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Janda, Karel and Turbat, Batbayar

University of Economics, Prague, Charles University in Prague

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Factors Influencing Portfolio Yield of Microfinance Institutions in Central Asia¹

*Karel JANDA** *Batbayar TURBAT***

Abstract: We analyze the determinants of portfolio yield of microfinance institutions in Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Azerbaijan, Mongolia, Afghanistan, and China over the period 1998-2011. We confirm that targeting women borrowers improves the financial results of microfinance institutions whereas the effectiveness of group lending or advantages of rural lending, in contrast to the initial expectations, were not confirmed. We also consider the contributions of different governance forms of microfinance institutions and the macroeconomic factors potentially influencing the financial performance of microfinance institutions. As a part of this paper we also provide a self contained introduction to microfinance theory for a reader not familiar with microfinance

Keywords: Microfinance; Central Asia; Earnings.

JEL codes: G21, O16, P34.

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* Karel Janda, University of Economics, Faculty of Finance and Accounting, W. Churchill Sq. 4 130 67 Prague 3, Czech Republic; Charles University in Prague, Faculty of Social Sciences, Institute of Economic Studies, Opletalova 26, 110 00 Prague 1, Czech Republic; Affiliate Fellow at CERGE-EI, Politických vězňů 7, 111 21 Prague 1, Czech Republic; e-mail: Karel-Janda@seznam.cz

** Batbayar Turbat, University of Economics, Faculty of Finance and Accounting, W. Churchill Sq. 4 130 67 Prague 3, Czech Republic; e-mail: batbayar.t@gmail.com

1. Introduction

The distinguishing feature of this paper is a regional focus on microfinance institutions (MFIs) in the countries of Central Asia which were under the socialist (communist) government up to the 1990. Microfinance movement in these countries therefore started later and under different conditions than in countries like India or Bangladesh with their democratic governments and democratic institutions. This paper covers 90 MFIs in Kazakhstan, Tajikistan, Kyrgyzstan, Uzbekistan, Azerbaijan, Mongolia, Afghanistan, and China over the recent period 1998-2011. Our econometric analysis confirms that targeting women borrowers improves the financial results of MFIs in these developing Central Asian countries whereas the effectiveness of group lending or advantages of rural lending, in contrast to the initial expectations, are not confirmed.

With the promise of transformation of poverty reduction into a private sector business, microfinance has been receiving lots of attention as a tool with a high potential for the effective alleviation of poverty (Bauer et al., 2012). Microfinance is believed to be helpful in overcoming many problems associated with poverty alleviation programs in the form of different types of aids - financial or nonfinancial, and NGO-based lending activities. Given the success of microfinance in many developing countries up to 1990's, it was also promoted as a market-economy-consistent financial instrument for development in low-income countries which were under the one-party rule of socialist governments up to 1990. However up to now there is not sufficient evidence about the performance and sustainability of microfinance institutions in these countries. Therefore this paper strives to contribute to a

better understanding of this issue with a focus on financial performance of MFIs as a precondition for their sustainable development.

There are at least two ways how to empirically evaluate the success of microfinance. First and seemingly most straightforward way is to measure the impact of microfinance on borrowers. Secondly, we can evaluate the performance of microfinance institutions (MFIs) themselves in connection with different factors.

The first approach, impact studies, relies on monitoring certain economic indicators which help to determine the livelihood level of studied group. These indicators are, for instance, food consumption expenditures, savings, entrepreneurial activities. Impact study usually involves the comparison of baseline and treatment groups at two different moments. An example of such impact study is a recently published experimental study by EBRD (Attanasio et al., 2011), which involved 40 villages in Mongolia. This study found that about two thirds of all borrowers used their loans mainly to invest in a new or existing enterprise, whereas this result does not seem to differ for group loan and individual loan groups. Moreover, the longer the exposure to the microcredit the higher the probability of creation of new business is. This result is the strongest in the group where group loans were disbursed to women borrowers. These findings appear to be supporting the key idea of microfinance which is to ease the credit constraint.

Another approach to the evaluation of microfinance can be studying the microfinance institutions and their portfolios. The idea behind this approach is that if the microfinance institutions are making any changes to the community they are operating in, these changes or difference should be observable on the portfolios of microfinance institutions. For instance, one of the key microfinance techniques – group lending – should be decreasing the default

risk of the portfolio as it makes the borrowers less risky by pooling the risk of individual borrowers.

The first possible way to evaluate the performance of microfinance institutions is to compare them to classical finance institutions. That is to compare their risk and profitability using portfolio at risk, yield on gross portfolio etc. However, there is likely to be a systematic error involved in this approach, since the microfinance institutions aim at reaching the poor whereas the customers of classical finance institutions have historically higher income. It may, therefore, seem falsely that lending methodologies of these two types of finance lead to significantly different outcomes whereas the differences are mainly in the types of customers they reach.

The second possible way to study the effectiveness of microfinance methodologies is to compare the microfinance institutions among themselves. Naturally, it is logical to expect that microfinance institutions also differ from one another. That is, for instance, some MFIs may be more eager to lend to women or lend in groups. Thus we can compare these MFIs to the rest of institutions, which do not make any difference between men and women borrower or group and individual loan, and see whether certain methodologies really make difference in terms of the risk of portfolio.

Our paper follows the path of the second way of studying microfinance described above. In other words it studies microfinance institutions, which utilize different lending methodologies, through the impact on the default risk of these institutions' portfolio (repayment rate), portfolio yield and the profitability. However, there are not many empirical papers of this type. One reason for the scarcity of this type of literatures can be the fact that the microfinance sponsors and development agencies are interested more in the literature,

which studies the explicit effects of microfinance. That is the type of research, which studies the impact of microfinance on poverty/borrowers. The problem of this type of research is that it requires a significant amount of funding and data is expensive to obtain and unavailable for the public. Nevertheless, we see as an important limitation of impact studies the fact that they usually cover only certain communities – a village or neighborhood and as a result the findings of research can vary greatly due to the group specific behaviors and characteristics and may not apply to other groups or communities.

2. Literature Review

Our paper is quite close to the papers by Coleman and Osei (2008), Mersland and Strom (2009), and Crabb and Keller (2008). Therefore in the following paragraphs we will discuss these papers in a detail. We will also use this discussion to introduce and describe the major microfinance approaches and concerns addressed in our paper.

Coleman and Osei (2008) study MFIs for an evidence of characteristics determining their performance. Their research uses a sample of 52 microfinance institutions based in Ghana and studies how the different aspects of the governance affect the profitability and outreach of those microfinance institutions. They determine the following factors that influence the profitability and outreach of MFIs: board size, board competence, board independence, the size of MFIs, asset structure and the age of MFI. They find that the size of the MFI is positively correlated to both profitability and outreach. According to the authors, this finding reflects the fact that a large MFI has greater ability to accommodate risk through diversification and to enhance productivity. The effect of asset structure is found to be similar to that of the size of MFIs. A more powerful background of fixed assets may be a reason for their success according to the authors.

Coleman and Osei (2008) argue that governance plays an important role in the performance of MFIs. They argue that the independence of the board and a clear separation of the positions of a CEO and board chairperson affect positively the profitability and outreach. Although they do not explicitly study the effect of governance on the portfolio risk (repayment rate), from the fact that higher portfolio risk or poor repayment hinders the profitability it can be implied that good governance should also have a positive effect on the portfolio risk and repayment.

Mersland and Strom (2009) also find a positive link between the profitability and the quality of governance. These authors used data from third-party rating agencies, which yielded a dataset of 278 microfinance institutions based in 60 countries between 1998 and 2007. The contribution of these authors is the fact that they studied the impact of legal form of MFIs on the profitability and found that in contrast to the common belief the legal form does not affect the profitability. In other words, NGOs can operate as efficiently and effectively as privately owned microfinance institutions.

Another paper that studies the impact of methodologies and other factors defining MFIs on the portfolio risk of MFIs is Crabb and Keller (2008). This paper may serve as an example of comparison of microfinance institutions in terms of lending methodologies that they apply. The paper was designed to measure how each lending methodology contributes to the risk of microfinance institution portfolio and thus how they affect the self-sufficiency of the institution.

Crabb and Keller (2008) point out that several types of microfinance lending are employed by microfinance institutions. These as mentioned in their paper are individual lending, group lending and village lending. Individual lending is lending to individuals, which are responsible for their own loans only. At first glance, it may look as if it is the lending we

know from the conventional banking. However, we should note that data used did not include any representatives from the conventional banking. Moreover, individual lending in the scope of microfinance can be different lending methodology e.g. due to alternative approach to collateral.

The second microfinance model is group lending. Crabb and Keller (2008) point out that this methodology was initially developed by the Grameen Bank of Bangladesh and was designed to serve rural and landless women who wish to finance income-generating activities. Loans are distributed to groups in the sense that all the individuals in the same group guarantee the repayment of the loans by all the other members. This lending methodology can be facilitated by the use of further techniques such as requirement to save, prompt repayment, mandatory meetings of the group members etc. Moreover, this model is effective in reaching the poor households, which are unable to offer collateral.

The third common model considered by Crabb and Keller (2008) is so called village banking. Indeed this model is utilized in areas where the social bound is expected to be stronger due to different factors. For instance, XacBank of Mongolia makes use of this model in remote areas since the members of small communities scattered across the country tend to be more dependent on each other. Village banking is very similar to group lending since it groups individuals to a group and each member is responsible for the loan made to all other members. The difference is that these groups are actually naturally formed or existent in the community already and loans are based on the savings generated in the community and members collect the repayment of the loans themselves.

Another methodology of reducing risk in microfinance loan activities is targeting women. Targeting women seems to have two aspects – empowering and risk reducing. It empowers

women who usually face tougher burdens in finding a job or running own business. On top of that women are said to be more disciplined borrowers than men, thus lending to women may reduce the portfolio risk.

Crabb and Keller (2008) carried out their research by studying the impact of individual loans and lending to women on the portfolio risk while controlling for the other economic variables for different countries. The authors found out that actually lending to individuals does not have significant impact on the portfolio risk. This seems to contradict the theory put forward by Grameen Bank. However Crabb and Keller conclude that lending to women actually decreases portfolio risk, which conforms to standard Grameen Bank results.

3. Overview of microfinance theory

This section is intended for a reader who is a beginner in the area of microfinance. The readers experienced with microfinance practice and theory may easily skip this section. The material in this section is based primarily on the classical book of Armendáriz and Morduch (2000) and empirical illustrations (examples) relevant to Central Asia are drawn primarily from Mongolian microfinance sector.

Microfinance is a set of financial services including deposits, loans, payment services, and insurance products offered to the poor and low-income households and, micro-enterprises, which are run on commercial basis in contrast to other poverty alleviation programs. However, in comparison to conventional financial service providers, a microfinance institution should have the poverty reduction set as one of its highest priorities. Thus, profitability is not the only criterion when it comes to evaluation of individual financial products. For instance, despite the fact that deposit product offered to low-income households might be unprofitable due to the small average size; a microfinance institution is likely to

choose to offer the product. That is because deposits could bring about benefits other than profit such as financial discipline that in return will affect the microfinance clientele in a positive way. Moreover, microfinance intends to combine conventional financial techniques with methodologies that are suited to cutting costs without imposing higher default risk through making use of its clientele's specific needs.

However, a series of questions has to be answered prior to implementation of microfinance. It is common to think that low-income households are not capable of paying back any sort of loan, since they are too poor. This presumption ignores the fact that these households can have entrepreneurial opportunities as well and will eventually lead to deeper social and economic isolation which as a consequence lead to a higher level of poverty. Therefore, we need to know what impact microfinance will have on the poor and on the economy.

Lending to the poor can have the following positive impacts on individuals and on the economy as a whole:

- More economic opportunities will find its way to become micro enterprises, which in return creates jobs. Aside from this, lending represents a self-employment opportunity for those, who are not able to get hired due to the lack of necessary knowledge or disability. This ability to create jobs is crucial especially in economic downturns, because the poor or low-income households are the ones that get hit hard the most during these times.
- Increased activity of micro enterprises promotes the supply of locally available and affordable goods and services to low income households and small business in return. In other words microfinance can assist in elevating the living standard, especially in

rural areas like that of Mongolia where almost 80% of households depend on the raising of livestock and suburban districts of major cities.

- Microfinance can help the low-income households and businesses to cope with income or expenditure volatilities better, even though there might be available alternatives such as pawnshops. Microfinance can provide with loans which not only can create new income generating activity, but also can be utilized with deposits to smoothen to consumption over time.
- If the micro enterprises yield higher return than employment alternatives, human capitals are used more effectively in terms of return. Therefore, we can assume that lending to the poor represents better usage of capital and contributes to the economic growth, given the validity of decreasing marginal return to capital and underserved state of poor households.
- According to the principle of diminishing marginal returns to capital, enterprises which have little capital prior to the investment should be able to earn higher return on the investments than the enterprise with bigger capital. The poorer an entrepreneur is, probably the stiffer credit constraint he/she will face. Therefore, a poor entrepreneur is forced to invest available funds in activities that have the biggest return on investment in the first place. A greater return on investments means the poorer entrepreneur is willing to pay higher interest rates than richer or bigger entrepreneurs. Armendáriz and Morduch (2000) points out the finding of Nobel price holder economist Robert Lucas

which assures that borrowers in India are willing to pay fifty eight times as much for capital as borrowers in the United States³.

All of above implies that microfinance or the lending to poor can help alleviate the poverty and, furthermore, in some cases affect the growth in a positive way.

Then, a question of why the existent financial institutions were not able or not willing to do so, since the market represents an opportunity to boost the profit? According to Armendáriz and Morduch (2000), first of all, risk is the biggest obstacle to overcome to reach the poor. Generally, outcomes from micro entrepreneurial activities are more volatile and sensitive to market changes. Coupled with high operational costs derived from the small size of transactions with micro enterprises, the risk will lead to the situation which was predominant prior to microfinance – poor and low-income households are tagged as by the conventional banks “too risky and too costly”. With the emergence of microfinance it became clear that it is actually possible to provide these households with financial service on commercial basis through more flexible and specifically tailored products. Banks can offset the high risk and additional transaction cost by charging higher interests than usual interest rate, since these households are willing to pay higher interest rate corresponding to their higher return on capital.

Moreover, government imposed interest rate restriction if existent can also prevent conventional financial institutions from reaching the poor. These restrictions make it impossible to offset for the higher risk and operational costs as was suggested in previous paragraph. The Bank of Mongolia (the central bank), however, stands fast in this regard and

³ Armendáriz de Agion and Morduch, “The economics of Microfinance”, Introduction, page 6

prevents the government from imposing any sort of interest rate ceiling. Therefore, financial institutions including the MFI in Mongolia do not face any interest rate related restriction.

A higher interest rate is not the solution to all the problems that financial institutions. In fact, higher interest rates bring about additional problems (e.g. adverse selection), as well as they cannot resolve some existing problems. All the financial institutions face the principal-agent problem at certain degrees. In the case of lending to the poor the problem can be severer due to the lack of acceptable collateral that serves as a guarantee and pledge to the lender of conventional loans.

The future client – the agent has an investment project, for which it needs funds. So the client has to turn to the lender –the principal for funds. The agency problem is related to the information asymmetry existent on the market. That is when the lender is not able to observe the riskiness of each borrower, client’s effort put in the project, or the outcome of the project. Agency problems can occur at three stages:

1. The first time a financial institution faces the agency problem is during the loan processing. The problem derives from the fact that it is too difficult or expensive to obtain the required information to tell apart the borrowers, who is more likely to put in effort required, from those borrowers who are not intending to put in required and risk the outcome. In the case of micro enterprises, the problem is doubled, because these enterprises lack the financial statements or sufficient collateral, which can indicate their quality and intention. Therefore it is not possible to distinguish “low quality” clients and accounting for the risk without using more suited methodologies.
2. The second stage involves problems such as inability of the bank to monitor whether a borrower is putting enough effort in the project or even funds are being used as it was

meant. Again conventional banks assume that these households lacking proper collateral are more likely to shirk on average since they have “nothing” to lose by behaving this way.

3. At last stage, if the bank cannot tell whether the project was successful or not, borrowers will tend to shirk and ask for a reprieve in paying the loan if they are not motivated to not shirk. The agency problem is more severe in communities where judicial system is weak and credit registry is absent, which are the main attributes of microfinance target market – low income community. For instance in rural areas (and in some cases in urban areas) of Mongolia one of the major problems the financial institutions face is inexistence of universal credit registry.

Armendáriz and Morduch (2000) point out that conditions that make these information asymmetry problems common in lender – borrower relationship severe are limited liability and a lack of acceptable assets as for collateral. According to the authors limited liability can be understood as a moral taboo to seize asset from the very poor households for social and legal reasons.⁴ These authors capture these agency problems and their consequences on simple mathematical models, which can be summarized as in the following sections.

Adverse selection

According to Armendáriz and Morduch (2000), the essence of adverse selection lays in the fact the lender’s inability to tell apart the ones, who are more likely to invest in sufficient effort and eventually will succeed in their projects from those who are less successful, without signaling instruments such as collateral. That is because financial intuitions are foreign to the community and cannot collect the related information effectively. Therefore it cannot charge

⁴ “Armendáriz de Agion and Morduch, “The economics of Microfinance”, Chapter 2 –Why Intervene in Credit Market?, page 36.

discriminatory (or individual) interest rates according to risk level of borrower and all borrowers are charged the same average interest rate, which is too high for some.

In the model a population of potential clients consists of “safe” borrowers and “risky” borrowers. A safe borrower obtains revenue \underline{y} per unit invested with certainty. A risky borrower obtains \bar{y} per unit invested with probability p , where $0 < p < 1$. If succeeds, the final outcome for the risky borrower will be higher than the outcome of that safe borrower: $\underline{y} < \bar{y}$. That is because the risky one doesn't put in as much effort as the safe one, thus doesn't suffer disutility as high as the safe one. However, both borrowers give the same result on average:

$$\underline{y} = p \cdot \bar{y}.$$

Assumption of the model is that market is competitive, so that the bank will be lending as soon as the costs of lending k (per unit lent which includes loan principal and transaction costs and interest paid to depositors) is recovered. Assuming that expected return of safe borrowers is higher than marginal costs of lending ($\underline{y} > k$) is realistic since the essence of microfinance says that the low-income households have worthy investment opportunities. Since the banks are aware of the fact that there is a certain portion of population with risky project have charge risk premium on each contract: $k + A$, where A is the risk premium.

The question is whether the borrowers will be willing to accept the contract. It is evident that both types of borrower will decide to borrow if the total payment including interest payments is smaller than their expected outcome. However, if the bank opts for interest rates (including the principal) higher than \underline{y} , the safe borrowers will quit borrowing and as consequence the

pool of borrowers will consist of only risky borrowers. With time bank will find out that the current risk premium A is not sufficient enough, thus it has to increase the premium to higher level S . $k + S$ corresponds to the risk level that the borrowers will fail with higher probability $(1 - p)$, compared to the previous probability $(1 - q)(1 - p)$. Figure 1 illustrates this behavior of lender. Thick intervals of the line represent situations where the bank is lending to both or the risky borrowers. Expected profit of the bank is depicted on the vertical axe. Bank breaks even when the interest rate is equal to the total amount of costs and risk premium ($k + A$ or $k + S$). Banks expected profit drops from positive to negative at interest rate, which is slightly bigger than \underline{y} , because the expected return from lending does not cover up risk increase. Thus he banks is forced raise the interest rate all the way up to new breakeven point. The lending stops when the interest rate exceeds \underline{y}/p , because no one is willing to borrow, even the risky borrowers.

Conclusion of the model is that there is a certain interval of interest rate, where the low-income household will produce the most. Hitting this right interval is important since both the safe and risky types have worthy opportunities, economic output is the greatest and thus the poverty is the lowest. According to current settings of the model the best solution is feasible. However, the conclusion of the model changes easily when assumptions are not met.

In reality outcome the outcome for safe borrowers is so small or the riskiness of the risky borrowers so high that costs of lending increased by risk premium $k + A$ exceed the outcome of the safe borrowers. As a consequence only the risky borrowers are willing to take on the contract and interest rate will rise over $k + S$. Is the situation efficient?

No, the situation is inefficient because both types of borrowers have equally worthy opportunities and portion of the population cannot realize their projects due to the lack of

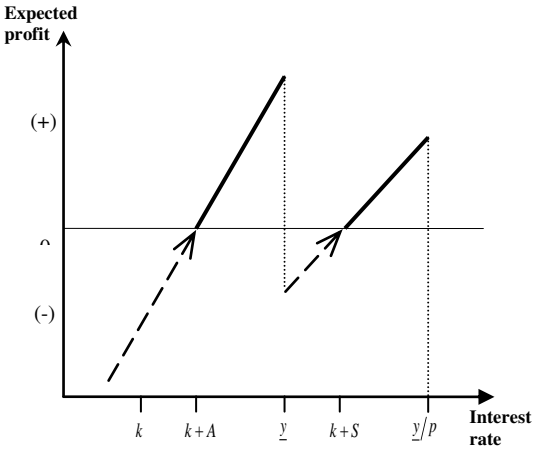


Figure 2: Adverse selection
 At gross interest rate between $k + A$ and \underline{y} both safe and risky borrowers will borrow. Raising interest rate above \underline{y} by a little will result in expected loss because only risky borrowers will borrow and the risk premium is too small to compensate for the risk. Therefore, the lender has to raise its interest rate above $k + S$. Above \underline{y}/p no one is willing to borrow.

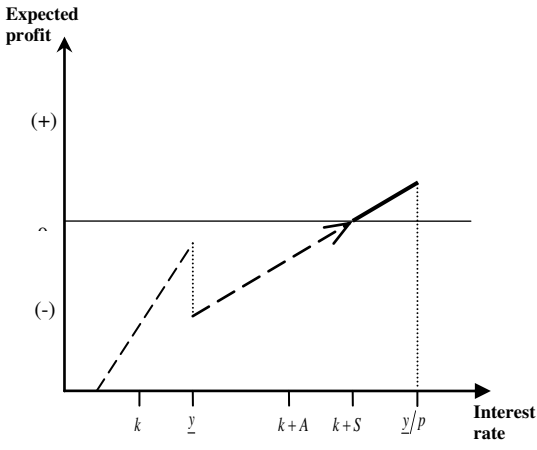


Figure 2: Adverse selection
 When risky borrowers are so risky or yield for safe borrowers is so small that $k + A > \underline{y}$, only risky borrowers will borrow, thus the lender has to raise interest rate to $k + S$ to break even.

capital. And there is no guarantee that the bank will choose right interest rate, because it does not know the probability of default of its borrower. Therefore it can overshoot the interest rate driving the safe borrowers or all the borrowers away, which will eventually lead to a common misconception in the form of following statement: “the low income households are too poor to be able to afford loans from financial liabilities”. This is inefficient, because not only the economy is smaller than it could have been, but also the financial institutions could have earned higher expected profit in the case of complete information.

Moral hazard

The problem of moral hazard can occur as above mentioned at two stages. Again the problem can be resolved with use signaling instrument – collateral with expected value higher or equal to the loan repayment amount. A bank does not have direct control over their borrowers when

it comes to effort level required during the realization of project to succeed. Therefore, it's highly likely that effort that a borrower puts in will be smaller than it would have been in the case of self-financing of the project if there is no threat of losing a collateral asset.

In this case of ex ante moral hazard, the interest rate plays an important role since the problem can be solved through selection of motivating interest rates. This is can be shown on simple model described by Aghion: If the borrower puts in all the effort, he will make profit y with certainty and bear an opportunity cost c , which could be for instance alternative costs. If the borrower decides to not work hard, he will make profit y with probability $p < 1$. In this case he doesn't have to bear the opportunity cost. IR is interest increased by principal amount, which is higher than k . Net return equals to $(y - IR) - c$ if the borrower expend effort. Rest of the time, net return of the borrower equals to $(y - IR) \cdot p$ (the borrower will pay nothing in a case of unsuccessful project, due to the limited liability or lack of collateral).

The borrower will decide to expend effort if it brings higher net return:

$$(y - IR) - c > (y - IR) \cdot p;$$

Solving the equation yields:

$$IR < y - \frac{c}{(1 - p)};$$

If the total repayment (interest and principal) to the bank is raised above $y - [c/(1 - p)]$, the borrower will decide not to work hard and take the chances. And the bank will suffer the cost k with probability $(1 - p)$.

To illustrate importance of collateral, we can introduce collateral to above explained Aghion's model. L is collateral and $L > 0$. The model now looks as follows:

$$(y - IR) - c > (y - IR) \cdot p + (-L)(1 - p)$$

which results in:

$$IR < y + L - \frac{c}{(1 - p)} ;$$

As we can see here collateral give much freedom to the lender in terms of set of interest rates which do not cause shirking. The higher the value of collateral, the higher can be the interest rate. And the lender will be able to recover at least the amount L in any cases.

However, due to the fact the lender does not have information regarding the probability, he cannot calculate the maximum interest rate for avoiding the ex ante moral hazard. Furthermore, the chance that the lender will choose a wrong interest rate is much higher without the help of collateral. Therefore the bank might cease to lend to low-income households who usually lack acceptable collateral, since it knows it will suffer loss with probability with $(1 - p)$.

At last a bank can face ex post moral hazard, which is essentially borrowers' attempt to keep the whole outcome and lying to the bank. The problem in comparison to ex ante moral hazard cannot be tackled effectively through interest rate. Only the collateral seems to be able to resolve it. In addition the low-income communities usually lack aside the collateral effective law enforcement. Thus the problem becomes irresolvable in the setting of microfinance target market.

Both moral hazard problems and the absence of acceptable collateral seem to hinder the attempts of commercial banks to lend to this segment. However we will see that this lack of collateral and information problem (especially ex post moral hazard) can be overcome by applying microfinance loan methodologies such as group loan, alternative approach to collateral, etc. which will be discussed in the following section.

Any room for microfinance?

The number of these poor clients was not small when microfinance initiatives were taking place. The poverty incidence in Mongolia was as much as 36.1% in year 2002⁵ and some 184 000 out of 559 610 households were considered as very poor and poor (the next National survey was due in 2012 and new data is not available yet). A market survey conducted by “Sant Maral” NGO from 2001 showed that 87% of households saved at home and 82% borrowed very often or sometimes, strikingly only 7% used bank loans despite the fact that 92% of all households used bank service at least once a month (chiefly as a means of payment) by the time the survey was conducted. This survey revealed that the absence of the commercial banks did not necessarily mean that low-income population had had no access to financial services prior to microfinance. In other words, this segment of the financial market was to a certain degree served by unofficial institutions such as pawnshops, neighbors, friends, coworkers and relatives.

This remind researchers that before attempting any interventions to the market one should make sure that the current state needs any sort of intervention. For example, an existence of market imperfections: financial institutions choose to lend only to privileged individuals or well capitalized enterprises might be due to the facts they are not aware of the social costs. It

⁵ “Mongolia Poverty Assessment“; April 13, 2006; Document of the World Bank

means that the supply of financial products including the loans to these privileged households and enterprises is higher than it should be if the social costs are taken into account, and interest rates are lower for these borrowers. In contrast poor and low income households are underserved, because supply to these individuals could be higher since lending produces negative social costs. Social costs can be, for instance, social disutility from increased economic inequality, which is caused by decision of financial institutions to lend to privileged ones. Attempts to solve this problem through governmental channels led only to the drain of funds and moral hazard.

Moreover, we should analyze whether new microfinance institutions can bring improvements or efficiency over the existing institutions. For instance, if the market fails to deliver required services in required amount, entrepreneurs and households cannot obtain all of the capital needed. As a result, productivity of the population will decrease. On the other hand if microfinance is introduced to a market where there is no room for improvements or higher efficiency, it will crowd out the existing lenders, which means inefficient use of sources.

Therefore, the existing institutions, which play a similar role to microfinance, should be assessed upon certain criterions such as the efficiency of their activities and their effect on the allocation of resources. For instance, high interest rate cannot be a proof of inefficiency itself, since it can be merely associated with the high costs of lending, or reflecting the fact that borrowers are unable to offer acceptable collateral and the legal enforcement system is weak.

Efficiency

In the case of efficiency loan institutions are evaluated whether their interest rates are low enough to allow a maximum number of worthy business opportunities to be realized. A business opportunity is worth realizing when it brings expected return higher than costs of

lending including the alternative costs increased by risk premium. If the expected return of a project is smaller, the realization of the project will cause retraction of the economy.

Following factors may produce inefficiency:

- An existence of monopoly. Restriction of loan disbursement will lead to a situation, where only exceedingly productive entrepreneurs can afford to borrow to finance their projects, and a number of projects whose returns are smaller than interest rate charged by a monopolist, but higher than the capital costs of moneylenders will not be funded. The total amount of product generated in the economy would decrease in comparison to that in the absence of the monopolist.
- High average fixed costs. High interest rate due to high average fixed costs is inefficient, because these costs can be easily lower by increasing the number borrowers.

In order to see whether inefficiency is existent, we will analyze interest rates. If the high interest rates cannot be explained by high risk (default rate), it has to be monopoly price or the high fixed average costs. And microfinance can bring about efficiency.

Distribution

Facilitating distribution in terms of race, gender, social class, religion and geographic region is essential, since usually

- The level of financial service in rural areas is very low;
- The incidence of poverty is high in women headed households than in men headed households;

- Monthly salary for women is lower than for men⁶;

Getting rid of discrimination will contribute to the development of the society where worthy investment projects used to be excluded on the basis of race, gender, etc, and will yield more equal society. However, getting the discrimination sorted out may be actually a difficult task as the root of discrimination seems to stay apparent on financial products even after the introduction of microfinance. Agier and Szafarz (2013) found in their study, which included 34 000 loan applications from a MFI based in Brazil, that women are actually given small smaller loans in comparison to men despite their higher number.

Distribution in terms of how the generated funds in the economy are allocated could be next concern. Theoretically, a local informal lender is able to adjust its interest rates to each borrower's demand. In this case the moneylender doesn't have to strict the amount of money lent in order to raise the interest rate using price discrimination. This practice may be efficient in terms of total generated funds in the economy. But the moneylender can in this way squeeze out almost all the borrower's surplus. In other words, this strategy increases the potential for exploitation. Therefore, pro poor policies or microfinance could improve the situation.

Solution offered by Microfinance

The main difference, which distinguishes microfinance institutions from conventional financial institutions, apart from the fact that they serve the poor clientele is that they use unique methodologies and techniques to reach its target clientele. This methodologies help them manage the risk, overcome the lack of collateral and reducing the costs of services.

⁶ "Country gender assessment – Mongolia", Asian Development Bank and World Bank, page3

The building blocks of microfinance/methodologies

Micro loans are financial product run on commercial basis which are intended to fund economic activities run by poor or low income households and in some cases smoothen the income or expense cycle so that these household get a chance of self-employment reducing the poverty. Poor and low income households can benefit from microcredit services as mentioned previously in the following way:

- Increase household's income by investing in existing micro businesses or starting new economic activities
- Better response to income or expense shocks. Expenditure shocks such as illness of family members, tuition fees of school are examples of shocks that often urge the households to sell the assets which are used in their economic activities. With the access to micro loan they will be able to overcome the situation without losing the economic activity.
- Protect against risk in advance using loans to create additional income streams,

Micro loan products are characterized by:⁷

- The size, which is generally smaller than in conventional financial institutions. In some cases, the size of loans can grow in time given that all the obligations prior to that point have been met. These obligations are punctual repayment of previous loans, attending group meetings, etc.
- Higher interest rates and fees, which is directly affected by transaction cost and risk.

⁷ "Microfinance distance learning course – UNCDF"

- Purpose, which could be smoothening of expense or income shocks or most importantly financing the working capital, investment in business assets such as tools and instrument or inventories.
- Repayment intervals. These intervals are usually short because of the nature of micro enterprise to generate small incomes in short intervals.
- Term, which is short due to the size of loan.

Besides these characteristics, the way these products delivered to market – credit methodology is equally important aspect of micro credits as long as it is the area where the problem of high transaction costs, moral hazard and adverse selection could be mitigated. Micro loan methodologies is characterized by⁸

- Target market. Target market can be created with regards to age, sex, income level, geographical locations – rural areas etc, social layers or ethnicity. Most MFIs define their target markets based on development objectives such as the alleviation of poverty, an increase in employment. The target market for Mongolian MFIs includes two important and relatively different sectors. These sectors are households in very remote rural areas which lack financial services of any sort; households in suburban districts of Ulaanbaatar who have possibilities to utilize the formal banking services, but due to inadequacy or lack of information have not done so yet. Therefore, a MFI has to take into account market preferences and cost considerations, in order to succeed.

⁸ “Microfinance distance learning course– UNCDF”

- Who receives the micro loan – individual or group? Apart from credit techniques that is used by banking sectors for individual clients, microfinance possesses group loan techniques, which is useful where collateral is absent and transaction costs are high.
- Delivery method. In contrast to the conventional banking, MFI endeavor to make the financial services more approachable through how the loan officers communicate with clients and simplicity of its office environment.
- Loan process. It includes a range of process such as screening of the clients and selection, communication with loan officer, choosing the repayment intervals, attending meetings, or gathering essential information such as personal character and property background about clients who have applied for loans, for instance, by visiting the house and business site.

Group lending

Group lending is an example of adaption of informal sector practices by microfinance. It is a microfinance methodology, which is used to overcome some of the information asymmetry problems and the lack of acceptable collateral. Lending to groups should facilitate repayments of loans in the following: individuals, who know each other well, possess sufficient information on personal character and property background, thus individuals will try to form a group with safe ones. Moreover, mutual monitoring and assistance can be carried out among lenders in a group, because everyone is responsible for performance of the whole group.

In a classic model of group lending groups are formed by 3-10 individuals, who don't possess collateral and are willing to get together to apply for a group loan. These individuals are assessed upon their personal characteristics and ability to generate income. Group loans

usually start with small loans and the size of loans is gradually increased as groups pay the initial loans demonstrating its reliability. Repayment intervals are short and every member must meet its obligations in order to be able to apply for further loans. Despite the fact the loans are disbursed to individuals who form the group, group liability is applied in a way which disqualifies all member of the group for the future loans unless installments of all members are made on time and at a predetermined amount. In other words, each member is responsible for the repayment of loans disbursed to other members of the same group. Therefore, group members are forced to form a group with equally safe borrowers, monitor each other and pay off the amount owed by a delinquent borrower unless they want to lose their chance to borrow again and at a bigger amount. By this means an MFI transfers the screening and monitoring processes to clients themselves, which means an MFI is not required to collect information on each borrower's risk. Instead, the process will be carried out by the group members who possess the required information. Moreover, the financial discipline imposed by social capital in group lending seems to play an important role. Bauer, Chytilová and Morduch (2012) found in their experimental behavioral research that a certain group of borrowers is more likely to borrow from a microcredit institution specifically. According to these authors, this is due to that fact microfinance loan coupled with social pressure is more effective in converting small income flows into large sums than saving on their own.

Adverse selection

Adverse selection problem emerges from the information shortages on the lenders side, thus the lender is forced to charge a single interest rate and as a result interest rate can grow so high that safe borrowers stop borrowing. Group lending may be better than individual lending

to a group of people, because the lender gets rid of a part of the risk it faces: risk that a certain portion of borrowers will default.

However, the lender still bears some risk – the risk that all of the borrowers will default. In comparison to the total default risk of lending to the same number of individuals as in the groups lending, the default risk under group lending is significantly smaller given the behavior does not change. The smaller the risk is the lower is the risk premium, which means the problem of adverse selection is far less serious than it used to be.

If the group lending is introduced, the financial institution can solve the problem without charging different nominal interest rate or striving to obtain more information. Letting borrowers do the job of risk rating is rational, because they know better how risky they are and their potential peers are. Since nobody wants to repay loans for someone else, the safe borrowers will form groups with safe borrowers. Meanwhile the risky borrowers are forced to form groups in order to be able to borrow. Now an MFI can charge only one interest rate for safe and risky borrowers that can be not demotivating for the safe borrowers at the same time.

The risky borrowers are charged higher rates effectively since the lender transfers some of the risk directly to themselves. Because an investment project of risky borrowers are more likely to fail, a borrower in risky borrowers' group who doesn't want to lose to access to loans has to repay the debt of defaulting peers more frequently. The effective interest rate charged to a risky borrower is equal to or greater than the single interest rate.

Now let's see what group lending can do for reduction of adverse selection, mathematically.

A group is made of N number of borrowers. A fraction of the population $q < 1$ is made of safe borrowers. Then the fraction $(1 - q)$ is made of risky borrowers. Let's assume that group

lending will not affect the behavior of each individual. That is, p and return remain the same and there is no moral hazard problem associated with group lending. Additionally we assume that return of each individual if successful is big enough to pay off debts of his peers. Like the Armendáriz Aghion's model assumption of complete information of peers is not essential.

Likelihood that a group of N individuals will consist of only risky borrowers is $(1-p)^N$. Because we assume that each borrower if successful is able to pay off the total liability of the group to the lender, the only time the lender suffers loss of repayment is when all borrowers in the group are unsuccessful and thus default. The probability that all the borrowers in group will default is

$$[(1-p)(1-p)]^N$$

And the entire loan is repaid with probability:

$$1 - [(1-p)(1-p)]^N$$

For the comparison, now let's assume that individual loans are disbursed to an equal number of borrows N . Probability of default and return to their business remains the same as previous case. However, they are now on their own and responsible only for the loan repayment of their own. Therefore, the loan will be repaid in individual cases with probability:

$$1 - (1-q)(1-p)$$

And the total amount of loans will repaid with probability:

$$[1 - (1-q)(1-p)]^N$$

Comparison of these two probabilities reveals that the probability of total repayment in the case of group loan is higher:

$$1 - [(1-q)(1-p)]^N > [1 - (1-q)(1-p)]^N$$

The left side of the inequality can be rewritten as follows:

$$\begin{aligned} 1 - [(1-q)(1-p)]^N &= [1 - (1-q)(1-p)] \cdot [1^{N-1} + 1^{N-2} \cdot ((1-q)(1-p))^1 + \dots + ((1-q)(1-p))^{N-1}] = \\ &= [1 - (1-q)(1-p)] \cdot [1 + (1-q)(1-p) + ((1-q)(1-p))^2 + \dots + ((1-q)(1-p))^{N-1}] \end{aligned}$$

Because $1 - (1-q)(1-p)$ is smaller than 1 (it is a probability), given $N > 1$:

$$[1 - (1-q)(1-p)] > [1 - (1-q)(1-p)]^N$$

And the multiplier is higher than 1:

$$[1 + (1-q)(1-p) + ((1-q)(1-p))^2 + \dots + ((1-q)(1-p))^{N-1}] > 1$$

Therefore, the inequality is proved:

$$1 - [(1-q)(1-p)]^N > [1 - (1-q)(1-p)]^N \blacksquare$$

The conclusion is that group lending is less risky than individual lending. It means that the lender can charge an interest rate lower than $k + A$, where costs of capital are increased by risk premium, because the portion of the population is risky. Now the interval, where the expected profit of the lender is positive, is wider in the direction of smaller interest rates (figure 1), which means the adverse selection can be avoided far more easily despite the fact the share of the risky borrower is still q .

Moreover, if we assume, additionally, instantly applicable selection of peers according to risk (complete information of peers), cross liability, and no moral hazard problem at this stage, the lender does not even have to rise the interest rate by the risk premium, since all the risk is transferred to the borrowers.

However, the problem of the model is that it overestimates the probability of full recovery in the case of group lending. Our assumption of ability of each borrower to pay off the total debt of the group is unrealistic. Instead, most of the time only partial recovery is available. But this partial recovery thanks to cross liability is still sufficient to lower the default risk: because outcomes of our N individuals are the same regardless of the loan type (group or individual) and in the case of group lending recovery rate – ratio of the total repaid amount to total disbursed amount is always higher or equal to that in individual lending.

Moral hazard ex ante

Ex ante moral hazard problem occurs when a borrower who has received the loan decides not to work hard to insure the return to its projects. Instead the borrower shirks and hopes that things look well by the time when the repayment is due. Group lending decreases the risk of ex ante moral hazard by inducing the borrowers to monitor each other's choice of projects and encouraging the peers to punish anyone who puts in little effort⁹.

From the previous section know that an individual borrower decides to work hard only if the certain income less the expenses is higher than expected return from shirking, which results in

$$IR < y - \frac{c}{1-p}$$

⁹ “Armendáriz de Agion and Morduch, “The economics of Microfinance”, Chapter 4 – Group Lending, page 97.

In the case of group lending a borrower takes into account the possibility of default of its peer and group liability. If one borrower decides to shirk, another one will shirk as well. Because due to the cross liability the one who worked hard will have to pay for its peer if defaults. Therefore, they will both decide to work if:

$$(2y - 2IR_g) - 2c > p^2(2y - 2IR_g) \Rightarrow IR_g < y - \frac{c}{1 - p^2}$$

The conclusion of this Armendáriz de Aghion's model is that risk of inducing moral hazard is decreased by the implementation of group lending, because $p^2 < p$, IR_g can rise higher than in individual lending.

In real life situation, lenders in the same group will induce pressure on their peers so that their peers will succeed. However, this mechanism can work only given that a borrower loses their access to credit if he defaults thanks to credit constraint or his entry in credit registry. Because credit registry is not widespread in poor and low income communities; especially in the remote rural areas of Mongolia, inducing some type of post credit constraint is necessary.

Moral hazard ex post

Even if investment projects are successful, there is still a chance that the borrower will avoid repayment to the bank. Because the bank doesn't possess the necessary information to distinguish borrowers who are likely to run away with the money, it decides not to lend at all.

Group lending methodology helps to tackle the problem in the same way as it did in the case of ex ante moral hazard – through joint responsibility, which means that a borrower forced to repay for him and its peer if the peer fails to repay. This possible repayment for its peer is the key that induces mutual peer monitoring.

Again, the model would work only if the borrowers are able to find out true outcome of their peers' projects and there is a sanction, for instance, in the form of credit constraint.

Generally, group lending reduces risk of lending in comparison to individual lending under following conditions:

- Total actual repayment of a non-defaulting lender has to be higher than total amount of principal and interest payment.
- A borrower, who paid for his peer's debt with certain amount, can further borrow.
- A borrower, who defaulted, will face credit constraint.
- A borrower can obtain the necessary information more easily and cheaply

At first glance the model of group lending seems to effectively mitigate the problem of adverse selection and moral hazard. However the model does not take into account costs borne by borrowers. In fact monitoring and transaction costs are not annulled but transferred to borrowers. These costs, coupled with fact that information on the risk of the potential peers is not existent in some cases, can be so high that clients will be demotivated from borrowing. For the households who live in rural areas like that of Mongolia which are very sparsely populated and have weak infrastructure, monitoring the peers and attending group meetings can be very time-consuming and thus costly. On the contrary poor and low-income households in suburban districts of major cities and centers of provinces could benefit from group lending since communication among the borrowers or with the bank is not as costly as it in the case herder families.

4. Empirical model

The goal of our research is to study the impact of different factors on portfolio yield of microfinance institutions by comparing the subgroups of the microfinance institutions which use different lending methodologies. Methodologies, which this paper focuses on, are group lending, targeting women borrowers and lending to rural borrowers (where social bound is expected to be stronger due to borrowers' interdependency). However, it is useful to note that only microfinance institutions are involved in this research, thus only relative effectiveness of such methodologies is to be studied. The outcome of this study, therefore, can only suggest how effective the studied methodologies are in comparison to the rest of microfinance institutions. It does not say anything about how effective these methodologies are in comparison with the conventional banking in terms of portfolio risk. For instance, individual loan in microfinance terms could mean a different product thanks to the alternative approach to collateral. Even though these methodologies are the main subject of this paper, other institutional factors and macroeconomic variables which are also important in determining the financial performance of MFIs are considered too.

The following hypotheses are tested in this paper:

Hypothesis 1: Group lending increases the yield of the portfolio.

Armendáriz and Morduch (2005) suggest that group lending decreases the risk of default thanks to the formation of groups with individuals of the same type. That is, risky borrowers form groups with risky borrowers and safe borrowers with same borrowers. The Grameen Bank is based mainly on this idea. However, Gine et al. (2009) show in their experimental study of microfinance that group loan may actually make the borrower to take on riskier

projects than they would otherwise choose. Gine et al. (2009) argue that group lending facilitates profitable risk taking while maintain high rates of loan repayment. In other words, implicit insurance mechanism imposed by group loan helps to avoid greater default risk for the whole group.

Hypothesis 2: Targeting women borrowers increases the yield of the portfolio

Targeting the woman borrowers is one of the building blocks of microfinance. Women are deemed to be more reliable and responsible borrowers than men (Armendáriz and Morduch (2005)). Therefore we should be able to see better repayment rate or lower portfolio risk with the increase of portion of women borrowers. Also Barr and Kinsey (2002) found in their study that men are more likely to behave anti-socially, which may be the cause of lower repayment rate by men.

Hypothesis 3: Lending to rural population increases the portfolio yield.

Given the emphasize of microfinance lending on social factors and relationships among people, the rural populations with its higher stability of population and with their more focused earning activities seems more suitable for microfinance approaches than the urban population. This may transform into lower default risk and higher repayment rates leading to higher portfolio yield in rural areas.

Hypothesis 4: Good governance leads to higher portfolio yield.

Papers such as Coleman and Osei (2008), and Mersland and Strom (2009) argue that good governance of MIFs contribute to good performance. In contrast to these authors, we will be using as an indicator of good governance the legal entity of individual microfinance institutions. Armendáriz and Morduch (2005) point out that the non-profit bodies are less

successful in enforcing the loan conditions and managing the portfolio risk. Moreover, Dokulilová, Janda and Zetek (2009) point out that MFIs face problems in areas such as ethics, management, legal entity and other uncontrollable surroundings. Therefore, we will test the hypothesis that the banks and non-bank financial institutions are most effective and NGOs are the least effective in terms of portfolio management and earning performance.

The model to be studied in this research therefore looks as follows:

$$\begin{aligned}
 yield_{ijt} = & \alpha + \beta_1 per_group_{ijt} + \beta_2 per_rural_{ijt} + \beta_3 female_{ijt} + \delta_1 nbfi_i + \delta_2 cu_i \\
 & + \delta_3 bank_i + \theta_1 num_bor_{ijt} + \theta_2 ave_size_{ijt} + \theta_3 growth_{jt} + \theta_4 inflation_{jt} \\
 & + \varepsilon_{ijt}.
 \end{aligned}$$

Table 1: Dependent and independent variables explained

Dependent and independent variables	Description
$yield_{ijt}$	The yield of microfinance institution i in country j in period t
per_group_{ijt}	Percent of outstanding loans disbursed as group loans by institution i in country j in period t
per_rural_{ijt}	Percent of outstanding loans made to rural customers by institution i in country j in period t
$female_{ijt}$	Percent of women borrowers in institution i in country j in period t

$nbfi_i$	Dummy for institutions in the form of nonbank financial institution
cu_i	Dummy for credit unions
$bank_i$	Dummy for banks
num_bor_{ijt}	Number of outstanding borrowers
ave_size_{ijt}	Average loan size in USD for institution i in country j in period t
$growth_{jt}$	Growth rate of the economy in country j in period t
$inflation_{jt}$	Inflation in country j in period t

The dependent variable *yield* stands for the earning performance of individual MFI, which is expressed by the yield of the gross loan portfolio. However while it is called portfolio yield, it is more of a nature of a lending related revenue expressing the earning performance of a MFI. First group of independent variables are the percent of outstanding loan disbursed in a group loan form, the percent of outstanding loans disbursed to rural customers, the share of women borrowers served by the i -th microfinance institution in county j in time t , and dummies for the legal form of microfinance institution i . The constant of the regression α represents the average risk of portfolio lent to men for all the microfinance institutions in the form of NGO given that only individual and non-rural loans are disbursed when other institutional and macroeconomic variables are controlled for. Vectors of coefficients β and δ are of the major interest in this study.

$$\beta = (\beta_1, \beta_2, \beta_3); \quad \delta = (\delta_1, \delta_2, \delta_3)$$

β_1 is expected to be non-negative under assumption that group lending is effective in reducing the level of the risk and increasing the yield. The coefficient β_2 is associated with rural lending and it is expected to be positive because of better suitability of rural population to microfinance as compared with urban population. As women borrowers are said to be more responsible, a greater presence of women among borrowers should drive the average level of risk down. Therefore, β_3 is expected to have a positive sign.

All of the δ s are expected to have positive signs since NBFIs, CUs and banks are expected to have better governance than NGO thanks to their profit driven operations. Banks are expected to perform the best among all forms among others due to their size, which enables better diversification. Credit unions are expected to have in magnitude the second large coefficient because they can receive savings which can facilitate financial behavior of the borrowers. NBFIs are expected to perform somewhat better than NGOs as NBFIs are expected to make profits.

$\theta = (\theta_1, \theta_2, \theta_3, \theta_4)$ is a vector of coefficients for institutional and macroeconomic variables. Institutional characteristics, which can have impact on the risk, are the number of borrowers of each microfinance institution and an average loan size of the each institution. As these microfinance institutions are subject to different economic environment in different countries, macroeconomic variables in country j in t period such as economic growth and inflation (represented by deflator) need to be controlled for.

The number of outstanding borrowers of microfinance institution i in country j in period t is represented by the variable num_bor_{ijt} . We assume that the bigger the portfolio gets the more it will be diversified. Therefore, the sign of θ_1 is expected to be positive. Another institutional

variable ave_size_{ijt} is an average loan size. The expected sign of the coefficient for this variable is ambiguous as smaller loans can be easier to repay and, however, at the same time smaller loans will not allow entrepreneurial activities in a greater extent, thus lowering the borrowers' ability to repay.

Variable $growth_{jt}$ is the growth rate of the economy. When the economy is running smoothly and growing, also the businesses of microfinance borrowers are expected to thrive, which means the earnings of borrowers should increase and thus the likelihood of default should decrease. Therefore, the expected sign for this coefficient is positive. The last variable – GDP deflator represents inflation in the economy. The effect of inflation on the low income borrowers seem to be ambiguous. Inflation is known to have reallocating effect in favor of borrowers. However, this is valid only if the earnings of the borrowers rise with inflation fast enough.

5. Data

The data used in this research is collected from an open database MIX Market where microfinance institutions upload their financial information and other microfinance related information. Because MIX Market platform does not allow complex work with the data uploaded, the data was manually downloaded and recompiled to fit our research goals. Moreover, World Bank databank was used for macroeconomic data. The consequent data used for the research is an unbalanced panel data of 90 microfinance institutions in the Central Asia over the period from 1998 to 2011. It should be noted that this time frame is used primarily because most of the observations are missing for the earlier years due to the fact that microfinance movement was not developed in these countries before 1990s.

The countries where the studied microfinance institutions operate are Mongolia, Kazakhstan, Tajikistan, Kyrgyzstan, Uzbekistan, Azerbaijan, China, and Afghanistan. Microfinance institutions from these countries were chosen according to the completeness of the data they provide on MIX Market. Descriptive statistics for the compiled data, after removal of certain errors, are presented in the following table. Two observations had values which were out of the possible range for *per_group* and *per_rural*.

Table 2: Descriptive statistics

Variable	Number of observations	Mean	Standard deviation	Min	Max
<i>Yield</i>	342	0.354	0.152	0.053	1.142
<i>per_group</i>	352	0.159	0.310	0	0.998
<i>per_rural</i>	352	0.247	0.353	0	1
<i>Female</i>	531	0.513	0.246	0.019	1
<i>num_bor</i>	595	15625	39921	4	411833
<i>ave_size</i>	592	2477.18	8786.92	0	171473.4
<i>growth</i>	1138	0.083	0.057	-0.019	0.345
<i>inflation</i>	1138	0.142	0.135	-0.188	0.878

As a result of incomplete data provided by MFIs the number of observations for the individual variables varies greatly.

The table with the descriptive statistics reveals that there are microfinance institutions which offer only individual loans and also institutions operating solely in urban areas. Microfinance institutions studied range from very small to large in terms of the number of outstanding borrowers.

As stated before, the data is for 90 MFIs from the Central Asia. There are 8 MFIs based in China, 6 MFIs based in Mongolia, 21 MFIs based in Kazakhstan, 13 MFIs based in Kyrgyzstan, 15 MFIs based in Tajikistan, 6 MFIs based in Afghanistan, 16 MFIs based in Azerbaijan and 5 MFIs based in Uzbekistan included in this study. Of which, 58 are nonbank financial institutions, 15 are banks, 6 are credit unions and 11 are non-governmental organizations.

These countries and MFIs were chosen to be included in this study because of several characteristics. Firstly, similar history and economic and political development were experienced by these countries. Moreover, microfinance initiatives in these countries are new. While microfinance was introduced only in the late 90s of the 20th century in this region, its implementation process had attracted significant amount of attention and effort.

6. Results

6.1 Pooled OLS Regression

In the following table the estimation of our model using OLS regression with pooled data is presented.

Table 3: Results of robust OLS estimation

Dependent variable: <i>yield</i>		
Variable	Estimated value	P-value
<i>per_group</i>	0.055**	0.020
<i>per_rural</i>	-0.059**	0.020
<i>female</i>	0.122***	0.001

<i>nbfi</i>	0.152***	0.000
<i>cu</i>	0.119**	0.049
<i>bank</i>	0.087***	0.008
<i>num_bor</i>	-4.13e-07***	0.007
<i>ave_size</i>	-9.65e-06***	0.001
<i>growth</i>	-0.248**	0.035
<i>inflation</i>	0.236***	0.001
<i>constant</i>	0.198***	0.000

*** - statistically significant at 1% level

** - statistically significant at 5% level

* - statistically significant at 10% level

The coefficients of all variables are statistically significant.

Table 4: F-statistic and the coefficient of determination

	Value
Number of observations	311
F(10, 300)	19.79***
P-value	0.000
R-squared	0.267

According to the F-statistic the model is significant and explains 26.7 percent of the variation in the dependent variable. With respect to the number of observation the coefficient of determination is acceptable.

Using a link test in STATA we can tell how well the model fits the data. This simple test of model fit is a regression of the dependent variable on the prediction and the square of

prediction. If the model is specified correctly, then the coefficient on the prediction should be close to 1 and the coefficient for the square of prediction should not be statistically significant. In other words, the square of prediction should have no explanatory power. The following table contains the result of the link test.

Table 2: Test for misspecification

Dependent variable: <i>yield</i>		
Variable	Estimated value	P-value
\widehat{yield}	0.916	0.206
\widehat{yield}^2	0.120	0.907
<i>constant</i>	0.014	0.911

From the results of the misspecification test we can see that the null hypothesis that the coefficient for the prediction squared is equal to zero cannot be rejected (p-value=0.907). Thus link test above suggests that the model is specified correctly. Therefore we can now go to the individual variables, interpret the results and relate them to our research hypotheses.

The coefficient for the variable *per_group* is statistically significant and different from zero, which means that this variable is relevant in explaining the earning performance. It suggests that an increase in the share of group loans in the whole portfolio by 1 percentage point leads to an increase in the yield of the gross loan portfolio by 0.055 percentage points. In other words, group loans appear to produce higher revenue than then individual loan at this point. This may be done through higher interest. However, one should note that this higher revenue is coming at the cost of higher portfolio risk.

From the results of the estimation of our model we see that lending to the rural areas seems to be decreasing the earning performance of MFIs according to the OLS estimate. On average an

increase in the share of rural loans by 1 percentage point lead to a decrease of the yield of the gross loan portfolio by 0.059 percentage point. In contrast, lending to women borrowers seems to increase the yield.

The hypothesis that NBFIs, CUs and banks should perform better in comparison to NGOs in terms of ability to produce revenue was confirmed in this study. On average banks have 8.7 percent higher, CUs 11.8 percent higher and NBFIs 15.2 percent higher yield of the gross loan portfolio. One of the reasons of current transformation of NGOs to these types of institutions seems to be earning performance, which is easier to achieve with good governance.

The estimated model suggests that with an increase of number of borrowers average yield decreases. Moreover, it seems that the bigger the loans grow the lower the yield of the gross loan portfolio becomes. It is possible that with the growth of size loans and the number of borrowers microfinance institutions might be forced to compete with conventional bank and this fact might be making MFIs act more like conventional banks. However, this can be true only given that conventional banking sector has lower interest rates.

It is also interesting that with the growth of the economy the yield of the gross loan portfolio decreases and vice versa. Under assumption that the performance of these local economies is positively correlated with the global economy, this result seems to be in line with the findings of Janda and Svárovská (2012). They point out that returns on investment in microfinance investment funds are not positively correlated with returns on the market portfolio.

6.2 Panel Estimation

When we evaluate statistical significance of our results obtained in the previous subsection we may notice that while all the estimated coefficients are statistically significant, the level of

significance among some key coefficients varies remarkably. While the lending to females increases the yield of MFI on 1% significance level with a wide margin (P-value of 0.001), the coefficients related to hypotheses about group lending and rural lending are significant only on 5% level (P-values of 0.02). Therefore it is advisable to investigate the validity of our results obtained in the previous subsection.

At this point we should recall that the data being used in this paper is actually panel data in which entities are observed across time. Our data consist of 90 entities, for which observations (though incomplete) exist over the period from 1998 to 2011. In other words, it is a combination of times series for each of the observed entities. Up to this point, our analyses were carried out using pooled OLS regression, which treats each observation as individual observation ignoring the time series property. However, this may be inefficient use of data as the main advantage of panel data is the fact that unobservable variables and factors can be controlled for given that they are significant. These unobservable factors can be, for instance, corporate cultural differences among MFIs, some aspects of corporate governance, the public image of a certain institution, or a relationship with sponsors and regulatory bodies i.e. factors specific to an individual MFI.

The common techniques of panel data are fixed effects model and random effects model. Fixed effect model should be used when we believe that there are some time-invariant unobserved variables which have impact on independent variables. Fixed effect model can help us better explore the relationship between dependent and independent variables within a microfinance institution. Each MFI has its own individual characteristics that may influence the independent variables e.g. the business practices of a certain microfinance institution may lead the borrower act more responsible or less responsible resulting in a higher or lower rate

of default. It is worth noting that an assumption behind this model is that these characteristics are specific to an institution and time-invariant. In other words each MFI is different, thus the error term and the constant which capture these characteristics should not be correlated with the each others. Fixed effect model removes the effect of those time-invariant characteristics from the explaining variables so we can assess the effect of the explanatory variables on the dependent variable.

In addition to the rationale behind fixed effect model, random effect model assumes that the variation across institutions is random and uncorrelated with the explanatory variables included in the model. In other words, unobserved effects of institutions are not explainable by the independent variables in the model. Therefore, in contrast to fixed effect model unobserved effect is entered as an explanatory variable in random effect model.

The decision whether random effects or fixed effects should be used is made using Hausman test. The null hypothesis of Hausman test is that the preferred model is random effects opposed to the alternative hypothesis that fixed effect model should be used.

Table 6: Hausman test

Dependent variable: <i>yield</i>	
Hausman test	19.23
P-value	0.002

At a 0.05 significance level, we reject the null hypothesis that the preferred model is random effects model in favor of alternative hypothesis that the fixed-effects model is preferred. Therefore, we will choose the fixed effects model for our panel regression.

In the following table the result of pooled OLS from the previous subsection is compared to the estimates obtained using panel data technique.

Table 3: Comparison of pooled OLS and fixed-effects model

Dependent variable: <i>yield</i>		
	Pooled OLS	Fixed effect
Dependent variables	Estimate (P-value)	Estimate (P-value)
<i>per_group</i>	0.055** (0.020)	0.017 (0.549)
<i>per_rural</i>	-0.059** (0.020)	-0.002 (0.929)
<i>female</i>	0.122*** (0.001)	0.302*** (0.006)
<i>nbfi</i>	0.152*** (0.000)	Omitted
<i>cu</i>	0.119** (0.049)	Omitted
<i>bank</i>	0.087*** (0.008)	Omitted
<i>num_bor</i>	-4.13e-07*** (0.007)	-7.26e-07 (0.229)
<i>ave_size</i>	-9.65e-06***	-12.1e-

	(0.001)	06***
		(0.009)
<i>growth</i>	-0.248**	-0.085
	(0.035)	(0.389)
<i>inflation</i>	0.236***	0.035
	(0.001)	(0.299)
<i>Constant</i>	0.198***	0.241***
	(0.000)	(0.000)
<i>observation</i>	311	311
<i>Number of</i>		76
<i>groups</i>		
<i>Wald chi2 /</i>	19.79	5.55
<i>F test</i>		
<i>P-value</i>	0.000	0.000

The comparison of pooled OLS and fixed-effect models shows that all the signs are the same for both fixed-effects and pooled OLS. However, fixed-effects model returns that coefficient on the variables *per_group*, *per_rural* and *num_bor* are not significantly different from zero. These findings suggest that there were unobserved time-invariant variables specific to each MFIs, which resulted in the previous significance of variables *per_group*, *per_rural* and *num_bor*. The magnitude of the significant variables has grown in the panel data model as compared to pooled OLS model. We see that the coefficient for the female borrowers has increased from 0.122 to 0.302, which means the previous conclusion regarding targeting women remains the same. However, our panel estimation suggests that group loans and rural lending do not statistically significantly influence the yield. This means that group lending

despite its increased risk does not lead to a higher yield of the gross loan portfolio. In other words, group loan does not appear to be effective. When it comes to the rural lending, the insignificant coefficient actually works in its favor, as compared with results obtained by pooled regression approach. It suggests that rural lending does not really decrease the yield of the gross loan portfolio. This finding suggests that the set of microfinance methodologies used in rural lending might be as effective as the ones used for urban lending.

At last we should note one disadvantage of fixed-effects model. That is the fact that we cannot study the impact of the legal form on the yield of the gross loan portfolio. Dummy variables used for this are omitted due to collinearity and the effect is absorbed by the individual intercept of each institutions.

7. Conclusions

Measuring the impact or the social effects of microfinance is rather problematic since the economics science itself is still somewhat ambiguous when it comes to reflecting the equality and social benefits in calculation. Another possible way of answering the question of effectiveness of microfinance is to study the microfinance institutions themselves. That is by comparing these institutions among themselves in terms of how different lending methodologies influence their financial performance indicators. The underlying rationale is that microfinance institutions with good finance performance are more sustainable than the ones which are not able to product sufficient financial yield.

In this paper we postulated several hypotheses related to financial performance of MIFs, which were based on the results previously discovered in microfinance literature. According to our empirical results the hypothesis that group lending increases the yield of the portfolio

was rejected as long as we use fixed effect panel regression instead of simple pooled OLS regression. The next hypothesis we made was about the contribution of women targeting towards the financial performance of MIFs. The highly statistically significant positive relationship between the percent of women borrowers and the portfolio yield according to both specification of our model (pooled OLS and fixed effects) suggests that women borrowers might be not only safer for lenders from the point of view of higher repayment rate but they may be actually charged higher interest rates in comparison to men. In general, targeting women seems to be an effective methodology in terms of default risk management and a general finance performance management of MFIs.

Hypothesis that rural areas are more suitable for microfinance approaches and thus rural lending is likely to improve the performance of MFI was not confirmed. The portfolio of MFIs does not seem to be statistically significantly affected by rural lending. This finding together with the results about (non)influence of the group lending confirm that the emphasize on lending to women is likely to be the most successful contribution of the microfinance approach to lending.

The hypothesis that good governance, which is expected to be present in more profit-oriented institution, can lead to better performance in terms of portfolio risk and earning performance was confirmed by our pooled regression estimation.

In this paper we measured the financial performance of microfinance institutions with the earning performance of MIFs in the terms of yield of the gross loan portfolio. However there are more possibilities for further research in this area. In order to receive more complete picture of financial performance of MIFs, other indicators of earnings like return on assets (ROA) may be used. Since the return should be always considered together with the risk, an

inclusion of a measure of riskiness, like portfolio at risk, into our analysis would improve its explanatory power too and would be an interesting extension of this paper.

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