentives or other collateral substitutes, necessary to maintain high repayment rates? If repayment problems arise, the impact of loan officers needs to be analyzed in this context. Do they exert outside pressure on defaulting members of a group?

III.3 Earlier Empirical Evidence

Some questions have been addressed. Wydick [1999] who uses data of ACCION in Guatemala, focused his empirical investigations on the impact of different kind of social cohesion on borrowing group performance: social ties, peer monitoring, and peer pressure. Strong social ties proved to have a rather negative effect on group behavior – a result which received further support from the study of van Bastelaer and Leathers [2002] in Zambia and Ahlin and Townsend in Thailand [2003]. Improvement of the repayment performance was associated mostly with variables used as proxies for peer monitoring and peer pressure. However, Mondal and Tune [1993] emphasize that too weak social ties may also lead to negative outcomes, if there is no willingness to support the fellow group members.

The findings of Zeller [1998] are different, showing that in Madagascar groups with a higher level of social cohesion had a significantly higher repayment rate. Wenner [1995] used the data from 25 Costa Rican FINCA credit groups to study the validity and cost-effectiveness of group lending as a means to transmit informations about borrowers. He found that members of groups engaged in formal screening with an internal code of regulations had a low probability for delinquency, indicating that screening indeed resulted in an informational efficiency gain, a result which is supported by Zeller [1998].

Paxton [1996] investigated the group dynamics of the MFI “Le Project de Promotion du Petit Credit Rural” in Burkina Faso. The results indicated that urban, homogeneous groups with sufficient training and reliable leaders had the highest probability of repaying their loans. Moreover, a domino effect was observed, thus influencing the loan default rate. Paxton [1996] also found another obstacle, namely a long-term mismatching problem, not discussed in theory. It states that groups tend to experience repayment difficulties after several loan cycles which they could not foresee during the process of building the group. As loan sizes increase due to the dynamic incentives, preferred loan terms and volumes will differ with the consequence that borrowers with smaller loan volumes will reject joint-liability for borrowers with higher loan volumes in the same group if the latter run into repayment difficulties. Paxton [1996] showed that the probability of loan repayment may decrease if a group runs into the mismatching problem. Similarly, Godquin [2002] discovered, as well, that the borrowers’ repayment performance deteriorated with the age of the group.

IV. EMPIRICAL TESTING OF THE MICRO-FINANCE MECHANISM OF CONSTANTA

In this section we present the sampling design, the data and the results of our survey which allows us to test the effectivity of all components of a micro-lending contract. By using a questionnaire, we surveyed 108 randomly selected groups of the Batumi branch of Constanta⁹ (24% of all groups). To exclude correlated answers, one randomly selected member of each group was questioned and his answers were considered representative for the whole group.

The questionnaire focuses on the process of group formation, loan repayment and income performance, and on activities between group members after the loan disbursement. All questions were close-ended, enabling the borrowers to give precise and unambiguous responses. When necessary, additional explanations were given by the interviewers. No serious problems with missing values occurred. To assess the trustfulness of the interviewee’s responses we asked the clients whether they would be able to borrow from other official credit institutions in the region. 97 interviewees answered truthfully (those without collateral, 89% of the borrowers, would not have access) and were included into the sample.

To study the dynamics of the group-lending mechanism, we define several hypotheses which are related to the theoretical results shown in section 3.1. Then we designed an econometric model which replicates the two-stage nature of the principal-agent relation: the mutual screening process before signing the loan contract, and the mutual monitoring and enforcement process after the credit disbursement. The aim of the model is on the one hand to test in what way the theoretical predictions are correct and on the other hand to discover novel empirical relationships beyond existing theories.

9. Batumi is the capital city in the region named Adjara, an area which shows no economical or cultural differences in comparison to the other parts of Georgia. The lending technology used in the local branch of Constanta does not differ from the technology applied in the other regions of the country.

IV.1 Assortative matching

IV.1.1 Hypothesis

Starting with the analysis of group formation, we aim to identify what variables influence the process of self-selection. Theoretically, the key factor of group lending is that types with similar repayment risks will group together. We test the theoretical outcome by the following

Hypothesis 1: The lower the interviewed borrower’s probability for a loan default is, the lower is the risk of the business projects of all peers in his group.

We apply an econometric model, which is constructed so that it captures the most important factors contributing to the self-selection process (equation 1). An ordered logit model was specified to obtain the coefficient estimates.

Group quality (GQ) = f (borrower’s risk type (RT), information (I), education (E), credit needs (CN), relationship (R), monitoring (M), peer control (PC), peer pressure (PP))

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

where $j = 1, 2, \dots, J$ indicates the ordered categories in the dependent variable.

The dependent variable, *group quality*, indicates how the borrower evaluated the risk of the business projects of his peers at the time the group was formed (a scale ranging from 1- “all businesses were quite risky” to 5- “all businesses were quite safe”). It is an aggregate assessment of the group members’ risk characteristics, excluding the interviewed borrower.

The interdependence between *group quality* and the independent variable, *borrower’s risk type*, enables the testing of hypothesis 1. In contrast to *group quality*, which shows the risk characteristics of the group, *borrower’s risk type* reflects the risk profile of the interviewed borrower. It is computed as a cluster analysis score using the following three indicators: 1) borrower’s average monthly business income measured as an interval that ranges from 1- “up to 100 GEL” to 5- “more than 400 GEL”, 2) development of the monthly income after the disbursement of the first loan (1- “decreased substantially” to 5- “increased significantly”), and 3) borrower’s own assessment of the stability of his business project (1- “quite unstable” to 5- “very stable”). Three clusters were specified: “low risk” (24% of the interviewed borrowers), “intermediate risk” (44%), and “higher risk” (32%) (see Table 1).

- insert Table 1 about here -

The second independent variable, *information*, indicates how well the borrower knew the business projects of his peers at the time the self-selection took place (from 1- “no

information at all” to 5- “detailed information about all projects”). It is often assumed (cf. Stiglitz [1990]) that group members have perfect information about each other.

Variables *education*, *credit needs*, and *relationship* show whether certain personal characteristics help the applicants to enter a certain group. *Education* (a dichotomous variable taking a value of 1 if the respondent has a university degree and 0 otherwise) stands for higher knowledge and better learning skills. The parameter coefficient should be positive if the assumption holds that higher educated people become better entrepreneurs. *Credit needs* indicates how much money the interviewed client would have borrowed from Constanta assuming that there were no constraints on the loan size. It is an interval ranging from 1-“up to 500 GEL” to 5- “more than 2.000 GEL”. *Relationship* (a nominal 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, and 3- if the group members are just partners) shows whether kinship or friendship provides any advantages to the applicants in the selection process.

The other exogenous variables test whether the groups of lower risk have internal rules that are stricter than the rules followed by the borrowers from higher risk groups. *Monitoring* indicates the frequency of meetings between group members (from 1- “once a month” to 5- “every day”). *Peer control* shows how often the borrowers discuss their business problems within the groups (1- “never” to 5- “on a regular basis”). *Peer pressure* measures the group members’ willingness to sanction delinquent partners. It is a latent variable extracted by a factor analysis using the following three highly correlated variables: (1) pressure the group exerts or would exert on a delinquent member (answers rating from 1- “no pressure” to 5- “extremely strong pressure”), (2) sanctions the group imposes or would impose on a delinquent member (from 1- “no sanctions” to 5- “immediate exclusion from the group”) and (3) sanctions the MFI imposes or would impose 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”).

IV.1.2 Empirical Results

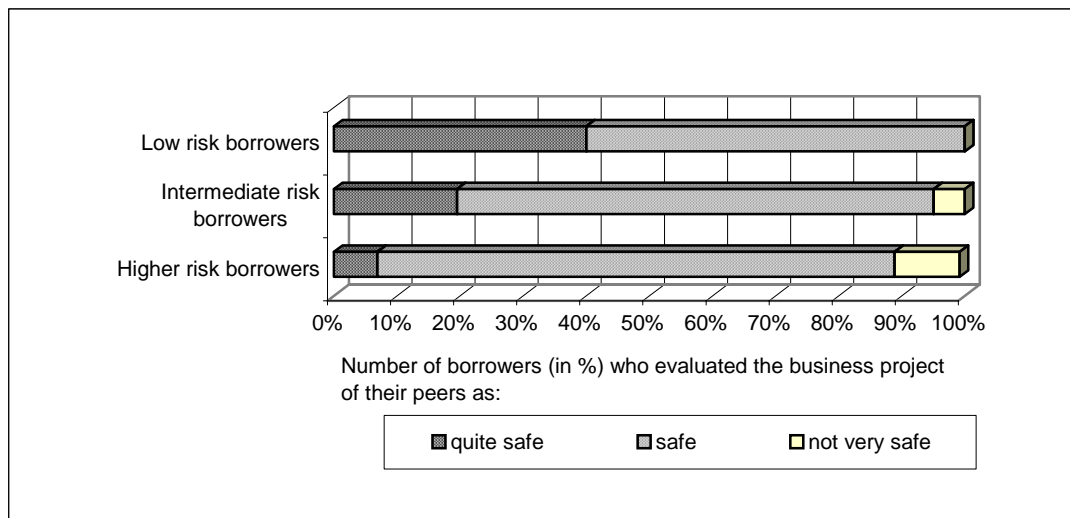
We evaluate the efficiency of the self-selection process by applying the specified econometric model to the empirical data. Descriptions and descriptive statistics on all key variables are presented in Table 2. Note that the dependant variable, *group quality*, has only three categories, even though by definition it could take five values, from 1- “all businesses quite risky” to 5- “all businesses quite safe”. In our survey none of the borrowers chose answers (1) or (2) - indicating high risk businesses.¹⁰

10. At first glance, this outcome raises the question of biased answers. However, there are good reasons to reject such conjecture. Firstly, the variable group quality is not a self-report of the risk-characteristics of the interviewed borrower, but an aggregate evaluation of the other group members. Secondly, the mere fact that

- insert Tables 2 and 3 about here -

The empirical results are listed in Table 3. *Risk type* and *information* significantly influence the *group quality*. Figure 1 illustrates the first part of this finding by showing that the borrowers with lower risk characteristics have chosen partners with more reliable business projects. The significance of the second variable, *I*, makes clear that borrowers a priori do not dispose all necessary information about their perspective peers as assumed in theory.¹¹ The other independent variables are statistically insignificant, showing that personal characteristics do not substantially influence the process of self-selection.

Figure 1: Borrowers' Self-Selection



Result 1: The group formation is influenced by the two variables *Borrower's risk type* and *Information*. In favor of hypothesis 1, we found that lower risk borrowers, by making use of the local information which is also generated during the selection process and which is only available to them, indeed team up with lower risk borrowers and vice versa.

Result 1 is also fundamental to the further analysis. For that we may return to the business risk of the 'other' borrowers in each group as it is assessed by the interviewed borrower. As emphasized in section 3.1, theory makes two propositions with respect to assortative matching if the group-lending contract is properly designed. The first proposition that an applicant who believes that his perspective peers run unprofitable businesses would not join the group, is supported by Result 1. The second proposition that only low risk borrowers should be attracted to peer group loans is supported by the fact that no borrower evaluated his peers' projects as high risk businesses. Thus, due to the borrowers' self-selection process and due to the fact that almost no default occurred, we may conclude that no high risk businesses were able to build a stable group and to receive a group loan.

there were almost no defaulting borrowers corresponds to the interviewee's assessment that his peers are not running any high-risk businesses. We return to this conjecture when discussing result 1.

11. This supports the critical discussion of Jain and Moore [2003] about the information status of borrowers.

IV.2 Testing the efficiency of the applied incentive mechanisms

IV.2.1 Hypothesis

When loans are disbursed, it is hypothesized that the mechanism gives borrowers either a direct incentive or, via the induced behavior of peer monitoring, peer pressure, and peer support an indirect incentive to both choose investments of low risk and refrain from strategic default, mitigating the problems of moral hazard and contract enforcement:

Hypothesis 2: The repayment rate will significantly improve if peers (1) monitor each other more intensively; (2) impose stronger social sanctions; (3) show more willingness to provide peer support; and (4) appreciate the opportunity to have access to subsequent loans and (5) to higher loan volumes.

We take into consideration the dynamics of the group-lending mechanism. Borrowers may choose between different strategies. If all group members decide for the same move, contribute their shares or defect, the outcome is straightforward. The group repays or defaults. If the group members choose different moves, they have to go through the second stage of their repayment decision. Those borrowers ready to contribute their shares, need to compare the discounted benefits of having access to further loans with the cost of repaying the outstanding loan(s). They have to decide whether to force the delinquent partner(s) to repay, or alternatively, to make up for the difference and to exclude the defaulters.

To capture all aspects of the decision making, two equations are introduced. At the first stage, to be called ‘internal repayment performance’, the members of the groups decide about their repayment without being delinquent. At the second stage, to be called ‘external repayment performance’, behavior is observed when the repayment was due and when loan officers may put the group under pressure. Equation (2) (see also Table 4 in the Appendix) reflects the dynamics of the first stage of the repayment decision and shows all major factors that affect the internal repayment performance between the members of the credit group. The dependent variable is dichotomous with a value of 1 if there were no cases of internal delinquency in the group and 0 otherwise. A binary logit model is specified.

Internal delinquency (ID) = f (borrower’s risk type (RT), peer control (PC), peer pressure (PP), peer support (PS), dynamic incentives (DI), staff pressure (SP), business correlation (CORR), social ties (ST))

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

Equation (3) (see also Table 5 in the Appendix) replicates the second stage of the repayment decision. We aim to find the characteristics distinguishing between groups with external repayment problems from groups with perfect repayment history or groups which experienced

internal repayment problems but solved them without violating the repayment schedule. We use a multi-nominal logit model where the dependent variable can take three values: 1 if there were no repayment problems in the group, 2 if the group had internal repayment problems but solved them, and 3 if there were cases of external delinquency in the group.

Delinquency status (DS) = f (group quality (GQ), peer control (PC), peer pressure (PP), peer support (PS), dynamic incentives (DI), staff pressure (SP), business correlation (CORR), social ties (ST))

$$\ln \left[\frac{P(DS = j)}{P(DS = 3)} \right] = \alpha^j + \delta_1^j PC + \delta_2^j PP + \delta_3^j PS + \delta_4^j DI + \delta_5^j GQ + \delta_6^j SP + \delta_7^j CORR + \delta_8^j ST \quad (3)$$

where $j = 1, 2$ refers to the delinquency status of the borrowing groups as described above, and $P(DS = 3) = 1 - P(DS = 1) - P(DS = 2)$.

To verify the validity of hypothesis 2 we perform tests for parameter significance of the variables *peer control*, *peer pressure*, *peer support* and *dynamic incentives*. A description of the first two variables is provided in section 4.1.1. *Peer support* shows the willingness for mutual help among group members. It is a dichotomous variable with a value of 1 if ceteris paribus borrowers prefer group to individual lending and 0 otherwise. *Dynamic incentives* is a factor analysis score measuring to what extent the borrower values the access to subsequent loans that are (1) of a bigger size, (2) at lower interest rate, (3) with longer terms to maturity, and (4) at lower transaction costs.

The RHS of both equations contains four more variables, which may influence repayment behavior. The *borrower's risk type* in equation (2) and *group quality* in equation (3) are expected to be correlated where the internal repayment performance is affected by the individuals' risk and the external repayment behavior depends on the characteristics of the complete group. *Business correlation* shows to what extent the returns of borrowers are linked to each other, because of mutual trading activities, common clientele, common suppliers, etc. The degree of interdependence is measured on an ascending scale from 1- "no correlation among members' businesses" to 5- "extremely strong correlation". The variable indicates whether risk diversification matters.¹² *Social ties* reflects the degree of homogeneity among the group members with respect to social characteristics.¹³ The last variable, *staff pressure*, shows how often the loan officers pay a visit to the group members (1- "less than

12. For a discussion about the relevance of risk diversification, cf. Krahn and Schmidt [1994]. A different argument is raised by Armendariz de Aghion [1999] who asserts that a high business correlation would guarantee better (if not excessive) monitoring, which reduces the probability of strategic default. This argument is in contrast to Krahn and Schmidt [1994] insofar as they expect a lower repayment probability for a high business correlation, while Armendariz de Aghion [1999] expects a higher repayment probability.

13. Common characteristics shared by the group members are gender, age, education, income, and place of living.

once a month” to 5- “several times a week”). It is a proxy of the loan officers’ monitoring efforts.

IV.2.2 Empirical Results

The empirical results from the specified binary and multinomial logit models are presented in Tables 4 and 5. The coefficients are maximum likelihood estimates. The parameter significance is evaluated by the Wald statistics.

IV.2.2.1 Internal Repayment Performance

In our sample 24 % of the groups experienced repayment problems. Table 4 shows that there are two variables which significantly influence the internal repayment performance: *peer support* and *peer pressure*. Internal solutions to the repayment problems were then realized when the borrowers were willing to support or control their delinquent peers.

- insert Table 4 about here -

Starting with *peer support* which takes a value of 1 if borrowers prefer group to individual lending we found that the group contract was preferred by 30% of the groups. In these groups, by supporting the delinquent partner, *all* problems of delinquency were solved, even without informing the staff. In groups whose members prefer individual lending, in only 60% of the cases with internal repayment problems the group managed to repay the entire debt on time. Most of them did it by imposing sanctions on the defaulting member and eventually forcing him to repay, whereas only a minority solved the problem by making up the difference.

In this context it has to be mentioned that the main reason of borrowers to prefer the group to the individual lending scheme, is their confidence in the group’s willingness to provide mutual help either by temporarily covering repayment obligations or by offering labor support which usually prevents the occurrence of repayment problems. Vice versa, the absence of peer support in a group implies that each borrower has to manage his problems independently, thus increasing the probability of failure. We conclude with:

Result 2: Groups with a preference for group loans show more willingness for *peer support* so that the probability that a group member ends up with a repayment problem is smaller than for groups where the borrowers preferred an individual lending scheme.

We also analyze whether the willingness to provide peer support changes over time when, according to Paxton [1996], more and more problems are expected to occur (due to a potential mismatching). We measured the sensitivity of group support to the loan cycle by separately applying the econometric model to two sub-samples of borrowers, the first one with three or less loans and the second one with more than three loans. *Peer support* is statistically

significant only in the second sub-sample. We may conclude that group support grows stronger in the course of time (which is also in line with recent findings of Murgai et al. [2001]). This finding gives evidence to the viability of group lending and its ability to generate high repayment rates over a relatively long period of time. The results presented here are different to those of Paxton's [1996] investigation with respect to the mismatching problem. We will return to this contradicting evidence in the next section.

Peer control is the second significant variable. Its coefficient surprisingly exhibits a negative sign. To interpret this result, we assert that for most of Constanta's borrowers, the exchange of business information is more a corrective measure than a preventive one.

Result 3: The more repayment difficulties arise in a group, the more intensive the intra-group exchange. At the MFI Constanta, the real state of the investments is verified if one group member declares inability to repay. *Peer control*, then, accounts for the borrowers auditing effort, where the business conditions of the delinquent peers are analyzed.

IV.2.2.2 External Repayment Performance

Internal delinquency is an intra-group problem and does not affect the lender. The MFI is usually not aware of all cases of internal delinquency because borrowers may solve their problems within the group. By employing equation (3), we analyze the impact of joint-liability contracts on groups which were not able to pay the weekly installments on time. Table 5 presents the estimates of the applied multinomial logit model. Column (1) reveals the variables differentiating between 'perfect payers' and 'defaulters', whereas Column (2) compares 'defaulters' with groups whose members solved their repayment problems by their own. From the statistical properties of the variables *group quality*, *peer pressure*, and *staff pressure* we may conclude that the members of the groups, which are most likely to promptly fulfill their repayment obligations, run safer businesses, exert stronger pressure on delinquent partners, and communicate more often with the loan officers. The negative coefficient of *business correlation* points to a problem which several MFIs face, namely the vulnerability to external shocks of groups where the returns proved to be positively correlated.

- insert Table 5 about here -

Starting with the variable *peer pressure*, it shows to be significant in both cases, indicating that the probability of default is considerably smaller for groups whose members impose or threatened to impose social sanctions.

Result 4: *Peer pressure* significantly improves the external repayment but does not influence the internal repayment performance indicating that most borrowers of Constanta exert peer pressure only if a repayment problem has occurred. The result is confirmed by the negative sign of the *peer control* variable in Column (1).

A further crucial factor is the self-selection process. While the *borrower's risk type* showed to be not significant for the improvement of the internal repayment performance (Table 4), the significance of the *group quality* variable (Table 5) indicates that groups consisting of higher-risk borrowers are more likely to be delinquent than groups formed by low-risk clients. Repayment difficulties made it then necessary that peers and loan officers exert pressure upon the delinquent borrowers to make them repay their overdue rates.

Result 5: Even though higher-risk borrowers did not default more often than low-risk clients, in case of delinquency higher risk borrowers were less able to employ support measures for solving repayment problems internally before a rate is due. Instead peer pressure was mostly necessary to ensure a delayed repayment of the loan rates.

Column (2) reveals further support with respect to this finding. Focusing on the role of the loan officers and their influence on the group dynamics, we observe that most of the groups who experienced internal repayment problems but successfully solved them had been more intensively monitored by the loan officers.

Result 6: *Staff pressure*, being significant, shows that the control exercised by the MFI over the problematic groups improves the cooperation among the members.

A further interesting finding can be derived from a comparison of the statistical characteristics of the variables *group quality* and *social ties*. *Group quality* specifies the members' business characteristics whereas *social ties* measures the homogeneity of the group in terms to several demographic and social factors. The significance of the former and the insignificance of the latter indicate that the lender's repayment performance can be improved only if clients build groups of similar investment risks. Other group characteristics have no impact. These results are similar to the findings of Wydick (1999) where social ties proved to have no (or a negative) effect on borrowing group behavior.

The variable *business correlation* measures the degree of interdependence across members' businesses. With respect to this variable one has to take the negative consequences of bad risk diversification into account as well as the potentially positive consequences if the borrowers monitor each other in a better way (see Footnote 12). In Constanta the variable negatively affects the expected return of the lender:

Result 7: (1) An increase in the (scale of) *business correlation* significantly raises the probability that all group members will suffer the same negative shock, then leading to more delinquencies. (2) Regressing the *business correlation* variable on *monitoring* shows the coefficient to be insignificant (with a *p*-value of 0.698).

IV.2.2.3 Testing the Influence of Further Variables

In the final subsection, we analyze two further variables often discussed in the context of group loans, namely the insignificance of *dynamic incentives* and *gender aspects*.

Result 8: The variable *dynamic incentives* does neither affect the internal nor the external repayment performance of the borrowers of Constanta.

An explanation for this surprising result is that Constanta's clients, having small, and only occasionally developing businesses, were not in need of a stream of increasingly larger loans. To test for reliability we checked whether there is any correlation between the dynamics of a borrower's business and his demand for increasing loans. A Spearman's non-parametric test (Table 6) shows that the two variables are positively correlated (at .05 significance level). The more dynamic the development of the business project the higher the borrower values the opportunity to obtain larger loans. After the first loan cycles, however, many of Constanta's clients refuse to increase the borrowed amount, showing that access to *subsequent* loans is an issue, while increasing loan size is not.¹⁴

- insert Table 6 about here -

Some credit programs like the Grameen Bank explicitly target *women*, which suggests that women are better borrowers than men because they have a better developed sense of group solidarity (cf. Bernasek and Stanfield [1997]). Others (cf. e.g. Rahman [1998] or Kritikos and Bolle [2000]) argue that there are differing reasons (although highly correlated with gender aspects) for the better repayment behaviour of this target group, such as fewer borrowing possibilities or greater responsibility towards the family. In 1997, Constanta offered loans only to women, but successfully expanded its activities to male borrowers. The empirical data show that women do not outperform men.

V. CONCLUSIONS AND POLICY RECOMMENDATIONS

The aim of this study is to investigate the complete dynamics of joint-liability micro-lending technologies. The results enable us to explain three puzzles of micro-finance. The *first puzzle* focuses on the impact of joint-liability contracts on the behavior of borrowers. Starting with the hypothesis of assortative matching, the empirical results support the theoretical proposition that low risk borrowers indeed team up with low risk borrowers. Since virtually all borrowing groups repaid their loans, it seems that the MFI Constanta was also successful in meeting the second hypothesis of assortative matching: Potential borrowers with high risk characteristics did not apply for this kind of loan contract confirming the hypothesis that the mechanism supports efficient self-selection.

14. Since the next loan actually disbursed depends on the business needs and reported cash flow of each borrower the observed average increase is only 15 to 30%.

Focusing on the clients' behavior after the contract signature, there exist sufficient *individual* incentives for each group member to repay his loan as long as his business develops well. Strategic defaults were not a serious problem. Moreover, there was no incidence of excessive monitoring: borrowers had not experienced pressure from their peers to invest only in certain projects. Whenever repayment problems were created (e.g. by external influences), the incentive system did, in fact, cause *mutual* activities. At the MFI Constanta, peer support grows stronger over time, in particular when the group members prefer joint-liability to other schemes. Peer pressure and controlling are used by borrowers mainly as corrective measures and help the MFI solve the enforcement problem.

As the variables *external repayment performance* and *business correlation* showed, a cost-effective MFI should also restrict its offers to borrowers where the expected marginal enforcement cost is covered by the expected marginal revenue of the group and it needs to take care for the business correlation of the group members before the group formation.

Let us turn to the *second puzzle*. In theoretical papers, it is emphasized that the joint-liability contract leads to an efficient self-selection and to peer measures so that almost all problems of moral hazard and adverse selection are solved by the borrowers themselves. The screening, monitoring and enforcement efforts of lenders are not explicitly considered. At the same time several micro-lending practitioners claim that high repayment rates occur only because of the activities of loan officers (cf. e.g. Jain [1995]). As emphasized in section 2, each lending organization indeed spends money, time and effort in the process of group building, after the loan disbursement and, in particular, in case of delinquency.

The empirical results of the present paper support the existence of both, activities between the borrowers and by the loan officers. It allows for the conclusion that the activities of the loan officers have a rather complementary effect on the efficacy of the mechanism. The screening process is complementary in the sense that, while there is deliberate grouping, loan officers take restrictive measures towards the freshly created borrower group. The loan repayment performance will be better, if the loan officers ensure that the prerequisites mentioned in section I are met, that the loan sizes are not too high in relation to the expected cash flow of the borrowers, and that the businesses are not correlated.¹⁵

In this context, it has to be emphasized that it is important for another reason that the loan officers threaten to use the known sanctions of the joint-liability approach on the first day a group is in arrears. The probability that a delinquent borrower will be able to "save" his business from insolvency is higher the earlier the appropriate measures are taken for a positive turn-around of the business (see e.g. Evers et al. [2000]). In short, the loan officers,

15. Screening activities were not included as an explanatory factor in the model due to the highly standardized screening procedure. They are fixed and do not substantially vary among the current clients.

by making immediate use of the “letter of the law”, induce borrowers to better solve their repayment problems. Thus, our answer to the second puzzle is: The mechanism performs as described in theory, if the loan officers fulfill their complementary duties.

The *third puzzle* focuses on the result that the variable *dynamic incentives* proved to have no impact on the repayment performance at Constanta. This puzzle can be solved if a further factor is analyzed, namely the long term development of borrowers in a group. We suggest that there are two typical forms of long-term development of borrower groups. According to recent research (Lazear [2003] and Kritikos and Wießner [2004]), we may differentiate between entrepreneurs who are characterized by their skills and abilities in the decision process of developing a business project. Depending on their skills, there might be entrepreneurs who are able to realize a business of increasing size (to be classified as *dynamic business*), and there might be entrepreneurs who are running – due to their lower skills - a business with less or no dynamic perspective (to be classified as *static business*).

Entrepreneurs who formed groups of dynamic investments respond positively to dynamic incentives. However, after some loan periods, due to the more dynamic investments they have a higher probability of running into a long term mismatching problem. This mismatching problem may lead to differing outcomes. Some of the businesses in a group might be able to gain high profits while others may suffer losses. Then, a domino effect may be unleashed, according to which the defaulters in the group (who generate losses) may encourage those borrowers (who generate profits) to decide for default, as well. The probability that such a group will run into repayment problems will *increase* over time.

The second investment type concerns a group making investments with low development prospects. Such groups need access to further loans (and feel sanctioned from the threat of exclusion), but do only initially – during the first loan periods - respond to dynamic incentives. Over the course of loan periods, due to their relatively static investments, they have no mismatching problems because the probability of having one group member with high profits and another one with no profits is low. If these borrowers deliberately chose this kind of contract, they will be willing to provide peer support. The probability that a complete group such as this will run into a repayment problem *decreases* over time.

It is in the interest of MFIs to minimize the probability of a domino effect. The variable ‘dynamic incentives’ in group-lending methodologies should be restricted. Long-term prospects within group loans should only be given to investments with low development perspectives. Borrowers with dynamic investments who make use of group loans in the beginning will then switch to individual credit offers if they are in need of higher loans. Since such a restriction is in sharp contrast to the aim of many MFIs to become financially self sufficient (cf. Schreiner [2002] and Woller [2002]), MFIs which restrict the size of their group loan, should also start to offer individual loans for those clients who are in need of

higher loans and who will make a higher contribution to the profitability of an MFI. Combined offers like this will also be a proper answer to the commercialisation of microlending which has taken place in recent years (cf. e.g. Christen and Drake [2002]).

VI. REFERENCES

- Ahlin, C. and R. Townsend (2003). Using Repayment Data to Test Across Models of Joint Liability Lending, Disc. Paper.
- Armendariz de Aghion, B. (1999). On the Design of a Credit Agreement with Peer Monitoring, *Journal of Development Economics*. 60: 79-104.
- Armendariz de Aghion, B. and C. Gollier (2000). Peer Group Formation in An Adverse Selection Model, *The Economic Journal*. 110: 632 – 642.
- Armendariz de Aghion, B. and J. Morduch (2000). Microfinance Beyond Group Lending, *Economics of Transition*. 8: 401-420.
- Armendariz de Aghion, B. and J. Morduch (2003). Microfinance: Where do we stand?, Disc. Paper, Boston and New York.
- Banerjee, A., T. Besley and T. Guinnane (1994). Thy Neighbor's Keeper: The Design of a Credit Cooperative, *Quarterly Journal of Economics*. 109: 491-515.
- Bernasek, A. and J.R. Stanfield (1997). The Grameen Bank as Progressive Institutional Adjustment, *Journal of Economic Issues*. 31: 359-366.
- Besley, T. and S. Coate (1995). Group Lending, Repayment Incentives and Social Collateral, *Journal of Development Economics*. 46: 1-18.
- Christen, R. and D. Drake (2002). Commercialization. The New Reality of Microfinance, in: D. Drake and E. Rhyne (eds.), *The Commercialization of Microfinance*. Connecticut: Kumarian Press.
- Evers, J., S. Jack, A. Loeff and H. Siewertsen (2000). *Reducing Cost and Managing Risk in Lending to Micro Enterprises*. Hamburg: Handbook for Micro-Lending.
- Ghatak, M. (1999). Group Lending, Local Information and Peer Selection, *Journal of Development Economics*. 60: 27-50.
- Ghatak, M. and T. Guinnane (1999). The Economics of Lending with Joint-liability: Theory and Practice, *Journal of Development Economics*. 60: 195-228.
- Gibbons, D.S. and S. Kasim (1990). *Banking on the Rural Poor*, University Sain Malaysia.
- Godquin, M. (2002). Microfinance Repayment Performance in Bangladesh: How to Improve the Allocation of Loans by MFIs? Disc Paper, Paris.
- Hashemi, S.M. and S. Schuler (1997). *Sustainable Banking with the Poor: A Case Study of the Grameen Bank*. Washington: JSI Research and Training Institute.
- Hoff, K. and J. Stiglitz (1990). Imperfect Information and Rural Credit Markets – Puzzles and Policy Perspectives. *The World Bank Economic Review*. 4: 235-250.
- Hulme, D. and P. Mosley (1996). *Finance Against Poverty*. London: Routledge.
- Jain, P.S. (1996). Managing Credit for the Rural Poor: Lessons from the Grameen Bank. *World Development*. 24: 79-89.
- Jain, P.S. and M. Moore (2003). What Makes Microcredit Programmes Effective? Fashionable Fallacies and Workable Realities, IDS Work. Paper 177.
- Khandker, S. (1998). *Fighting Poverty with Microcredit: Experience in Bangladesh*. New York: Oxford U. Press for the World Bank.

- Krahnert, J.P. and R.H. Schmidt (1994). *Development Finance as Institution Building*. London: Westview Press.
- Kritikos, A.S. (1999). Micro-credits with incentive-guided solidarity action, *Kredit und Kapital*. 32: 393-425.
- Kritikos, A.S. and F. Bolle (2000). Kreditvergabe ohne herkömmliche Sicherheiten, in: E. Scholing (ed.) *Währung und wirtschaftliche Entwicklung* Köln: Duncker & Humblot: 133-156.
- Kritikos, A.S. and F. Wießner (2004). Existenzgründungen: Die richtigen Typen sind gefragt, *IAB-Kurzbericht*. 3: 1-6.
- Laffont, J.-J. and T. N'Guessan (2000). Group Lending with Adverse Selection, *European Economic Review*. 44: 773-784.
- Lazear, E.P. (2003). Entrepreneurship, IZA Disc. Paper No. 760, Bonn.
- Micro Credit Summit (2002). Council of Practitioners, Institutional Profile. Washington.
- Mondal, W.I. and R.A. Tune (1993). Replicating the Grameen Bank in North America: The Good Faith Fund Experience, in: A.N.M. Walid (ed.). *The Grameen Bank: Poverty Relief in Bangladesh*. San Francisco: Westview Press.
- Morduch, J. (1999a). The Microfinance Promise, *Journal of Economic Literature*. 37: 1569-1614.
- Morduch, J. (1999b). The Role of Subsidies in Microfinance: Evidence from the Grameen Bank, *Journal of Development Economics*. 60: 229-248.
- Murgai, R., P. Winters, E. Sadoulet, and A. de Janvry (2001). Localized and Incomplete Mutual Insurance, *Journal of Development Economics*. 67: 245-274.
- Nagarajan, G. (2000). Fundusz Micro, Poland. *Micro Banking Bulletin*. 4: 1-7.
- Navajas, S., M. Schreiner, R.L. Meyer, C. Gonzales-Vega, and J. Rodriguez-Meza (2000). Microfinance and the Poorest of the Poor: Theory and Evidence from Bolivia, *World Development*. 28: 333-346.
- Paxton, J.A. (1996). *Determinants of Successful Group Loan Repayment: An Application to Burkina Faso*. Dissertation, Ohio State University.
- Rahman, A. (1998). Microcredit Initiatives for Equitable and Sustainable Development: Who pays? *World Development*. 26: 12-33.
- Rai, A.S. and T. Sjöström (2004). Is Grameen Lending Efficient? Repayment Incentives and Insurance in Village Economies, *Review of Economic Studies*. 71: 217-234.
- Schreiner, M. (2002). Aspects of Outreach: A Framework for Discussion of the Social Benefits of Microfinance, *Journal of International Development*. 14: 1-13.
- Sharma, M. and M. Zeller (1997). Repayment Performance in Group-Based Credit Programs in Bangladesh: An Empirical Analysis, *World Development*. 25: 10.
- Stiglitz, J.E. (1990). Peer Monitoring and Credit Markets, *The World Bank Economic Review*. 4: 351-366.
- Stiglitz, J.E. and A. Weiss (1981). Credit Rationing in Markets with Imperfect Information, *American Economic Review*. 71: 391-410.
- Van Bastelaer, T. and H. Leathers (2002). Social Capital and Group Lending: Evidence from Joint Liability Seed Loans in Zambia's Southern Province, Disc. Paper, Maryland.

- Van Tassel, E. (1999). Group Lending Under Asymmetric Information, *Journal of Development Economics*. 60: 3-25.
- Varian, H.R. (1990). Monitoring Agents with Other Agents. *Journal of Institutional and Theoretical Economics*. 146: 153-174.
- Vigenina, D and A.S. Kritikos (2004). The Individual Micro-Lending Contract: Is it a Better Design than Joint-Liability? *Economic Systems*. 28: 155-176.
- Wenner, M.D. (1995). Group Credit: A Means to Improve Information Transfer and Loan Repayment Performance, *Journal of Development Studies*. 32: 263-281.
- Woller, G. (2002). From Market Failure to Marketing Failure: Market Orientation as the Key to Deep Outreach in Microfinance, *Journal of International Development*. 14: 305-324.
- Woller, G. and M. Schreiner (2002). Poverty Lending, Financial Self-Sufficiency, and the six Aspects of Outreach, Disc. Paper, Ohio.
- Woolcock, M.J.V. (1999). Learning from Failures in Microfinance, *American Journal of Economics and Sociology*. 58: 17-42.
- Wydick, B. (1999). Can Social Cohesion be Harnessed to Repair Market Failure? Evidence from Group Lending in Guatemala; *Economic Journal*. 109: 463-475.
- Zeller, M. (1998). Determinants of Repayment Performance in Credit Groups: The Role of Program Design, Intra-Group Risk Pooling, and Social Cohesion in Madagascar, *Economic Development and Cultural Change*. 46: 599-620.

TABLE 1. CLUSTER INDICATORS

	Low risk	Intermediate risk	Higher risk
Average monthly income of the borrowers	4.64 (0.49)	2.71 (0.554)	1.5 (0.509)
Changes in the monthly income since the first loan disbursement	4.08 (0.49)	4.45 (0.504)	3.97 (0.186)
Stability of the business project of the borrowers	3.64 (0.7)	3.88 (0.593)	3.43 (0.504)

TABLE 2: DESCRIPTIVE STATISTICS

	Variables	Mean	Std. Dev.
<i>Group Quality</i>	Categorical Variable (1- “low group quality”, 2- “intermediate group quality”, 3- “high group quality”)	4.16	.49
<i>Internal Delinquency</i>	Dichotomous variable (1- “no incidence of internal delinquency in the group”, 0 otherwise)	.77	.423
<i>Delinquency Status</i>	Categorical variable (1- “no repayment problems in the group”, 2- “internal repayment problem in the group”, 3- “external delinquency in the group”)	.31	.621
<i>Borrower’s Risk Type</i>	Categorical variable (1- „low risk borrowers”, 2- “intermediate risk borrowers”, 3- “higher risk borrowers”)	2.05	.755
<i>Information</i>	Scale (1- “no information about other group members’ business projects” to 5- “detailed information about the other group members’ business projects”)	4.36	.898
<i>Education</i>	Dichotomous variable (1- “university”, 0 – “secondary school or college”)	.23	.424
<i>Credit needs</i>	Scale (1- “less than 500 GEL” to 5- “more than 2000 GEL”)	2.24	1.03
<i>Relationship</i>	Categorical variable (1- “relatives among group members”, 2- “close friends among group members”, 3- “the group members are just partners”)	2.27	.792
<i>Monitoring</i>	Scale (1 “group members meet once a month” to 5 “group members meet every day”)	4.65	.94
<i>Peer Control</i>	Scale (1- “members never discuss business problems within the group” to 5- “members regularly discuss business problems within the group”)	2.30	1.34
<i>Peer Pressure</i>	Factor Analysis Score indicating the pressure exerted by the group on delinquent members	-5.6E-17	.830
<i>Business Correlation</i>	Scale (1- “no correlation across group members’ project returns” to 5- “extremely strong correlation about other group members’ business projects”)	3.48	1.2
<i>Staff Pressure</i>	Scale (1- “the loan officer pays a visit to the group less than once a month” to 5- “the loan officer pays a visit to the group several times a week”)	3.39	1.39
<i>Peer Support</i>	Dichotomous variable (1- “preferences to a joint-liability loan contract”, 0- “preferences to an individual loan contract”)	.28	.453
<i>Social Ties</i>	Scale indicating the number of common characteristics shared by the group members: gender, age, education, income, and place of living.	2.63	1.18
<i>Dynamic Incentives</i>	Factor Analysis Score indicating to what extent the borrower values the access to subsequent loans that are of a bigger size, at lower interest rate, with longer terms to maturity, and at lower transaction costs.	.000	.926

TABLE 3. SELECTION PROCESS: ORDERED LOGIT MODEL

Test of parallel lines ^a :		Number of obs =	84
Chi2 (10)	= 10.429	Wald chi2(11)	= 29.262
Prob > chi2	= .404	Prob > chi2	= 0.001
		Nagelkerker R2	= 0.399

	Coefficient	Std. Error	df	Wald
Risk Type (1)	1.972**	(0.933)	1	4.469
Risk Type (2)	1.486*	(0.845)	1	3.093
Information	1.268**	(0.498)	1	6.484
Education (1)	-1.104	(0.785)	1	1.976
Credit Needs	0.23	(0.222)	1	1.07
Relationship (Relatives)	0.257	(0.777)	1	0.109
Relationship (Friends)	-0.632	(0.701)	1	0.814
Monitoring	0.506	(0.436)	1	1.343
Peer Control	-0.337	(0.23)	1	2.149
Peer Pressure	-0.042	(0.372)	1	0.013
Intercept 1	3.254	(2.791)	1	1.359
Intercept 2	10.051***	(3.356)	1	8.97

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

(a) The null hypothesis states that the slope coefficients are the same across response categories. The high p-value (.404) implies that the null hypothesis of identical slope coefficients across response categories cannot be rejected.

Notes: The table presents the results of the ordered logit model used to test hypothesis 1 (equation (1)). The coefficients (column 2) are maximum likelihood estimates. The statistical significance of the individual coefficients is evaluated by the Wald test.

TABLE 4. BINARY LOGIT MODEL OF GROUP INTERNAL REPAYMENT PERFORMANCE

Wald chi2(11) = 22.894
 Groups with internal delinquency = 21 Prob > chi2 = 0.006
 Groups without repayment problems = 66 Nagelkerker R2 = 0.346

<i>Internal Delinquency</i>	Coefficient	Std. Error	Wald	Exp (B)
Peer Support	2.035**	(0.923)	4.860	7.652
Dynamic Incentives	-0.137	(0.365)	0.141	0.872
Risk Type (1)			1.540	
Risk Type (2)	-0.691	(0.803)	0.742	0.501
Risk Type (3)	0.198	(0.731)	0.073	1.218
Peer Pressure	0.393	(0.378)	1.080	1.481
Peer Control	-0.768***	(0.243)	10.024	0.464
Staff Pressure	-0.373	(0.238)	2.465	0.689
Business Correlation	0.002	(0.269)	0.000	1.002
Social Ties	-0.101	(0.285)	0.126	0.904
Intercept	4.386***	(1.639)	7.159	80.294

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

Notes: The table presents the results of 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. Column 5 lists the odd ratios (Exp B).

TABLE 5. MULTINOMINAL LOGIT MODEL OF GROUP EXTERNAL REPAYMENT PERFORMANCE

	(1)		(2)	
	No delinquency vs. External Delinquency		Internal Delinquency only vs. External Delinquency	
	Coefficient	Wald	Coefficient	Wald
Peer Support	2.920	(2.198)	1.014	(0.202)
Dynamic Incentives	-0.725	(0.644)	-1.046	(1.087)
Group Quality	3.697**	(4.749)	3.319*	(3.180)
Peer Pressure	1.746*	(3.439)	2.106**	(4.258)
Peer Control	-1.480*	(3.770)	-0.906	(1.286)
Staff Pressure	0.272	(0.480)	1.129**	(4.803)
Business Correlation	-1.550*	(3.117)	-2.090**	(5.044)
Social Ties	-0.402	(0.350)	-0.511	(0.442)
Intercept	-2.012	(0.118)	-4.452	(0.426)

Wald chi2(11) = 26.220
 Prob > chi2 = 0.024
 Pseudo R2 = 0.085

Number of obs = 84

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

Notes: The table presents the parameter estimates of the separate logistic regressions of the multinomial logit model used for testing hypothesis 2 (equation 3). We compare, in succession, 1) groups, which never experienced repayment problems with defaulting groups, and 2) groups which experienced internal repayment problems but managed to solve them independently with groups that failed to. The statistical significance of the individual coefficients is evaluated by the Wald test.

TABLE 6: SPEARMAN' RHO NON-PARAMETRIC TEST FOR CORRELATION BETWEEN DYNAMIC INCENTIVES AND THE DYNAMICS OF BORROWER'S INCOME FLOWS

			<i>Changes in the borrower's monthly income</i>
Spearman ' rho	<i>Ever-increasing loans</i>	Sig. N Correlation Coefficient	.021 95 .236**

** Correlation is significant at the .05 level

Summaries:

This paper provides an empirical analysis of joint-liability micro-lending contracts. Using our data set, we examine the efficacy of various incentives set by this contract such as joint-liability between groups of borrowers or group access to future and to larger loans. As proposed by theory, we find that joint liability induces a group formation of low risk borrowers. After the loan disbursement, the incentive system leads to peer monitoring, peer support and peer pressure between the borrowers, thus helping the lending institution to address the moral hazard and enforcement problem. This paper also demonstrates that the mechanism realizes repayment rates of nearly 100%, if the loan officers fulfill their complementary duties in the screening and enforcement process. Finally, we make clear that dynamic incentives, in contrast to theory, have to be restricted if the two long-term problems of the joint-liability approach, i.e. its mismatching problem and the domino effect, are to be tackled notably.

Dieses Papier analysiert auf Basis eigener Daten die Wirksamkeit sogenannter Mikrokredit-Verträge. Insbesondere wird untersucht, in welcher Weise Instrumente wie die Gruppenhaftung oder der Zugang zu weiteren, dann höheren Krediten das Rückzahlungsverhalten von Kreditnehmern beeinflusst, wenn diese keine Sicherheiten stellen können. Die empirische Analyse weist die Bildung homogener Gruppen von Kreditnehmern in Bezug auf deren Ausfallrisiko nach. Erfüllen die Kreditsachbearbeiter ihre komplementären Aufgaben, so führen die Instrumente nach Kreditvergabe zu ‚Peer Support‘ und ‚Peer Pressure‘, sobald einzelne Kreditnehmer in einer Kreditgruppe Zahlungsschwierigkeiten haben. Insgesamt läßt sich zeigen, daß die Anreizmechanismen in ihrer Kombination Kreditausfälle nahezu ausschließen. In diesem Papier zeigen wir auch, daß im Kontrast zu theoretischen Ansätzen die dynamischen Anreize zu beschränken sind, wenn die zwei Hauptprobleme von Gruppenverträgen, nämlich Domino-Effekte und ‚Matching-Probleme‘, ausgeschlossen werden sollen.