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Efficiency of Microfinance Institutions in Bangladesh

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Abstract

This study presents an empirical analysis of the cost efficiency of a sample of microfinance institutions (MFIs) operating in Bangladesh. These MFIs substantially vary in size and can also be characterized by their affiliation with donor and funding agencies. Therefore, the measurement of their performance poses an important challenge for the donor agencies and policymakers. Using stochastic frontier models in the measurement of the level of efficiency for the MFIs, the study suggests that larger MFIs are more efficient with some evidence of a trade-off between efficiency and outreach.

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1. Introduction

Microcredit fosters small scale entrepreneurship through simple access to credit by disbursing small loans to the poor, using non-traditional loan configurations such as collateral substitutes, collateral-free loans, group lending, progressive loan structures, and varied repayment schedules. The operational and institutional framework of a typical microfinance institution (MFI) is substantially different from that of a formal financial institution and they do not rely on deposits as their primary source of funds. In addition to disbursing microcredit; they also provide non-credit services such as capacity building, marketing of products, and vocational training. In Bangladesh and in other developing countries, MFIs provide financial services mostly to women, small scale entrepreneurs, and landless farmers. An analysis of the performance of these MFIs is important given that their loan recipients constitute a large fraction of the population. It is also important for donors, practitioners and policymakers to indentify the institutional features that contribute to their performance. Using financial data on MFIs in Bangladesh, this study makes an attempt to analyze the relative efficiency of MFIs and detect the sources of inefficiency.

The stochastic frontier analysis (SFA) technique was initially introduced in the context of estimating production functions to account for the sources of technical inefficiency, which may result in actual output to fall below the potential output level, indicated by being in the interior of the production possibility frontier. When modeling the estimation of a cost function such inefficiency may result in raising the cost of production above the cost frontier. Recent applications of the stochastic frontier model, in analyzing formal financial institutions in developed countries, can be extended to the evaluation of the technical efficiency of MFIs operating in developing countries. The non-monotonic parameterization in the stochastic frontier analysis is useful since it can estimate the marginal effects of the exogenous determinants of technical efficiency. Bangladesh has been at the forefront of the microcredit movement. While researchers have studied the impact of microcredit on borrowers, the topic of the performance of MFIs in Bangladesh has been somewhat neglected. We use a stochastic frontier model to analyze the technical efficiency of MFIs and to highlight the challenges that lie ahead as they strive to provide financial services to rural and urban households in Bangladesh. Although the trade-off between outreach and financial performance has been well documented, this is possibly the first study to show empirical evidence of this trade-off between depth of outreach and cost efficiency of MFIs in Bangladesh.

The note is organized as follows. Section 2 presents an overview of the efficiency of financial institutions while Section 3 briefly discusses the state of the microcredit sector in Bangladesh. Section 4 describes the data and the variables used in our study, Section 5 presents the econometric model of frontier analysis, and Section 6 provides a narrative of the empirical results of the frontier model and technical efficiency. Finally, a summary of important findings and conclusion is offered in Section 7.

2. Efficiency of a Financial Institution

The concept of efficiency is utilized to analyze the performance of financial institutions in terms of the relationship between inputs and output. An efficient firm is able to maximize its output for given a quantity of inputs, i.e., it is operating at the lowest cost. Microfinance Consensus Guidelines (CGAP, 2003) provides a common framework for measuring performance by listing nine ratios for measuring efficiency and productivity. The most commonly used indicator of efficiency is operating expense divided by average gross loan portfolio.

There is a large literature pertaining to estimating the efficiency of formal financial institutions in both developed countries and emerging economies. Berger and Humphrey (1997) discuss 130 such studies that use frontier analysis for financial institutions in 21 countries. Studies analyzing efficiency of individual MFIs include Schreiner's (2003) analysis of cost effectiveness of Grameen Bank in Bangladesh by comparing its subsidy to its output and an analysis of the relative success of Bank Rakyat Indonesia by Hartungi (2007). Using a sample of semi-formal rural financial institutions from Mexico, Paxton (2006) found that institutional factors are the primary determinants of efficiency. In another study, Paxton (2007) shows that average loan size and institutional age are positively associated with efficiency. Bassem (2008) uses data envelop analysis (DEA) and shows that the size of an MFI has a negative effect on efficiency of MFIs in the Mediterranean region.

Table 1. Descriptive Statistics

	2004	2005	2006	2007
Total members	297,288	381,020	328,072	384,854
Loans Outstanding	1,110.50	1,318.67	1,280.73	1,659.51
Lending Rate	25.61	24.57	22.78	24.54
Cost per taka Loan	0.24	1.18	0.19	0.19
Profit	85.90	-4.47	110.99	74.95
Break Even Interest	30.70	132.80	21.71	22.27
Number of MFIs	45	52	71	70
	MFIs excluding the Big Three			
Total members	21,707	60,553	69,431	77,467
Loans Outstanding	102.93	137.09	200.80	308.93
Lending Rate	24.96	24.45	22.60	24.54
Cost per taka Loan	0.24	1.23	0.19	0.18
Profit	8.02	-120.42	9.95	13.57
Break Even Interest	28.69	138.90	21.35	22.05
Number of MFIs	42	49	68	67
	PKSF Partner MFIs			
Total members	13,816	56,753	66,946	75,085
Loans Outstanding	67.14	90.57	171.71	283.35
Lending Rate	24.78	24.17	22.35	24.51
Cost per taka Loan	0.18	1.41	0.18	0.15
Profit	5.25	-152.22	8.25	12.07
Break Even Interest	22.17	162.09	20.71	18.61
Number of MFIs	33	40	62	60

Monetary amounts are in Million Taka [USD 1 = 78 Bangladeshi Taka]

3. Microcredit in Bangladesh

In Bangladesh, microcredit was introduced in 1976 as an experimental program disbursing small loans to groups of poor women to invest in indigenous home-based businesses. This type of microcredit was based on solidarity group lending in which each member of a group guarantees the repayment by all members. These programs had an almost exclusive focus on credit for income generating activities accompanied by mandated savings mechanisms targeting the ultra-poor borrowers who were mostly women. Since then, microfinance operation and the number of MFIs have rapidly expanded, especially after the mid eighties.

Table 1 shows that the number of members (borrowers) and the amount of loan outstanding have steadily increased over the four-year period covered in our study. There is a general tendency for the average lending rate and the cost per taka loan to have declined over this time period. This indicates some learning in the context of efficiency as MFIs expand their operation over time.

The Palli Karma-Sahayak Foundation (PKSF) is a second tier apex organization that channels funds from donor agencies to its partner organizations. PKSF partner organizations borrow from PKSF, often at subsidized rates, and are also subject to certain terms and conditions that include increased disclosure requirements and stricter adherence to PKSF guidelines. Table 1 shows that PKSF partners charge a lower lending rate than the non-partners and have a lower break-even rate of interest (except for year 2005). Evidently, PKSF partner MFIs appear to be more efficient than their non-partner counterparts in our sample.

4. Data and Variables

The data was compiled by the research associates at the Institute of Microfinance (InM) utilizing existing copies of audited financial statements housed at PKSF library or solicited from various MFIs.

Cost (*C*) is measured by total expenditure and is used as the dependent variable in our cost function estimation. Total loans (*LN*) constitute the primary output of an MFI while other assets (OS) including cash in hand, fixed deposits, and miscellaneous assets, constitutes their secondary output. Price of labor (*PL*) input is measured by the average cost of employees. Cost of capital, the other input price is divided into two parts – cost of borrowed funds (*CB*) and cost of deposits (*CD*). As is customary, fixed inputs (*FI*) are included in the cost function as netputs.

Institutional age (*AGE*) measured by years in operation should result in learning and is expected reduce inefficiency of an MFI. We expect larger MFIs to have higher efficiency due to economies of scale and scope in diversifying their loan portfolio. This is also supported by the fact that larger MFIs have a smaller breakeven interest rate. Size (*SZ*) of an MFI is measured by the total number of its members. Although initial studies found evidence of a trade-off between outreach and financial performance, more recent studies such as Quayes (2012) show that greater depth of outreach can actually reinforce the performance of an MFI, primarily due to higher repayment rates of small borrowers. We include average loan balance (ALB) to measure the inverse of depth of outreach to estimate its possible effect on the efficiency of an MFI. Finally, we include total borrowing from PKSF (*PKS*) to see if PKSF has a positive impact on its partners. The motivation behind using the amount of PKSF borrowing instead of simply using a dummy variable for PKSF partners is to also capture any subsidy effect of PKSF lending.

5. Econometric Model

A stochastic frontier model is utilized to estimate a cost frontier using output quantity and input price. The zone below the cost frontier is unattainable; therefore all firms are either on or above the frontier. Those on the frontier have the lowest cost for a given level of output, and those that lie above the frontier have a higher cost for a given level of output. Therefore, this is the frontier of efficiency since firms operating on the frontier have "best practice" management procedures.

The econometric frontier model estimates the frontier and measures the distance between the inefficient units and the frontier by the residuals, which is an intuitive approach adopted in traditional econometrics. However, when we assume that the residual has two components (noise and inefficiency) we have the stochastic frontier model. Therefore, an important element of the econometric frontier models is the decomposition of the error terms.

Most of the recent studies that have estimated efficient frontiers are based on Aigner, Lovell & Schmidt (1977) and Meeusen & van den Broeck (1977) who introduced the stochastic production or cost frontier models independently.

We start by defining a production function defined as $f(z_i, \beta)$ characterized by efficiency such that the ith firm would produce:

$$q_{it} = f(z_{it}, \beta) \tag{1}$$

where, q is the scalar output and z_i is the vector of K inputs used by the firm i, $f(z_i, \beta)$ is the production frontier, and β is the vector of technology parameters. The assumption in stochastic frontier analysis is that each firm produces less than its potential output due to some degree of inefficiency. More specifically, we can write the above equation as:

$$q_{it} = f(z_{it}, \beta)\varepsilon_{it} \tag{2}$$

where ε_i is the level of efficiency for firm i; with $0 < \varepsilon_i \leq 1$. If $\varepsilon_i = 1$, the firm is achieving the optimal level of output with given technology in the production function $f(z_i, \beta)$. When $\varepsilon_i < 1$, the firm is not making the most of the inputs given the technology embodied in the production function $f(z_i, \beta)$. Since we assume output to be strictly positive, i.e., $q_i > 0$, the degree of technical efficiency is also assumed to be strictly positive i.e., $\varepsilon_i > 0$.

Output is also assumed to be subject to the random shocks, implying that:

$$q_{it} = f(z_{it}, \beta)\varepsilon_{it} \exp(v_{it}) \tag{3}$$

where v_i is the one-sided disturbance term used to represent cost inefficiency.

Taking the natural logarithm of both sides yield:

$$\ln(q_{it}) = \ln\{f(z_{it}, \beta)\} + \ln(\varepsilon_{it}) + v_{it} \tag{4}$$

Since there are k inputs and that the production function is linear in logs, defining $u_{\text{i}} = -\ln(\varepsilon_i)$ can be expressed as:

$$\ln(q_{it}) = \beta_0 + \sum_{j=1}^{k} \beta_j \ln(z_{jit}) + \ln(\varepsilon_{it}) + v_{it} - u_{it} \tag{5}$$

Since u_{i} is subtracted from $\ln(q_i)$, restricting $u_{\text{i}} \geq 0$ implies that $0 \leq \varepsilon_i \leq 1$, as specified above.

A detailed version of this derivation is provided by Kumbhakar and Lovell (2000) where it is also shown that a dual cost function performing an analogous derivation can be specified as:

$$\ln(c_{it}) = \beta_0 + \beta_q \ln(q_{it}) + \sum_{j=1}^{k} \beta_j \ln(p_{jit}) + \ln(\varepsilon_{it}) + v_{it} + u_{it} \tag{6}$$

where q_i is output, z_{ji} are the input quantities, c_i is cost, and p_{ji} are input prices.

In our specification, the inefficiency effect is required to lower output. The model fitted by the frontier estimation is of the following form:

$$y_{it} = \beta_0 + \sum_{j=1}^{k} \beta_j x_{jit} + v_{it} + su_{it} \tag{7}$$

The explicit Cobb-Douglas functional form of the empirical model was used for the study of MFIs in this study is specified as follows:

$$\ln C_{it} = \beta_0 + \beta_1 lnLN_{it} + \beta_2 \ln OS_{it} + \beta_3 CB_{it} + \beta_4 CD_{it} + \beta_5 PL_{it} + \beta_6 FI_{it} + (v_{it} + u_{it}) \tag{8}$$

The inefficiency model is defined as:

$$U_{it} = \delta_0 + \delta_1 AGE_{it} + \delta_2 SZ_{it} + \delta_3 ALB_{it} + \delta_4 PKS_{it} \tag{9}$$

We employ maximum likelihood random effects time varying inefficiency model formulated by Battese and Coelli (1995) where the idiosyncratic error term is specified as heteroskedastic with variance expressed as a function of covariates.

6. Empirical Results

A stochastic frontier model was used for the panel data over four years to estimate the parameters of a linear model with disturbance terms generated by a specific mixture of distributions.

Higher levels of output result in higher cost, indicated by the statistically significant positive sign of the coefficient of loan. However, the estimated coefficient for other assets is not statistically significant. Higher cost of borrowing should result in increased costs, and although its estimated coefficient has a negative sign, it is not significant. The estimated coefficient for cost of deposits is not statistically significant either. Most of the MFIs in our sample accept deposits from its members in the form of member savings but very few accept deposits from nonmembers (non-borrowers). The cost of labor has a statistically significant positive sign, indicating that an increase in cost per employee will raise overall costs. Finally, fixed input also has a positive statistically significant impact on costs.

Table 2. Frontier Cost Function Model for MFIs

	Model I
Loan	0.919*
	(14.24)
Other Assets	-0.061
	(-1.35)
Cost of Borrowed Funds	-0.029
	(-0.84)
Cost of Deposits	-0.042
	(-1.43)
Cost of Labor	0.158*
	(3.27)
Fixed Inputs	0.072**
	(2.29)
Constant	-2.461*
	(-4.54)
Wald Chi Square	12789
Inefficiency Model	
Age	-0.046
	(-0.75)
Total Members	-0.805*
	(-3.44)
Average Loan Balance	-0.404**
	(-2.00)
PKSF Borrowing	-3.902*
	(-4.28)
Constant	10.816*
	(3.90)

t statistics are shown within parenthesis
*Indicates statistical significance at the 0.01 level.
**Indicates statistical significance at the 0.05 level.

Cost is a function of all input prices; the percentage increase in the total production is based on the interpretation of the coefficient of the Cobb-Douglas function, as the elasticity of production. The cost of labor matters, a one percent increase in the cost of labor will increase operating cost by approximately 0.16 percent and a one percent increase in the cost of fixed inputs will increase the cost by approximately 0.07 percent. Cost increases by 0.92 percent due to a one percent increase in loan which translates into a scale effect of 1.09 (1/0.919) of loan portfolio, indicating increasing returns to scale. This also implies that larger MFIs should have better efficiency as evident from our results in table 2.

The statistically significant positive effect of size on the efficiency implies economies of scale which is also confirmed by the size-wise breakdown of inefficiency estimates of the MFIs reported in table 3. Institutional age does not have a statistically significant effect on cost. The negative coefficient of the average loan balance per borrower implies that larger loans tend to be more cost efficient, i.e., the decrease in cost efficiency tends to decrease with the average loan size. It means that inefficiency increases with depth of outreach for this sample of MFIs.

The negative coefficient of the PKSF borrowing implies that increased borrowing from PKSF seems to reduce cost inefficiency, i.e., increase efficiency. This is also evident in Table 3 where the average efficiency levels of PKSF partners are consistently lower than their non-partner counterparts. Although there are no pre-qualifying criteria for MFIs to be PKSF partners, they are subject to some regulations, periodic monitoring, and a set of defined financial disclosure which may have resulted in more efficient management. In addition, they are also assured of a steady flow of funds (at a subsidized rate) which also contributes to their better performance. The rate of interest used in our estimation does not reflect the subsidy provided by PKSF. Notwithstanding the potential problem of endogeneity in the selection of its partners, we believe it was a novel approach to use PKSF partnership as an efficiency factor to analyze the importance of external oversight and regulation.

Table 3. Cost Efficiency – Size and PKSF Partners

Year	Small	Medium	Large	Big Three	PKSF	Non-PKSF
2004	2.6090	2.6197	1.4578	1.0532	1.6615	3.9101
2005	2.5752	2.2604	2.2287	1.5269	14.3515	3.2148
2006	2.0834	1.9986	2.2015	2.3407	2.0692	2.2069
2007	2.4080	1.4639	1.7110	1.8996	1.4820	3.6148
Average	2.3792	2.0203	1.9228	1.7051	1.7589	3.3859

Big Three includes the three dominant MFIs in Bangladesh – Grameen Bank, ASA, and BRAC. While both Grameen Bank and ASA are the most efficient MFIs, the inefficiency level of the big three is dragged up by the inefficiency level of BRAC. We sorted the rest of the MFIs by their membership size into three groups – the bottom quartile as small MFIs, the top quartile as large MFIs, and the remaining middle half as medium MFIs. Table 3 shows that MFIs of all categories become more efficient over time. Fifty five percent of the MFIs show an increase in efficiency between the year 2004 and the year 2006 and 57% of the MFIs show an increase in efficiency between the year 2004 and 2007. When we compare the year 2006 and 2007, 62% of the MFIs show an increase in efficiency. A quick glance across the columns reveals that larger MFIs are generally more efficient than smaller MFI. This is better captured in the last row where we report the four-year average inefficiency scores of the various groups. Finally, PKSF partners are more efficient than their non-partner counterparts (except for the year 2005).

7. Conclusion

Bangladesh, being at the forefront of the microcredit movement, it is important to delineate the relationship between financial performance of MFIs and their outreach efforts. This is possibly the first study to show empirical evidence of a trade-off between depth of outreach (inverse of average loan balance per borrower) and cost efficiency for MFIs in Bangladesh. It also shows that PKSF partner organizations demonstrate better efficiency than their non-partner counterparts; indicating that external oversight and regulation can enhance efficiency. The results from our study also show that size matters and larger MFIs are more efficient than smaller MFIs. Amongst the big three, Grameen Bank and ASA are very close to the efficient frontier. Finally, there is some evidence of learning by most of the MFIs in our sample over time. As smaller MFIs survive and grow, they undergo the process of learning efficiency. Donors and government agencies can formulate policies that foster the growth of small MFIs that are successful and facilitate an even playing field between large and small MFIs. On average, PKSF partners are more efficient than those who are not PKSF partners. We believe the efficiency of PKSF partners can be attributed to their uniform disclosure and organizational practice. We also believe that the recent formation of a microfinance regulatory authority should have some positive impact on the operation and efficiency of MFIs. Future research can focus on the correlation and interaction between disclosure and organizational structure and efficiency.

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