Outreach and Efficiency of Microfinance Institutions

Hermes, Niels; Lensink, Robert; Meesters, Aljar

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Niels Hermes[#*], Robert Lensink[#¶] and Aljar Meesters[#]

#Centre for International Banking, Insurance and Finance (CIBIF),
Faculty of Economics and Business, University of Groningen, the Netherlands
¶ CREDIT, University of Nottingham, UK

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Abstract

This paper uses stochastic frontier analysis (SFA) to examine whether there is a trade-off between outreach to the poor and efficiency of microfinance institutions (MFIs). Using a sample of more than 1,300 observations, our study suggests that outreach and efficiency of MFIs are indeed negatively correlated.

* Corresponding author: Faculty of Economics and Business, University of Groningen, PO BOX 800, 9700 AV Groningen, the Netherlands; telephone: +31-50-363-4863; fax: +31-50-363-8252; email: c.l.m.hermes@rug.nl
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1. Introduction

Microfinance institutions (MFIs) focus on providing credit to the poor who have no access to commercial banks, in order to reduce poverty and to help the poor with setting up their own income generating businesses. In the literature, this focus is generally described as outreach. Because providing credit to the poor in many cases is a very costly activity, MFIs are often loss making, i.e they are not financially sustainable. Yet, in many cases MFIs succeed in lending to domestic small companies and poor agents, because Western donors and NGOs provide financial support by offering them loans against below-market interest rates.

Recently, however, there seems to be a shift from subsidizing MFIs institutions to a focus on financial sustainability and efficiency of these institutions. This goal stresses the importance of being able to cover the cost of lending money out of the income generated from the outstanding loan portfolio and to reduce these costs as much as possible. Among other things, this increased focus on financial sustainability and efficiency is due to a number of developments the microfinance business has been recently confronted with, such as the increasing competition among MFIs, the commercialization of microfinance (i.e. the interest of commercial banks and investors to finance MFIs), technological change that also has become available for, and implemented in microfinance, and financial liberalization and regulation policies of the government (Rhyne and Otero, 2006). These developments have induced microfinance institutions to change their behavior, and to broaden their services and activities.

The question that pops up is whether and to what extent shifting the focus towards increased financial sustainability and efficiency has implications for the outreach of MFIs. On the one hand, the commercialization of microfinance may attract increased commercial funds, which may contribute to supporting the outreach goal of MFIs. They may enlarge the amount of loans to the poor and/or ensure the provision of such loans for a longer period of time.

Thus, the absolute number of poor people that have access to MFIs may be increased. Moreover, increased competition, technological change, and financial market policies, which focus on strengthening market forces and improving the stability of MFIs, may positively contribute to the efficiency of MFIs. This, in turn, may help generating more financial resources with which the poor can be helped. Under these circumstances, outreach and financial sustainability and efficiency seem to be compatible objectives. Yet, focussing on financial sustainability and efficiency may also go at the cost of lending to the poor. As lending money to the poor – especially the very poor and/or the rural poor – can be very costly, the outreach and sustainability goal may be conflicting. Especially in policy circles there is a hefty debate on the compatibility versus the trade-off between sustainability and outreach. Whereas the so-called welfarist view stresses the importance of outreach and the threat of focusing too much on sustainability, the institutionalist view claims that MFIs should focus on sustainability.

While from a policy perspective it is very important to know whether the strife for financial sustainability and efficiency is compatible or conflicting with the outreach goal, there are surprisingly few studies that have investigated this issue in a systematic and appropriate way. Most studies only provide anecdotal evidence. This study aims at contributing to closing this gap in the literature. In particular, we provide an indepth analysis of the potential compatibility or trade-off between effciency of MFIs and their outreach. We use stochastic frontier analysis (SFA), a technique that has not been used extensively in the field of microfinance, to measure the efficiency of individual MFIs. We then link the efficiency measures obtained from the SFA to measures of outreach. For the analysis we use data for 435 MFIs, which we obtained from MixMarket^{TM} over the period 1997-2007.

The remainder of the paper is organized as follows. Section 2 discusses the literature on the relationship between financial sustainability, efficiency and outreach of MFIs. In

section 3 we set out the research methodology and explain the SFA in some detail. Section 4 continues with a description of the dataset, after which the estimation results are presented in section 5. In section 6 we summarize the main findings and provide conclusions we derive from the analysis.

2. Financial sustainability, efficiency and outreach: A short discussion of the literature

Recently, MFIs have been confronted with a number of challenges that has affected their way of doing business.[1] First, in several countries competition among MFIs has increased rapidly. This has led to lower interest rates, lower costs, more efficiency, and the introduction of new financial services, such as saving accounts, insurance services, etc. Second, commercial banks have started to become interested in providing microfinance, since in the past MFIs have shown that this can be a successful and profitable business. K-REP in Kenya is an example of a commercial bank that is involved in lending to the poor. Moreover, in some countries the government has actively stimulated commercial banks to become involved in microfinance.[2] Again, this has put pressure on MFIs to reduce interest rates and costs and raise efficiency.

Third, commercial banks and investors, especially those from developed countries, have become increasingly interested in financing MFIs. Large banks such as Citigroup, Deutsche Bank and HSBC, for example, have separate microfinance divisions, supporting activities of MFIs. The interest of multinational banks is due to the so-called "double bottom line" of financing and supporting MFIs: it allows banks and investors to show their corporate social responsibility, while at the same time these investments provide attractive risk-return profiles (Deutsche Bank Research, 2007). The first example of commercial capitalization of MFIs was the creation of an investment fund called Profund in 1995, which raised $23 million

[1] This section is partly based on Rhyne and Otero (2006).
[2] In Malaysia, Nepal and Thailand, for instance, the government has initiated programs stimulating commercial banks to develop microfinance activities. In India the National Bank of Agriculture and Rural Development (NABARD) recently initiated a program to involve private banks in microfinance.

to finance Latin American MFIs. In 2006 private investment funds, also known as microfinance investment vehicles (MIVs), held portfolios of MFIs shares with a total value of $2.3 billion (CGAP, 2007). Yet, the increased interest from commercial players has also raised the need for MFIs to become financially sustainable and enhance their efficiency.

Moreover, two additional recent developments have helped MFIs to improve their sustainability and efficiency. First, new banking technology, such as charge cards, ATMs, the use of cell phones and the internet has begun to enter the microfinance business, helping to reduce costs and improve the delivery of services. Second, several developing countries have recently liberalized financial markets, while at the same time installing regulations to help improving the stability of the microfinance business. These changes of financial market policies may also contribute to improving the sustainability and efficiency of microfinance.

The above developments and the resulting emphasis on sustainability and efficiency of MFIs may go at the cost of their outreach, however. Reaching the poor and providing them with credit may be very costly. Making very small loans involves high transaction costs, in terms of screening, monitoring and administration costs, per loan. Several authors therefore argue that the unit transaction costs for small loans to the poor are high as compared to unit costs of larger loans (Hulme and Mosley, 1996; Conning, 1999; Paxton and Cuevas, 2002; Lapenu and Zeller, 2002). Thus, there may be a trade-off between efficiency and outreach, implying that the shifting focus towards increasing sustainability and efficiency reduces the scope for the more traditional aim of many MFIs, which is lending to the poor.

What is the evidence on this trade-off between efficiency and outreach? In policy circles there has been a hefty debate on this issue between the welfarists, who propagate the dominance of the outreach goal (Woller, 2002; Montgomery and Weiss, 2005; Hashemi and Rosenberg, 2006), and the institutionalists, who stress the importance of sustainability and efficiency (Rhyne, 1998; Christen, 2001; Isern and Porteous, 2006). Both camps provide (in

many cases mostly anecdotal) evidence to support their view. Recently, however, representatives from both camps seem to have moved towards the centre, concluding that, under certain conditions, sustainability and outreach may be compatible (Morduch, 2005).

In the academic literature, however, we find surprisingly few rigorous testing of this issue. The most comprehensive study is from Cull et al. (2007). They examine the financial performance (using measures of profitability) and outreach in a large comparative study, based on a new and extensive data set of 124 MFIs in 49 countries. The study suggests that MFIs that focus on providing loans to individuals perform better in terms of profitability. Yet, the fraction of poor borrowers and female borrowers in the loan portfolio of these MFIs is lower than for MFIs that focus on lending to groups. It also suggests that individual-based MFIs, especially if they grow larger, focus increasingly on wealthier clients, a phenomenon termed as "mission drift". This mission drift does not occur as strongly for the group-based MFIs. Thus, Cull et al. do find evidence for a trade-off between efficiency and outreach.

Cull et al. (2007) support the findings of earlier studies, which, however, used less rigorous techniques and/or smaller datasets. Olivares-Polanco (2005) investigates the determinants of outreach in terms of the loan size of MFIs, using data for 28 MFIs in Latin America for the years 1999-2001. The analysis includes only one observation for each MFI in the dataset. Using simple OLS, Olivares-Polanco's study confirms the existence of a trade-off between sustainability and outreach. Makame and Murinde (2006) analyze the outreach versus sustainability trade-off using a balanced panel dataset for 33 MFIs in five East African countries for the period 2000-2005. Using different measures of the depth (loan size) and breadth (number of borrowers) of outreach, they find strong evidence for a trade-off between outreach and sustainability and efficiency.

Navajas et al. (2003) do not directly analyze the existence of the trade-off, but their study may have implications for outreach versus sustainability. They discuss the Bolivian

microfinance market developments since the mid-1990s and show that due to increased competition MFIs changed their lending technologies and the borrowers on which they focus their activities. In particular, their discussion suggests that the new competitor in the market (in Bolivia, this was Caja Los Andes) offered loan contracts that attracted less poor and more productive borrowers. Consequently, the first mover in the microfinance market (Bancosol) had to adjust its lending policies and, according to Navajas et al. (2003), it switched to loan contracts that prevented the less poor, more productive borrowers to move to Caja Los Andes. Implicitly, this suggests that competition leads to less access to credit for the poorest, i.e. less outreach. In a related paper, McIntosh et al. (2005) focus on the effects of increased competition in microfinance. In their study, they empirically show that wealthier borrowers are likely to benefit from increasing competition among microfinance institutions, but that it leads to lower levels of welfare for the poorer borrowers. This seems to support the view that outreach is hurt by the pressure of competition on the business of microfinance.

A related issue is that of financial regulation. It has been argued that regulation of microfinance is necessary, just like it is for commercial banks, due to the existence of information asymmetry (Hardy et al., 2003; Marulanda and Otero, 2005). Yet, regulation may divert attention away from outreach, if regulatory requirements focus too much on financial goals such as capital adequacy, financial sustainability, etc. Hartarska and Nadolnyak (2007), using data for 114 MFIs from 62 countries specifically investigate the impact of regulation on the performance of MFIs. In general terms, they do not find any evidence that regulated MFIs perform better in terms of either sustainability of outreach as compared to non-regulated MFIs, a finding that is consistent to what has been found for banks in general (Barth et al,. 2004). Thus, changes in financial market regulation do not seem to have an impact on the compatibility or trade-off between the two goals of MFIs. Makame and Murinde (2006), however, do find evidence for a negative relationship between regulation and outreach.

To conclude, the above review shows that there is only limited empirical evidence on the compatibility or trade-off between sustainability and outreach of MFIs. The few studies available suggest that there is a trade-off, yet they mostly use small datasets and/or simple analyses, except for Cull et al. (2007). Our study aims at going beyond the existing empirical analyses in two important ways. First, we use a substantially larger dataset, containing information for a large number of MFIs over a longer period of time than any of the previous studies in this field. Secondly, we use different measures of sustainability. In particular, we look at the cost efficiency of microfinance institutions. In order to do this, we formulate a cost function, apply stochastic frontier analysis (SFA) to determine a cost frontier, and determine which factors may explain the distance from the best practice cost function (i.e. cost inefficiency).

3. Methodology

In our analysis we measure cost efficiency in terms of how close the actual costs of the lending activities of an MFI are to what the costs of a best-practice MFI would have been in case it produces identical output under the same conditions. Cost efficiency measures the reduction in cost that could have been achieved if an MFI were both allocatively and technically efficient. As cost functions are not directly observable, inefficiencies are measured in comparison with an efficient cost frontier. Most studies on cost efficiency use data envelopment analysis (DEA) or stochastic frontier analysis (SFA) to calculate this frontier. We use SFA, since it controls for measurement errors and other random effects.[3] More specifically, we use the SFA suggested by Battese and Coelli (1995), henceforth the BC model. A first advantage of the BC model as compared to the standard two-step SFA of Aigner, Lovell and Schmidt (1977), and Meeusen and van den Broeck (1977) is that the BC

[3] Non-parametric techniques do not allow for measurement error and luck factors. These techniques attribute any deviation from the best-practice MFI to technical inefficiency. For a more extensive review of the non-parametric and the parametric approach, see Matousek and Taci (2004).

model simultaneously estimates the cost frontier and the coefficients of the efficiency variables. Wang and Schmidt (2002) show that a two-step approach suffers from the assumption that the efficiency term is independent and identically truncated, normally distributed in the first step, while in the second step the efficiency terms are assumed to be normally distributed and dependent on the explanatory variables. This method inherently renders biased coefficients. A second advantage of the BC model is that it can be estimated for an unbalanced panel, which normally increases the number of observations.

The general BC model specifies a stochastic cost frontier with the following properties:

$$(1) \qquad \ln C_{i,t} = C(y_{i,t}, w_{i,t}, q_{i,t}; \beta) + u_{i,t} + v_{i,t}$$

where $C_{i,t}$ is the total cost MFI i faces at time t and $C(y_{i,t}, w_{i,t}; \beta)$ is the cost frontier. In this cost frontier, $y_{i,t}$ represents the logarithm of output of MFI i at time t, $w_{i,t}$ is a vector of the logarithm of input prices of MFI i at time t, q are MFI specific control variables and β is a vector of all parameters to be estimated. The term $u_{i,t}$ captures cost inefficiency and is independent and identically distributed with a truncated normal distribution[4]. $v_{i,t}$ captures measurement errors and random effects, e.g. good and bad luck, and is distributed as a standard normal variable. Both $u_{i,t}$ and $v_{i,t}$ are time and MFI specific and can be represented as:

$$(2) \qquad u_{i,t} \sim N^{+}(m_{i,t}, \sigma_u^2)$$

$$(3) \qquad v_{i,t} \sim iidN(0, \sigma_v^2)$$

Next, we model the inefficiency of an MFI as:

[4] Thus, the total costs a MFI faces are never lower than the costs of the frontier. For a graphical representation of the frontier and its dynamics, see Berger et al. (1993). The authors show how inefficiency is determined by both technical and allocative inefficiency.

$$m_{i,t} = \delta_0 + \sum_n \delta_n z_{n,i,t} \tag{4}$$

In equation (4), the z represents the vector of n variables that determine the inefficiency (m) of MFI i at time t. The deltas represent the coefficients. Equations (1) and (4) are solved in one step by using maximum likelihood.

For the specification of the cost function we use the model developed by Sealey and Lindley (1977), who state that a bank acts as an intermediate between funders and borrowers. The cost function has a translog specification, and can be specified as follows:

$$\begin{aligned} \ln(TC_{i,t}) = {} & \beta_0 + \beta_1 \ln(SALARY_{i,t}) + \beta_2 \ln(R_{i,t}) + \beta_3 \ln(GLP_{i,t}) \\ & + \beta_4 \ln(SALARY_{i,t})^2 + \beta_5 \ln(R_{i,t})^2 + \beta_6 \ln(GLP_{i,t})^2 \\ & + \beta_7 \ln(SALARY_{i,t}) \ln(R_{i,t}) + \beta_8 \ln(SALARY_{i,t}) \ln(GLP_{i,t}) \\ & + \beta_9 \ln(R_{i,t}) \ln(GLP_{i,t}) \\ & + \sum_{j=1}^{4} \beta_j MFITYPE_{i,j} + \beta_{15} LLR_{i,t} + u_{i,t} + v_{i,t} \end{aligned} \tag{5}$$

In equation (5) *TC* represents total costs a MFI faces, *SALARY* represents the price of one factor of labor for one year, *R* is the interest expenses of holding money, *GLP* is the gross loan portfolio, and *MFITYPE* refers to the type of MFI. *TC* is measured as the total expenses to total assets ratio times total assets in US dollars. *SALARY* is the operating expenses to total assets ratio times total assets in US dollars, divided by the total number of employees. *R* is the financial expenses to total assets ratio divided by the total deposits to total assets. *GLP* is the gross loan portfolio to total assets ratio times total assets in US dollars.[5] In the cost function in

[5] Data for *TC*, *SALARY*, *R* and *GLP* are not directly available from the dataset we have used for this study (MixMarket™; see section 4 for a description of this source). Instead, information in terms of ratios, such as total costs to total assets, etc. are given only. This is why we have multiplied these ratios with total assets to obtain data for *TC*, *SALARY*, *R* and *GLP*.

equation (5), *SALARY* and *R* are the inputs, while *GLP* represents total output. The cost function specification takes into account the individual input and output variables, the square of these variables, as well as combinations of these variables. All variables in equation (5) are taken in logs.

In order to control for the fact that different types of MFIs may have different cost functions, we add a vector of dummies for the type of MFI (*MFITYPE*). In particular, cost functions may differ between types of MFI due to differences in the levels of subsidies these institutions receive from outside. The data we use (discussed in more detail below) do not provide detailed information about subsidies received, which stresses the need for adding controls for MFI type.[6] In the estimation outcomes discussed below we report the results for the specific dummy variables we have created for the type of MFI. In particular, we have dummy variables for banks (*BANK*), cooperatives (*COOP*), non-bank financial institutions (*NONBANK*) non-governmental organizations (*NGO*), rural banks (*RURBANK*) and other organizations (*OTHER*). The dummy variable *OTHER* is left out of the empirical analysis for reasons of singularity. Finally, loan loss reserves (*LLR*) are included to control for differences in the risk taking strategies among MFIs (Fries and Taci, 2005).

As mentioned before, the central aim of the paper is to investigate the trade-off (or compatibility) between sustainability and efficiency versus outreach of MFIs. In the framework we use, $m_{i,t}$ is our measure of inefficiency of an MFI. To analyze the relationship between efficiency and outreach we specify an empirical model, in which the inefficiency variable is the dependent variable and in which we have a number of measures of outreach. Additionally, we include a number of control variables that may also influence the inefficiency of MFIs.

The general specification of the inefficiency equations we estimate is as follows:

[6] By adding dummies for different types of MFIs we assume that subsidy levels are similar for the same type of MFIs.

(6) $$m_{i,t} = \delta_0 + \delta_1 \ln(ALB) + \delta_2 WOMAN + \delta_3 YEAR + \delta_{i=4...7} LOANTYPE_i + \delta_8 AGE$$

In this equation *m* stands for the first moment of the inefficiency distribution for MFI *i* at time *t*. The higher this moment, the more likely it is that the MFI is inefficient. The first two variables in this equation are standard measures of outreach; they have also been used in other studies. These variables are central to our analysis. *ALB* is the log of the average loan balance per borrower (in US dollars). Higher values of *ALB* indicate less depth of outreach, since in this case the MFI is expected to provide fewer loans to poor borrowers. *WOMAN* denotes the percentage of female borrowers in the total loan portfolio of the MFI. Higher values for this measure indicate more depth of outreach, since lending to women is associated with lending to poor borrowers.

Before developing our expectations with respect to the trade-off between outreach to the poor and efficiency of an MFI, we want to stress once again that the dependent variable of equation (6) measures the extent to which an MFI is considered to be inefficient. This means that we expect that for the outreach variable *WOMAN* the coefficient will be significantly positive. For the outreach variable *ALB* the expected coefficient will be significantly negative.

The remaining variables in equation (6) are control variables. *LOANTYPE* is a vector of dummy variables indicating which type of loans an MFI mainly provides. The inefficiency of an MFI may depend on the type of loans it mainly provides. From the literature we know that some types of loans demand more efforts than other ones. We have four different dummies, indicating that the MFI mainly provides individual loans (*INDIV*), group loans (*GROUP*), village loans (*VILLAGE*), and individual, group and village loans (*ALLTYPE*). The group of MFIs not included in one of the four dummies consists of those institutions that do

not report their main lending type. This group of MFIs is left out of the empirical analysis for reasons of singularity.

YEAR is a time running from 1 to 11. This variable is added to control for the possibility that inefficiency effects may change over time. *AGE* is a measure of the age of the MFI, i.e. the number of years since its establishment. Adding this variable allows for the possibility to test the hypothesis that older, more experienced MFIs are more efficient. An alternative hypothesis, however, may be that older institutions have had to learn how to cope with microfinance practices by trial and error, whereas more recently established institutions may profit from the knowledge with respect to microfinance practices that has been built-up during the past few decades. In other words, new MFIs may leapfrog older institutions in terms of the efficiency of their activities. If the first hypothesis holds, the coefficient for *AGE* is negative and significant, whereas in the second case the coefficient will be positive[7].

4. Data

The data on MFIs are taken from MixMarket™, a global web-based microfinance information platform. After adjustments for missing data we have information for 435 MFIs over a period of 11 years (1997-2007). Our full sample consists of 1,318 observations. Appendix table A provides the correlation matrix of the variables used in the analysis. Table 1 describes the dataset in terms of the number of MFIs per year for which we have information. As can be seen from table 1A we have only 6 observations for 1997 and 13 for 2007. In between these two years, the number of observations increases from 19 in 1998 to 298 in 2006. Table 1B shows the number of observations per MFI. For almost 50 per cent of all MFIs in our dataset,

[7] We also included size effects (measured as the number of active borrowers to which the MFI provides loans) and regional effects (by including regional dummies for African, and East Asian and Pacific countries) in the original empirical specification of the inefficiency equation. Yet, in the empirical analysis these variables turned out not to be statistically significant, which is why we have excluded them from the discussion in the main text of the paper. The results of these regressions are available on request from the authors.

we have only one or two observations. Moreover, there is not a single MFI for which we have data for entire 1997-2007 period.

<Insert tables 1A and 1B here>

Table 2 provides information on which loan type is used most often by MFIs in different country regions. The information is taken from the Mix Microbanking Bulletin, which makes a distinction between individual lending, group or solidarity lending, village bank lending and mixed lending (which means that an MFI does not focus on using either one of the three types of lending).[8] The table shows that especially the Latin American MFIs in our sample mainly provide individual loans, whereas for African MFIs group lending is relatively more important.

<Insert table 2 here>

Table 3 provides descriptive statistics with respect to loan types and different measures of outreach. The table suggests that MFIs that focus on group lending and village banking are associated more with lending to the poor than MFI focusing on individual lending. For instance, the average loan balance per borrower is much lower for MFIs focussing on group lending and village lending as compared to MFIs, which focus on individual lending. In addition, the percentage of female borrowers is higher for MFIs focussing on group and village lending as compared to those MFIs that mainly lend on an individual basis. Finally, the percentage of clients below the poverty line is higher for MFIs

[8] Note that for several MFIs in our dataset information on the loan type is not available, which also why the sum of the rows do not add up to the total amount reported in the last column of table 2.

that mainly use group and village lending as compared to MFIs focusing on individual lending.[9]

<Insert table 3 here>

5. Estimation strategy and results

Table 4 provides the estimation results with respect to the relationship between outreach and efficiency. The procedure we have used to generate these results is carried out as follows. As was mentioned before, the approach we follow (i.e. the SFA proposed by Battese and Coelli (1995)) simultaneously estimates the cost frontier and the inefficiency equation. With respect to the cost function we always estimate using the full specification of equation (5). This strategy is followed, since our main focus is not on the specification of the cost frontier, but on the specification of the inefficiency equation, and on the trade-off between outreach and efficiency in particular.

With respect to the inefficiency equation (6) we follow a specific-to-general approach (Brooks, 2002). This allows us to explicitly investigate the sensitivity of the results regarding the trade-off between outreach and efficiency to different specifications of the inefficiency equation. We start the analysis by including the two outreach variables in the inefficiency equation separately. We then include both outreach variables together in one regression. In table 4, the results for these three different specifications are presented in columns [1] to [3]. These three specifications are the ones on which our analysis is primarily focused.

Next, we add different sets of the control variables, which we have discussed above, to the three specifications of columns [1] to [3]. These extended specifications are presented in

[9] Unfortunately, for three of the six measures of outreach presented in the table, we have insufficient information in our dataset, which is why we only carry out the analysis with the outreach variables *ALB* and *WOMAN*. The average savings balance per saver is sometimes used as a measure of outreach. Yet, we have not used this measure in our analysis, since not all MFIs are allowed to offer savings accounts due to legal restrictions. Using this measure would therefore, at potentially, result in biased outcomes.

columns [4] to [6]. Since our data have a panel structure, all estimations have been carried out using pooled regressions.

<Insert table 4 here>

Panel A of table 4 refers to the estimation results of the cost frontier. A positive coefficient implies an outward shift of the cost function, and hence – ceteris-paribus – higher costs. The estimation results for the cost function appear to be as expected in most cases: the coefficients for *SALARY* and *GLP* are always significant and positive. The coefficient for *R* is negative, which is not as expected. Yet, several of the interaction and quadratic terms are significant as well and some of them are positive, which makes it difficult to directly observe the marginal effect of *R* on total costs. We use the so-called delta method to calculate the average marginal effect of *R* on total costs.[10] The calculations show that the marginal effect is significant and positive.[11] This leads us to conclude that our specification of the cost frontier fits theory reasonably well. Finally, all dummy variables for the type of MFIs, as well as the risk variable *LLR* are statistically significant in all specifications in table 4, indicating that the type of MFI and the risk taking strategy of an MFI indeed affect the cost frontier.

Panel B of table 4 refers to the estimation of the inefficiency equation. The results in columns [1] through [3] suggest that there is rather strong evidence for a trade-off between outreach to the poor and efficiency of MFIs. In all equations, the coefficient for *ALB* is negative and highly significant. This suggests that MFIs with lower average loan balances (i.e. those that focus more on lending to the poor) are less efficient. In addition, the results indicate that MFIs that focus more on female borrowers are less efficient, since the coefficient for *WOMAN* is positive and significant.

[10] The delta method is available in STATA®; see also Oehlert (1992) for a specification of this method.
[11] For completeness, we also calculated the marginal effects of *SALARY* and *GLP* on total costs with the help of the delta method. The results show also for these two variables the marginal effect is significant and positive.

The results for the outreach variables do not change when we include different sets of control variables. The coefficient for *ALB* remains to be negative and highly significant in all specifications presented in columns [4] through [6]. Also for *WOMAN* the results remain the same given different specifications.[12]

With respect to the results for the control variables panel B of table 4 shows the following.[13] First, the variable *YEAR* is always negative and statistically significant, indicating that during recent years MFIs in general have become more efficient. This may be explained by a learning curve effect: due to the strong growth of the microfinance business worldwide, knowledge has increased and has spilled-over, and people have become more experienced in managing MFI activities. Second, of the loan type dummies included in the analysis *GROUP* and *ALLTYPE* always have a negative and significant coefficient (see columns [5] and [6]), indicating that MFI focusing on group lending and/or on combining group, individual and village lending are more efficient. Especially the results with respect to *GROUP* are interesting, since they are not line with what has been found elsewhere in the literature. Our results indicate that group lending practices are generally less costly, supporting the view that this lending technique helps reducing information costs related to lending to the poor more than other lending techniques do. Third, the coefficient for the variable *AGE* is positive and significant, indicating that older MFIs are less efficient (see column [6]). This supports the view that more recently established institutions profit from the knowledge with respect to microfinance practices that has been built-up during the past few decades. Based on the existing knowledge base new MFIs may leapfrog older institutions in terms of the efficiency of their activities.

[12] These results also hold for specifications of the model including size and region effects (i.e. control variables that were not significant; see footnote 7).

[13] We also included the dummies for the type of MFI in the inefficiency equation (the estimation results are available from the authors on request). The results show that if we do this these dummy variables are all insignificant. We also find this result if we include the dummies in the inefficiency equation, but leave them out of the cost frontier estimations. These results clearly indicate that the type of MFI is primarily relevant for the cost frontier, while there is no indication that it is a relevant issue for explaining differences in inefficiency between different MFIs.

Summarizing the results in table 4, we find support for the fact that there is a trade-off between outreach and efficiency of MFIs in our sample. These findings remain to be significant even after controlling for a large set of control variables.

5. Conclusions

This paper has used SFA to examine whether there is a trade-off between outreach to the poor and efficiency of MFIs. Using a sample of more than 1,300 observations, we find convincing evidence that outreach is negatively related to efficiency of MFIs. More specifically, we find that MFIs that have lower average loan balances, which is a measure of the depth of outreach, are also less efficient. Moreover, we find evidence showing that MFIs that have more women borrowers as clients – again a measure of the depth of outreach – are less efficient. These results remain robustly significant after having added a long list of control variables.

In view of the current move to commercialization of the microfinance industry this appears to be bad news. Commercialization may induce a stronger emphasis on efficiency. Our study suggests that improving efficiency may only be achieved if MFIs focus less on the poor. It should be noted, however, that our results do not necessarily imply that a stronger focus on efficiency is bad for poverty reduction. As Zeller and Johanssen (2006) have pointed out, due to spill-over effects MFIs that strive for efficiency, and score low on outreach to the poor, may ultimately cause a higher poverty reduction at the macro level than MFIs that score high on outreach indicators. This assumes that these efficient MFIs are able to contribute to improving economic conditions at the local, regional and country level, and that these contributions ultimately are higher than the contributions to poverty alleviation made by MFI concentrating on outreach rather than efficiency. To the best of our knowledge, until now no study has empirically investigated the existence (let alone the size) of the effects of increased

efficiency of MFIs at the regional or macro (country) level. Further research is needed to look into this issue more carefully.

One final note with respect to the current process of commercialization of microfinance is that commercialization does not necessarily mean more focus on efficiency. Commercial parties may have different aims when investing in MFI, for example, since they aim at helping the poor as part of their corporate social responsible behavior. Moreover, they may be interested in investing in MFIs as part of an investment strategy that focuses on risk diversification rather than profit maximization at the level of individual MFIs. If investors are seeking to diversify their portfolios they are not necessarily interested in the most efficient MFIs. Again, further research is needed to get a better knowledge of the exact reasons why commercial parties are involved in microfinance and how this affects the efficiency and outreach of MFIs.

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Table 1A: Description of the panel (MFIs per year)

Year	Number of MFIs for which we have data in a particular year
1997	6
1998	19
1999	30
2000	42
2001	60
2002	123
2003	190
2004	243
2005	294
2006	298
2007	13
Total	1,318

Table 1B: Description of the panel (Number of year observations per MFIs)

Number of year observations available	Number of MFIs
1	104
2	106
3	85
4	49
5	48
6	19
7	8
8	7
9	5
10	4
11	0
Total	435

Table 2: Loan type and country region

Region	*Loan type*				
	Individual	Mixed	Solidarity	Village	Total
Africa	29	87	51	3	170
East Asia and the Pacific	49	40	3	1	93
Eastern Europe and Central Asia	7	13	3	0	23
Latin America and the Caribbean	99	22	0	0	121
South Asia	0	40	7	10	57
Total	184	202	64	14	464

Table 3: Descriptive statistics of outreach measures per loan type

		Individual	*Mixed*	*Group*	*Village*	*Total*
Average loan balance per borrower (ALB)	Mean	1,132	567	115	85	715
	St. dev.	904	791	46	38	858
	Obs.	184	202	64	14	464
% loans below US$300	Mean	54	67	94	95	71
	St. dev.	21	31	12	7	29
	Obs.	23	42	11	10	86
% woman borrowers (WOMAN)	Mean	43	64	65	97	58
	St. dev.	24	26	24	5	27
	Obs.	138	168	60	14	380
Average savings balance per saver(US$) (ASB)	Mean	1,892	2,332	37	22	1,751
	St. dev.	10,415	26,409	60	32	18,412
	Obs.	172	183	62	14	431
% clients below poverty line	Mean	29	55	75	68	57
	St. dev.	33	24	50	44	34
	Obs.	5	22	4	9	40
% clients in bottom half of the population	Mean	12	13	0	50	17
	St. dev.	16	6	–	0.5	15
	Obs.	5	21	1	4	31

Table 4: Results of the estimations

	[1]	[2]	[3]	[4]	[5]	[6]
Panel A						
SALARY	2.154***	2.184***	2.227***	2.216***	2.211***	2.091***
	(0.189)	(0.222)	(0.213)	(0.213)	(0.209)	(0.212)
R	-0.188***	-0.212**	-0.283***	-0.267***	-0.260***	-0.268***
	(0.071)	(0.087)	(0.081)	(0.082)	(0.081)	(0.081)
GLP	0.329***	0.334***	0.311***	0.313***	0.377***	0.420***
	(0.073)	(0.090)	(0.086)	(0.086)	(0.086)	(0.087)
*SALARY*R*	0.018**	0.021**	0.027***	0.026***	0.023***	0.023***
	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
*R*GLP*	0.003	0.004	0.005	0.005	0.005	0.006
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
*SALARY*GLP*	-0.016**	-0.016*	-0.008	-0.007	-0.01	-0.004
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
$SALARY^2$	-0.085***	-0.092***	-0.096***	-0.096***	-0.094***	-0.092***
	(0.012)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)
GLP^2	0.015***	0.015***	0.014***	0.014***	0.013***	0.010***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
R^2	0	0.001	0	0.001	0	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
BANK	-0.405***	-0.368**	-0.476***	-0.438***	-0.420***	-0.416***
	(0.147)	(0.162)	(0.160)	(0.158)	(0.160)	(0.160)
COOP	-0.897***	-0.885***	-0.939***	-0.887***	-0.899***	-0.922***
	(0.145)	(0.160)	(0.158)	(0.157)	(0.157)	(0.157)
NONBANK	-0.652***	-0.557***	-0.716***	-0.669***	-0.650***	-0.657***
	(0.147)	(0.160)	(0.161)	(0.159)	(0.161)	(0.161)
NGO	-0.629***	-0.540***	-0.724***	-0.667***	-0.692***	-0.714***
	(0.149)	(0.164)	(0.162)	(0.162)	(0.163)	(0.163)
RURBANK	-0.879***	-0.879***	-0.939***	-0.882***	-0.930***	-0.982***
	(0.148)	(0.164)	(0.163)	(0.163)	(0.164)	(0.165)
LLR	0.199***	0.197***	0.191***	0.188***	0.185***	0.183***
	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Constant	-7.227***	-6.871***	-7.572***	-7.579***	-7.945***	-7.644***
	(0.887)	(1.133)	(1.066)	(1.063)	(1.059)	(1.057)
Panel B						
ALB	-0.196***		-0.162***	-0.159***	-0.169***	-0.170***
	(0.017)		(0.018)	(0.018)	(0.019)	(0.019)
WOMAN		0.394***	0.227***	0.228***	0.231***	0.228***
		(0.074)	(0.059)	(0.059)	(0.059)	(0.059)
YEAR				-0.015**	-0.013*	-0.013*
				(0.007)	(0.007)	(0.007)
INDIVIDUAL					0.084*	0.051
					(0.044)	(0.046)
GROUP					-0.209***	-0.200***
					(0.063)	(0.064)
VILLAGE					0.254**	0.251**
					(0.126)	(0.126)
ALLTYPE					-0.090**	-0.083*
					(0.042)	(0.042)
AGE						0.004***
						(0.001)
Constant	1.915***	0.459*	1.751***	31.880**	26.880*	28.564*
	(0.114)	(0.269)	(0.178)	(14.559)	(14.942)	(14.988)
Obs.	1237	1004	1004	1004	1004	1004

Standard errors in bracelets

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix table A: Correlation table

	TC	*R*	*SALARY*	*GLP*	*BANK*	*COOP*	*NONBANK*	*NGO*	*RURAL*	*Other*	*ALB (in $)*	*year*	*WOMAN*	*INDIVIDUAL*	*ALLT*
TC	1														
R	0.0902	1													
SALARY	0.5654	-0.1296	1												
GLP	0.9602	0.0898	0.4943	1											
BANK	0.4798	0.0404	0.2996	0.4415	1										
COOP	-0.3278	-0.3147	0.0177	-0.2771	-0.2812	1									
NONBANK	0.113	0.0938	0.0141	0.103	-0.268	-0.4159	1								
NGO	-0.1094	0.2112	-0.2339	-0.1444	-0.1922	-0.2982	-0.2842	1							
RURAL	-0.1369	0.0338	-0.1215	-0.1018	-0.1278	-0.1983	-0.189	-0.1355	1						
Other	0.0679	-0.0073	-0.0156	0.0493	-0.0357	-0.0553	-0.0528	-0.0378	-0.0252	1					
ALB (in $)	0.238	-0.0488	0.3462	0.2747	0.2293	0.0772	-0.0879	-0.1909	-0.0482	0.0764	1				
year	0.047	0.0631	0.0685	0.0927	-0.0811	0.06	-0.062	0.0576	0.0646	-0.1182	0.1165	1			
WOMAN	-0.1274	0.2347	-0.2609	-0.1646	-0.1143	-0.1951	-0.0742	0.4698	-0.0163	-0.0882	-0.2315	0.0118	1		
INDIVIDUAL	0.2474	-0.0388	0.2144	0.2387	0.1499	-0.1191	0.0062	-0.0913	0.1268	-0.0329	0.0717	-0.1547	-0.2173	1	
ALLTYPE	0.2062	0.1434	-0.0353	0.2255	0.2065	-0.1761	0.0606	0.0434	-0.1234	-0.0372	-0.0753	-0.1054	0.0925	-0.174	
GROUP	-0.1526	0.0749	-0.2355	-0.1281	-0.1064	-0.1651	0.3405	-0.0451	-0.075	-0.0209	-0.1228	-0.0237	0.0562	-0.0981	-(
VILLAGE	-0.0158	0.1309	-0.066	-0.0335	-0.0448	-0.0695	0.0823	0.0545	-0.0316	-0.0088	-0.0535	-0.0197	0.1481	-0.0413	-(
ALB	0.4032	-0.1541	0.6735	0.4358	0.2885	0.192	-0.1065	-0.3995	-0.0031	0.0775	0.6917	0.1144	-0.4504	0.2304	-(
LLR	0.9121	0.036	0.4629	0.9058	0.416	-0.2725	0.1072	-0.1455	-0.0774	0.0354	0.2489	0.0434	-0.1838	0.2181	(

Appendix table A (continued): Correlation table

	GROUP	*VILLAGE*	*ALB*	*LLR*
GROUP	1			
VILLAGE	-0.0263	1		
ALB	-0.2563	-0.128	1	
LLR	-0.1514	-0.0671	0.3919	1