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Financial Sustainability of Non-Governmental Microfinance Institutions (MFIs): A Cost-Efficiency Analysis of BRAC, ASA, and PROSHIKA from Bangladesh

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Abstract: Microcredit for poverty alleviation program got huge success in many parts of the world in reducing income-poverty and human-poverty. The progress on human poverty reduction was faster than the income-poverty. There are insignificant researches of financial efficiency of microcredit delivery programs undertaken by the Microfinance Institutions (MFI). The objective of this paper is to measure the cost-efficiency of three leading micro-finance providers: BRAC, ASA, and PROSHIKA from Bangladesh. The paper intends to achieve five years X-efficiency scores for the above-mentioned micro-finance providers. In the light of this main objective, the specific two objectives of this study are: (i) To find efficiency score of these three NGOs for the study years to identify the best and poor practices; and, (ii) To analyse the potential improvement. We investigate financial efficiency of the group-based lending institutions by using data envelopment analysis (DEA), which is a frontier approach. The study finds that the credit program of BRAC-1998, BRAC-2000, and PROSHIKA-1998 were 100% efficient in output maximization and PROSHIKA-1998, BRAC 1998, and PROSHIKA-2000 were 100% efficient in input minimization. However, the micro credit program of BRAC, ASA, and PROSHIKA were not efficient for the year 1999.

The other study period for the three micro-finance providers were less than 100% efficient in both input minimisation and output maximization problem. Our findings imply that the improvement of micro-finance programs in poverty alleviation requires changes both at program & providers levels as well as at the policy level of donors and/or other organizations who provide funds to these micro-finance providers.

Keywords: Data envelopment analysis (DEA); Micro-finance institutions (MFI); Cost-efficiency analysis; Bangladesh

JEL Classifications: P42, O12, O16, G21

1. Introduction

Poverty alleviation is the main objective of United Nations Millennium Development Goal (Hahn, 2009), and microcredit is considered as an effective tool in poverty alleviation around the globe (Al-Mamun & Mazumder, 2015; Karim & Osada, 1998; Kono & Takahashi, 2010; Pitt & Khandker, 1998; Weber, 2013). Microcredit is one of the significant innovations in development policy and a key element for the 21st century's socio-economic development. It helps improving socio-economic conditions of the poor, and has served millions of customers, provided billions of dollars in financing micro-entrepreneurs over the last few decades (Ahlin & Jiang, 2008; Al-Mamu & Mazumder, 2015; Fouillet, *et al*., 2013; Gehlich-Shillabeer, 2008; Mia & Chandran, 2016; Roodman & Morduch, 2013). As micro-credit has significant role in poverty alleviation, it brings a lot of attention both from policy makers as well as from academic researchers (Hermes & Lensink, 2007; Niels Hermes & Lensink, 2011; Weber & Ahmed, 2014). Further, microcredit performance in terms of repayment and financial sustainability is exemplary (Evans, *et al*., 1999); however, the studies (Bhanot & Bapat, 2015; Al-Mamun, *et al*., 2014; Hudon & Traca, 2011; Mersland & Strom, 2010; Mohiuddin, 2000) reveal that a large number of microfinance programs still depend on donor subsidies to meet the high costs (i.e. they are not financially sustainable) and poor borrowers required to pay high interest rate called as "Poverty Penalty" (Gutiérrez-Nieto, *et al*., 2017).

MFIs often start lending operations as an NGO to offer microcredit in business development to the low-income community in developing countries, whose clientele typically lacks either credit histories, or collateral, or both (Baklouti, 2013; Chudill, Gropper, & Hartarska, 2009; Hartungi, 2007; Quayes, 2012). MFIs' micro credit programs are designed to serve such clients with two slightly contradictory objectives i.e. institutional paradigm (MFIs must meet their operational costs with financial sustainability) and the welfare paradigm (social outreach) (Azad, Munisamy, Masum, & Wanke, 2016; Haq, Skully, & Pathan, 2010). Financial sustainability refers to the ability of an MFI to achieve unsubsidized, full cost recovery and outreach refers to extending financial services to a large number of people (breadth of outreach) with preference towards the lower income strata of the poor (depth of outreach) (Wijesiri, Yaron, & Meoli, 2017). According to Wijesiri, *et al*. (2017), age and size have positive influence on MFIs' sustainability and social outreach.

Although, outreach to the poor and sustainability are the great goals for MFIs (Dichter, 1996); however, it is costly activities to provide credit to the poor (Hermes, Lensink, & Meesters, 2011). Many MFIs in developing countries have had limited achievements in cost efficiency (Hermes and Lensink, 2011; D'Espallier *et al*., 2013). There is a challenge for MFIs to choose between sustainability and the outreach to the poor (Baklouti, 2013). Financial sustainability is considered as the benchmark of microfinance institutions' (MFIs) performance (Baumann, 2003). According to Microcredit pioneer Yunus (2007), financial sustainable institution can ensure long-term operation

and service to society. A sustainable or efficient MFI can serve the social purpose better than a bankrupt MFI. Several studies were conducted to investigate the impact of microcredit programs in different regions, however, there has been little study conducted on the microfinance institutions' financial sustainability (Haq, Skully, & Pathan, 2010). Moreover, several studies recently showed MFIs declining financial performances brought attention to the need of examining the efficiency of MFIs (Wagner & Winkler, 2013; Azad, Munisamy, Masum, & Wanke, 2016). That is why we conducted empirical study to measure the cost-efficiency of micro-credit program of Bangladeshi MFIs (BRAC, ASA and PROSHIKA) in poverty alleviation. They have started their operations since 1972, 1978 and 1976 respectively with a common objective of poverty alleviation and empowerment of women. The target population of the three are landless and asset-less rural poor where 98% of the members are women. The loan has been used basically for undertaking non-farm activities. Directing all efforts towards reaching the poor via credit has excluded a considerable number of the hard core poor. Though the target people of the three NGOs are poor, they distribute loans to those members who have a maximum 0.5 of acre of land[1].

As donor funds for microcredit services are depleting, only financial sustainable microcredit programs might survive and get more investment for this purpose from private investors on cost-benefit basis.

2. Microcredit Programs in Bangladesh and Elsewhere

In Bangladesh, micro-credit program was initiated by the Nobel laureate Professor Muhammad Yunus in 1970s in order to improve the socio-economic condition of poorest of the society (Chowdhury & Chowdhury, 2011; Khandker, 2005; Mazumder & Wencong, 2013; Rahman, Luo, Ahmed, & Xiaolin, 2012; Weiss & Montgomery, 2005). Since 1990, Bangladesh experienced rapid growth and achieved tremendous success in developing innovative micro-credit models, (Chowdhury, *et al.*, 2005; Rahman, *et al*., 2012). About 2,116 NGOs[2] provide microcredit services to the millions of poor rural people competitively in Bangladesh (Mazumder & Wencong, 2013; Zeller, *et al*., 2001). Specifically, Bangladeshi NGOs provide collateral-free micro credit to poor women to improve their socio-economic conditions (Amin, *et al*., 1998). Further, NGOs and rural people have become connected and also mutually dependent through micro-credit operations in Bangladesh (Karim, 2008). Bangladeshi NGOs have become successful to improve socio-economic conditions of rural poor (Ahmad & Townsend, 1998); for instance, 'BRAC' is considered as one of the largest successful NGOs in the world (Develtere & Huybrecht, 2005).

Nawaz (2010) claims that although microfinance has resulted in a moderate reduction in the poverty alleviation, but there are still more prospective clienteles remaining out of reach of many MFIs. Globally, there are 1033 large scale MFIs that offer their services to 116.6 million borrowers in 2015 (MIX, 2017). These financial service providers (FSP) have a gross loan portfolio of USD 92.4 billion and 58.9 billions of deposits. The South Asian region (Bangladesh, India, Pakistan, Afghanistan, Nepal, and Sri Lanka) have the greater coverage with the primary focus on serving female borrowers, representing 92% (MIX, 2017). At a global level, FSPs recorded an annual growth of 8.6% in the loan portfolio and 13.5% in borrowers (MIX, 2017).

[1] Possession of larger amount of land in rural Bangladesh is considered above the poverty line person and does not qualify for the poverty alleviation related Microfinance services.

[2] Some of them are very small NGOs serving a few hundred clients.

3. Conceptual Framework and Methods

3.1 Conceptual framework

According to Coelli (2003), modern efficiency measurement begins with Farrell (1957) who drew upon the work of Debreu (1951) to define a simple measure of firm efficiency, which could account for multiple inputs. The efficiency of a firm consists of two components: technical efficiency, which reflects the ability of a firm to obtain maximal output from a given set of inputs, and allocative efficiency (price efficiency), which reflects the ability of a firm to use the inputs in optimal proportions, given their respective prices (Coelli, 2003). These two measures are then combined to provide a measure of total economic efficiency. Leibenstein (1966) introduced the theory of inefficiency generated from non-competition and named it X-efficiency. Where competitive pressure is light, many people will trade the disutility of greater effort, or search for the utility of feeling less pressure and of better interpersonal relations (Leibenstein, 1966). This X-efficiency appears to be large and tends to dominate scale and scope efficiency (Berger & Humphrey, 1997).

In recent years, there has been a trend towards measuring efficiency using one of the frontier analysis methods; and in frontier analysis, the institutions that perform better relative to a particular standard are separated from those that perform poorly (Mayoux, 1997). Such separation is done either by applying a non-parametric or parametric frontier analysis to firms within the financial services industry (Mayoux, 1997). The parametric approach includes stochastic frontier analysis, the free disposal hull, thick frontier and the distribution free approach (DFA) while the non-parametric approach is Data Envelopment Analysis (DEA) (Mayoux, 1997). Coelli (2003) noted that DEA involves the use of linear programming methods to construct a non-parametric piecewise surface (or frontier) over the data, so as to be able to calculate efficiencies relative to this surface. The computer program can consider a variety of models. The three principal options are:

(1) Standard Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS) DEA models that involve the calculation of technical and scale efficiencies. These methods are outlined in Fare, Grosskopf and Lovell (1994).

(2) The extension of the above models to account for cost and allocative efficiencies. These methods are outlined in Fare *et al*. (1994).

(3) The application of Malmquist DEA methods to panel data to calculate indices of total factor production change; technological change; technical efficiency change and scale efficiency change. These methods are discussed in Färe, Grosskopf, Norris, & Zhang (1994).

The choice of the DEA approach was motivated by the fact that it does not require to make arbitrary assumptions regarding the functional form of the frontier. In lieu of requiring a priori assumptions about the analytical form of the production function, DEA builds the best practice production function based on observed data (Wijesiri, Yaron, & Meoli, 2017). It is flexible and offers to choose input/output data; based on the objective/s of performance assessment. Mathematical programming procedure used by DEA for efficient frontier estimation is comparatively robust (Seiford & Thrall, 1990). This study is to investigate the efficiency of this group- based lending institutions using DEA frontier approach. Frontier analysis does this by converting the multiple inputs and outputs into a single measure of productive efficiency. By doing so it identifies those units, which are operating relatively efficiently and those, which are not. The efficient units, those making best use of resources, are rated as being 100% efficient whilst the inefficient ones obtain lower scores.

Despite the leading role of Bangladesh born MFIs in offering microcredits, the existing studies have examined only the role of microcredit programs not the provider institutions (Mazumder and Lu, 2015; Habib and Jubb, 2015; Azad, Masum, Munisamy, & Sharmin, 2016) and have overlooked the efficiency examination of the delivering organizations; MFIs. That's why the main objective of this study is the measurement of the cost-efficiency of microfinance institutions originated from Bangladeshi NGOs (BRAC, ASA and Proshika) in poverty alleviation. More specifically, the study is intended to achieve the X-efficiency scores for five years for three NGOs. In the light of this main objective, the specific objectives of the study are:

(1) To find the efficiency score of these three NGOs for the study years to identify the best practice and poor practice; and

(2) To analyse the potential improvement

3.2 Methods

***Data collection*:** Secondary data required for the study were collected from the annual reports and other publications of 3 NGOs, case study series 1, 7, 8 of Dewan (1997), CDF micro finances statistics of different years and different publications of Credit and Development Forum. In addition, various government publications, such as ministry of planning, ministry of finance, World Bank Group-Bangladesh Profile, The little data book 2002 of The World Bank Statistical year book, economic survey reports, South Asian data file from web page, publications of University Press Limited (UPL) were also reviewed. Further, adequate publications and research documents of international organizations, such as MIMAP, UNDP, World Bank, ADB, Oxfam were consulted.

***Mode of analysis*:** Theoretical aspects of subject such as group based lending institution, x-efficiency, data envelopment analysis (DEA) was covered through desk study. The present study is an empirical one, only the secondary data were used in this study. Collected data were analysed through different statistical techniques viz. average, tables, graphs etc. DEA program has been used in the analysis of efficiency scores to make the study more informative and analytical.

***Data Envelopment Analysis (DEA)*:** Frontiers have been estimated by using different methods over the past 40 years (Coelli, 2003). In frontier analysis, the institutions that perform better relative to a particular standard are separated from those that perform poorly; and such separation is done either by applying a non-parametric or parametric frontier analysis to firms within the financial services industry (Coelli, 2003). The non-parametric approach is Data Envelopment Analysis (DEA), which is a useful decision-making tool in benchmarking (Mayoux, 1997). The DEA technique has been used in efficiency analysis of banks (Berger & Young, 1997; Favero & Papi, 1995; Kwan, 2001; Resti, 1997; Sathye, 2001; Wheelock & Wilson, 1995; Yue, 1992). DEA is sensitive to the choice of input-output variables and it reveals which of the input-output variables need to be closely monitored by bank management to improve efficiency (Sathye, 2001).

***Algebraic explanation of DEA*:** DEA is the non-parametric mathematical programming approach to frontier estimation, and discussion of Pf DEA models presented here is brief, with relatively little technical detail. The piecewise-linear convex hull approach to frontier estimation, proposed by Farrell (1957) was considered by only a handful of authors in the two decades following Farrell's (1957) paper. Charnes, *et al*. (1978) coined the term data envelopment analysis (DEA). They proposed a model, which had an input orientation and assumed constant returns to scale (CRS). The following discussion of DEA begins with a description of the input-oriented CRS model. The discussion begins with Farrell's (1957) original ideas, which were illustrated in input/input space and hence had an input-reducing focus. These are usually termed input-oriented measures.

4. Results

4.1 Efficiency scores

Frontier analysis shows how much inefficient units need to reduce their inputs or increase their outputs in order to become efficient. Input and output variables which were included to analyse are Revolving Loan Fund (RLF), Total staff (TS), Recovery rate (RR), Outstanding borrower (OB), Total disbursement (TD), Outstanding loan (OL), Membership (MS).

Table 1. Efficiency scores of three NGOs in study years

Units	Score (%)
BRAC 1998	100.00
BRAC 1999	96.40
BRAC 2000	100.00
BRAC 2001	100.00
ASA 1998	100.00
ASA 1999	90.49
ASA 2000	100.00
ASA 2001	100.00
Proshika 1998	100.00
Proshika 1999	92.93
Proshika 2000	100.00
Proshika 2001	98.93

From the table 1, it is clear that the efficiency scores of all twelve units are greater than 90% and eight units are 100% efficient, three units are 91 to 99.9% efficient and one unit is 80 to 90% efficient.

4.2 Potential improvement

The potential improvements graph shows what percentage a unit needs to either decrease its inputs or increase its outputs in order to become 100% efficient. The potential improvements graph shows the target input and output levels needed for a unit to become "fully" efficient. This is important because they are peer-based targets, so they should be achievable. We can observe the potential improvement matrix from the Table 2.

Table 2. Potential improvement matrix

NGO, Year	Score, Suggestion for change
BRAC 1998	100%. This unit is fully efficient and there was no need to improve efficiency.
BRAC 1999	96.4%. This unit was not fully efficient. Its efficiency could have improved by reducing revolving 100%, loan fund and total staff by 3% and by increasing total disbursement and membership by 7% and 10% respectively.
BRAC 2000	100%. This unit was 100% efficient and there was no need to improve efficiency.
BRAC 2001	100%, This unit was 100% efficient and there was no need to improve efficiency.
ASA 1998	100%. This unit was 100% efficient and there was no need to improve efficiency
ASA 1999	90.5%. ASA 1999 was not fully efficient and its efficiency could have improved by reducing RLF and total staff by 9% and increasing outstanding loan and membership by 9% and 18% respectively.
ASA 2000	100%. This unit was 100% efficient and there was no need to improve efficiency.
ASA 2001	100%. This unit was 100% efficient and there was no need to improve efficiency.
Proshika 1998	100%. This unit was 100% efficient and there was no need to improve efficiency.
Proshika 1999	92.9%. Its efficiency could have improved by reducing RLF and total staff by 7% and increasing recovery rate, outstanding borrower and total disbursement by 13%, 15%, 7% respectively.
Proshika 2000	100%. This unit was 100% efficient and there was no need to improve efficiency.
Proshika 2001	98.9%. Its efficiency could have been improved by reducing RLF and total staff by 1% and increasing recovery rate 107%, outstanding borrower 32%, total disbursement 2%, and outstanding loan 20%.

Therefore, it is clear from the analysis of efficiency score and potential improvement of the three NGOs for the year's 1998, 1999, 2000, 2001, is that the activity of 1999 for the three NGOs and activity of 2001 of Proshika was not efficient. All these inefficiency could have improved by reducing RLF and total staff. That is the cause of inefficiency for BRAC-1999, ASA-1999, Proshika-1999 and 2001 was the excess use of RLF and total staff. Table 3 shows total potential improvement of the input and output variables.

Table 3. Total potential improvement of the input and output variables

Total Potential Improvements	Percentage (%)
Total Staff	-7.26
Membership	10.09
Outstanding loan	10.37
Total disbursement	6.21
Outstanding borrower	17.6
Recovery rate	41.22
Revolving loan fund	-7.26

The analysis of total potential improvement shows that the total staff and Revolving Loan Fund (RLF) was necessary to reduce by 7.26% and membership, Outstanding loan, Total disbursement, Outstanding borrower and Recovery rate was necessary to increase by 10.08%, 10.37%, 6.21%, 17.6%, and 41.22%, respectively in order to find the activity of these 3 NGOs efficiency for the four years under consideration.

Tables 4 and 5 present the total potential improvement by changing inputs and outputs, and the correlation between inputs and outputs variable respectively.

Table 4. Total potential improvement by changing input and output variables

Unit	RLF	TS	RR	OB	TD	OL	Member Ship
BRAC 1998	0%	0%	0%	0%	0%	0%	0%
BRAC 1999	-3%	-3%	0%	0%	+7%	0%	10%
BRAC 2000	0%	0%	0%	0%	0%	0%	0%
BRAC 2001	0%	0%	0%	0%	0%	0%	0%
ASA 1998	0%	0%	0%	0%	0%	0%	0%
ASA 1999	-9%	-9%	0%	2%	0%	9%	18%
ASA 2000	0%	0%	0%	0%	0%	0%	0%
ASA 2001	0%	0%	0%	0%	0%	0%	0%
Pro 1998	0%	0%	0%	0%	0%	0%	0%
Pro 1999	-7%	-7%	13%	15%	7%	0%	0%
Pro 2000	0%	0%	0%	0%	0%	0%	0%
Pro 2001	-1%	-1%	107%	32%	2%	20%	0%

4.3 X-Y plot

Frontier analysis includes X-Y plot that allow the detection of the correlation between input and output variables. This allows identifying factors that are effectively representing the same criteria and factors that are synonymous with efficiency.

Table 5. Correlation between input and output variables

Variables / Variables	RLF	Total staff	Recovery rate	Outs. borrower	Total disbursement	Outstanding Loan	Membership
RLF	1.00	0.79	-0.08	0.89	0.86	0.95	0.90
Total staff	0.79	1.00	0.06	0.96	0.83	0.91	0.91
Recovery rate	-0.08	0.06	1.00	0.05	0.29	0.01	-0.26
Outstanding borrower	0.89	0.96	0.05	1.00	0.92	0.98	0.94
Total disbursement	0.86	0.83	0.29	0.92	1.00	0.94	0.80
Outstandi11ng Loan	0.95	0.91	0.01	0.98	0.94	1.00	0.94
Membership	0.90	0.91	-0.26	0.94	0.80	0.94	1.00

4.4 Frontier plot

The efficiency frontier, derived from the most efficient unit in the Data-set, represents a standard of best achieved performance. As a result, it can be used as a threshold against which to measure the performance of all the other branches. The efficiency frontier 'envelopes' the inefficient units within it and clearly shows the relative efficiency of each unit. Unit, which are located on the frontier, are performing better than any unit below the frontier. Any unit on the frontier is considered 100% efficient and any unit below it is relatively less efficient and has an efficiency rating of less than 100%. If a unit is found to be inefficient then it should be able to produce its current level of outputs with fewer inputs (input minimization) or generate a higher level of outputs given the same inputs (Outputs maximization).

Table 6. Output maximization

100% Efficient	Less than 100% efficient
BRAC 1998	-
-	BRAC 1999
BRAC 2000	-
-	BRAC 2001
-	ASA 1998
-	ASA 1999
-	ASA 2000
-	ASA 2001
Proshika 1998	-
-	Proshika 1999
-	Proshika 2000
-	Proshika 2001

4.4.1 For output maximization

Output maximization:
Inputs = Total staff and RLF;
Output = Outstanding borrower

In Table 6, the frontier analysis for output maximization shows that BRAC-1998, BRAC-2000, and Proshika-1998 are 100% efficient.

4.4.2 For input minimization

Input minimization:
Input = Total staff;
Outputs = Membership and Outstanding borrower

In the input minimization problem, if we want to minimize total staff to achieve a specific number of member and outstanding borrower, the frontier analysis shows the following efficiency frontier. The position on the graph represented by Proshika, 1998, BRAC-1998 and Proshika 2000 demonstrate a level of performance which is superior to all the other units and is considered 100% efficient: Proshika, 2000 because it is the most efficient at processing membership and Proshika, 1998 because it is the most efficient at processing outstanding borrower. The other units are not efficient as they are not on the frontier line.

The frontier analysis of Input minimization in Table 7 shows that Proshika-1998, Proshika-2000, and BRAC-1998 are 100% efficient.

Table 7. Input minimization

100% Efficient	Less than 100% efficient
BRAC 1998	-
-	BRAC 1999
-	BRAC 2000
-	BRAC 2001
-	ASA 1998
-	ASA 1999
-	ASA 2000
-	ASA 2001
Proshika1998	-
-	Proshika 1999
Proshika 2000	-
-	Proshika 2001

5. Discussion and Conclusion

As a social approach of microfinance for poverty alleviation, microfinance related NGOs provide four socio-economic services such as lending capital for micro-entrepreneurships, health program, education program and support program for human resource development. To analyse the efficiency of this financial system--Revolving loan fund (RLF) and total stuff were used as input variables. On the other hand, recovery rate, outstanding borrower, total disbursement, outstanding loan and membership were used as output variables to find the efficiency score with a non-parametric approach, data envelopment analysis (DEA). Development program by microfinance has worked efficiently (100%) in some years and has not worked efficiently in some other years.

The analysis of total potential improvement showed that the input variables named total staff and revolving loan fund were necessary to reduce by 7.26% and membership, outstanding loan, total disbursement, outstanding borrower and recovery rate were necessary to increase by 10.08%, 10.37%, 6.21%, 17.6%, 41.22% respectively in order to find the micro credit program of these NGOs efficient for the study years. It was found that the microcredit program of BRAC, ASA and PROSHIKA for the year 1999 was not efficient. One of the explanations of inefficiency of 1999 could be attributed to floods that affected most of the micro-entrepreneurs' small business activities and had repercussions on loan repayment, deposit and other related activities.

The analysis of optimisation shows that the microcredit programs of BRAC-1998, BRAC-2000 and PROSHIKA 1998 were 100% efficient in Output maximization and PROSHIKA-1998, BRAC-1998 and PROSHIKA-2000 were 100% efficient in Input minimization and the other study period for the three MFIs were less than 100% efficient in both input minimisation and output maximization. Except 1999, overall performance of three MFIs could be considered as efficient. To create more efficient delivery system, microcredit programs for poverty alleviation will require changes not only at microcredit application level by MFIs, but also crucially in donors' policy formation level. Donors need to include empowerment concerns in all funding guidelines, monitoring and evaluation and programme support for creating sustainable microcredit program delivery institutions; NGOs and other MFIs.

The examination of X-efficiency of micro-credit in poverty alleviation has important public policy implications. Measurement of X-efficiency of Bangladeshi MFIs in poverty alleviation through micro-credit will be useful to various interest groups such as public policy makers, academics, donors and NGOs. To confirm the replicability and sustainability of MFIs, it needs to analyse the efficiency score and potential improvement. Referring back to the two objectives of MFIs i.e. institutional paradigm or financial sustainability and social outreach; the study shows overall financial sustainability/efficiency of the three MFIs except the year of 1999. Regarding the social efficiency or social outreach, even though we have not addressed this issue in this study; number of clients, percentage of women borrowers and graduating from extreme poverty can give us an idea about the success of these three MFIs. They are present in the market for last forty years

and have largely succeeded in their social outreach to targeted clients i.e. poorest of the poor of the society predominated by women. For example, BRAC[3] offered microfinance services to 5.4 million borrowers in 2016, 10% higher than 2015; more than 90% of them are rural women and 86975 households graduated from extreme poverty. ASA[4] served 7.5 million borrowers with more than 90% of them are women. PROSHIKA[5] has 2.77 million borrowers with more than 90% rural women.

All three MFIs offer microfinance services as well as skill development, women empowerment activities, health care and basic education services. Study on financial sustainability and social efficiency of MFIs are inconclusive and there are differences of findings with studies in other regions. For example, Tahir and Tahrim (2015) studied efficiency of Cambodian MFIs using DEA and Dynamic MI and found that Cambodian MFIs are efficient in scale of operation and relatively inefficient at managing assets and costs. Basem (2014) based on a study of 33 MFIs in MENA regions, on the other hand, found that those MFIs were not efficient in scale but was efficient in management of assets and cost. In another study (Nghiem, *et al*., 2006) of 46 Vietnamese MFIs, location was identified as most significant variable in determining MFI efficiency. Our findings and comparable studies on other countries and regions help us to conclude that future research on MFIs efficiency require to include more variables like location, age, size, training level of staff, skills, management experience and distance from the clients. Regarding the DEA approach, it is sensitive to outliers and measurement errors and unable to allow random noise in efficiency measurement and assumptions that all deviations from the frontier means inefficiency can distort the resultant efficiency measures. Future study might address this issue as well. Despite these shortcoming in evaluating MFIs' efficiency, International micro-lenders are increasingly tapping into the emerging opportunity by extending small business loans to millions of borrowers" (Bruton *et al*., 2011, p.718) and the long-term sustainability of micro-lending is becoming an important field of investigation in international business (Bruton, Khavul, & Chavez, 2011).

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