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Do transaction costs affect technical efficiency? Case of Indian microfinance institutions

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Abstract: *The present paper measured and analyzed the technical efficiency for a sample of 74 MFIs of India using the stochastic production frontier approach, which incorporates a model for technical inefficiency effects including administrative expenses, personnel expenses and fixed cost. The study revealed that the mean technical efficiency of MFIs turned out to be 68 per cent and also reported wide variations in technical efficiency across sampled firms ranging from 39 per cent to 97 per cent. The presence of substantial amount of technical inefficiency suggests that microfinance institutions can increase their output level by 32 per cent without increasing the quantum of inputs. The study, further, highlighted that reduction in administrative costs and fixed costs on the one hand, and enhancing the personnel expenses on the other, would be cumulatively handy in enhancing the efficiency of MFIs operating in India. The variations in transaction costs owing to age, location and level of maturity may be the significant factors for enhancing the efficiency and performance of MFIs. The study recommends that transaction costs especially administrative and fixed needs to be taken into account while examining the interest rates charged by microfinance institutions.*

Keywords: Microfinance Institutions (MFIs), Transaction Cost, Technical Efficiency, Stochastic Frontier Approach (SFA)

Introduction

Microfinance has been used in many poverty reduction projects of the government and development agencies in India. Reserve Bank of India issues guidelines to banks for mainstreaming and enhancing the outreach of micro credit providers. The organizations engaged in microfinance activities in India may be categorized as the wholesalers, non-governmental organisations, self-help group federations (SHGs). Although there is a presence of a variety of tools and means to achieve objectives of micro finance yet SHG-bank linkage programme has emerged as the major micro finance programme in India and is being implemented through commercial banks, rural regional banks and co-operative banks. The studies across the world proved microfinance as an effective tool to help the poor get out of poverty trap (Seibel and Kunkel, 1997; Hung, 1998 etc.). The nature of microfinance institution is unique and quite different from traditional financial institutions and significantly smaller in size having limited resources but the key focus of their services is towards farmers, other poor households and other deprived class and often provides small collateral free group loans. The gross loan portfolio of MFIs raised to $ US 121.31billion by 43.8 million active borrowers and 1.94 million depositors who deposited $ US 1.89 billion in 2016 (www.mixmarket.org). Microfinance has been proved

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as a key tool for poverty alleviation all over the world. Microfinance institutions focus on providing finance to poor in setting-up their own income generating business. An efficient MFI management is supposed to pursue twin goals, i.e., financial intermediation/social upliftment and poverty reduction. The former goal envisages that MFIs should generate enough revenue to meet their operating and financial costs while the second goal focuses on poverty alleviation and depth of outreach along with achieving financial sustainability.

Existing literature indicates about three types of costs that an MFI have to incur when it advances a loan, i. e., the cost of the money that it lends; the cost for loan defaults; and the cost of the transaction. The costs that are born by the consumer and not transferred to the seller of the good are the transaction costs of the borrowers (Wallis & North, 1987). Transaction costs are part of the total cost of the transaction for the borrowers, in addition to interest rates and fees paid to the institution. The transaction costs have been oftenly used to justify the high interest rates charged from lenders owing to the small loan size in the microfinance literature (Morduch, 2000; Armenda`riz & Morduch, 2010). Cheung (1969) defines transaction costs as costs that arise due to the existence of institutions and the appearance of an economic exchange. The transaction cost refers to cost of identifying and screening the client, processing the loan application, completing the documentation for disbursing the loan, collecting repayments and following up on non-payments. It consists of three costs; the costs of administering credit, coordination costs and the costs of the risk of default. Administrative costs are those which are directly attributable to the processing, delivering and administering of loans, while coordination costs are those resources which a financial institution devotes to ensure that clients follow the loan contracts (Saito and Villanueva, 1981). The risk of loan default is the inability of a borrower to meet his/her loan obligation as at when due and it costs to the firm (Balogun and Alimi, 1990).

Polski and Kearney (2001) specifies two types of transaction costs in banking activities; one includes interest expense which reflects the costs of funds for banking activities and the other non-interest expenses, reflecting the costs of information and coordination. Shankar (2007) advanced the concept of transaction costs by categorising them as direct and indirect one. Direct transaction costs comprise of training costs, the cost of direct administrative activities and cost of monitoring while, the indirect transaction costs contain the fixed costs of offices (branch, regional and head office), depreciation and taxation costs. These costs may affect significantly the performance of microfinance institutions.

Recent studies indicate that transaction costs are a major contributor to high-interest rates on microcredit loans. Transaction costs are non-proportional to the amount of loan. Since the average loan size being of a MFI is smaller than most other lending institutions (commercial banks etc.), the transaction cost on a percentage basis for a microfinance loan tends to be higher. Tankha (2002) identified the factors that impacted group formation costs as the number of groups handled by a field worker and conveyance expenses, group training costs and average staff salaries in the region. Administrative costs are not proportional to loan size. Shankar (2006) suggested that MFIs can reduce direct transaction costs by increasing the number of groups per square kilometer in order to save the time of field worker and conveyance cost which would be very handy in enhancing the productivity of field worker.

The efficient functioning of MFIs is of paramount importance for long-run sustainability, which refers to the capability of the institutions to generate enough income to at least repay the opportunity cost of all inputs as well as assets (Chaves and Gonzalez Vega, 1996). Recent researches have addressed the efficiency aspect of MFIs (Caudill et al., 2009; Gutie´rrez-Nieto et al., 2009; Hermes et al., 2011; Hudon & Traca, 2011) as well as the governance issues (Labie &

Mersland, 2011). The level of efficiency of MFIs has been measured using different parametric and nonparametric approaches across the world. Lafourcade *et al*. (2005) have used ratio analysis technique for MFI efficiency measurement, whereas Desrochers and Lamberte (2003) used stochastic frontier analysis for the measurement of the efficiency of MFI. Singh *et al.* (2013) found 40.6 per cent mean technical efficiency which indicates that 59.4 per cent inputs (output) can be reduced (increased) without sacrificing the output. Thibaut Dehem & Marek Hudon (2013) found that in India the average annual total Transaction cost per outstanding loan is higher for clients of urban SHGs than for those of rural SHGs. Singh *et al.* (2015) in their study on 78 microfinance institutions in India using stochastic frontier model found 64 per cent mean technical efficiency; besides the high incidence of administrative cost in affecting technical efficiency negatively.

In this backdrop, the present study attempts to measure the efficiency of microfinance institutions in India with the objective to help in improving the functioning of MFIs in the country. The study further seeks to identify the factors responsible for variations in efficiency level by analysing the both component of transaction cost, i.e., direct and indirect costs.

The remainder of the paper is as follows. The next section deals with the methodology employed in the course of the study followed by the results derived from the model. The final section pinpoints conclusions and suggests policy recommendations for MFIs.

Research Methodology

Stochastic Frontier Analysis

SFA is the most common parametric technique used for efficiency measurement of firms (Berger and Humphrey, 1997). A measure of technical efficiency was first introduced by Farrell (1957) for a cross section of firms by using deterministic approach. Later on, a more satisfactory means of estimating technical efficiency viz., the stochastic frontier model was independently developed by Aigner et al. (1977) and Meeusen and Van den Broeck (1977). In the analysis of firm's efficiency/ inefficiency, it is not the average of observed relationships between firm's inputs and outputs that are of interest but the maximum possible output that is obtainable from a given combination of inputs. Thus, the frontier production function can be defined as the maximum feasible or potential output that can be produced by a firm with a given level of inputs and technology. The technical efficiency of individual sample firms can be estimated on the basis of cross-section or panel data.

Bravo-Ureta and Pinheiro (1993) has drawn attention to those applications which attempt to investigate the relationship between technical efficiency and various socio-economic variables. The identification of factors which influence the level of technical efficiency of firms is, indeed, very important. If efficiency varies across producers or through time, it is important to seek determinants of efficiency variation. Early studies adopted two stage approaches. The first stage involves the estimation of the stochastic frontier production function and the prediction of firm level technical inefficiency effects or (TE). In the second stage, the predicted technical inefficiency effects (TIE) are regressed against a vector of explanatory variables (firm's specific factors).

The available studies prominently employ the intermediation approach as well as the production approaches for measuring the efficiency of the firm (Berger and Humphrey, 1997). Under intermediation, approach inputs can be defined as labour, capital cost and interest payable on deposit, whereas the loans and financial investments are considered as output. On

the other hand, in the production approach, the financial institutions are considered as the producers of deposits and loans. Therefore, the input choice under this approach is labour, capital and materials whereas output choice is the number of borrowers and number of savers. Hence, gross loan portfolio has been considered as a single output as well as the dependent variable in the present analysis besides personnel, offices and net active borrowers as expenditure (Norman and Stocker, 1991). For empirical analysis, a stochastic frontier production function in Cobb-Douglas form is specified as given below:

$$InY_i=b_0+b_1lnX_1+b_2lnX_2+b_3lnX_3+b_4lnX_4+ V_i-U_i \quad (1)$$

Where,

Y_i = Gross loan portfolio ($ US).
X_1= Personnel (in number)
X_2 = Offices (in number)
X_3 = Net Active Borrowers (in number)
b's = Parameters to be estimated
V_i = Symmetric error term, which is assumed to be independently and identically distributed having N $(0,\sigma^2_v)$ distribution.

and

U_i= One sided error term, reflecting technical inefficiency, which is assumed to be independent of V_i, is such that U_i is the non-negative truncation (at zero) of the normal distribution with mean μ and variance σ^2 (Aigner *et al.*, 1977), where

U_i is defined as:

$$U_i= a_0 + a_1\delta_1 + a_2\delta_2 + a_3\delta_3 \quad (2)$$

Where,

δ_1: Administrative Expenses;
δ_2: Personnel Expenses and;
δ_3: Fixed Cost.

The variables $\delta_1,\ldots\delta_3$ represent measurement of technical inefficiency effects to indicate possible effects of firm specific characteristics on the efficiency of MFIs. The b's and a's are expressed in terms of (Coelli and Battese, 1996):

$$\sigma^{2s} =^{\sigma v + \sigma} u^2 \text{ and } ^{\gamma = \sigma} u^{2/\sigma s} \quad (3)$$

Where, the γ parameter lies between zero and one. It is pertinent to mention here that the above model for the inefficiency effects can only be estimated if the inefficiency effects are stochastic and have a particular distributional specification. Hence, it is interesting to test the following hypotheses:

a) H_0: $\gamma = a_0 = \ldots = a_3 = 0$, i.e., inefficiency is absent

b) H_0: $\gamma = 0$, i.e., inefficiency effects are not stochastic
c) H_0: $a_0 = \ldots = a_3 = 0$, i.e., the coefficients of explanatory variables in the model are simultaneously zero
d) H_0: $a_1 = \ldots = a_3 = 0$, i.e., the coefficients of the variables in the model for inefficiency effects are zero.

The tests of these hypotheses for the parameters of the frontier are conducted using the generalized likelihood ratio statistics (Coelli and Battese, 1996). λ is defined as:

$$\lambda = -2 [L (H_R) - L (H_G)] \quad (4)$$

Where, L (H_R) is the value of likelihood function for the frontier model, in which parameter restrictions specified by null hypothesis, H_0, are imposed, and L (H_G) is the value of the likelihood function for the general linear frontier model. If the null hypothesis is true, then λ has approximately a chi-square (or mixed square) distribution with degrees of freedom equal to the difference between the parameter estimated under H_G and H_R respectively (Coelli and Battese, 1996).

To study analyses the impact of administrative expenses, personnel expenses and fixed cost on the efficiency of 74 MFIs operating in India. The administrative expenses are likely to cast negative effects on the level of efficiency as the high administrative cost put a financial burden either on clients or on organisation itself. The personnel expenses may cast positive or negative impact depending upon the outreach and scale of operations of the MFIs. Similarly the impact of fixed cost is expected to be positive as fixed cost is sort of compliment to other inputs employed by the MFIs in their lending operations.

The technical efficiency of the individual MFI, given the specification of the model, is defined by $TE_i = E (-U_i)$. Thus, the technical efficiency of individual MFI is between zero and one, and is inversely related to the inefficiency model. Furthermore, the parameters of the stochastic frontier production function model are estimated by the method of maximum likelihood using the Econometric Computer Program FRONTIER Version 4.1xp.

The Database

Data used in the study is obtained from Mix Market Network (www.mixmarket.org). In the present attempt, a total of 74 micro finance institutions (refer Table 5) have been sampled depending upon the availability of data for the year 2015. Information related to gross loan portfolio, assets, fixed costs, offices, personnel, administrative expenses, net active borrowers etc. was gathered from the mix market network. The present study focuses on all the three components of direct transaction cost, e g. administrative cost, training cost and cost of monitoring. However, personnel expenses are considered as a proxy for training cost and monitoring cost due to lack of availability of specific data. Similarly, out of the three components of indirect transaction cost, i.e., fixed costs, depreciation and taxation costs, only fixed costs are considered in the study as the depreciation and taxation costs are very negligible in Indian MFIs. The study uses administrative expenses, personnel expenses and fixed costs as a percent of total expenses for individual MFIs. The study uses personnel expenses as a proxy for training cost and cost monitoring.

Results and Discussion

Summary Statistics of Key Variables

The basic statistics of the variables used in the study is presented in Table 1. A level of severe variability has been observed in most the variables considered for the study. Gross loan portfolio, personnel, cost per borrower, assets and net active borrowers indicate larger variability as compared to other variables. The mean value of variables gross loan portfolio, assets, cost per borrower, and borrowing per loan officer have been registered as $ US 62.24 million, $ US 26.15 and $ US 627.11, respectively.

Table 1: Summary Statistics for Selected MFIs Operating in India

Variables	Minimum	Maximum	Mean
Gross Loan Portfolio ($ US Million)	0.15	615	62.24
Assets ($ US Million)	0.43	806	63.25
Cost Per Borrower ($ US)	6	420	26.15
No of offices	2	787	86.47
Personnel (Nos.)	16	7089	789.87
Administrative Expenses (%)	0.002	0.118	0.045
Personnel Expenses (%)	0.012	0.036	0.021
Fixed Cost (%)	0.007	0.029	0.017
Net Active Borrowers (Million)	1651	0.44	0.31

Estimation of Stochastic Frontier Model

The maximum-likelihood estimates of the parameters in the stochastic frontier production function along with the technical inefficiency effects models are presented in Table 2. The estimated parameters of the frontier production functions are attached with expected sign. The parameter estimates for the input variables like personnel, offices and net active borrowers have been found positive and statistically significant at 5 per cent level of significance. The parameter estimates depict that increasing the quantum of personnel, offices and net active borrowers are very beneficial in the productivity of the sampled MFIs.

Table 2: Parameter Estimates of Stochastic Frontier Function for MFIs in India

Variable	Parameters	Coefficient	Standard error
Stochastic Frontier Model			
Constant	b_0	7.231	0.1257
Personal	b_1	0.033*	0.021
Offices	b_2	0.127*	0.097
Net Active borrowers	b_3	2.181*	1.083
Inefficiency Model			
Constant	a_0	-0.322	0.458
Administrative expensive	a_1	7.525*	3.209
Personnel Expenses	a_2	-0.188*	0.086
Indirect cost	a_3	0.333*	0.156
Variance Parameters	σ^2_s	0.627*	.294
	γ	0.746*	0.230
Log likelihood Function		53.11	

Note: Figures in the parentheses indicate standard errors.

* Significant at 5 percent level of significance.

The estimated coefficients of the explanatory variables for the technical inefficiency effects have some vital implications and require attention. The coefficient of variable administrative expenses is positive and statistically significant and exhibits that higher administrative expensive promotes inefficiency among the operating MFIs. Estimated coefficient of variable personnel expenses, which includes the expenses for training and monitoring, is negative and statistically significant signifying that higher expenditure on personnel will enhance the efficiency of the MFIs. The coefficient of fixed cost is again positive and statistically significant thereby showing that high fixed cost culminates inefficiency in the MFIs. The parameter γ is estimated to be 0.746, which suggests that 74.6 per cent inefficiency is due to the firm's own decision and the remaining 25.4 per cent are due to the factors outside the control of the micro finance institutions.

Table 3: Likelihood-Ratio Tests of Hypotheses for Parameters of the Stochastic Frontier Model

Null Hypothesis	Log likelihood	λ	Critical Value	Decision
H_0: $\gamma = a_0 = \ldots = a_3 = 0$	41.72	27.78	11.91	Reject H_0
H_0: $\gamma = 0$	40.78	29.66	5.13	Reject H_0
H_0: $a_0 = \ldots = a_3 = 0$	36.87	37.48	11.07	Reject H_0
H_0: $a_1 = \ldots = a_3 = 0$	37.94	35.14	10.37	Reject H_0

Note: The critical values for the hypotheses are obtained from Table 1 of Kodde and Palm (1986, p. 246) at q + 1 degrees of freedom, where q is the number of parameters to be estimated.
The Log-Likelihood values in Column No. 3 are compared with the base values of the model in Table 2. All values are significant at 5% level.

Tests of Hypothesis for Inefficiency Model

Table 3 presents the various tests of null hypothesis associated with the models were carried out using the likelihood ratio (LR) statistics. The first null hypothesis, H0: γ = a0 = … = a3= 0, i.e., that inefficiency is absent from the model, is rejected 5 per cent level of significance thereby implying that the traditional production function is not an adequate representation of the data for sampled MFIs in India. The second null hypothesis, H0: γ = 0, which specifies that the inefficiency effects are not stochastic, is again rejected at 5 per cent level of significance which accepts the presence technical inefficiency. The third null hypothesis considered in the model, H0: a0 = … = a3= 0, i.e., that the coefficients of the explanatory variables in the inefficiency models are simultaneously zero, is also rejected. It indicates that the three explanatory variables taken in the model make a significant contribution in the explanation of the inefficiency effects associated with the MFIs. The final null hypothesis considered, H0: a1 =… = a3= 0, i.e., that the coefficients of the variables in the model for inefficiency effects are zero, is also rejected for the sampled MFIs in India. It reflects that all the coefficients of the explanatory model are significantly influenced by the administrative expenses, personnel expenses and fixed costs on the efficiency of 74 MFIs operating in India.

Distribution of Technical Efficiency

The technical efficiency of each institution under study was estimated for the year 2015. The mean efficiencies of all institutions have also been calculated. The individual technical efficiency values of each sampled MFI are presented in Table 5.

Table 4: Frequency Distribution of Technical Efficiency of Selected MFIs in India

Technical efficiency (Per Cent)	Frequency	Per Cent
Below 50	07	09.46
50-60	24	32.43
60-70	23	31.08
70-80	13	17.57
80-90	04	6.76
90-100	03	02.70
Mean	68.23	
Minimum	38.51	
Maximum	97.21	

Table 5: Individual Technical Efficiency of MFIs in India

Sl No	Name of MFI	Efficiency in %	Sl No	Name	Efficiency in %
1	SKDRDP	97.21	38	Saija	64.22
2	Spandana	90.49	39	IDF Financial	63.12
3	Samhita	90.09	40	Sambandh	61.88
4	Mahashakti	88.43	41	Pratigya	61.83
5	HPPI	84	42	Navachetna	60.78
6	Satin	81.24	43	Svasti	60.74
7	Bhartiya Micro	80.51	44	Pahal	59.71
8	Arth	79.39	45	Chaitanya	59.35
9	Cashpor	78.78	46	Dhosa	59.14
10	Adhikar	78.78	47	SMILE	59.11
11	DishaMicrofin	77.24	48	Jagaran	59.09
12	Equitas	75.76	49	LokBiradari Trust	58.96
13	ESAF	75.25	50	ASA	58.88
14	Janalakshmi	74.32	51	BWDC	58.52
15	GramaVidiyal	73.56	52	IMPACT	58.31
16	Ujjivan	73.52	53	NFPL	58.29
17	Prayas	72.49	54	Mahasemam	58.07
18	Future Financial	72.26	55	Agora	57.48
19	GKFSPL	71.98	56	Sahara utsarga	57.3
20	Margdarshak	71.13	57	Guardian	56.84
21	SV Creditline	69.68	58	Nirantara	56.09
22	Pustikar	69.04	59	Sarvodaya Nano	56.04
23	Madura	69.01	60	Sewa Bank	55.62
24	Repco	69.01	61	CDOT	54.64
25	BSS	68.84	62	Dakshin	54.32
26	Asirvad	68.33	63	NEED	53.33
27	Sanghamithra	68.3	64	Belghoria	52.1
28	Fusion	68.13	65	SMGBK	51.97
29	Annapurna Microfinance	67.32	66	SebaRahara	51.48
30	Suryoday	66.68	67	Asomi	50.76
31	Annapurna Cooperative	66.55	68	MCM	49.98
32	Utkarsh	66.38	69	GramalayaMicrofin	49.01
33	Belstar	65.79	70	Grameen Sahara	45.47
34	RGVN	65.58	71	Shakti Mahila	45.44
35	Sonata	65.54	72	BWDA	44.35
36	RASS	65.44	73	HiH	42.34
37	Arohan	65.09	74	Bal Mahila	38.51

The examination of technical efficiency of the individual institution revealed that there were wide variations in the level of technical efficiency. The mean efficiency ranges from 38.51 per cent to 97.25 per cent. The mean technical efficiencies over the years indicate that about 09 per cent of MFIs have technical efficiency less than 50 per cent level whereas, 32 per cent of sample institutions have registered technical efficiency between 50-60 per cent and only 07 percent of the sampled MFIs have estimated technical efficiency above 80-90 per cent. The table further reveals that only 03 per cent of the institutions have technical efficiency above 90 per cent. The mean technical efficiency of Indian microfinance institutions included in the study during the period is registered to be 68.23; which implicates that approximately two-third of the potential output is being realized by the microfinance institutions in India. It also indicates that microfinance institutions can increase their output level by 32 per cent by the same amount of inputs and technology.

Conclusions and Suggestions

The paper examined the technical efficiency and factors affecting thereof for a sample of 74 microfinance institutions in India using stochastic frontier production model which also incorporates a technical inefficiency model. The mean technical efficiency showed wide variation across sample firms ranging from 36 per cent to 97 per cent with overall mean technical efficiency being 68 per cent. However, the findings show that microfinance institutions can still increase their output level by 32 per cent by the same amount of inputs and technology. Further, the technical inefficiencies of MFIs are significantly related to administrative costs, personnel cost and fixed cost.

The coefficient of variable administrative expenses is positive and statistically significant and exhibits that higher administrative expensive promotes inefficiency among the operating MFIs. Estimated coefficient of variable personnel expenses, which includes the expenses for training and monitoring is negative and statistically significant signifying that higher expenditure on personnel will enhance the efficiency of the MFIs. The coefficient of fixed cost is again positive and statistically significant thereby showing that high fixed cost culminates inefficiency in the MFIs. The parameter γ is positive and statistically significant at 5 per cent level suggesting that inefficiency effects are significant in the analysis of micro finance institutions. The study recommends that transaction costs especially administrative and fixed needs to be taken into account while examining the interest rates charged by microfinance institutions. The variations in transaction costs owing to age, location and maturity may be significant factors for enhancing the efficiency and performance of MFIs. There is a requirement to provide support infrastructure in terms of better business models to self-motivated youth with customised financial products at their door steps. There is urgent need to review the pattern and composition of administrative expenses for better performance of theses grass-root level organisation which is instrumental not only in enhancing employment opportunities but also works as effective for financial inclusion and prosperity with a human face. In case future research it is strongly recommended to apply the study on larger sample size with pooled data and region wise analysis.

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