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Abstract

In this paper we focus on microfinance institutions in South Asia. These microfinance institutions (MFIs) provide credit to the poor who have no access to commercial banks. This is done to reduce poverty and to help the poor with setting up their own income generating businesses. There appears to be in general a conflict between the outreach activities of such MFIs and their sustainability. It may also influence the efficient functioning of such organizations. Therefore, the focus in literature has shifted from subsidizing MFIs to their financial sustainability and efficiency. It is now presumed that such institutions should be able to cover the cost of lending money out of the income generated from the outstanding loan portfolio and to reduce these costs as much as possible. Besides it there is an element of increasing competition among MFIs which is coupled with factors like commercialization, technological change and financial liberalization and regulation policies of the government.

In view of such developments we analyze the behavior of microfinance institutions in South Asia comprising MFIs in India, Nepal, Bangladesh and Sri Lanka. We look into major aspects of access to poor by MFIs, sustainability in activities and finances as well as the efficiency of such organizations from different parameters.

Using data for 5 years for 142 MFIs across these nations, our results indicate that the goals of sustainability and efficiency are not always mutually supportive. In the long run thus these organizations should choose their focus to those outreach activities in which they exhibit efficiency from different angles such that sustainability along with reduced dependence on lenders as well survival in competitive environment is feasible.

Key words: *Micro finance institutions, South Asia, sustainability, efficiency, competition*

JEL Codes: *G21, G32, G33, C33, I31*

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INTRODUCTION

Microfinance institutions (MFIs) are operating world over to provide finance to needy, poor and outreach population. These institutions largely fill the gap of banking institutions for remote areas. The operation and modus operandi of MFIs in rural areas serves to reduce or eliminate poverty and thus lauded for poverty alleviation mechanism. Thus an efficient operation of these MFIs in developing nations in whichever areas they operate becomes of paramount importance both for economic efficiency and social objective. Although the economic and social objectives may not always be supportive to each other, yet efficiency from these both angles is important for optimal resource utilization.

An exhaustive review by Brau and Woller (2004) covers over 350 articles and discusses about MFI sustainability, products and services, management practices, clientele targeting, regulation and policy, and impact assessment. The period of coverage for the review by Brau and Woller (2004) is up to 2004 and thus we cover a review of some selected studies carried out in the later years.

An overview of the studies after 2004, indicates that large number of studies have used multi country data ad some studies also have focused on a single country like India, Pakistan or a region like South Asia.

In terms of econometric tools and statistical applications, we can distinguish three major strands, viz., set of studies applying non-parametric techniques like data envelopment analysis (DEA) or financial ratio analysis, others using regressions (linear or logistic or panel) and yet others applying stochastic frontier models. Thus some of the studies that have adopted DEA analysis include for instance, Qayyum and Ahmad (2006), Basharat, Hudon and Nawaz (2015), Widiarto, Emrouznejad and

Leonidas (2017), Isabelle Piot-Lepetit and Nzongang (2014), Gutierrez-Nieto *et. al.* (2009), Hassan, Sanchez and Ngene (2012). Many studies have used stochastic frontier models (for instance, these include Hermes, Lensink and Meesters(2011), Servin, Lensink and Marrit (2012) and others).

The study by Herms, Lensink and Meesters (2011) uses stochastic frontier analysis to examine whether there is a trade-off between outreach to the poor and efficiency of microfinance institutions (MFIs). Their results indicate that outreach is negatively related to efficiency of MFIs. It is observed that MFIs that have a lower average loan balance (a measure of the depth of outreach) are also less efficient. Their evidence shows that MFIs that have more women borrowers as clients (again a measure of the depth of outreach) are less efficient.

The paper by Olivares-Polanco (2005) used data from 28 Latin American MFIs to conduct a multiple regression analysis to test for some of factors that, according to the literature on microfinance, may affect loan size. The results of the regression indicate first that the type of institution, in terms of NGO versus financial institution, regardless of being regulated or not, has no effect on loan size. The results indicate that more competition may lead to larger loan sizes and less depth of outreach. It also confirms an old belief in microfinance that there is a trade-off between depth and sustainability.

The study of Conning (1999) deals with the contract design problem facing microfinance-lending organizations that want to maximize the impact and outreach of their lending activities to a target population of poor borrowers while remaining financially sustainable. Tradeoffs between outreach, sustainability and financial leverage are shaped by the endogenous monitoring and delegation costs that arise within a chain of agency relationships subject to moral hazard between borrowers, loan staff, MFO equity-owners, and outside investors. All else equal, sustainable MFOs that target poorer borrowers must charge higher

interest rates; have higher staff costs per dollar loaned, and less leverage. Analysis of data for 72 MFOs tends to support the findings.

The article by Copestake *et. al.* (2005) divided social performance into poverty outreach and impact, and then compared two approaches to assessing each. The study covered 1,352 sponsored village banks with a membership of nearly 28,000 (83 percent of them women). Peru ranks as a middle-income country, the distribution of income is highly unequal and hence poverty incidence is high. In 2001, 54.8 percent of the population was below the national income poverty line, including 24.4 percent below the extreme poverty line. It carried out a quantitative analysis using regression with difference in difference approach. The results indicated that the programme had a significant effect on individual and household income but no effect on business sales or profits. On poverty outreach, it suggested that poverty scoring can facilitate continuous monitoring based on the collection of a relatively small and easily observed set of indicators. On impact, it highlights that there is a role for qualitative in-depth interviews in helping MFI managers to monitor impact at the client level, particularly if these can be linked in with periodic surveys and poverty monitoring.

Another paper by Copestake (2007) focuses on three things which include meaning of mission drift, the extent to which poverty oriented MFIs are successfully able to avoid mission drift through better social performance management, and to explore the scope for more systematic balancing of social and financial goals. With a theoretical model it distinguishes between social and financial performance preferences and possibilities, and thus defines mission drift as ex post changes in stated preferences to fit unplanned performance outcomes. Second, evidence is reviewed from Imp-Act (an action research program into performance management systems) of a global sample of explicitly poverty oriented MFIs. The study suggests that many MFIs do have strong social as well as financial performance preferences, a significant room for maneuver in managing them, and that there is scope for them

to do so better. This can help to accelerate the pace of innovation and growth in a more poverty and gender aware manner, and to reduce mission drift. Third, there is scope for better social performance management more widely by applying conceptual framework developed in this paper for MFIs.

The study by Cull, Kunt and Morduch (2007) examines as to why microfinance institutions have secured high loan repayment rates but, relatively few earn profits? It explores patterns of profitability, loan repayment, and cost reduction with unusually high-quality data on 124 institutions in 49 countries. The evidence shows the possibility of earning profits while serving the poor, but a trade-off emerges between profitability and serving the poorest. Raising fees to very high levels does not ensure greater profitability and the benefits of cost-cutting diminish when serving better-off customers. The key dependent variable in their analysis of profitability is the financial self-sufficiency (FSS) ratio. The financial self-sufficiency ratio is adjusted financial revenue divided by the sum of adjusted financial expenses, adjusted net loan loss provision expenses, and adjusted operating expenses. It indicates the institution's ability to operate without ongoing subsidy, including soft loans and grants. The base regressions describe the correlates of profitability focusing particularly on the roles of costs and interest rates charged on loans. The study allows these factors to vary by lending type using the reduced-form equation which considers FSS (financial self-sufficiency ratio of a micro-finance institution) as a function of yield (based on lending type), labor cost, capital cost, MFI's history, its orientation and regions. The two variables namely labor and capital cost are also distinguished separately by type. It also uses OSS and ROA as dependent variables. Their results suggest that institutional design and orientation matters importantly in considering trade-offs in microfinance. The trade-offs can be stark: village banks, which focus on the poorest borrowers, face the highest average costs and the highest subsidy levels. By the same token, individual-based lenders earn the highest average profits but do least well on indicators of outreach to the very poor. At the same

time, there exist examples of institutions that have managed to achieve profitability together with notable outreach to the poor – achieving the ultimate promise of microfinance.

The study by Daher and Erwan Le Saout (2013) reviews the results of the literature relative to the financial performance of MFIs. A statistical analysis of the financial performance of MFIs is carried out by distinguishing their type and geographic location which complements the results of the reviewed literature with the four most representative financial indicators proposed by the SEEP Network. The analysis is performed using a dataset from the Microfinance Information Exchange Market (Mix Market), covering approximately 1,956 MFIs around the world over the period 2005–2010. It calculated four indicators of performance and risk — return on assets, return on equity, gross yield on gross portfolio and portfolio at risk (30 days). The performance indicators of the MFIs were used according to their type and their geographic location. The geographical segmentation distinguishes across Latin America and the Caribbean, Eastern Europe and Central Asia, South Asia, Africa, East Asia and the Pacific, and the Middle East and North Africa. The segmentation according to the type of MFI includes NGOs, non-bank financial institutions (NBFIs), credit unions or cooperatives, commercial banks, rural banks, and others without status. The results show that there are differences in return and risk from one region to another, and between the different types of MFI. However, these results are not sufficient to explain the differences in financial performance and their evolution.

The study by Kaur (2016) looks at the financial efficiency of microfinance institutions in India and analyses their efficiency to reach women and the poorest of the poor. For the purpose of the study, data have been collected for the Fiscal Year 2012 for 87 MFIs operating in India from the MIX Market database. Application of Data Envelopment Analysis shows, on an average financial efficiency of Indian MFIs is much higher than their social efficiency. However, study does not find evidence

for the presence of trade-off between financial and social efficiency. The study by Begoña, Carlos and Cecilio (2007) using a data envelopment analysis (DEA) measures the efficiency of MFIs. The study ranks DEA efficiencies under different models and specifications; e.g. particular sets of inputs and outputs. The results show that MFIs efficiency can be explained by means of four principal components of efficiency. For the purposes of this paper, data was obtained from Microrate web page for the year 2003. The analysis covers thirty Latin American MFIs from Bolivia, Colombia, Dominican Republic, Ecuador, Mexico, Nicaragua, Peru and Salvador. Some of them are for profit institutions and others are not profit oriented. Some MFIs are just specialized banking institutions, while others are non-governmental organizations (NGOs). It indicates that there are country effects on efficiency and effects that depend on non-governmental organization (NGO)/non-NGO status of the MFI.

The study by Haq, Skully and Pathan(2010) examines the cost efficiency of 39 microfinance institutions across Africa, Asia and the Latin America using non-parametric data envelopment analysis. Their findings show non-governmental microfinance institutions under production approach, are the most efficient and this result is consistent with their fulfillment of dual objectives namely alleviating poverty and simultaneously achieving financial sustainability. However, bank-microfinance institutions also outperform in the measure of efficiency under intermediation approach. The result depicts that banks are the financial intermediaries and have access to local capital market. It may be possible that bank-microfinance institutions may outperform the non-governmental microfinance institutions in the long run.

The paper by Hartarska and Roy (2012) evaluates the effectiveness of several governance mechanisms on microfinance institutions' (MFI) performance. They define performance as efficiency in reaching many poor clients. A stochastic cost frontier is applied using output as the number of clients. The study explores the impact of measurable governance mechanisms on the individual efficiency

coefficients. The dataset was constructed from publicly available data from www.ratingfund.org. It consists of all available risk assessment reports conducted by five major rating agencies until June 2007.The results show that efficiency increases with a board size of up to nine members and decreases after that. MFIs in which the CEO chairs the board and those with a larger proportion of insiders are less efficient. Their evidence suggests that donors' presence on the board is not beneficial; there is no consistent evidence for the effect of competition, weak evidence that MFIs in countries with mature regulatory environments reach fewer clients, while MFIs regulated by an independent banking authority are more efficient.

Our Model and Data Base

As discussed above, there are mainly three methods used to measure efficiency, viz., Financial Ratio Analysis, Data Envelopment Analysis, Stochastic frontier analysis. Mostly data availability has determined either of the choices or preference for normative approach has led to SFA. We have chosen SFA and panel data for this analysis.

Stochastic Frontier Method

Among parametric techniques, stochastic methods can be used to correct for measurement and other random errors in the estimation of the production possibility frontier (PPF). For the latter (i.e., PPF), a set of parameters is selected that best fit the sample data.

Model Specification

In the estimation of MFIs efficiency, our specification is based on a general stochastic frontier model that is presented as:

$$\ln q_j = f(\ln x) + v_j - u_j \qquad (1)$$

Where: $\ln q_j$ is the variable which represents an output of microfinance organization (MFI) from two perspectives including either of a financial variable (like total assets or return on assets or gross loan portfolio or

operating expenses) or number of maximum borrowers per staff member. Depending upon the type of dependent variable chosen x is a vector of factor inputs. The specification of each of the five dependent variables and the set of vector inputs is mentioned below.

v_j is the stochastic (white noise) error term.

u_j is a one-sided error term representing the technical inefficiency of the MFI "j"

Both v_j and u_j are assumed to be independently and identically distributed (iid) with variance σ_v^2 and $\sigma_u^{2,}$ respectively

From the estimated relationship $\ln \hat{q}_j = f(\ln x) - u_j$

The efficient level of microfinance organization's outcome (with zero technical inefficiency) is defined as:

$\ln q^* = f(\ln x)$

This implies $\ln TE_j = \ln \hat{q}_j - \ln q^* = - u_j$

Hence $TE_j = e^{-u}{}_j$, $0 <= e^{-u}{}_j <= 1$

If $u_j = 0$ it implies $e^{-u}{}_j = 1$, we presume that MFI is technically efficient.

This implies that technical efficiency of j^{th} MFI is a relative measure of its output as a proportion of the corresponding frontier output.

An MFI is technically efficient if its output level is on the frontier which in turn means that q/q^* equals one in value.

In our analysis we measure both the output and cost efficiency in terms of how close the actual output/costs of the lending activities of an MFI are to what the output/costs of a best-practice MFI would have been in case it produces identical output under the same conditions. Cost efficiency measures the reduction in cost that could have been achieved if an MFI were both allocatively and technically efficient. As cost functions are not directly observable, inefficiencies are measured in comparison with an efficient cost frontier.

Thus we distinguish three broad criteria namely, financial efficiency like i) utilisation of overall assets, return on assets, and gross loan portfolio; ii) cost efficiency like operating expenses and iii) output efficiency like number of employees in relation to loan portfolio or return on assets.

Thus we use the following functional forms:
Gross Loan Portfolio=f(total assets, operating expenses and number of loan offices) (a)

Total revenues or return on assets= f((total assets, operating expenses and number of loan offices) (b)

Assets=f(operating expenses and number of loan offices, number of employees) (c)

Total number of employees= f (total assets, operating expenses and number of loan offices) (d)

The equations (a) to (d) thus represent loan portfolio efficiency, revenue efficiency, asset use efficiency and employees efficiency.

We covered all the MFIs for the four countries namely India, Bangladesh, Nepal and Sri Lanka for which by and large information was available from 2009-14. Thus the non-availability of information for a particular MFI in either of these countries for any of the five years, led us to drop that year's observation and our sample of MFIs formed an imbalanced panel data. Basic information about the coverage of MFIs used in our analysis is presented in terms of numbers as well as percentage change in the duration of our coverage in Tables 1 and 2 respectively. It provides a synoptic view of our coverage relating to their total assets, gross loan portfolio, operating expenses, maximum borrowers per staff members and number of employees.

Table 1: Basic Information about MFIs Covered in Our Analysis (Absolute Figures)

Country	Total MFIs (numbers)	Assets (in thousand Dollars)	Gross Loan Portfolio	Operating Expense	Maximum borrowers per staff member	Number of Employees
India	89	7216750	7154584	523804	1176	100118
Bangladesh	27	6024674	4310062	455576	308	94379
Nepal	26	329129	249023	21877	326	5640
Sri Lanka	16	836144	673659	54421	382	6057

Source: Estimated.

Table 2: Basic Information about MFIs Covered in Our Analysis (Percentage Change)

Total MFIs	**Percent change between beginning and latest year → country↓**	**Assets**	**Gross Loan Portfolio**	**Operating Expense**	**Max. Borrowers per staff member**	**Number of Employees**
89	India	41.34	59.72	34.76	-40.82	9.47
27	Bangladesh	86.98	85.83	62.25	-6.95	-0.28
26	Nepal	80.95	88.28	51.59	5.16	70.18
16	Sri Lanka	30.48	35.26	0.57	-6.37	17.87

Source: Estimated.

RESULTS

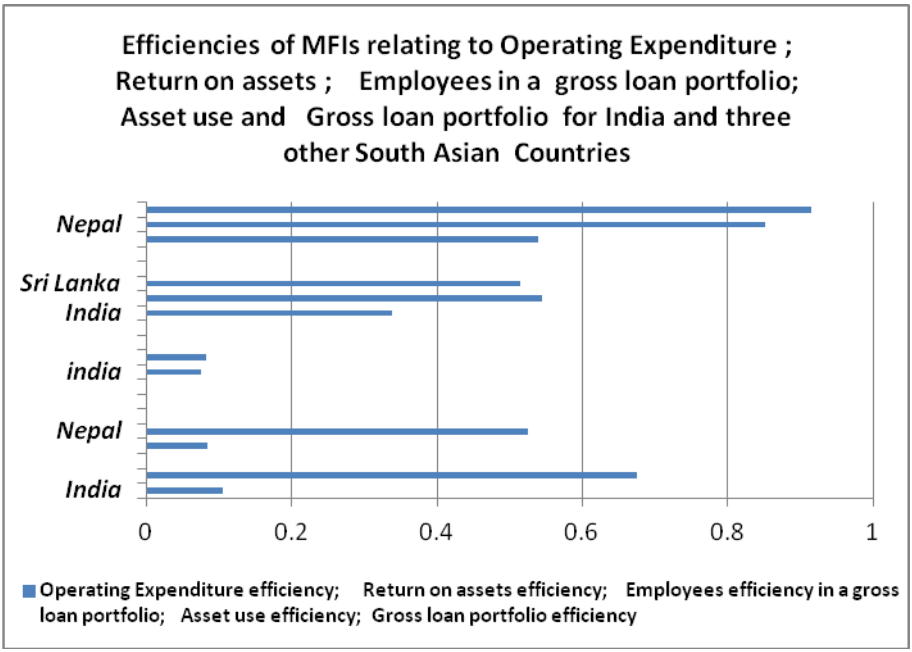
Using the above data set we have estimated efficiency using the earlier mentioned four criteria. The results of SFA for these criteria for four South Asian countries including India, Bangladesh, Nepal and Sri Lanka are presented in Annexure A (Tables A1 to A17). The results for India indicate that for asset use, gross loan portfolio was statistically significant (Table A1) and the same is true for Operating efficiency (Table A2). However, for return on assets, only the size of assets was significant (Table A3). For employees' efficiency, operating expenses (Table A4) or Gross loan portfolio (Table A5) mattered. In case of Bangladesh results indicated that statistically significant variables respectively for: asset use is gross loan portfolio (Table A6), return on assets, it is size and operating expenditure (Table A7), gross loan portfolio, it is size of assets (Table A8), for employees efficiency, it is gross loan portfolio (Table A9) or operating expenses (Table A10). For Nepal asset use efficiency was influenced by gross loan portfolio (Table A11), operating expenses by return on assets and gross loan portfolio (Table A12), return on assets by size and operating expenses (Table A13), gross loan portfolio by size and operating expenses (Table A14). For Sri Lanka, for both asset use and operating expenses, gross loan portfolio was the significant variable (Tables A15 and A16) and return on assets no variable was significant (Table A17).

Using only those results where at least one of the explanatory variables was statistically significant, efficiency values across these criteria for the four South Asian countries are presented in Tables B1 to B4 and Chart 1 below. It can be observed that India has the lowest median efficiency relative to other South Asian nations.

Further in terms of comparable efficiencies for individual country, using estimated values of efficiencies for each MFI included in our sample, we find that for majority of MFIs in India for the latest period of coverage assets use efficiency is higher relative to return on assets

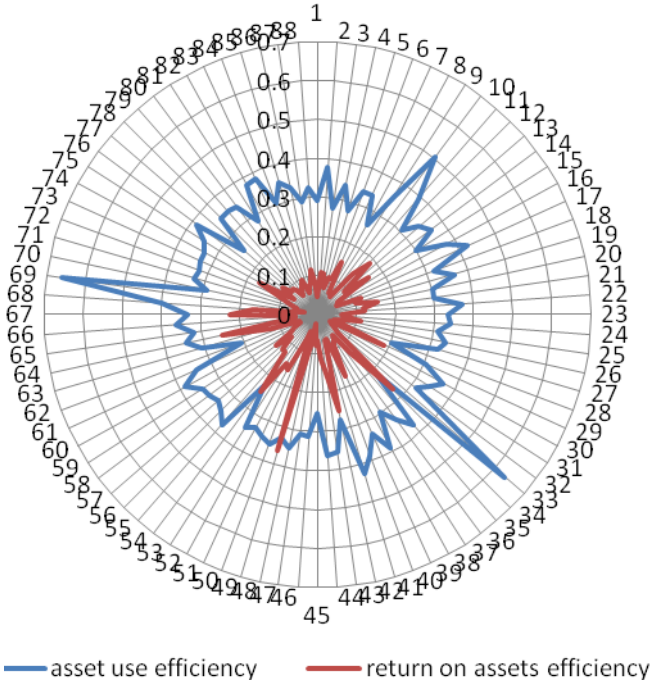
(Chart 2). Similarly relative to operating expenditure (efficiency), efficiency of gross loan portfolio is higher for Indian MFIs (Chart 3). Likewise by and large MFIs in Nepal (Charts 4 and 5) and Bangladesh (Chart 6) seem to have an akin trend. However, for Sri Lanka the operating efficiencies seem to be higher for a majority of MFIs relative to their assets use efficiencies (Chart 7).

Chart 1: Efficiency of Indian MFIs relative to three other South Asian nations



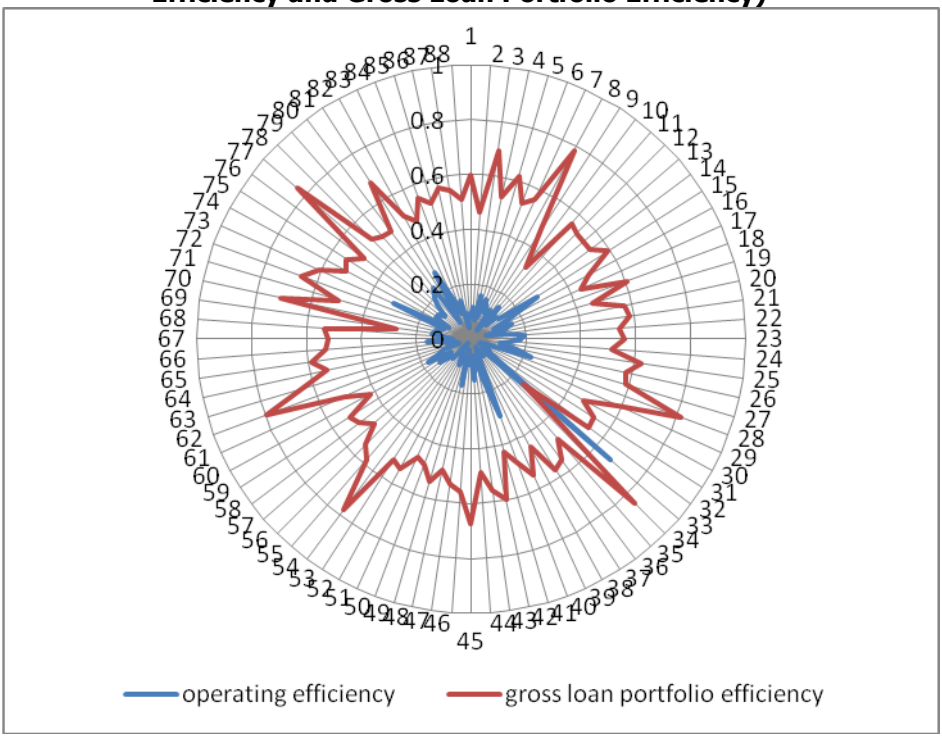
Source: Estimated.

Chart 2: Comparison Different Efficiencies for India (Asset Use and Return on Assets)



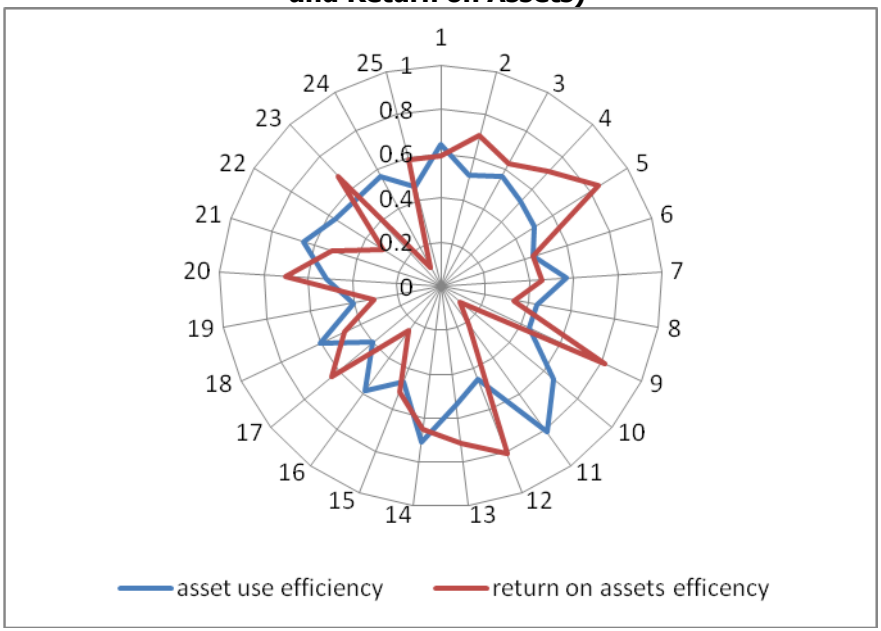
Source: Estimated.

Chart 3: Comparison Different Efficiencies for India (Operating Efficiency and Gross Loan Portfolio Efficiency)



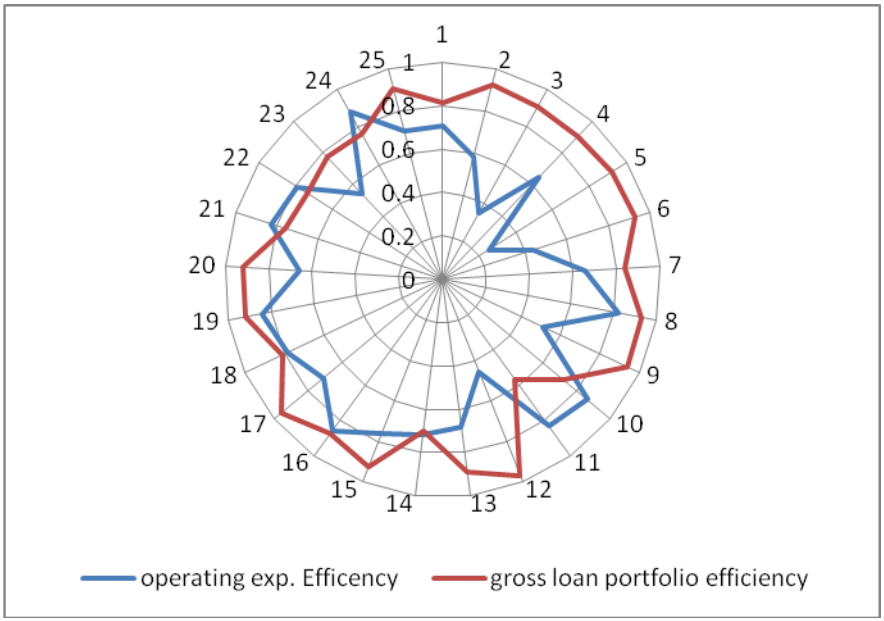
Source: Estimated.

Chart 4: Comparison Different Efficiencies for Nepal (Asset Use and Return on Assets)



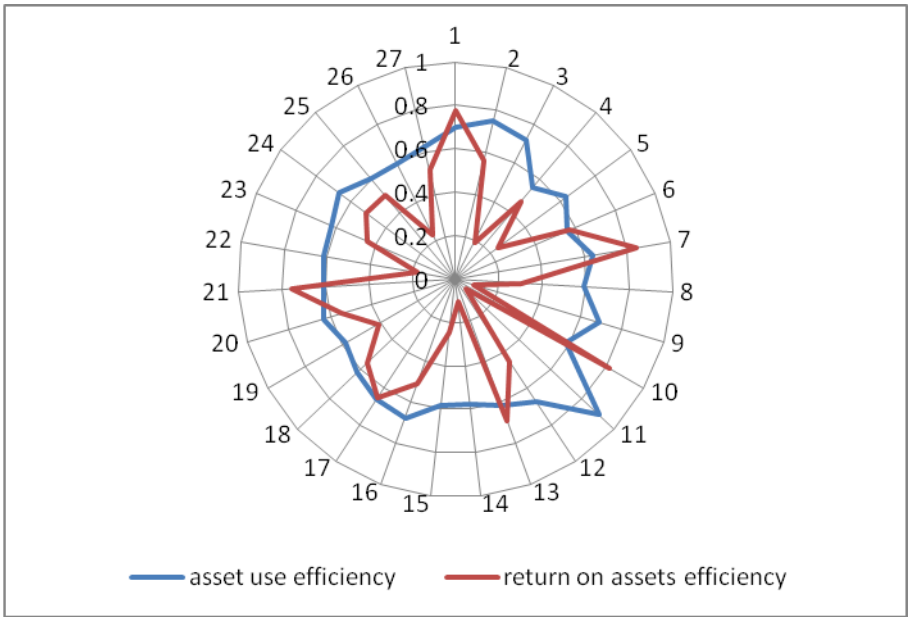
Source: Estimated.

Chart 5: Comparison Different Efficiencies for Nepal (Operating Efficiency and Gross Loan Portfolio Efficiency)



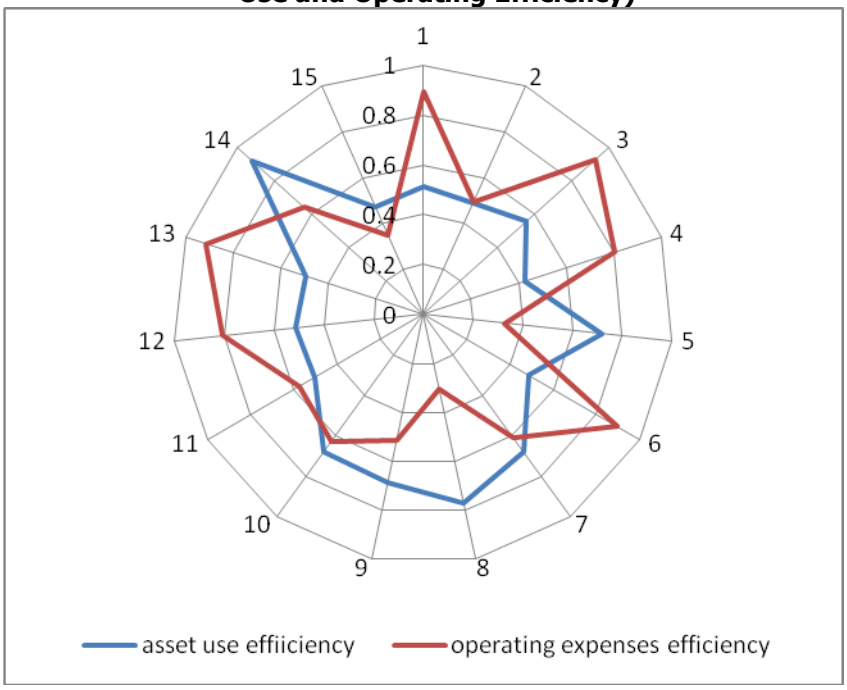
Source: Estimated.

Chart 6: Comparison Different Efficiencies for Bangladesh (Asset Use and Return on Assets)



Source: Estimated.

Chart 7: Comparison Different Efficiencies for Sri Lanka (Asset Use and Operating Efficiency)



Source: Estimated.

These results thus indicate that India has the lowest efficiency in comparison to other three south Asian nations. This is due to large geographical spread and more coverage of population in the Indian MFIs. Also it can be observed that three of the south Asian nations namely, India, Bangladesh and Nepal can do better by improving their efficiency pertaining to return on assets.

We further looked into residual of efficiencies and possible factors that could explain the differences in these residuals. From the literature we find that some of these factors relate to age of MFIs (more efficiency if well established or older), operating self sufficiency (or otherwise), profit or non-profit legal status, the extent of outreach

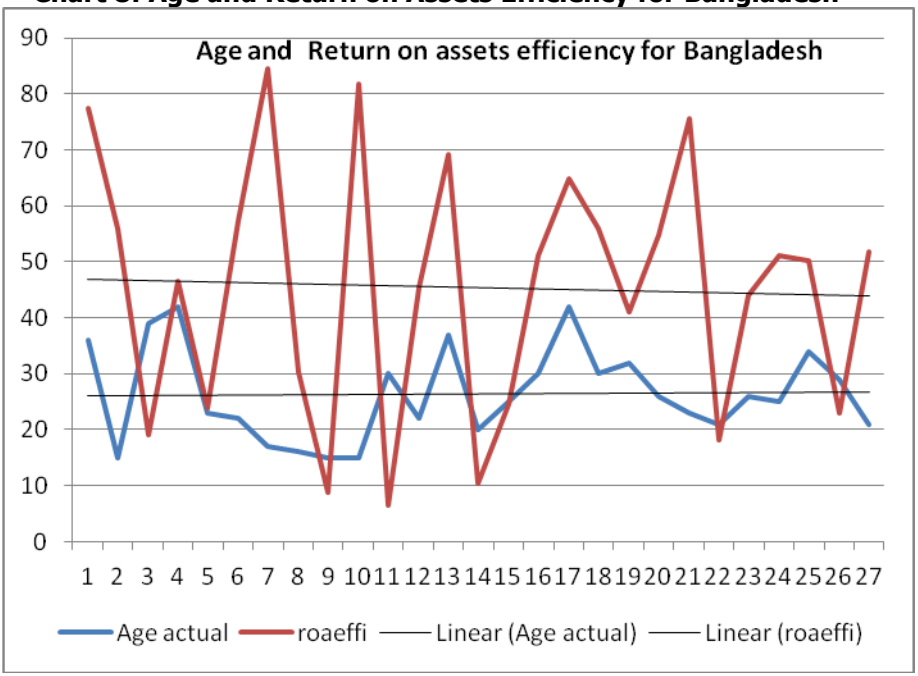
activities and extent of debt to equity ratio of MFIs. Using these variables we found correlations with residuals of efficiencies for the four countries. (Annexure B Tables B5 to B8). The overview of correlation coefficients which were statistically significant at 5 percent level and where values of coefficient were more than 0.5 indicated that for India, for instance, age was significantly related with residuals of gross loan portfolio (GLP) and employees efficiencies (Table B5). Likewise operating self sufficiency (OSS) was correlated with residuals of ROA efficiency and profit status with residuals of operating expenditure efficiency (Table B5). Similarly for Bangladesh the notable correlations were between OSS and ROA residuals, age and employees' efficiency residuals, outreach and employees' efficiency residuals and profit margin and ROA efficiency (Table B6). For Nepal notable correlations included OSS and ROA efficiency residuals, outreach and asset efficiency residuals and profit status and asset efficiency residuals (Table B7). Lastly for Sri Lanka legal status and asset efficiency residuals were noteworthy (Table B8). Keeping in view these significant correlations we used these variables as explanatory variables with residuals of efficiency as dependent variables for all the four countries separately. However, except for Bangladesh, the results did not indicate any of the above mentioned variables as statistically significant explanatory variable in these second stage regressions.

The results of Bangladesh are presented in Annexure Table B9 to B13. The results for residuals of asset use efficiency in the second stage regressions indicated that these residuals were significantly influenced positively by age (coefficient .0110) and OSS (.002) and negatively by profit margin (coeff. -.001) and outreach activities (-.039) (Table B9). Results for Gross loan portfolio efficiency residuals indicated also the positive significant influence of age (coeff.=.014) and OSS(.003) and negative significance of profit margins (coeff.-.002) (Table B10). However, the results for second stage for residuals of ROA efficiency depicted only positive and negative influence of respectively OSS (coeff. .002) and outreach activities (coeff=-.062) (Table B11). For Operating

expenses efficiency residuals the positive significant influence was noted for age and OSS (respective coefficients .012 and .001) and negative impact of profit margins (coeff.=-.001) (Table B12). For residuals of employees efficiency positive significant impact of profit margins (coeff=.001) and negative impact of OSS (coeff.=-.001) was observed (Table B13). These results of second stage apparently conveyed us that the variables like age, profit status, OSS, profit margins may have a bearing on overall explanations of different efficiencies.

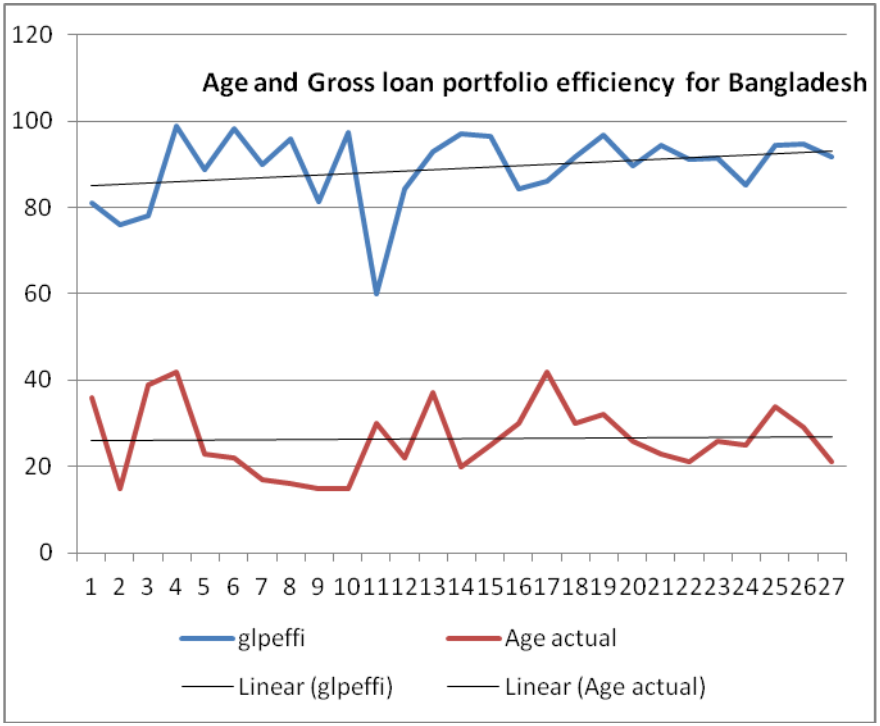
Thus keeping these results in mind we plotted three efficiencies namely return on assets, gross loan portfolio and employees operating expenditure efficiency against age of MFIs. These are presented below for Bangladesh in Charts 8 to 10. These seem to confirm that there is a saturation point in managing return on assets which tends to decline as age of MFIs grows (Chart 8). However, the expertise improves in managing gross loan portfolio which has an increasing trend with age of MFIs (Chart 9). Likewise employees' efficiency in terms of operating expenditure tends to decline with age of MFIs (Chart 10). These results indicate that as MFIs grow in age their role as lending organization or their banking functions improves but this leads to a kind of sustainability and stability of employees in the organization thus limiting the possibilities of reducing operating expenditure per employees after a certain status of maturity in the respective services.

Chart 8: Age and Return on Assets Efficiency for Bangladesh



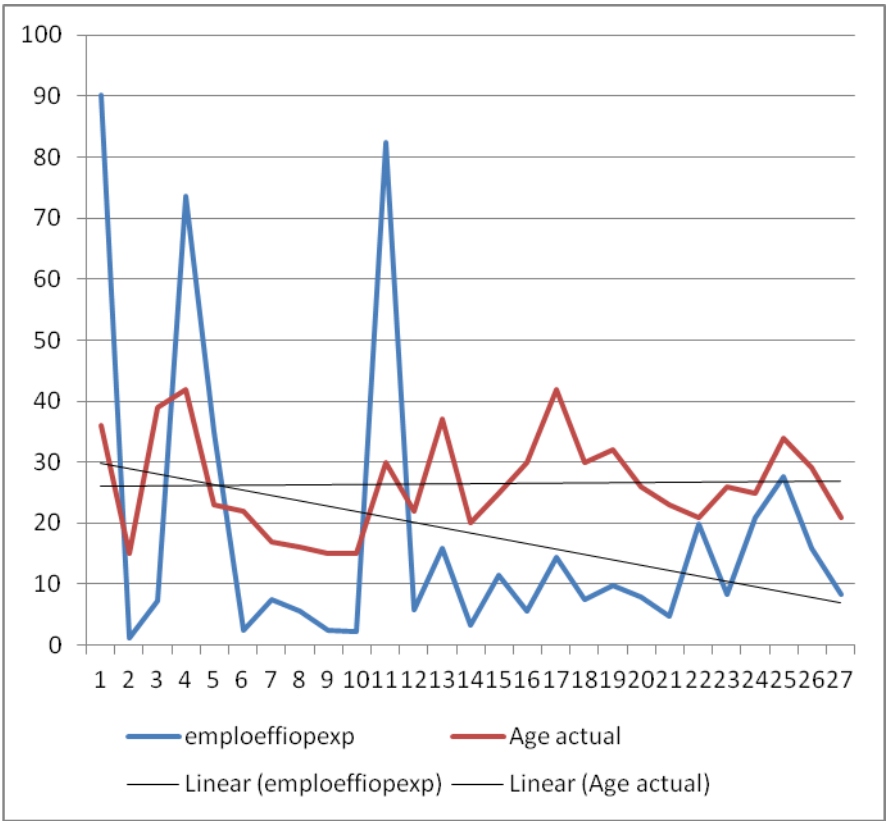
Source: Estimated.

Chart 9: Age and Gross Loan Portfolio Efficiency for Bangladesh



Source: Estimated.

Chart 10: Age and Employees Operating Expenditure Efficiency for Bangladesh



Source: Estimated.

CONCLUSIONS

Our analysis of efficiency for MFIs carried out for four South Asian countries including India, Bangladesh, Nepal and Sri Lanka using stochastic frontier analysis indicates that India has the lowest median efficiency relative to other south Asian nations. This holds for all the four efficiency criteria relating namely to asset use, return on assets, gross loan portfolio and employees operating expenditure. These criteria used

by us are further explored in terms of the residuals of efficiency values through second stage regressions. However, except for Bangladesh in the second stage regressions none of the hypothesized variables including age, profit status, operating self sufficiency, extent of outreach activities and profit margins, were found to be statistically significant. The results for Bangladesh indeed indicated significant impact of these variables on the explanation of various efficiency parameters. Our graphical exploration of pattern between age and possible improved efficiencies of MFIs using Bangladesh data indicated that age benefits by improving managing ability of gross loan portfolio yet there is a pattern depicting that the efficiencies of return to assets and operating expenditure efficiencies of employees tend to stabilize or stagnate. Apparently there seems to be increasing sustainability due to the maturity of MFI with commensurate inevitable other inefficiencies.

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ANNEXURE A

Table A1: Asset Use Efficiency for Indian MFIs

Time-invariant inefficiency model Number of obs = 426; Number of groups= 88 Obs. per group: min =3; avg = 4.8; max =6; Wald χ^2 (2) =7943.91; Log likelihood= -14.94046; Prob > χ^2 = 0.000			
assets	Coef.	z	P>z
ROA	-0.022	-1.52	0.127
GLP	0.958	87.6	0
cons	1.928	0.08	0.935
mu	1.099	0.05	0.963
lnσ^2	-2.469	-25.85	0
ilgtγ	-0.106	-0.49	0.623
σ^2	0.085		
γ	0.473		
σu^2	0.04		
σv^2	0.045		

Source: Estimated.

Table A2: Operating Expense Efficiency for Indian MFIs

Time-invariant inefficiency model Number of obs =426; Number of groups = 88 Obs per group: min =3; avg =4.8; max = 6; Wald χ2 (2) =981.30 Log likelihood = -188.85392 ; Prob > χ2 = 0.0000			
OPEX	Coeff.	z	P>z
ROA	-0.002	-0.11	0.914
GLP	0.73	30.07	0
constant	4.39	2.96	0.003
μ	2.277	1.58	0.115
lnσ^2	-0.878	-5.86	0
ilgtγ	1.516	7.09	0
σ^2	0.415		
γ	0.82		
σu^2	0.341		
σv^2	0.075		

Source: Estimated.

Table A3: Efficiency for Return on Assets for Indian MFIs

Time-invariant inefficiency model		Number of obs = 426	
Number of groups =88		Obs per group: min =3	
avg =4.8;	max =6;	Wald χ^2 (2) = 12.83	
Log likelihood = -539.121		Prob >χ^2=0.0016	
ROA	Coef.	z	P>z
assets	0.227	2.27	0.023
OPEX	-0.124	-1.15	0.251
cons	0.980	0.14	0.892
μ	2.459	0.34	0.732
ln $б^2$	-0.105	-1.19	0.233
ilgt γ	-0.469	-1.96	0.05
$б^2$	0.900		
γ	0.385		
$бu^2$	0.346		
$бv^2$	0.554		

Source: Estimated.

Table A4: Employees Efficiency for Indian MFIs

Time-invariant inefficiency model			
Number of obs =426; Number of groups = 88			
Obs per group: min = 3; avg = 4.8; max = 6;			
Wald χ^2 (2) = 36.77 Log likelihood = -213.36956 ; Prob > χ^2 = 0.0000			
BPSM	Coef.	z	P>z
ROA	0.030	1.39	0.164
OPEX	0.131	5.56	0
cons	6.294	0.21	0.835
μ	2.645	0.09	0.93
ln $б^2$	-1.146	-9.61	0
ilgtγ	0.845	4.42	0
$б^2$	0.318		
γ	0.700		
$бu^2$	0.222		
$бv^2$	0.095		

Source: Estimated.

Table A5: Employees Efficiency for Indian MFIs (Alternative Specification)

Time-invariant inefficiency model Number of obs =426; Number of groups = 88 Obs per group: min =3; avg = 4.8; max= 6 Wald χ^2 (2)=124.55 Log likelihood= -170.41337 ;Prob > χ^2 = 0.0000			
BPSM	Coef.	z	P>z
ROA	0.001	0.03	0.974
GLP	0.223	10.84	0
cons	4.442	0.35	0.73
μ	2.562	0.2	0.842
ln σ^2	-1.153	-8.67	0
ilgtγ	1.203	6.08	0
σ^2	0.316		
γ	0.769		
σu^2	0.243		
σv^2	0.073		

Source: Estimated.

Table A6: Asset Use Efficiency for Bangladesh MFIs

Time-invariant inefficiency model Number of obs =122 Number of groups =27 Obs per group: min =3; avg =4.5; max =6 Wald χ^2 (2) =8249.62 Log likelihood= 133.17135 Prob > χ^2 =0.0000			
assets	Coef.	z	P>|z|
ROA	-0.009	-1.18	0.237
GLP	1.008	88.54	0
Cons	0.519	0.55	0.585
μ	0.451	0.49	0.624
ln σ^2	-4.211	-18.2	0
Ilgt γ	1.117	3.18	0.001
σ^2	0.015		
γ	0.753		
σu^2	0.011		
σv^2	0.004		

Source: Estimated.

Table A7: Efficiency for Return on Assets for Bangladesh MFIs

Time-invariant inefficiency model Number of obs =122 Number of groups =27 Obs. per group: min =3; avg =4.5; max =6 Wald χ^2 (2) =10.90 Log likelihood = -160.24545 Prob > χ^2 =0.0043			
ROA	Coef.	z	P>|z|
assets	-0.361	-1.66	0.096
OPE	0.577	2.52	0.012
cons	-0.619	-0.48	0.634
μ	0.141	0.06	0.948
$б^2$	0.711	0.81	0.42
ilgtγ	0.948	0.78	0.434
$б^2$	2.037		
γ	0.721		
б u^2	1.468		
б v^2	0.569		

Source: Estimated.

Table A8: Gross Loan Portfolio Efficiency for Bangladesh MFIs

Time-invariant inefficiency model Number of obs=122 Group variable: iid Number of groups =27 Obs per group: min =3; avg =4.5; max =6 Wald χ^2 (2) =28025.73 Log likelihood = 136.99287 Prob > χ^2 =0.0000			
GLP	Coef.	z	P>|z|
assets	0.994	53.5	0
OPE	0.002	0.09	0.927
Cons	0.000	0	0.998
μ	-0.550	-0.28	0.777
ln $б^2$	-2.341	-0.99	0.32
ilgt γ	3.227	1.32	0.186
$б^2$	0.096		
γ	0.962		
бu^2	0.093		
бv^2	0.004		

Source: Estimated.

Table A9: Employees Efficiency for Bangladesh MFIs

Time-invariant inefficiency model Number of obs=122 Number of groups=27 Obs per group: min =3; avg =4.5; max =6 Wald χ^2 (2) =17.52 Log likelihood= -5.8634647; Prob>χ^2=0.0002			
NOE	Coef.	z	P>|z|
ROA	-0.009	-0.51	0.611
GLP	0.238	4.14	0
cons	5.290	4.54	0
μ	2.237	6.26	0
ln $б^2$	0.310	0.81	0.415
ilgt γ	4.274	9.78	0
$б^2$	0.364		
γ	0.986		
б u^2	1.345		
б v^2	0.019		

Source: Estimated.

Table A10: Employees Efficiency for Bangladesh MFIs (Alternative Specification)

Time-invariant inefficiency model Number of obs = 122; No. of groups =2; Obs per group: min = 3; avg =4.5; max =6; Wald χ^2 (2) =30.37 Log likelihood = -1.0554868; Prob > χ^2=0.0000			
NOE	Coef.	z	P>|z|
ROA	0.020	-1.11	0.27
OPE	0.188	5.47	0.00
cons	6.727	10.7	0.00
μ	2.453	7.23	0.00
ln $б^2$	0.494	1.41	0.16
ilgt γ	4.615	11.84	0.00
$б^2$	1.638		
γ	0.990		
б u^2	1.622		
б v^2	0.016		

Source: Estimated.

Table A11: Asset Use Efficiency for Nepal MFIs

Time-invariant inefficiency model Number of obs= 99; Number of groups=25 Obs per group: min =3; avg =4.0; max =6; Wald χ^2 (2) =989.87 Log likelihood=15.707771 ; Prob > χ^2 =0.0000			
assets	Coef.	z	P>z
ROA	-0.014	-0.74	0.46
GLP	0.946	29.98	0
cons	1.718	2.31	0.021
μ	0.628	1.06	0.288
ln σ^2	-2.753	-10.71	0
ilgt γ	0.320	0.56	0.576
σ^2	0.064		
γ	0.579		
σu^2	0.037		
σv^2	0.027		

Source: Estimated.

Table A12: Operating Expense Efficiency for Nepal MFIs

Time-invariant inefficiency model Number of obs=99; Number of groups=25; Obs. per group: min =3; avg =4.0; max =6 Wald χ^2 (2) = 259.78; Log likelihood = -94.746704 Prob > χ^2 =0.0000			
OPE	Coef.	z	P>z
ROA	0.237	3.72	0
GLP	0.837	13.98	0
cons	0.449	0.46	0.648
μ	-0.529	-0.15	0.881
ln σ^2	-0.107	-0.07	0.944
ilgt γ	0.637	0.28	0.782
σ^2	0.898		
γ	0.654		
σu^2	0.588		
σv2	0.311		

Source: Estimated.

Table A13: Efficiency for Return on Assets for Nepal MFIs

Time-invariant inefficiency model Number of obs=99 Number of groups= 25; Obs per group: min =3; avg =4.0; max =6 Wald χ^2 (2) =27.96; Log likelihood= -141.21836; Prob > χ^2=0.0000			
ROA	Coef.	z	P>z
assets	-0.481	-3.02	-0.003
OPE	0.702	5.09	0
cons	-0.159	-0.1	0.92
μ	-1.387	-0.2	0.838
$\ln\sigma^2$	1.134	0.68	0.496
ilgt γ	1.125	0.51	0.609
σ^2	3.108		
γ	0.755		
σu^2	2.346		
σv^2	0.762		

Source: Estimated.

Table A14: Gross Loan Portfolio Efficiency for Nepal MFIs

Time-invariant inefficiency model Number of obs.= 99; Number of groups =25 Obs per group: min =3; avg =4.0; max =6 Wald χ^2 (2) =1820.42 Log likelihood =19.18904 ; Prob > χ^2=0.0000			
GLP	Coef.	z	P>z
assets	0.911	29.04	0
OPE	0.080	3.04	0.002
cons	0.249	0.76	0.444
μ	-0.335	-0.23	0.822
$\ln\sigma^2$	-1.988	-1.17	0.242
ilgtγ	1.302	0.61	0.544
σ^2	0.137		
γ	0.786		
σu^2	0.108		
σv^2	0.029		

Source: Estimated.

Table A15: Asset Use Efficiency for Sri Lanka MFIs

Time-invariant inefficiency model Number of obs=56; Number of groups =15; Obs per group: min=3; avg=3.7; max = 6 Wald χ^2 (2)=1003.66; Log likelihood=35.4916; Prob > χ^2=0.0000			
assets	Coef.	z	P>z
ROA	0.004	0.24	0.811
GLP	0.951	31.65	0
cons	1.569	3.39	0.001
μ	0.541	3.47	0.001
lnσ^2	-2.846	-6.59	0
ilgtγ	2.015	3.49	0
σ^2	0.058		
γ	0.882		
σu^2	0.051		
σv^2	0.007		

Source: Estimated.

Table A16: Efficiency of Operating Expenses for Sri Lanka MFIs

Time-invariant inefficiency model Number of obs.=56; Number of groups =15; Obs. per group: min=3; avg =3.7; max=6 Wald χ^2 (2)=215.28; Log likelihood= -3.19606;Prob > χ^2=0.0000			
OPE	Coef.	z	P>z
ROA	0.028	0.890	-0.376
GLP	0.846	14.670	0.000
cons	1.051	1.210	0.228
μ	0.000	0.000	1.000
lnσ^2	-0.832	-0.720	0.474
ilgt γ	2.537	1.970	0.048
σ^2	0.435		
γ	0.927		
σu^2	0.403		
σv^2	0.032		

Source: Estimated.

Table A17: Efficiency of Return on Assets for Sri Lanka MFIs

Time-invariant inefficiency model Number of obs =56; Number of groups =15; Obs. per group: min=3; avg =3.7; max =6 Wald χ^2 (2) =2.61; Log likelihood = -77.1419;Prob > χ^2 =0.270			
ROA	Coef.	z	P>z
assets	-0.469	-1.58	0.114
OPE	0.450	1.39	0.166
cons	2.500	1.41	0.157
μ	0.722	0.53	0.59
lnσ^2	0.155	0.29	0.774
ilgt γ	-0.482	-0.34	0.737
σ^2	1.168		
γ	0.382		
σu^2	0.446		
σv^2	0.722		

Source: Estimated.

ANNEXURE B

Table B1: Comparison of Different Efficiencies for India

	Asset use efficiency	Operat-ing efficiency	Return on assets efficiency	Gross loan portfolio efficiency	Employees efficiency in operating exp.	Employees efficiency in gross loan portfolio
average dev	0.0403	0.0542	0.0441	0.0687	0.0290	0.0350
max	0.6619	0.6730	0.3621	0.8443	0.5050	0.5703
min	0.2033	0.0195	0.0241	0.2481	0.0167	0.0190
median	0.3373	0.1045	0.0842	0.5386	0.0684	0.0746
average	0.3403	0.1222	0.1025	0.5496	0.0810	0.0891

Source: Estimated.

Table B2: Comparison of Different Efficiencies for Bangladesh

	Gross loan portfolio efficiency	Employees efficiency in gross loan portfolio	Employees efficiency in operating exp
max	0.9881	0.9012	0.9051
min	0.5997	0.0114	0.0078
average	0.8913	0.1840	0.1676
median	0.9144	0.0825	0.0626
avedev	0.0646	0.1634	0.1618

Source: Estimated.

Table B3: Comparison of Different Efficiencies for Nepal

	Asset use efficiency	Operating efficiency	Return on assets efficiency	Gross loan portfolio efficiency
average dev	0.0769	0.1328	0.1810	0.0834
max	0.8153	0.8802	0.8455	0.9660
min	0.3987	0.2523	0.0958	0.5664
average	0.5437	0.6749	0.5255	0.8513
median	0.5392	0.7048	0.5899	0.9029

Source: Estimated.

Table B4: Comparison of Different Efficiencies for Sri Lanka

	Asset use efficiency	Operating efficiency
max	0.922526	0.923850
min	0.424589	0.302753
average	0.594008	0.644664
median	0.514313	0.625612
avedev	0.119136	0.183203

Source: Estimated.

Table B5: Spearman Correlation for Efficiency Residuals with Selected Variables for India

	Resias-seteffici	Residop-reteff	Resiroa-effi	Residgl-peffi	resiempn 1-effi	Resieffiem -plno2	Ageac-tual	OSS	legal status	Profit-status	Debt to equity ratio
resiasseteffici	1										
residopreteff	0.4042*	1									
resiroaeffi	-0.0494	-0.2014*	1								
residglpeffi	-0.8315*	-0.2884*	0.1638*	1							
resiempno1effi	-0.3256*	-0.3260*	0.1017*	0.3750*	1						
Resieffi-emplno2	-0.3193*	-0.5242*	0.1542*	0.1383*	0.8362*	1					
Age_actual	0.0314	-0.0576	-0.0379	-0.2348*	-0.0055	0.2034*	1				
OSS	-0.0451	0.1500*	-0.5662*	-0.1711*	-0.1163*	-0.0379	0.1349*	1			
legal status	-0.1381*	-0.5144*	0.2330*	-0.0104	-0.0107	0.1798*	-0.1628*	-0.0361	1		
profitstatus	-0.2016*	-0.5438*	0.2857*	0.0768	0.0894	0.2690*	-0.1347*	-0.054	0.9316*	1	
Debt to equity ratio	-0.0161	0.0723	0.0588	-0.0105	-0.1035*	-0.0513	0.1828*	0.0929	-0.3708*	-0.3478*	1

Source: Estimated.

Table B6: Spearman Correlation for Efficiency Residuals with Selected Variables for Bangladesh

	resiasseteffi	resiroaeffi	resiglpeffi	resiempleffglp	oss	ageactual	outreach	profitmargin	profitstatus	resiasseteffi
resiasseteffi	1									
resiroaeffi	-0.0152	1								
resiglpeffi	-0.9911*	0.0923	1							
resiempleffglp	0.0148	-0.0632	-0.0661	1						
oss	0.0074	-0.7405*	-0.0556	-0.2607*	1					
ageactual	-0.0108	-0.1212	0.0292	-0.5886*	0.3001*	1				
outreach	0.0656	0.1097	-0.0297	-0.5851*	0.1434	0.5095*	1			
profitmargin	0.0039	-0.7423*	-0.0521	-0.2611*	0.9996*	0.2985*	0.1434	1		
profitstatus	-0.3437*	0.3437*	0.3437*	-0.3084*	-0.2301*	0.0793	0.0803	-0.2301*	1	
debttoequity	-0.0244	0.4145*	0.0343	0.0747	-0.4459*	-0.1848*	0.1227	-0.4480*	0.3129*	1

Source: Estimated.

Table B7: Spearman Correlation for Efficiency Residuals with Selected Variables for Nepal

	residuasseteffi	resioperexeffi	resiroaeffi	resiglpeffi	oss	outreach	profitstatus	debttoequity	ageactual
residuasseteffi	1								
resioperexeffi	0.3280*	1							
resiroaeffi	-0.3358*	-0.7778*	1						
resiglpeffi	-0.8944*	-0.4746*	0.4572*	1					
oss	-0.0858	0.4445*	-0.5858*	-0.1425	1				
outreach	-0.5626*	-0.0064	-0.1034	0.3351*	0.4399*	1			
profitstatus	-0.5713*	-0.0308	0.1009	0.3758*	0.2331*	0.5296*	1		
debttoequity	-0.3302*	-0.1744	0.1715	0.3636*	-0.1028	0.0864	0.186	1	
ageactual	0.1273	-0.0075	0.059	-0.0648	-0.0957	-0.1156	-0.3264*	0.0472	1

Source: Estimated.

Table B8: Spearman Correlation for Efficiency Residuals with Selected Variables for Sri Lanka

	Resiasseteffi	Residoperexpeffi	oss	legalstatus	outreach	profitstatus	debttoequity	Age actual
Resiasseteffi	1							
Residoperexpeffi	-0.2919*	1						
oss	-0.4057*	-0.0004	1					
legalstatus	0.5296*	-0.3008*	-0.4370*	1				
outreach	0.0285	-0.2774*	0.0071	0.1382	1			
profitstatus	0.3200*	-0.2372	-0.2188	0.6708*	0.0552	1		
debttoequity	0.0279	0.1166	-0.1653	0.2579	0.4022*	0.2925*	1	
Age actual	-0.1546	0.1832	-0.0319	-0.0606	0.0284	-0.2873*	-0.1145	1

Source: Estimated.

Table B9: Bangladesh Residual Dependent Variable (Asset Use Inefficiency) Panel Regression Results

Random-effects GLS regression Number of obs=122; Number of groups=27; R-sq: within=0.3069 Obs per group: min=3 between=0.1409; avg= 4.5; overall =0.1579; max =6; Random effects u_i ~ Gaussian; Wald χ^2 (4) =44.77; corr(u_i, X) = 0 (assumed) Prob > χ^2 =0.0000			
asset_r	Coef.	z	P>|z|
age_actual	0.011	4.07	0
oss	0.002	3.53	0
profitmargin	-0.001	-2.9	0.004
outreach	-0.039	-0.39	0.699
cons	-0.411	-3.63	0
бu	0.180		
бe	0.044		
ρ	0.944		

Source: Estimated.

Table B10: Bangladesh Residual Dependent Variable (Gross Loan Portfolio Inefficiency) Panel Regression Results

Random-effects GLS regression Number of obs =122; Number of groups=27 R-sq: within = 0.357; Obs per group: min =3; between = 0.2264 avg =4.5; overall =0.2496 max =6 Random effects u_i ~ Gaussian ; Wald χ^2(4) =58.66 corr(u_i, X) =0 (assumed) ; Prob > χ^2 =0.0000			
glr_r	Coef.	Z	P>|z|
age_actual	0.014	4.29	0
oss	0.003	4.41	0
profitmargin	-0.002	-3.49	0
outreach	-0.049	-0.42	0.676
cons	-0.598	-4.43	0
бu	0.208		
бe	0.055		
ρ	93379		

Source: Estimated.

Table B11: Bangladesh Residual Dependent Variable (Return on Assets Inefficiency) Panel Regression Results

Random-effects GLS regression
Number of obs=122; Number of groups=27
R-sq: within=0.0451 Obs per group: min =3
between= 0.5349 avg = 4.5
overall= 0.2330 max =6
Random effects u_i ~ Gaussian; Wald χ^2 (4) =32.75
corr(u_i, X) =0 (assumed) Prob > χ^2= 0.0000

roa_r	Coef.	z	P>|z|
age_actual	0.000	0.17	0.864
oss	0.002	3.52	0
profitmargin	0.000	-0.58	0.56
outreach	-0.062	-2.22	0.027
cons	-0.134	485	-2.01
бu	0.014		
бe	0.084		
ρ	0.026		

Source: Estimated.

Table B12: Bangladesh Residual Dependent Variable (Operating Expense Inefficiency) Panel Regression Results

Random-effects GLS regression
Number of obs =122 Number of groups=27
R-sq: within =0.3102 Obs per group: min = 3
between=0.1775 avg =4.5
overall=0.1869 max = 6
Random effects u_i ~ Gaussian Wald χ^2 (4)=47.11
corr(u_i, X) = 0 (assumed) Prob > χ^2= 0.0000

oe_r	Coef.	z	P>|z|
age_actual	0.012	5.47	0
oss	0.001	1.87	0.061
profitmargin	-0.001	-1.82	0.068
outreach	-0.030	-0.27	0.785
cons	-0.285	-2.52	0.012
бu	0.198		
бe	0.034		
ρ	0.971		

Source: Estimated.

Table B13: Bangladesh Residual Dependent Variable (Employees Inefficiency) Panel Regression Results

Random-effects GLS regression
Number of obs=122
Number of group =27
R-sq: within= 0.1360 Obs per group: min =3
between = 0.0214 avg = 4.5
overall = 0.0161 max = 6
Random effects u_i ~ Gaussian ; Wald χ^2 (4) =14.24
corr(u_i, X) = 0 (assumed) Prob > χ^2=0.0066

ne_r	Coef.	z	P>|z|
age_actual	0.001	0.52	0.604
oss	-0.001	-3.4	0.001
Profit margin	0.001	2.45	0.014
outreach	0.159	1.15	0.251
cons	0.111	0.84	0.402
б u	0.248		
б u	0.021		
ρ	0.993		

Source: Estimated.

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