

Efficiency Analysis of Microfinance Institutions in Bangladesh: Does Regulation Matter?

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Abstract—The aim of this study is to measure efficiency of various Microfinance Institutions (MFIs) in Bangladesh before and after introducing Microcredit Regulatory Authority (MRA) in order to capture the immediate impact of regulation. Data Envelopment Analysis (DEA) and Malmquist Productivity index technique have been used for this study. Findings reveal that 35% firms' average productivity increase sharply after enacting microfinance regulation. Seven firms have been graduated from the inefficiency level to efficiency level. However, most of the firms among the increased efficiency list are comparatively young in terms of starting their microfinance operations. Result of Tobit regression does not find any significant relationship between efficiency and regulation. Due to regulation, only number of outreach increases but to ensure more productive growth, MRA needs to be more proactive in strengthening policy environment and educating MFIs to be better equipped with sound financial and managerial tools and techniques.

Index Terms—Bangladesh; Data Envelopment Analysis; Malmquist productivity index; microfinance institution; microcredit regulatory authority.

I. INTRODUCTION

Microfinance is one of the pioneering innovations in Bangladesh. Since the emergence of microfinance, it was recognized as an instrument for social change and Microfinance Institutions (MFIs) were branded and perceived by most individuals as not for profit organization. Therefore, most of the previous studies in Bangladesh concentrated on investigating the impact of such MFIs on poverty reduction [1], increasing income [2]-[4], women empowerment [5], [6] and other social indicators [7]-[10]. But controversy arises with the growth of this sector as an industry, when it is argued that without strong financial performance the sustainability of the MFIs might be at risk [11]-[13]. Moreover, rapid expansion and informality of this sector also raised concern over client safety, maintaining transparency, and efficiency of this sector.

Therefore, measuring efficiency has become more popular in microfinance sector [14]. Moreover, availability of donor fund somehow is being conditioned upon efficient utilization of input (i.e., operating cost) and productive growth of output (i.e., amount of loan disbursement, number of clients) which further raises concern over measuring efficiency and productivity. However, the present study argues that the productive growth of this sector to some extent depends on appropriate regulatory practices. Because, regulatory practice will give MFIs some benchmarks to

measure performance. Thus the study intends to measure efficiency and productivity growth of this sector through incorporating the role of Microcredit Regulatory Authority (MRA) which was inaugurated during 2006 in Bangladesh. However, incorporation of the role of microfinance regulation has been generally a neglected area in efficiency and productivity analysis of MFIs. Although some performance assessment have been done [15] based on conventional accounting based financial ratios but to date few studies have incorporated contribution of microfinance regulation in the assessment of financial performance of MFIs through parametric or non-parametric approach.

Therefore, this study attempts to investigate the efficiency change in MFIs before (during 2004-2006) and after (during 2007-2010) enacting microfinance regulation, as well as to find out determinants of efficiency of the MFIs in Bangladesh to improve the operating performance.

II. OBJECTIVE OF THE STUDY

The general objective of this study is to analyze different components of efficiency change in MFIs in Bangladesh. Specific objectives are as follows:

- A. To analyze efficiency measures before and after enacting microcredit regulatory authority;
- B. To compare efficiency levels of different MFIs; and
- C. To find out various determinants of efficiency change.

III. MICROFINANCE REGULATION IN BANGLADESH

In the early 1970s microfinance institutions emerged in Bangladesh through the 'Jobra' experiment of Mohammad Yunus and a number of other, government-led initiatives. Following these initiatives, numerous MFIs have flourished in the country to serve the poor people. Although started since 1970's, its expansion started after 1990s and numerous MFIs mushroomed everywhere very quickly. The significant growth of this sector has also been acknowledged worldwide. Such expansion demands a regulatory frame work within which microfinance industry can grow and operate sustainably.

Without regulation small depositors went through many fraudulent activities by the MFIs, weak liquidity management leads to operational inefficiency, lack of transparency and reporting mechanism were also reducing MFI's reputation.

Scholars from different regions have suggested for microfinance regulations which might be either soft regulation, essentially based on public registration (licensing), self-regulation (special MFI legislation or

regulating by apex body) and prudent regulations (appropriate regulation that are able to guide and control microfinance operation sustainably). Evidence suggests that both self-regulation and special regulation failed to achieve expected growth of the microfinance industry. Therefore, prudential regulation is expected to achieve sustainability. Moreover, without proper regulation, attracting fund is quite difficult. But challenges for the developing countries arise while adopting prudent regulation due to the lack of proper mechanism for information and data collection, weak accounting standards and reporting mechanism, lack of professionalism and political interference [16].

Although primarily an apex institution, Palli Karma Shahayak Foundation (PKSF) since 1990s and later in 2000s, Microfinance Research and Reference Unit (MRRU) under Bangladesh Bank, has been supervising, monitoring and providing guidance to NGO-MFIs in Bangladesh. Until 2006, regulation was regarded as constraints of growth of this sector. Finally, the government of Bangladesh enacted "Microcredit Regulatory Authority Act, 2006" on July 16, 2006. According to the Act, no MFIs will operate without having license from MRA. Following the provision of either having 1000 borrowers or 40 lacs loan outstanding, only above 600 MFIs were selected among 4236 applicants in 2007 [17].

IV. LITERATURE REVIEW

Using DEA in traditional financial sector is very common phenomena [18], [19]. Now it is also being used for measuring efficiency of MFIs [11], [14], [20]-[23]. But incorporating the issue of microfinance regulation in addressing efficiency and productivity change of microfinance institutions is new. A brief summary of efficiency of microfinance institutions using DEA is given in Table I.

TABLE I: RESEARCH USING DEA ANALYSIS TO MEASURE EFFICIENCY OF MICROFINANCE INSTITUTIONS

Author	Methods	Scope	Findings
Piot-Lepetit & Nzongang [11]	DEA	52 MC ² (MFIs) in Cameroon	MC ² are relatively efficient in terms of financial and social outputs.
Collins [24]	DEA	Latin America	Bank MFIs are more efficient than NGO MFIs.
Fall et al. [14]	DEA	262 observations from Latin America, MENA and Africa	Higher Mean Technical Efficiency (MTE) score was observed in Latin America and the MENA region than the African MFIs.
Efendic & Hadziahmetovic [25]	DEA	Bosnia and Herzegovina	Analyzes financial and social efficiency of MFIs. Findings showed that financial efficiency was higher than social efficiency for most of the MFIs.
Bharti & Chitnis [26]	DEA	India	Analyzed whether size of MFIs affect efficiency of MFIs. Findings reported that there is a link

Author	Methods	Scope	Findings
Hassan and Tufta [22]	SFA	Grameen Bank, Bangladesh	Female employees are more efficient than male.
Masood and Ahmad [23]	SFA	40 MFIs in India	Age and higher outreach of MFI is positive determinant of efficiency than the size of MFI. Location and regulation also plays role in determining efficiency.
Sufian [27]	DEA	Malaysia	Size and market phenomena influence efficiency.
Qayyum and Ahmad [28]	DEA	India, Pakistan and Bangladesh	Eight, six and five MFIs from Pakistan, Bangladesh and India respectively are efficient.
Hassan and Sanchez [29]	DEA	South Asian Latin American and Middle East and North Africa	South Asian MFIs are leading in technical efficiency in compared to Latin American and MENA MFIs
Gutiérrez-Nieto, [30]	DEA	30 Latin American MFIs	Country effects and NGO/ Non-NGO status influence efficiency score of MFIs.
Bassem [31]	DEA	35 Mediterranean MFIs	Found eight relatively efficient MFIs and source of efficiency was technical.
Haq et al. , [16]	DEA	39 MFIs in Africa, Asia and the Latin America	Efficiency score varied based on different approach. For example, production and intermediation approach. NGO-MFIs are the most efficient under production approach, while bank-MFIs are efficient under intermediation approach.
Nawaz , [32]	DEA	204 MFIs in 54 countries	MFIs serving relatively well-off clients are more efficient. Lending to women is efficient if subsidies are present.
Tahir & Tahirim [33]	DEA	ASEAN countries	MFIs in Vietnam are relatively more efficient than MFIs in Laos.

V. METHODOLOGY

A. Data

The sample for efficiency analysis is extracted from Microfinance Information Exchange (MIX) network (www.mixmarket.org) database which provided information on 77 MFIs in Bangladesh.

This study consider year 2004 – 2010 for DEA based Malmquist Productivity Index analysis and there is only 23 MFIs that have the necessary information for all that years selected for this study. Since missing values are avoided in DEA efficiency analysis and the study ensures the presence of each MFI that is selected from the first year to the seventh year therefore, the full sample is required to be reduced.

The logic behind the selection of those years is the equal distribution of the pre-regulation and post-regulation period.

Moreover, increased number of years would decrease number of firms, as the information for each of the firm is absent consecutively. Thus, the full sample consisted of 23 firms with 7 years data which include total of 161 firm-year observations. However, some of the gaps in the data had been adjusted from the annual audit report and balance sheet of the particular MFI which had been collected from the website of that MFI. Except the Grameen Bank, others were NGO-MFIs and had license from MRA either in 2007 or 2008. Only one firm had got license in 2009.

B. Data Envelopment Analysis (DEA) Technique

DEA is used to measure the relative efficiency of organizations or parts of organizations having similar attributes and goals; for example, microfinance institutions, banks, hospitals etc. [34]. The organization or part of organization are known as ‘decision-making units/DMU’. Reference [35] argued that among all the efficiency analysis, use of non-parametric DEA approach is especially popular for several reasons; i) ability to include multiple input and output, ii) relative ease of incorporating numerous financial and non-financial measures [34] and iii) finally, ability to guide improvement of efficiency dimensions [36]. DEA model, introduced by Charnes, Cooper and Rhodes [37], is known as the CCR model which is based on constant returns to scale (CRS) assumption. By incorporating variable returns to scale (VRS), Banker, Charnes and Cooper [38] introduced BCC model.

DEA can be either input-orientated which assumes maximum increase in input usage with output levels held constant or output-orientated which assumes maximum increase in input usage with output levels held constant. Although input oriented CCR model is widely used in the banking sectors, VRS method is found suitable in microfinance industry [32]. The reasons may be are: 1) MFIs focus on increasing outreach; 2) since market development of MFIs are not similar to the conventional banking sector, MFIs mostly compete in an imperfect economic environment and 3) unlike commercial banks, they always have limited resources to spend on [32]. Therefore, it is assumed that output oriented variable return to scale technology will be better suited for this research.

It is assumed that there are n DMUs, and each has f inputs to produce g output. DMU in an output-orientated DEA model for N number of firms or DMU in a particular time period is as follows:

$$\begin{aligned} & \max \phi, \lambda \phi, \\ & \text{st } -\phi y_i + Y\lambda \geq 0, \\ & x_i - X\lambda \geq 0, \\ & \lambda \geq 0, \end{aligned} \quad (1)$$

where,

y_i is a $G \times 1$ vector of output quantities for the i -th firm ;

x_i is a $F \times 1$ vector of input quantities for the i -th firm;

Y is a $N \times G$ matrix of output quantities for all N firms;

X is a $N \times F$ matrix of input quantities for all N firms;

λ is a $N \times 1$ vector of weights; and ϕ is a scalar.

The above model shows CRS if $\lambda = 0$ and it changed into variable return to scale (VRS) if λ is used unconstrained.

C. The Malmquist TFP Index Technique

DEA based on Malmquist Index is used to measure the

efficiency and productivity of a decision making unit (DMU) between two time periods s and t which is sometimes also referred to as the Total Factor Productivity (TFP) index. The Malmquist TFP index can be defined as:

$$m_o(y_s, x_s, y_t, x_t) = \left[\frac{d_o^s(y_t, x_t)}{d_o^s(y_s, x_s)} \times \frac{d_o^t(y_t, x_t)}{d_o^t(y_s, x_s)} \right]^{1/2} \quad (2)$$

If the value of m_0 is greater than one then TFP is positive while a value less than one indicates a TFP decline.

D. Selection of input and output

DEA considers financial institutions as decision making units (DMU). To define input and output and the relationship between the input and output, reference [28] focused on three approaches: first, the production approach, considers deposits and loans as output while the number of employees and capital expenditures are as input [28]; second, intermediation approach which recognizes labor, capital and investment payable as input whereas loans and financial investment as output; and finally the assets approach which assumes the value of assets of financial institutions is output and creation of credit (loan) is the input [28].

Thus, the study based on available literature, selects three input that were total assets, operating expense and number of staff which is similar with the production approach and three output such as, gross loan portfolio, number of active borrowers and financial revenue.

E. Tobit regression model

In order to determine the factors affecting efficiency of MFIs in Bangladesh, the study then proposed several variables and applied Tobit regression model because conditions were applied on dependent variables and all the values of dependent variables lied between 0 and 1. Tobit is widely used [39] in conjunction with Data Envelopment Analysis (DEA) due to such condition. This study used STATA 10 software to analyze Tobit regression model. The Equation is as follows:

$$\text{Efficiency } i = \alpha + \beta_i C1 + \beta_i C2 + \beta_i DO1 + \beta_i DO2 + \beta_i DO3 + \beta_i P1 + \beta_i P2 + \beta_i F1 + \beta_i F2 + \beta_i F3 + \beta_i F4 + e_i \quad (4)$$

Where dependent variable, efficiency is the measure of average overall efficiency, technical efficiency and total factor productivity for each firm in the three regression model respectively. And α is constant value β_i , is the coefficient of variables and e_i is error term associated with variables.

VI. RESULTS OF EFFICIENCY OF MFI IN BANGLADESH

A. Impact of Technical vs technological efficiency of MFIs in determining total factor productivity change (TFPCH) in Bangladesh

The efficiency analysis have been carried out for years i.e. 2004 to 2010 by calculating Malmquist productivity index. The TFP change due to technical efficiency and technological efficiency change for the years (2005-2010) have been discussed assuming output oriented VRS technology and output oriented CRS technology and both of the results are almost similar.

In 2005, BRAC showed highest technological innovation and 72% of its TFP change was due to TECHCH. Similarly, 75% of Grameen Bank's efficiency changed due to technological improvement. During the year all firms except BASTOB and CDIP moved toward the frontier and the source of efficiency was completely technological in nature. Among the 23 MFIs only 17% showed negative or TFPCH<1 during 2005.

In 2006, only three firms could increase the technological efficiency and rest of the firms lost their efficiency gain due to no improvement in technology. During this year 2 large NGO-MFIs namely BRAC and ASA also experienced decline in TECHCH, consequently did not gain positive TFPCH. But Grameen Bank due to its efficient management however, showed TFPCH>1.

In 2007, one small NGO-MFI, namely BASTOB had dramatically changed their technologies and showed highest TFPCH. However, the year 2007 and 2008 although showed positive growth in TFP relative to the 2006, but in 2009 all the firms' inefficiency were due to the use of less innovative technology. Therefore, in 2010 most of the firms attempted to improve their existing technologies which resulted in the highest TFPCH among all the previous year.

Thus the overall result showed that, the average efficiency of Bangladeshi MFIs is due to the use of innovative technologies. It may be due to the introduction of new product schemes, dynamic lending methodologies or use of other technologies to improve the service quality.

B. Impact of pure technical vs scale efficiency change on TFPCH in Bangladeshi MFIs

Although this study focused on output oriented VRS (results are not shown), output oriented CRS (results are not shown) was also conducted for showing comparison between the two methods. For example –RIC was scale efficient under VRS technology but scale inefficient under CRS technology. Overall results showed that average scale efficiency of MFIs in Bangladesh has increased after 2008. Due to introduction of microcredit regulatory authority (MRA), in 2006, many MFIs have reformed either their operating, financial or managerial strategies to fit with the requirement specified by the MRA. Thus, resulted in improved technical as well as scale efficiencies.

C. Ranking of firms based on average total factor productivity change

Based on average efficiency score, 10 firms are ranked against the total factor productivity (results are not shown), among them six firms are found efficient in all efficiency aspects such as Grameen Bank, BEES, BASTOB, JCF, Wave, TMSS. Grameen Bank being most efficient microfinance bank [28], [40] might be benchmarked against other NGO-MFIs. Among the rest efficient firms, Buro Bangladesh and SSS loses TFP due to the loss in scale efficiency and pure technical efficiency respectively. Uddipan and Shakti lose their overall technical efficiency but still their TFP remains positive. BRAC and ASA lose TFP due to their scale inefficiencies. None of the efficiencies (overall efficiency, overall technical efficiency, pure technical efficiency, scale efficiency and total factor productivity) are gained by two MFIs that are Sajida and RIC. Changes in the average mean efficiency score over the

studied years also have been shown in the figure 1.

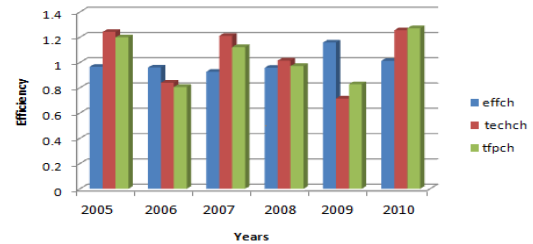


Fig. 1. Malmquist Index of Annual Means

D. Malmquist productivity index and change in total factor productivity due to regulation

Table 2 provides various efficiency measures of MFIs in Bangladesh. For measuring total factor productivity change in Bangladeshi MFIs especially after the establishment of MRA, the study has divided the result in to two periods before regulation (2004-2006) and after regulation (2007-2010) and investigates average effects from all the study periods. Sometimes it is argued that the environment for the microfinance industry has been improving over time due to regulation, and learning [40]. Based on above arguments, present study explores that 35% firm's average productivity increased sharply after enacting microfinance regulation. Seven firms (BASTOB, Buro Bangladesh, JCF, SSS, TMSS, Uddipan and CDIP) graduated from the inefficiency level to efficiency level. For example, BASTOB increased 49% of its total factor productivity (TFP) after getting license from MRA. Although CDIP increased its TFP by 22% than before, but their average TFP still remains below 1. Most of the firms among the increased efficiency list are comparatively young in terms of starting their microfinance operations. Young firms generally struggle more to raise capital and also remain enthusiastic to raise efficiency. Licensing or regulations of firms increase investors' and clients' confidence towards the firm, which in turn could enhance availability of fund to operate more efficiently. Research conducted by MRA [17] also found the evidence of positive change due to the provision of having license. Profit were also increased after receiving license [17]. However, 9% previously efficient firms were able to increase their productivity growth during the next period (2007-2010). Grameen Bank and BEES remained efficient throughout the both time periods and their total factor productivity increased 13% and 9% respectively over the previous three years (2004-2006). Wave although was able to increase their technical efficiency but their average productivity declined at 7.5%. The age of the MFIs is supposed to have a positive impact on the level of technical efficiency, due to learning-by-doing. Therefore, Grameen and BEES could maintain their technical efficiency growth positively, while Wave could not. 26% firms showed declining factor productivity which was previously efficient such as ASA, BRAC, DSK, RDRS, RRF and SHAKTI. It is argued that since MFIs differ in their goals and in the market segment they reach, therefore, varying levels of efficiencies could be attained. Although 17% firms has increased productivity slightly but still remains in inefficiency level such as Coast Trust, HEED, RIC, and SKS. Sajida also showed no positive change from their existing inefficiency level. Overall the findings suggest improvement of

efficiency of most of the MFIs in Bangladesh after enacting micro finance regulation.

TABLE 2: MALMQUIST PRODUCTIVITY INDEX BEFORE AND AFTER REGULATION

MFIs	2004-2006			2007-2010			2004-2010		
	Eff	Tech	Tfp	Eff	Tech	Tfp	Eff	Tech	Tfp
ASA	1.0	1.15	1.1	0.9	0.93	0.8	0.9	1.02	0.99
BAST	1.0	0.79	0.7	1.0	1.49	1.4	1.0	1.13	1.13
OB	00	9	56	00	4	94	00	6	6
BEES	1.0	1.02	1.1	0.9	1.24	1.2	1.0	1.17	1.19
BRAC	0.9	1.26	1.1	0.9	0.90	0.8	0.9	1.05	0.98
BURO	0.9	1.07	0.9	1.0	1.08	1.1	0.9	1.09	1.09
Bangladesh	14	5	83	63	6	55	96	6	1
CDIP	0.9	0.92	0.8	0.9	1.12	1.0	0.9	1.04	0.96
COAS	1.0	0.89	0.9	0.9	1.07	1.0	0.9	0.99	0.98
T Trust	29	5	21	58	8	33	86	5	1
CSS	1.0	0.89	0.8	1.0	1.00	1.0	1.0	0.95	0.95
DSK	1.0	1.12	1.1	0.9	0.89	0.8	1.0	0.98	0.99
Grameen Bank	1.0	1.20	1.2	1.0	1.39	1.3	1.0	1.37	1.37
HEED	0.9	0.99	0.9	1.0	0.95	0.9	0.9	0.96	0.94
IDF	0.9	1.01	0.9	1.0	0.96	1.0	1.0	0.98	0.99
JCF	0.9	1.01	0.9	1.0	0.99	1.0	1.0	1.00	1.04
RDRS	1.0	1.04	1.0	1.0	0.87	0.8	1.0	0.93	0.93
RIC	0.8	0.99	0.8	1.0	0.97	0.9	0.9	0.98	0.93
RRF	1.0	1.02	1.0	1.0	0.91	0.9	1.0	0.95	0.96
Sajida	0.9	0.97	0.8	0.9	0.97	0.8	0.8	0.97	0.86
Shakti	0.9	1.03	1.0	1.0	0.90	0.9	1.0	0.95	1.00
SKS	0.9	0.97	0.9	0.9	1.02	0.9	0.9	1.00	0.97
Bangladesh	89	1	60	58	9	86	67	4	1
SSS	0.9	1.04	0.9	1.0	1.02	1.0	0.9	1.03	1.03
TMSS	0.9	1.06	0.9	1.0	0.96	1.0	1.0	1.00	1.01
UDDIP	0.8	0.98	0.8	1.1	1.00	1.1	1.0	0.99	1.03
AN	91	0	73	62	9	72	43	5	8
Wave	1.1	0.98	1.1	1.0	1.05	1.0	1.0	1.02	1.07
Mean	0.9	1.01	0.9	1.0	1.02	1.0	0.9	1.02	1.01
Min	0.8	0.79	0.7	0.9	0.87	0.8	0.8	0.93	0.86
Max	1.1	1.26	1.2	1.1	1.49	1.4	1.0	1.37	1.37

E. Determinants of efficiency in microfinance institutions in Bangladesh

The study proposes several variables that determine the efficiency of microfinance institutions in Bangladesh. These variables are divided into various groups based on basic characteristics of MFI, depth of outreach, productivity, and financial management. Descriptive statistics of the variables are given in Table 3. Finally, Tobit regression analysis (Table 4) is carried out to measure the impact of the independent variables on various efficiency components of MFIs.

The study uses two basic characteristics of MFI such as

‘size’ of the MFI based on number of active clients as categorical variable ranging from 1-5 (5= very large; while 1= very small) and ‘regulation’ of the MFI as dummy (1= regulated; 0=otherwise). The results show significant negative impact of MFI size on overall technical efficiency and total factor productivity, while positive but insignificant association with overall efficiency. Increased borrowers with average small size loans per borrower might be responsible for increased transaction cost and probably have negative impact on efficiency. Reference [32] also reported that as outreach increases, the efficiency decreases.

TABLE 3: DESCRIPTION OF VARIABLES DETERMINING EFFICIENCY OF MFI

	Indicators (no.of observation)	Organizational Variable	Minimum	Maximum	Mean	Std. deviation
Characteristics of MFI	C1 (161)	Size of the MFI	2.00	5.00	3.63	0.81
	C2 (161)	Regulation of MFI	0.00	1.00	0.42	0.49
Depth of Outreach	DO1 (160)	Average loan balance per capita	0.08	0.32	0.18	0.04
	DO2 (160)	Average loan size per borrower	35.00	04.00	93.2	32.7
	DO3 (160)	% of women borrowers	0.00	1.03	0.89	0.23
Productivity	P1 (157)	Borrower per staff member	60	331.00	1.53	49.8
	P2 (152)	Cost per borrower	2.00	71.00	13.9	6.98
Financial management	F1 (161)	Debt to equity ratio(%)	0.39	41.12	6.49	5.54
	F2 (154)	Return on asset (ROA) (%)	-	0.15	0.02	0.05
	F3 (154)	Return on Equity(%)	0.26	0.49	0.07	0.37
	F4 (108)	Gross Portfolio (nominal) (%)	3.09	-	0.23	0.04

Moreover, small borrowers often take multiple loans from different MFIs to repay the previous loan, which involved risk of delinquency and affect efficiency of MFIs. Thus, efficiency is associated with larger amount of loan per borrower. Although efficiency measures showed some improvement after enacting microfinance regulation but regression result did not find any significant relationship among efficiency and regulation. Increased number of active borrowers helped to achieve greater economies of scale while greater portion of women borrowers were negative determinants of efficiency. Women borrowers usually take small amount of loan, therefore, MFIs reaching to more women perhaps experience declining efficiency. Although, these two indicators were the measures of microfinance institutions’ social goal (inclusive financial

growth) : to serve the poorest of the poor and more disadvantaged group of population (i.e. women), but showed negative indicators of efficiency. This was also evident in the regression table (table 4). Findings also revealed that borrowers per staff were positively associated and increased cost per borrower were negatively associated with efficiency which was also reported by reference [32]. Moreover, larger debt to equity ratio reduced MFI' efficiency but positive return on assets enhanced MFI efficiency.

TABLE 4: TOBIT REGRESSION ANALYSIS: REGRESSION COEFFICIENT FOR CHANGES IN EFFICIENCY, TECHNOLOGY AND TOTAL FACTOR PRODUCTIVITY

Independent variables	Efficiency change	Technical change	Total factor productivity change
C1	.0093005	-.0662734	-.0806804*
C2	-.0291894	.0371376	.0374264
DO1	1.454824	4.822504 *	2.442994
DO2	-.000702	-.004689	-.0000361
DO3	-.0017519	-.1257766	-.0055926
P1	-.0000488	.0017216 *	.0014528*
P2	-.013958 †	-.014729 †	-.0161975 *
F1	-.0044452	-.0088834	-.0049447
F2	-2.170095 †	-3.242826*	-1.617833
F3	-.0907786	-.2378644	-.3346187 †
F4	.0138107	.3760057	.2468636
Const	.4770905	.2696729	.1873063
Pseudo R2	0.1403	0.2626	0.3515

Sig at 0.01 **; Sig at 0.05 *; Sig at 0.10 †

Notes: C1=Size of MFI; C2=Regulated or not regulated; DO1=Average loan balance per borrower / GNI per capita; DO2=Average loan balance per borrower; DO3=% of women borrower; P1=Borrowers per staff member; P2=Cost per borrower; F1=Debt to equity ratio; F2=Return on assets; F3=Return on equity; F4=Yield on gross portfolio (nominal)

Return on assets was found to be significant with both overall and technical efficiency but their negative relationship indicated poor financial management by the MFI in Bangladesh. This might happened due to their quick expansion in the market. Trend showed that the number of branches of NGO-MFIs had increased faster (133%) than the increase in number of clients (31.61%) and borrowers (31.48%) over the last five years [41].

VII. POLICY IMPLICATION

Findings of this study suggest that more attention is needed to improve efficiency as it depicts the picture of poor financial management by the Bangladeshi MFIs. Care should also be given in case of increasing size of MFIs in terms of the number of active borrowers. Overlapping borrowers need to be scrutinized and clients' credit information and debt capacity need to be assessed appropriately and information need to be available for other MFIs also. Therefore, Microcredit Regulatory Authority (MRA) is expected to strengthen the policy environment to protect the savers, to preserve the confidence of the investors and strengthen the financial system.

Following initiatives might be taken by MRA and other stakeholders in order to increase performance of MFIs:

- MRA should focus more on organizing innovative training program and workshop to educate MFIs regarding financial management, technological application to make the operation more effective through reducing overlapping

borrowers and finally they should motivate MFIs to design appropriate financial product / service for the client.

- Annual reporting system by the individual MFIs should be supervised, analyzed and provided with feedback through organizing seminars.

- Introduction of new financial products, use of upgraded technologies and enhanced performance management systems should be encouraged through organizing various national and international microfinance expo or fair.

- Microfinance service provider should adhere to the necessary regulations to maintain financial discipline.

- Finally, Government should ensure reporting standard and develop institutional mechanisms. For example: credit bureaus and rating agencies can be instituted to improve the availability of information of borrowers.

VIII. CONCLUSION

This study examines the efficiencies and total factor productivity change of various microfinance institutions in Bangladesh. Overall results show that majority of the MFIs recorded high levels of either PTE or SE or both, resulting in higher overall TE. The study also investigates the impact of microcredit regulatory authority (MRA) act on the efficiency of the selected MFIs and explores that 35% firms' average productivity increased sharply after enacting microfinance regulation. Seven firms graduated from the inefficiency level to efficient level. Evidence suggests that most of the firms among the increased efficiency list are comparatively young

MFIs in terms of starting their microfinance operations. Moreover, introduction of separate

Microcredit Regulatory Authority (MRA) in 2006 has brought hope to control unplanned and unsustainable expansion of this sector. Although regression analysis does not find any direct relation between regulation and efficiency, but some indirect positive changes had started to take place, for example, outreach growth and financial management have begun to smooth for some previously small and inefficient NGO-MFIs in Bangladesh. Following the growth potentials of this sector, realizing the need for formalization of the system and improved regulatory environment, this study proposes several initiatives from the stakeholders. Therefore, this study might have practical implications for all the countries assuming to embrace inclusive financial growth in a sustainable manner. Therefore, future research is expected to include similar other countries where microfinance regulations are in effect to enhance efficiencies of MFIs.

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