Social and Financial Efficiency of Microfinance Institutions in Pakistan

ABSTRACT

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Targeting financially marginalized communities in an efficient way is the most desirable and possibly the most effective strategy for microfinance institutions (MFIs) to reduce incidences of absolute poverty, create self-employment opportunities, and improve socioeconomic wellbeing of the poor communities. This paper attempts to investigate social and financial efficiency of Pakistani microfinance institutions to bring forth optimal strategies for financing non-bankable poor in an efficient and self-sustainable way. The investigation of efficiency of the MFIs in Pakistan can help the major stakeholders of the industry in understanding the current scenario and to design optimal policy agenda for the future. The sample size of this study consists of all MFIs in Pakistan for the year 2013. The data about the MFIs has taken from '*Mixmarket'* database. After specifying 19 different DEA models, with the help of three input and four output variables, representing various dimensions of MFIs such as cost structure, financial structure and organizational characteristics, the study reveals that MFIs efficiency is sensitive towards the selection of input and output variables, the choice of CCR and BCC models and the number of input and output variables in the model. The study further reveals that there is no single way to efficiency however; it majorly depends on the scale, age and types of MFIs. Microfinance banks perhaps are not appropriate financial institutions to extend microcredit to poorer community member and to achieve the goal of women empowerment through the extension of credit to women. As a rough estimate inefficient MFIs can focus on the optimal use of Asset (which is common among the socially efficient MFIs irrespective of their types and size) followed by operating cost and loan officers respectively.

Keywords: Efficiency, Microfinance Institutions, DEA

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1. Introduction

Financial efficiency and profitability of 'for profit' institutions have been traditionally measured with the help of financial ratios (Hassan & Sanchez, 2009). However, financial ratios are inappropriate to investigate the sources of inefficiency, estimate financial or social efficiency with multiple inputs and outputs, and to decompose the sources of efficiency or inefficiency into technical, technological and scale efficiencies or inefficiencies respectively (Hassan & Sanchez, 2009). Microfinance Institutions (MFIs) are special institutions which simultaneously consider their social role to uplift the marginalized community members along with their commercial objective to secure self-sustainability. In standard literature this phenomenon is coined MFIs as 'double bottom line" institutions. (Gutierrez-Nieto, Serrano-Cinca, & Mar Molinero, 2007; Gutiérrez-Nieto, Serrano-Cinca, & Molinero, 2007). This simultaneity differentiates MFIs from conventional financial institutions. The achievement of socioeconomic efficiency is indispensable for MFIs to operate, independently and on a wider scale. Thus investigation of socioeconomic efficiency of MFIs is important for monitoring and optimal policy implications.

Efficiency assessment techniques are broadly divided into parametric; such as Stochastic Frontier Analysis (SFA), Thick Frontier Analysis (THA) etc., and non-parametric techniques such as Data Envelopment Analysis (DEA) (Berger & Humphrey, 1997; Gutiérrez-Nieto et al., 2007). According to Berger and Humphrey (1997) the popular efficiency assessment technique is DEA. This technique does not assume any prior specific shape of distribution and also free from specific functional form. In spite of the mentioned strengths of DEA it also has some demerits as well. Before investigating efficiency of Pakistani MFIs, it is important to consider the limitation of DEA. Otherwise it may yield misleading results. For example, an inefficient DMU may become efficient and vice versa because of inappropriate specification of the model or irrelevant

input or output variables (Gutierrez-Nieto et al., 2007). How to avoid or minimize the biasedness of this technique is a question of central importance for researchers and policy institutions? The DEA technique identify an efficient MFI based on extreme information therefore, it is unsafe to conclude an MFI efficient or otherwise based on a single input-output specification. To deal with this issue, this paper attempts to identify an efficient MFI based on all possible and theoretically important combinations of input and output variables. This idea was developed by Cinca and Molinero (2004). There are different statistical techniques such as "Factor Analysis" to identify factor inputs or outputs which are more important than other combinations of input and output variables for model specifications.

Pakistan initiated microfinance programs in 1980s. The Agha Khan Rural Support Program (AKRSP) and the Orangi Pilot Project were the first microcredit programs initiated in Pakistan. Today microfinance sector in Pakistan consists of; Microfinance banks, Rural Support Programs, NGOs, Islamic microfinance NGOs and specialized MFIs. Major changes have been observed in the microfinance sector in Pakistan. First, there were no practices of the provision of other financial services like microinsurance, deposit; micropensions etc., except microcredit but in recent days MFIs provide a set financial products and policies. Second, microcredit programs were imitated to help the poor and marginalized people without any commercial objectives but todays' most of the MFIs have changed their intentions and now they are looking for both; commercial gains and social success. Third, microfinance programs in Pakistan were multidimensional in nature but todays' microfinance programs are more specific and specialized.

Pakistan is one of the developing countries which recognized the importance of microfinance as a strong tool for socioeconomic uplifting of the poor and financially marginalized segments since the early 80's. Although, the country has initiated the efforts for the

last 30 years against poverty and gender disparity; however, the desired outcome has not been achieved. Under the "Microfinance Strategy 2007", the state bank of Pakistan set a target to reach 3 million borrowers until the end of 2010. Further, the growing target is expected from 3 million to 10 million by the end of 2015 (SBP, 2011)[3]. However, until the end of fiscal year 2012-13, around 2.43 million poor have only reached by microfinance institutions (Mixmarket, 2012).

This paper aims to gauge financial and social efficiency of Pakistani MFIs across the country to know the underlying factors which constitute a particular DMU efficient or otherwise. These factors have been investigated in different dimensions such as organizational characteristics, cost and financial structure of MFIs, the ability of MFIs to generate maximum profit, disburse maximum loans, and targeting 'poorer and financially marginalized' community members.

2 Theoretical Framework of the Study

The roots of microfinancing, to facilitate the poor by providing small loan for productive utilization and self-employment, can be traced back from philosophical concern of conceptualizing poverty as lacking of access to financial capital (Engberg-Pedersen & Munk Ravnborg, 2010; Hulme & Shepherd, 2003). According to this concept poor are assumed to be productive, capable of running their own small businesses and creditworthy to payback their loans. This idea initiated the extension of microcredit to the poor at different formal and informal levels (Ledgerwood, 1999). Informal credit have been remained a more dominant source for the poor who were not able to produce physical collateral to conventional financial institutions (Rhyne & Christen, 1999). In nutshell, conceptualization of poverty as lacking of access of the poor to financial capital, the extension of financial capital for self-employment and productive

[3] Please see table 1.3 and 1.4

utilization of credit, marginalization of poor by the traditional banks due to lacking of producing physical collateral, exploitation of the poor by informal credit sources and alleviation of poverty by business models are some of the factors which initiated microfinance activities across the globe.

The operations of microfinance institutions can be broadly observed into two contexts. First, Microfinance institutions can be observed as financial intermediaries such as they collect deposits from the clients and non-clients, they provide saving facilities to the clients and then mobilize the funds among the clients who need it (Christen & Drake, 2002; Qayyum & Ahmad, 2006). In this context, microfinance institutions more or less similar to conventional banks, in terms of their operations. Second, microfinance institutions can be treated as production units (Gonzalez, 2007; Haq, 2008). MFI institutions use certain inputs such as credit officers, capital and produce outputs such disbursement of loans, generating revenue and targeting the poor clients (Armendáriz & Morduch, 2010; Qayyum & Ahmad, 2006). Production approach seems more appropriate than intermediary approach because all MFIs do not provide the facility of saving and deposits, except microfinance banks (which is only one kind of MFIs) thus, this approach does not fit to maximum MFIs (Gutiérrez, Serrano-Cinca, & Molinero, 2007). Efficiency theories, to test financial or social efficiency and overall performance of microfinance thus do not seem good in production approach. The neo classical theory of production and production efficiency seems more suitable when the MFIs are assumed as productive units (such as firms), while they are producing almost same products, working in the same regulatory and environment, using more or less same inputs. Based on the assumptions of neoclassical economists, producers always operate efficiently in terms of both technical aspects and economic aspects as well (Kokkinou, 2010). For example technical efficiency means optimization by not

wasting productive resources while economic efficiency means producers optimize by solving allocation problem involving prices. The difference in production may be yielded, resulting from the differences in;

i. Technology of production
ii. Differences in the efficiency of the production process
iii. Differences in the environment where production is taking place

There is a fair chance of difference in production even when technology and production environment are almost the same, firms or industries may exhibit different productivity levels due to differences in their production efficiency (Kokkinou, 2010). Thus, this study attempt to investigate social and financial efficiency of the MFIs under the assumption of constant return to scale (input oriented CCR-model) and variable return to scale (input oriented BCC-model). The following Figure 1 shows theoretical framework of the study.

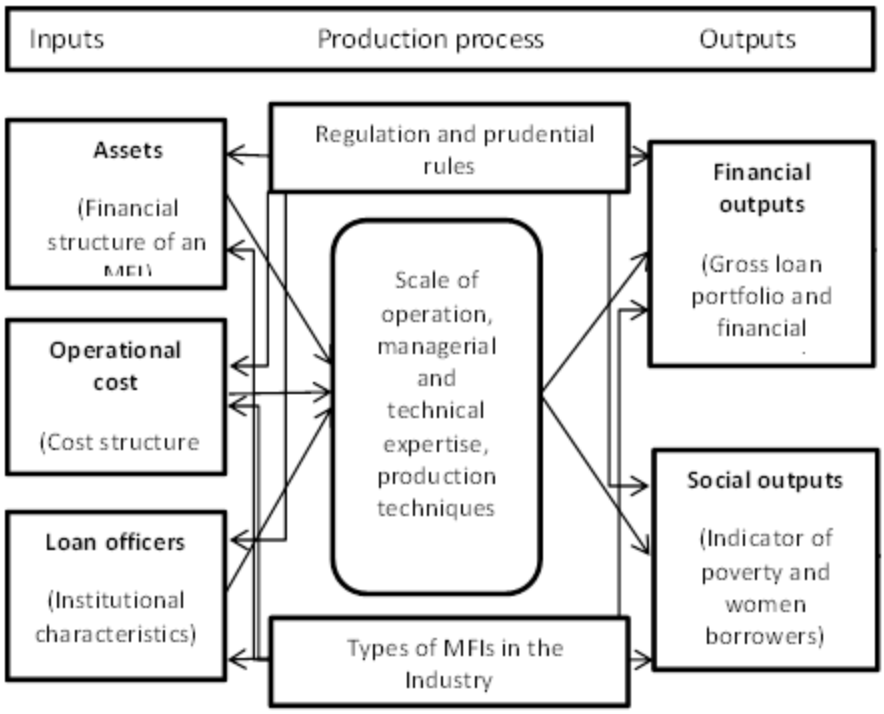

Figure 1: Theoretical Framework of the Study

Inputs: Factors which are used to produce something or deliver a service. These can affect the production process, Industry characteristics can and be affected from external factors.

Production process: This is a link between factors input and output. This may compromise the quality and quantity of inputs, exogenous factors, and industry characteristics while it can affect output and industry characteristics in turn. This may encompasses production technology, internal environment, scale of production.

Output: This may be in the form of physical production or the provision of service. Output is affected by inputs through the production process and affects organizational performance.

External Factors: Factors which are exogenous such as intervention of the government through regulation polices, donors, rating agencies. These factors may affect the whole process-starting from input selection to operational performance.

Industry Characteristics: Industry characteristics such as the number of FMIs in the industry, capital or labor intensity of the industry, what product is being produces or what service is being offered. Industry characteristics are affected by and also affect inputs, production process, output and organizational performance.

2. Material and Methods

The sample size of the study consists of all Pakistani MFIs, available with latest complete information on Microfinance Information eXchange (MIX). The study therefore; uses cross sectional data for the year 2012. The selection of input and output variables is based on the literature (Gutierrez-Nieto et al., 2007; Hassan & Sanchez, 2009; Mamiza Haq, Michael, & Shams, 2010). After going through the literature three inputs (Assets (Asset), Operating Costs (OC) and Loan Officers (LO)) and four outputs (two financial variables such as Gross Loan Portfolio (GLP), Financial Revenue (FR) and two social variables such as Women Borrowers (WB) and indicator of poorer clients' index (P)) selected to investigate how efficiently MFIs in Pakistan transform the selected inputs to achieve their twin objectives; optimal social and financial efficiency. Based on Gutiérrez et al. (2007) calculating poverty index requires to weight each MFI as; w = [{1-(Ki-Min (k)) / Range of K] where i represents the number of a particular MFI. Min (k) is the minimum of Average Loan per Borrower (ALPB) while max (k) is the maximum of ALPB. The range represents the difference between maximum and minimum (Max (K) - Min (k)). Based on the weight (w) assigned to each MFI, the indicator of poverty has been

thus obtained. Pi is an index of support of the poor, based on ALPB. This index favors those MFIs which have smaller ALPB. Pi for a specific MFI can be obtained when its weight (w) is multiplied by number of borrowers (B); wB = [{(1-(Ki-Min (k) / Range of K} * B]. It is a combination of two outreach indicators; width of outreach (number of borrowers) and depth of outreach (ALPB). Women borrowers and poverty index, both, are used as social indicators of MFIs.

MFIs in Pakistan are consists of seven specialized microfinance banks, three Non-Banking Financial Institutions (NBFI) and nineteen NGOs. Keeping into consideration the limitation of same input and output variables for DEA models this study adopted *a production approach* and avoided deposits with MFIs as input because the majority MFIs (particularly, NGO are mostly not regulated and thus are not able to mobilize savings and collect deposits from their clients) do not provide the facilities of saving or deposit collections. The following Table 1 represents input and output variables, their slandered definitions and measurement units.

Table 1: Inputs and Outputs and Their Definitions and Measurement

Symbol	Variable name	Variable definition	Unit
Input (A)	Total Assets	Total of all net asset accounts	$
Input (B)	Operating Cost	Expenses related to operations, such as all personnel Expenses, rent and utilities, transportation, office supplies, and depreciation	$
Input (C)	Number of loan officers	The number of individuals who are actively employed by the MFI to disburse loan and collect repayments.	Number
Output (1)	Gross loan portfolio	Gross loan portfolio outstanding principal balance of all of the MFI's outstanding loans including current, delinquent and restructured loans, but not loans that have been written off.	$
Output (2)	Financial revenue	Financial revenue generated from the gross loan portfolio and from investments plus other operating revenue	$
Output (3)	Indicator of Benefit to the poorest	Poverty Index, it is a combination of two outreach indicators; width of outreach (number of borrowers) and depth of outreach (ALPB).	$
Output (4)	Number of women borrowers	Number of active borrowers who are female	Number

Source: adopted from (Gutiérrez et al., 2007; Gutierrez & Goitisolo Lezama, 2011)

Data envelopment analysis efficiency score, with the help of the selected input and output variables, estimated under BCC (Banker, Charnes, & Cooper, 1984) and CCR (Charnes, Cooper, & Rhodes, 1978) input based models through 19 different specifications. Each specification of input/s and output/s represents a unique combination to reveal the sources of efficiency or inefficiency for each MFI. For example, the input variables represent three dimensions; asset (capital structure), operating cost (cost structure) and loan officers (the quality of human resources) and the output variables represent financial indicators (gross loan portfolio and financial revenue) and social indicators (indicator of poverty and targeting the women clients). First 12 models (A1, A2, A3, A4, B1, B2, B3, B4, C1, C2, C3, and C4) represent a

corresponding one to one relationship among the input and out variables. This will help identifying the channels of efficiency for each MFI. The next four models (ABC1, ABC2, ABC3 and ABC4) represent the combinations of all inputs with respect to financial and social indicators. Subsequent two models (ABC12 and ABC34) represent financial and social efficiency models. These are comprehensive models of financial and social efficiency than the previous models because it takes into consideration all input and output variables and constitute an MFI efficient or otherwise. The final model (ABC1234) represents overall efficiency based on all the selected input and output variables.

These models were estimated through DEA, a non-parametric technique, used for calculation of social and financial efficiency without prior information about the shape of the distribution of a data set. This technique allows the researchers to calculate social or financial efficiency with multiple inputs and outputs (Gutiérrez et al., 2007; Gutierrez & Goitisolo Lezama, 2011; Haq, Skully, & Pathan, 2010; Kabir & Benito, 2009). This technique is equally beneficial for commercial and non-commercial DMUs. Both input-oriented (IO) and output-oriented (OO) versions of the DEA methodology has been applied to the data for the sake of efficiency score comparison. In order to specify the mathematical formulation of the IOM, if there are K MFIs (in the language of DEA it is called DMUs) using N inputs to produce M outputs. Inputs are denoted by x_{jk} (j=1….n) and the outputs are represented by y_{ik} (i=1……m) for each MFI k (k=1……K). The efficiency of the DMU can be measured as (Coelli, Rao, & Battese, 1998; Qayyum & Ahmad, 2006; Shiu, 2002; Worthington, 1999).

Technical Efficiency = (Sum of weighted output/Sum of weighted input) $=TE_k = \theta =$

$$\sum_{i=1}^{m} u_i y_{ik} \Big/ \sum_{j=1}^{n} v_j x_{jk} \qquad (1)$$

Where y_{ik} is the quantity of the i^{th} output produced by the k^{th} MFI, x_{js} is the quantity of j^{th} input used by the k^{th} MFI, and u_i and v_j are the output and input weights respectively. The DMU maximizes the efficiency ratio, TEk, subject to;

$$\left(\sum_{i=1}^{m} \boldsymbol{u_i y_{ik}} \Big/ \sum_{j=1}^{n} \boldsymbol{v_j x_{jk}} \right) \leq \mathbf{1},\ where\ u_j\ and\ v_j \geq 0 \qquad (2)$$

The above equation (2) indicates that efficiency measures of an MFI cannot exceed 1, and the input and output weights are positive. The weights are selected in such a way that the MFI maximizes its own efficiency. To select optimal weights the following mathematical programming (output-oriented) is specified (Coelli et al., 1998; Qayyum & Ahmad, 2006; Shiu, 2002; Worthington, 1999).

3. CCR and BCC Input Oriented Models

Input-orientated DEA model looks at the amount by which inputs can be proportionally reduced, where the amount of output is supposed to be fixed. Contrary, the input oriented model, output-orientated model looks at the amount by which outputs can be proportionally expanded, where the amount of input is supposed to be fixed. The DEA can be conducted under the assumption of constant returns to scale (CRS) or variable returns to scale (VRS)

$$\text{Min } \theta = \theta o - \varepsilon\left(\sum_{i=1}^{m} {s_i}^{+} + \sum_{j=1}^{n} {s_j}^{-}\right) \qquad (3)$$

Subject to

$$\sum_{j=1}^{n} x_{ik}\lambda_k + {s_j}^{-} = \theta_{x_{io,}}\ j = 1, \ldots . n$$

$$\sum_{j=1}^{m} y_{jk}\lambda_k - {s_i}^{+} = y_{x_{io,}}\ i = 1, \ldots . m$$

$$\lambda_j, {s_j}^{-}, {s_i}^{+} \geq 0, \varepsilon > 0, k = 1, \ldots \ldots s$$

Where θo is the proportion of DMU*o*'s inputs needed to produce a quantity of output equivalent to its benchmarked DMU identified and weighted by the λi. S_i^- $sr+$ is the slack variables of input and output respectively. λ_j is a (n x 1) column vector of constants and indicate benchmarked DMUs.

The CCR model developed by Charnes et al. (1978) estimate the efficiency of DMU with the assumption of Constant Return to Scale (CRS). This assumption may fail in imperfect markets. The CRS assumption is only appropriate when all firms are operating at an optimal scale. The use of the CRS specification when all firms are not operating at the optimal scale results in measures of Technical Efficiency (TE) which are confounded by scale efficiencies (SE). The use of the VRS specification permits the calculation of TE devoid of these SE effects. SE can be calculated by estimating both the CRS and VRS models and looking at the difference in scores VRS model is essentially the CRS with an additional constraint added to the LP problem.

The BCC model developed by Banker et al. (1984) is a modified version of CCR. This model helps to investigate scale efficiency. If the restriction $\sum_{k=1}^{s} \lambda_k = 1$, is connected, then CCR model becomes BCC (Banker, Charnes, Cooper, 1984) model.

The modified form of CCR can be written as;

Min TE (θ) = $\theta o - \varepsilon\left(\sum_{i=1}^{m} {s_i}^+ + \sum_{j=1}^{n} {s_j}^-\right)$ (4)

Subject to

$\sum_{j=1}^{n} x_{ik}\lambda_k + {s_j}^- = \theta_{x_{io,}} \; j = 1, \ldots . n$

$$\sum_{j=1}^{m} y_{jk}\lambda_k - {s_i}^+ = y_{x_{io,}} \; i = 1, \ldots . m$$

$$\sum_{k=1}^{s} \lambda_k = 1$$

$\lambda_j, s_j^-, s_i^+ \geq 0, \varepsilon > 0, k = 1, \ldots\ldots n$

4. Estimation Techniques and Methodological Concerns

Following the model specification suggested by Cinca and Molinero (2004) the study estimated DEA efficiency for each feasible specification. Thus 19 different specifications of input and output variables have been estimated. Finally, super efficiently for all specified models have been estimated to rank the efficient MFIs (Lovell & Rouse, 2003). In terms of input oriented models, super efficiency of a DMU represents the maximum possible proportional increase in an input vector retaining the DMU efficiency (Khodabakhshi, 2007). The DEA efficiency and super efficiency of all selected models have been estimated in the Efficiency Measurement System (EMS 1.3 version). The following table-1&2 shows the results of various DEA efficiency models under the BCC and CCR models. The BCC models are used to estimate pure technical efficiency while CCR models are used to estimate overall technical efficiency. The ratio of CCR and BCC are then used to estimate scale efficiency and returns to scale (Banker & Thrall, 1992; Ruggiero, 2011). The maximum value of a technical or pure technical efficient MFI is 100. It means that the MFI is 100 percent efficient to transform inputs into outputs. Any MFI for which the efficiency score is less than 100 is considered inefficient on managerial and technical aspects (Charnes et al., 1978).

Table-1: DEA Efficiency of MFIs Based on BCC Input Oriented Model

DMUs	A1	A2	A3	A4	B1	B2	B3	B4	C1	B2	C3	C4	ABC1	ABC2	ABC3	ABC4	ABC12	ABC34	ABC1234
Akhuwat	54	33	41	15	45	37	43	18	21	10	30	16	61	38	52	22	61	52	61
Apna MF Bank	83	74	9	10	42	59	15	15	34	26	13	14	90	79	20	20	91	20	91
ASA Pakistan	100	100	100	100	79	90	100	100	22	17	59	82	100	100	100	100	100	100	100
Asasah	8	53	79	79	16	16	18	23	43	30	52	78	88	56	100	100	88	100	100
BRAC - PAK	73	95	58	60	20	34	20	24	14	14	23	38	73	95	58	60	95	60	95
Buksh Foundation	100	100	100	100	29	29	29	29	100	100	100	100	100	100	100	100	100	*100*	100
CSC	62	85	31	38	22	47	15	22	39	40	31	52	72	93	48	62	93	62	93
CWCD	82	80	28	14%	28	41	15	15	25	21	18	13	82	80	30	21	82	30	82
DAMEN	77	89	30	4	59	99	27	50	69	60	41	100	100	100	54	100	100	100	100
FFO	79%	75	63	66	32	42	30	35	32	28	35	47	81	79	69	72	81	72	81
FMFB - Pakistan	48	68	10	5	45	64	12	7	45	45	26	19	79	83	26	19	83	31	85
GBTI	33	40	10	12	37	61	25	25	58	56	39	46	61	81	41	46	81	46	81
JWS	69	74	36	41	29	51	20	30	37	31	29	52	79	80	52	64	82	64	82
Kashf Bank	57	81	1	1	22	36	1	1	52	53	5	5	82	98	5	5	98	5	98
Kashf Foundation	100	98	100	100	63	65	85	100	27	19	75	100	100	98	100	100	100	100	100
Khushali Bank	100	76	67	11	83	55	39	10	61	42	100	39	100	71	100	28	100	100	100
NRSP	99	84	100	50	100	100	100	95	17	12	100	39	100	100	100	95	100	100	100
NRSP Bank	63	85	13	3	59	80	16	4	43	41	27	7	96	100	30	7	100	30	100
Orangi	6	32	50	5	100	86	100	18	99	46	100	28	100	88	100	30	100	100	100
Orix Leasing	62	53	45	45	46	63	42	54	65	50	65	100	82	76	80	100	82	100	100
POMFB	18	42	6	4	12	40	7	7	28	41	20	16	29	54	20	16	54	20	54
PRSP	28	52	20	11	29	72	26	16	15	20	21	16	35	78	30	21	78	30	78
RCDS	59	76	34	36	27	58	21	29	36	35	30	54	69	83	53	62	83	62	83
SAFWCO	64	61	56	28	35	57	40	28	29	22	33	31	71	66	74	42	73	74	82
SRSO	86	61	48	51	75	68	47	62	47	26	49	89	100	69	72	95	100	95	100
SRSP	85	48	97	94	69	69	69	69	90	80	100	100	100	100	100	100	100	100	100
Sungi	98	79	100	100	100	100	100	100	43	38	52	62	100	100	100	100	100	100	100
TMFB	100	100	1	4	100	100	1	5	100	100	5	27	100	100	4	18	100	18	100
TRDP	83	61	82%	51	69	81	96	72	31%	19	54	50	99	81	100	77	99	100	100

Source: Authors' own calculations

Table-2: DEA Efficiency of MFIs Based on CCR, Input Oriented Model

DMUs	A1	A2	A3	A4	B1	B2	B3	B4	C1	B2	C3	C4	ABC1	ABC2	ABC3	ABC4	ABC12	ABC34	ABC1234
Akhuwat	54	30	34	13	36	36	35	16	19	8	22	15	61	37	52	22	61	52	61
Apna MF Bank	81	66	5	7	37	55	3	6	24	16	2	7	87	77	6	10	88	10	88
ASA Pakistan	100	89	82	88	54	90	69	87	21	16	32	62	100	100	99	100	100	100	100
Asasah	77	48	70	73	12	14	17	21	24	13	41	77	84	56	97	100	84	100	100
BRAC - PAK	73	85	48	53	16	34	16	21	13	13	16	32	73	93	52	57	93	57	93
Buksh Foundation	60	100	24	19	3	10	2	2	10	13	7	10	60	100	25	20	100	25	100
CSC	61	77	28	35	19	45	14	20	27	28	23	52	70	92	47	62	92	62	92
CWCD	78	72	27	7	22	37	12	4	14	11	9	4	78	80	30	8	80	30	80
DAMEN	77	80	26	36	51	98	26	44	61	52	38	96	100	100	54	96	100	96	100
FFO	74	68	59	63	22	37	27	34	15	12	22	43	74	76	67	71	76	71	76
FMFB - Pakistan	39	47	8	5	29	64	9	6	44	44	17	17	58	73	18	17	73	24	73
GBTI	31	36	7	11	25	55	9	16	28	27	12	33	42	56	1	33	56	33	56
JWS	68	66	31	37	27	49	19	27	29	23	24	52	77	80	50	64	80	64	80
Kashf Bank	57	71	0	0	16	36	0	0	49	49	0	1	76	90	0	1	90	1	90
Kashf Foundation	81	71	63	68	40	65	48	62	26	19	38	74	88	83	91	100	90	100	100
Khushhali Bank	61	51	27	9	32	49	22	9	61	41	50	31	83	65	57	26	86	63	87
NRSP	65	57	38	35	62	100	55	60	16	12	17	29	85	100	6	60	100	65	100
NRSP Bank	51	59	11	3	37	80	12	4	42	40	17	7	68	82	23	7	82	23	82
Orangi	65	29	42	5	100	82	100	14	84	31	100	21	100	84	100	24	100	100	100
Orix Leasing	60	48	39	41	39	59	40	49	44	29	53	100	77	60	79	100	77	100	100
POMFB	17	38	5	2	9	38	5	2	16	29	9	6	23	50	12	6	50	12	50
PRSP	27	47	17	10	23	72	22	15	13	18	15	15	34	73	30	21	73	30	73
RCDS	58	68	30	32	26	57	20	26	29	28	27	53	67	83	51	62	83	62	83
SAFWCO	63	55	47	26	34	55	39	25	23	16	32	31	70	65	73	41	71	73	81
SRSO	86	55	40	45	57	67	40	55	43	23	37	76	100	69	70	93	100	93	100
SRSP	66	40	80	75	18	20	33	37	17	9	39	66	69	46	100	96	69	100	100
Sungi	85	75	100	100	46	75	84	100	13	9	28	50	85	84	100	100	85	100	100
TMFB	53	64	1	4	32	72	1	4	100	100	4	23	100	100	3	16	100	16	100
TRDP	82	55	68	45	64	78	81	64	27	15	40	49	98	80	100	77	98	100	100

Source: Authors' own calculation

Table-3 DEA Super Efficiency of MFIs Based on CCR Input Oriented Models

DMUs	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	ABC1	ABC2	ABC3	ABC4	ABC12	ABC34	ABC1234
Akhuwat	54	30	34	13	36	36	35	16	19	8	22	15	61	37	52	22	61	52	61
Apna MF BK	81	66	5	7	37	55	3	6	24	16	2	7	87	77	6	10	88	10	88
ASA Pakistan	117	89	82	88	54	90	69	87	21	16	32	62	117	111	99	108	121	108	121
Asasah	77	48	70	73	12	14	17	21	24	13	41	77	84	56	97	106	84	106	106
BRAC - PAK	73	85	48	53	16	34	16	21	13	13	16	32	73	93	52	57	93	57	93
Buksh Found	60	112	24	19	3	10	2	2	10	13	7	10	60	112	25	20	112	25	112
CSC	61	77	28	35	19	45	14	20	27	28	23	52	70	92	47	62	92	62	92
CWCD	78	72	27	7	22	37	12	4	14	11	9	4	78	80	30	8	80	30	80
DAMEN	77	80	26	36	51	98	26	44	61	52	38	96	105	126	54	96	128	96	140
FFO	74	68	59	63	22	37	27	34	15	12	22	43	74	76	67	71	76	71	76
FMFB - Pak	39	47	8	5	29	64	9	6	44	44	17	17	58	73	18	17	73	24	73
GBTI	31	36	7	11	25	55	9	16	28	27	12	33	42	56	16	33	56	33	56
JWS	68	66	31	37	27	49	19	27	29	23	24	52	77	80	50	64	80	64	80
Kashf Bank	57	71	0	0	16	36	0	0	49	49	0	1	76	90	0	1	90	1	90
Kashf Found	81	71	63	68	40	65	48	62	26	19	38	74	88	83	91	104	90	104	104
Khushali Bk	61	51	27	9	32	49	22	9	61	41	50	31	83	65	57	26	86	63	87
NRSP	65	57	38	35	62	102	55	60	16	12	17	29	85	102	61	60	105	65	108
NRSP Bank	51	59	11	3	37	80	12	4	42	40	17	7	68	82	23	7	82	23	82
Orangi	65	29	42	5	157	82	119	14	84	31	189	21	181	84	209	24	181	209	217
Orix Leasing	60	48	39	41	39	59	40	49	44	29	53	104	77	60	79	108	77	120	120
POMFB	17	38	5	2	9	38	5	2	16	29	9	6	23	50	12	6	50	12	50
PRSP	27	47	17	10	23	72	22	15	13	18	15	15	34	73	30	21	73	30	73
RCDS	58	68	30	32	26	57	20	26	29	28	27	53	67	83	51	62	83	62	83
SAFWCO	63	55	47	26	34	55	39	25	23	16	32	31	70	65	73	41	71	73	81
SRSO	86	55	40	45	57	67	40	55	43	23	37	76	106	69	70	93	106	93	106
SRSP	66	40	80	75	18	20	33	37	17	9	39	66	69	46	107	96	69	107	107
Sungi	85	75	121	114	46	75	84	115	13	9	28	50	85	84	122	115	85	122	122
TMFB	53	64	1	4	32	72	1	4	120	192	4	23	100	136	3	16	136	16	136
TRDP	82	55	68	45	64	78	81	64	27	15	40	49	98	80	103	77	98	103	103

Source: Authors' own calculation

5. Results and Discussion

Table 1 and 2 shows efficiency score resulted from input oriented CCR and BCC models for 29 MFIs with 19 specifications, to comprehend that what constitutes an MFI efficient or otherwise. The last three columns (ABC12, ABC34, ABC1234) of the table1&2 represent financial, social and overall efficiency respectively. None of the MFIs is 100 percent efficient under all specifications. A total of 10 out of 29 MFIs while only 2 FMIs were found 100 percent efficient on social, financial and overall efficiency dimensions under BCC and CCR models respectively. An MFI which is efficient on social or financial dimensions is also 'overall efficient'. Under both model structures (BCC & CCR) the number of efficient MFIs increases when it has been used more input and output variables. This is evident from the last three columns of the table-1 &2. As these models involve more input and output variables, therefore the numbers of efficient MFIs are also higher to the rest of models' results.

The efficiency result of MFIs also varies across the return to scales. Under the CCR models, assuming a constant return to scale, only two out of twenty nine MFIs are overall efficient (means efficient on social, financial and overall dimensions-including all input and output variables) while under BCC models, assuming variable returns to scale, ten MFIs are efficient on social, financial and overall dimensions. This finding of the study caution misleading results, resulting from a single specification of DEA efficiency estimated for a DMU. Notwithstanding, such a single specification may not reveal the sources of efficiency or inefficiencies. The difference between the results of the CCR and BCC models of efficiency reveals the difference between managerial, technical and scale efficiencies. The MFIs which are socially, financially and overall efficient under CCR models such as ASA- Pakistan and Orangi) are at least efficient by either managerial or scale dimensions. Relaxing the assumption of constant return to scale

enhanced the number of efficient MFIs. This reflects that majority MFIs are efficient based on the managerial and technical skills but not on the scale dimensions. Thus the difference between BCC and CCR efficiency models reveal the sources of inefficiency resulted from the scale of the DMUs. The findings reveal that 2 out of 10 efficient MFIs, based on three comprehensive specifications (ABC12, ABC 34, ABC 1234) under CCR are efficient based on managerial and scale dimensions (Please see table 2 last three columns). Estimating efficiency of DMUs with a single specification and from full dataset will not reveal that how a particular DMU has achieved efficiency? Similarly, if a DMU is inefficient we shall not be able to detect the reasons of inefficiency.

Super efficiency for all 19 specifications of models has been estimated to know the rank of the efficient MFIs. As super efficiency of inefficient MFIs remains the same therefore, this technique only helps to rank the efficient MFIs (Scheel, 2000). Based on the CCR input efficiency model, the super efficiency of Oranagi (an NGO based MFI) is 216.60 percent followed by ASA- Pakistan (an NFBI) with a 120.90 percent score. It can be interpreted as keeping the same output level; an increase in the inputs usage by Orangi and ASA- Pakistan by 116 percentage points and 20 percentage points respectively will not affect the efficiency level of these MFIs.

6. Conclusion and Policy Implications

The assessment of MFIs' efficiency is imperative for all stakeholders for optimal policy measures. Data envelopment analysis is a popular non-parametric, non-stochastic, liner programing based efficiency technique. This paper concentrates on the technical aspects of DEA efficiency score that how it various across the selection of inputs and outputs, the number of

inputs or outputs and the selection of DEA estimation technique. The sample size of this study consists of all MFIs in Pakistan. We have modeled all feasible and meaningful specifications. After 19 different specifications with the help of three input and four output variables, representing various dimensions of MFIs such as cost structure, financial structure and organizational characteristics. We have used input oriented BCC and CCR data envelopment analysis oriented models. We have also estimated super efficiency for all MFIs to rank them according to their potential. This study attempted to investigate financial and social level of efficiency of MFIs and to gauge tracks to efficiency. This study also attempted to investigate the tradeoff between social and financial efficiency. Moreover, operational self-sufficiency, the impact of regulation on MFIs various aspects and the reasons for higher operating cost were the objectives of the study to help the state and other stakeholders in designing an optimal policy agenda.

The study attempted to achieve the required objectives using appropriate methodology. The study used data envelopment analysis technique to investigate social and finical efficiency. Tradeoff between social and financial efficiency has been estimated by Pearson correlation and scatter plot techniques. The impact of regulation on various aspects of MFIs and institutional determinants of operating cost were investigated by multiple regression models after satisfying the underlying assumption of normality, hetroskedasticity, multicollinearity and autocorrelation.

The findings of the study revealed that NGOs and NBFI were more efficient, based on the achievements of social and financial objectives than microfinance banks. Financial and social efficiency of MFIs were estimated by two ways to reveal information about 'managerial and technical' aspects of MFIs and to know about scale related information. The study revealed that none of the microfinance institutions was found 100 percent efficient under all financial and

social efficiency models. There were 13 MFIs which were pure technically efficient on financial aspects out of the 29 MFIs. Bukhsh foundation scored highest (77.7%) and remained financially efficient under 15 of 19 different pure technical efficiency models. Subsequently, non-banking financial institutions and microfinance banks stood second in financial efficiency ranking (55.5%) based on pure technical score.

Like financial performance of MFIs, there was also a difference in social performance of MFIs according resulted from variation in institutional characteristics. Twelve MFIs were found socially efficient based on input oriented pure technical efficiency models. Out of total socially efficient MFIs, nine were NGOs, one microfinance bank (Khushali bank) and two non-banking financial institutions (ASA- Pakistan, Orix leasing). The study reveals and recommends the followings. The study reveals that efficiency score resulted from DEA, is sensitive towards the choice of inputs, outputs, functional form and number of inputs and outputs. Based on the sensitivity of this technique, the study warns single specification of DEA and recommends multiple specifications of DEA efficiency models to conclude whether a particular DMU is efficient or otherwise. It was noticed that two MFIs could yield the same efficiency score, however; their way to achieve efficiency was quite different from each other. The MFIs had used different channels, which were considered their strengths, such as controlling operational cost or optimal utilization of loan officers and Assets. It was also noticed that MFIs were more efficient on their managerial and technical skills rather than the scale of operation of MIFs. It is recommended to estimate pure technical and scale efficiencies separately, to comprehend the sources of efficiency or inefficiency about various DMUs to identify peers for corresponding MFIs accordingly. The overall super efficiency result of an MFI, based on collective social and financial output variables (variable 1, 2, 3, and 4), is at least as efficient as financial or social

super efficiency model for that MFI. Increasing the number of input and output variables changes the efficiency score of DMUs. This is evident from Table-1&2. The higher the number of input and output variables the higher the efficiency chance for an MFI and vice versa. In this case the estimation of super efficiency is important along with technical and scale efficiencies. This allows the researchers to rank the MFIs, based on super efficiency score. Technical and scale efficiency in isolation cannot rank MFIs according to their corresponding efficiency levels.

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