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Efficiency Analysis of Micro-Finance Institutions (MFI) in Developing Countries

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Abstract

This paper investigates technical and scales efficiencies of micro finance institutions (MFI) in three regions, Latin America countries, Middle East and North Africa (MENA) countries, and South Asia countries, and compares efficiencies across regions and across type of MFIs. We find that technical efficiency is higher for formal MFIs (banks and credit unions) than non-formal MFIs (non-profit organizations and non-financial institutions). Furthermore, South Asian MFIs have higher technical efficiency than Latin American and MENA MFIs. The source of inefficiency is pure technical rather than scale, suggesting that MFIs are either wasting resources or are not producing enough outputs (making enough loans, raising funds, and getting more borrowers).

Keywords: Poverty, Micro-finance Institutions, Efficiency analysis and DEA, government policy;
JEL Classification: C14, G29, L31

1. Introduction

Microfinance institutions (MFIs) are relatively small financial institutions that have traditionally provided small loans (microcredit) to low income citizens with the objective of helping them to engage in productive activities (micro enterprise). They differ from traditional financial institutions in the sense that they only provide services to low-income customers and often provide loans without collaterals. Most importantly, MFIs have a different objective. While financial institutions seek wealth maximization, MFIs seek social wealth maximization. Brau and Woller (2004) argue that this objective could be decomposed into two operational objectives that managers of efficient MFIs should promote. First, MFIs should generate enough revenue to cover their operating and financing cost. Second, MFIs should focus on poverty alleviation. These two objectives require input minimization (use the least resources as possible for a given level of output) and output maximization (provide the most services as possible for given inputs).

The literature distinguishes two types of MFIs. On one hand, formal MFI include bank MFIS, non bank financial institutions and cooperative MFIs, which are subject to prudential regulation and their activities licensed by the government. On the other hand, semiformal MFIs consist mainly of non-government micro finance institutions (NGO-MFI), which are usually unregulated, but registered as a society.

This paper examines efficiencies of MFIs in three developing regions: Latin America, Middle East and North Africa (MENA) and South Asia, and studies whether there are significant differences in efficiencies among regions and among types of MFIs.

Previous studies use ratio analysis to study efficiency and performance of MFI. Performance ratios are standardized numbers and facilitate comparisons, and are used to highlight weaknesses and strengths. However, performance ratios do not capture whether a given MFI has chosen to reach social wealth maximization by focusing on one of the two operational objectives (poverty alleviation and self-sufficiency). For instance, an MFI could reach its goal by focusing on poverty alleviation without regard to operational self-sufficiency. An MFI that consciously choose to reach higher number of borrowers (or higher level of loans) would unfairly be catalogued as inefficient by performance ratio analysis. However, data envelopment analysis (DEA) method recognizes that an MFI choose a mix of the two operational objectives. An MFI would be efficient if, after choosing its mix of inputs and outputs, it uses its resources efficiently.

We use as inputs and outputs those variable used in previous studies of efficiencies, but use the raw level value of the variables (absolute value instead of relative value) to allow the DEA to estimate the weights MFI managers have chosen (e.g. the mix of outputs and inputs given their own assessment of the MFI main objective).

We find that technical efficiency is higher for formal MFIs (banks and credit unions) than non-formal MFIs (non-profit organizations and non-financial institutions). Furthermore, South Asian MFIs have higher technical efficiency than Latin American and MENA MFIs. The source of inefficiency is pure technical rather than scale, suggesting that MFIs are either wasting resources or are not producing enough outputs (making enough loans, raising funds, and getting more borrowers).

Further analysis of the change in efficiencies (Malmquist indexes) shows that technical efficiencies have not increased (instead they have slightly decreased) during the period 2001-2005. Thus, MFIs have been wasting resources (or have not reached their highest outcome) and this situation has not improved. South Asian MFIs show significant increases in their total productivity, due solely to their higher technological progress during the period and not to improvements in efficiency.

The remainder of this paper is divided as follows. Section 2 reviews Data Envelopment Analysis (DEA) and explains how efficiencies are estimated. Section 3

reviews related work on MFI, justifies the selection of inputs and output, and presents descriptive statistics of the data used. Section 4 presents the results. Section 5 concludes.

2. Estimation of efficiencies

This study uses Data Envelopment Analysis (DEA) to estimate efficiencies of MFI in three regions. A MFI's productivity is the ratio of outputs to inputs and it depends on production, process technology, differences in environments in which production occurs, among other variables. The MFI's efficiency is a comparison between observed and optimal values of outputs and inputs. The set of the optimal outputs, given the inputs (or the optimal inputs, given the outputs) is the efficient frontier. Farrell (1957) defines a simple measure of firm efficiency that could account for multiple inputs. He proposes that efficiency of any firm consists of two components: *technical efficiency* – the ability of the firm to maximize outputs from the given set of inputs – and *allocative efficiency* – the ability of the firm to use these inputs in optimal proportion given their respective prices. Combining these two measures provides a measure of economic efficiency.[1] The level of *technical efficiency* is related to managerial decisions, while *allocative efficiency* is related to regulatory environment or macro economic conditions (Lovell, 1993).

Technical efficiency can be decomposed into two parts, (1) *scale efficiency* and (2) *pure technical efficiency*. *Pure technical efficiency* refers to the firm's ability to avoid waste by producing as much output as input usage allows, or by using as little input as output production allows. Scale efficiency refers to the firm's ability to work at its optimal scale.

In order to get these efficiency measures, a production function of a benchmark efficient firm has to be estimated from sample data. There are two approaches to approximate the efficient production function: the parametric approach and the non-parametric approach. These approaches use different techniques to envelop the observed data and make different accommodations for random noise and for the flexibility in the structure of the production technology (Lovell, 1992).

The parametric (or econometric) approach specifies a production function and recognizes that deviation away from the technology is given by two components; one represents statistical noises and the other inefficiency. The random term is due to events outside the control of the firm, e.g. uncontrollable factors directly related with the production function, or econometric errors such as misspecification of the production

[1] Economic efficiency is also known as productive or overall efficiency. Because of data availability, we do not estimate cost efficiency, another aspect of economic efficiency.

function or measurement errors. This has led to the development of the "Stochastic Frontier Approach" (SFA), which seeks to take into account the external factors when estimating the efficiency of the firm.

The non-parametric approach does not require a production function to calculate the efficiency. It attempts to determine the efficiency of the firm against some imposed benchmark through mathematical programming. The most common version of this approach is Data Envelopment Analysis (DEA).

This paper uses the non-parametric approach, DEA, to estimate the production technology for the set of MFI institutions in three regions. We use DEA because it allows us to perform analyses with small samples, which is the case for Latin American countries, and also allows us to calculate Malmquist indexes to characterize productivity changes.[1]

DEA is a linear programming technique that allows calculating the relative efficiency of a business unit. It was developed by Charnes, Cooper and Rhodes (1978) in order to measure relative efficiency without knowing (*a priori)* the variables' relative importance or inter-relationship.

DEA can be used to calculate a Malmquist index, which measures productivity change that is decomposed in *technological change* and *efficiency change*. The **index** may be interpreted as an index of *total factor productivity*. It takes into account whether firms are improving in their use of resources to produce goods and services, and whether the existing technology has changed for good or for bad. A value greater than one means increases in productivity, while a value less than one indicate decreases in productivity over time. The *technical efficiency* change can be further decomposed into *pure technical change* -whether managers have improved using resources- or *scale efficiency change* –whether the MFI has moved to an optimal scale relative to the frontier. However, a change in *scale efficiency* may be caused by either (i) changes in the shape of the technology, (ii) change in the location of the MFI in the input/output space from one year to another, or a combination of (i) and (ii); while a change in the *pure technical efficiency* is caused by a movement of the MFI relative to the existing technology (under managerial control).[2]

[1] The estimation of economic efficiencies have become standard in the literature, therefore, we do not explain the technical details of how to get the efficiencies and the Malmquist indexes using DEA. Interested readers are referred to Coelli (1996) or Zhu (2003).

[2] For technical details see Coelli (1996)

3. Empirical Methodology

The literature distinguishes two types of MFIs. On one hand, formal MFI include bank MFIs, non bank financial institutions and cooperative FMIs, which are subject to prudential regulation and their activities licensed by the government. On the other hand, semiformal MFI compose mainly of non-government micro finance institutions (NGO-MFI), which are usually unregulated, but registered as a society.

Several studies have examined MFI's efficiencies in different regions. Lafourcade et al (2005) study African MFI's efficiencies using cost per borrower and cost per saver as a measure of efficiency, and find that formal MFIs have higher efficiencies compared with semiformal MFIs. However, among formal MFIs, cooperative (formal) MFI are the least efficient, doubling the cost per borrower and saver compared with other semiformal and formal MFIs. Furthermore, Lafourcade et al (2005) find that Africa is the most productive MFI region compared with other regions on the basis of cost per borrower and cost per saver.

Baumman (2005) uses borrower per staff and saver per staff for measuring efficiency. Higher levels of these measures suggest that MFI's high productivity of the staff in accomplishing their two operational goals. High levels of these measures may result in high level of efficiencies in MFI (www.mixmarket.org).

Other MFI studies have used typical variables used in studies of banking efficiencies. For instance, Farrington (2005) uses administrative expense ratio, number of loans, and loans to total staff members to examine MFI efficiencies. Moreover, he also considers loan size, lending methodology, sources of funds, and salary structure as drivers of efficiencies.

Gutierrez-Nieto et al. (2006) study MFI efficiencies in Latin America by specifying 21 specifications of inputs and outputs. They show that the classical ratio analysis does not capture DEA efficiency, which implies that DEA analysis should be performed to complement ratio analysis.

Hassan and Tufte (2001) examines cost inefficiency and determinants of the Grameen Bank (GB) using branch level cost data over the 1988-1991 period. They find average inefficiency score for the GB runs from 3 to 6 percent, and female-only branches are more cost-efficient than other types of branches. Three variables, primary school, secondary school, and bank density per square mile are found to statistically significant determinants of Grameen Bank cost inefficiency. Age or size of branch are not significant determinant. Operation of other micro-finance organizations side by side with the Grameen

Bank may improve operational efficiency of all micro-finance organizations. Infrastructure development by the Government may help reduce the transactions costs of GB and hence improve their operational efficiency.

We use as inputs and outputs those variable used in previous studies of efficiencies (Lafourcade et al., 2005; and Baumman, 2005). We perform DEA under two approaches, the production approach and the intermediation approach. In production approach, outputs are measured as number of bills or processed transactions, and inputs are measured as capital or labor force, but not as interest expenses. In contrast, the intermediation approach assumes that banks are considered brokers that transform financial resources into profits.

The inputs for the intermediation approach are operating expenses, which is administrative expenses excluding interest expenses; total financial expenses, which is the sum of interest expenses and loan loss provision expenses; and labor, number of individuals actively employed by the MFIs, including contract employees or advisors who dedicate the majority of time to the MFI (even if they are not on the MFI's employee roster). We add interest expense and loan loss provision expenses because there are many MFIs that have zero values in either of the variables and DEA requires non-zero value in order to solve the linear problem. The inputs used in the production approach are operating expenses and labor.

Outputs for the intermediation approach are gross loan portfolio, all outstanding client loans, including current, delinquent, and re-structured loans, but excluding interest receivables, employee loans, and loans that have been written off; total funds, all available funding including savings or funds provided from third parties; financial revenues, interest incomes and fee associated with financial activities. The only output in the production approach is number of active borrowers.

Outputs and inputs reflect the operational objectives: giving more loans to the poor, rising funds from third parties to provide them and assuring financial revenues to provide sustainability, while considering the resource scarcity. For example, assume that a MFI weights heavily operational self-sufficiency, which is defined in the database used in this study as financial revenues over total expenses (financial, loan-loss provision and operating expenses), then, the weights in DEA score would be higher for financial revenue in the numerator and equally important in the denominator of the DEA index score:

$$I_i = \frac{\omega_1 x_1 + \omega_2 x_2 + \omega_3 x_3 + \omega_4 x_4}{v_1 y_1 + v_2 y_2 + v_3 y_3 + v_4 y_4}$$

Where ω_j and v_j are weights, and *x* and *y* are output and inputs respectively.

3.1 Data and inputs and output definition

We select all MFIs with available data in the MIX market database.[1] There are 270 MFIs in the 2005 database. However, as of June 2007, there are only 215 MFIs with enough data in the year 2005 to perform the DEA analysis and 45 MFIs with 5 years of continuous data necessary to perform Malmquist analysis.

Table 1 shows the number of observation by region and by type in 2005. Our sample contains 141 MFIs from Latin American, 26 MFIs from MENA countries, and 4-7 MFIs from South Asia countries. We note that the majority of MFIs are non-profit (NGO), followed by non-bank financial institutions. Panel B in the same Table 1 presents median size by regions and by type.[2] Banks and non-bank institutions tend to be bigger than NGO and cooperatives. The median size for banks in our sample is US $ 83.4 million, while the median size for NGOs is US $ 3.4 million.

Table 2 shows the descriptive statistics for outputs and inputs used in the two approaches. Clearly all variables in all regions are skewed to the left. For example, the average gross loan is higher than the median, which means that a few MFIs provide high level of loans. Because of the skewness, we use median as a measure of central tendency.

Gross loan portfolios are higher than total funds in Latin America and MENA, particularly in MENA countries, where the median gross loan is around US $ 5.4 million whereas total funds median is around US $ 2.2 million. This is explained by the fact that many MFIs provide loans from own equity (MIX market, 2007). This is not the case for South Asia where total funds raised is higher than loans.

[1] www.mixmarket.org

[2] We show later that assets and liabilities distribution are skewed to the left and therefore median is a better measure of central tendency.

Table 1. Number of observations and median size by region and type

Panel A presents sample size whereas Panel B shows median size, measured by total assets, by region and type of institutions. We use all MFI with available data to perform data envelopment analysis (DEA) in order to measure efficiencies.

Panel A. Number of Micro Finance Institutions

	Region			
Type of Institution	Latin America	MENA	South Asia	Total
Bank	11		4	15
Cooperative/Credit Union	15		2	17
Non-Bank Financial Institution	36	4	6	46
Non-Profit (NGO)	74	18	28	120
Other	5	4	7	16
Total	141	26	47	214

Panel B. Median size (Total assets in 1,000 US $)

	Region			
Type of Institution	Latin America	MENA	South Asia	Total
Bank	130,565		16,419	83,400
Cooperative/Credit Union	8,818		695	7,074
Non-Bank Financial Institution	30,158	6,844	19,851	27,025
Non-Profit (NGO)	3,404	6,418	2,632	3,404
Other	19,681	8,621	7,034	9,468
Total	8,485	6,685	4,444	7,061

Operating expenses represent a higher proportion of total cost in all regions: 72 percent in Latin America,[1] 85 percent in MENA countries and 64 percent in South Asia. Moreover, a typical characteristic of an MFI is that gross loan portfolios represent a high proportion of total assets, more than 75 percent of the total assets in each region.

[1] 1,574/(1,574+600)=0.84

Table 2. Outputs and Inputs descriptive statistics (3 panels by region)

Inputs and outputs statistics for 214 MFIs during 2005 are shown in this Table. Both data and definitions are from "Mix Market" database (www.mixmarket.org).. Total financial expenses: the sum of financial expenses and loan loss provisions expenses. Operating expenses: administrative expenses excluding interest expenses. Labor: number of individuals actively employed by the MIF, including contract employees or advisors who dedicate the majority of time to the MFI (even if they are not on the MFI's employee roster). Gross loan portfolio: all outstanding client loans, including current, delinquent, and re-structured loans but excluding interest receivables, employee loans, and loans that have been written off. Total funds: all available funding including savings or funds provided by third parties. Financial revenue: interest income. Borrowers: number of active borrowers.

	Average	Median	1st quartile	3rd quartile
Panel A. Latin America				
Outputs				
Gross Loan Portfolio (in US$)	32,567	6,573	2,344	25,952
Total Funds	33,835	5,056	1,327	27,356
Financial Revenue	11,202	2,369	892	8,855
Number of Active Borrowers	34,601	12,929	4,772	29,818
Intputs				
Total Financial Expenses	3,754	600	157	2,436
-Financial Expense	2,818	432	82	1,997
-Loan Loss Provision Expense	937	139	36	557
Operating Expenses	5,239	1,574	581	4,306
Labor	229	96	34	258
Panel B. MENA				
Outputs				
Gross Loan Portfolio (in US$)	10,322	5,413	1,597	9,036
Total Funds	6,205	2,214	894	6,631
Financial Revenue	2,658	1,233	753	2,940
Number of Active Borrowers	30,650	13,379	6,516	36,173
Intputs				
Total Financial Expenses	359	154	62	313
Financial Expense	257	65	10	286
Loan Loss Provision Expense	102	44	8	79
Operating Expense	1,653	897	466	1,778
Labor	209	77	50	249
Panel B. South Asia				
Outputs				
Gross Loan Portfolio (in US$)	26,574	3,396	1,200	8,527
Total Funds	26,129	3,818	1,479	10,107
Financial Revenue	6,798	790	369	2,592
Number of Active Borrowers	346,713	38,645	11,709	74,578
Intputs				
Total Financial Expenses	1,919	278	116	625
Financial Expense	1,672	234	79	488
Loan Loss Provision Expense	247	34	8	140
Operating Expense	3,332	503	166	1,884
Labor	1,390	229	66	577

The median numbers of employees are 96, 77 and 229 in Latin America, MENA and South Asia respectively, which denotes the relative small size of MFIs. We cannot make comparison among regions for any of the input or output variables because each region has its own cultural, historical, social, political and religious characteristics.

4. Analysis of Efficiency Results

We generate a benchmark frontier for each region to estimate the efficiencies. Pooling the data would be erroneous because each region has unique environment. Each MFI's efficiency is calculated relative to other MFIs that confront similar economic, social and political environment. We calculate both output oriented efficiencies and input oriented efficiencies. However, we report only output oriented efficiencies because the results, and therefore the conclusions, are similar using either orientation.

Table 3 presents average efficiencies by regions and type of MFI as well as two-way ANOVA to test whether there are significant differences among regions, among types of MFIs and whether there is an interaction effect between region and type of MFI.

Panel A shows average technical efficiency, which is 72 percent for the whole sample. As shown in the ANOVA table, we find significant differences among types of MFI and among regions. South Asia MFIs have higher technical efficiency than Latin America and MENA MFIs. Moreover, average efficiencies are lower than 80 percent in each region, which means that there is enough room for improvement in either using resources or providing more services.

Table 3. Micro Financial Institutions Efficiencies using Intermediation Approach (by regions and by type)

The Table presents average efficiencies by region and type and reports two-way analysis of variance (ANOVA) to test whether there are significant differences in efficiencies among regions, among type of institutions, and whether there is interaction effect.

Panel A. Average Technical efficiency (CRS) and ANOVA

	Region			
Type of Institution	*Latin America*	*MENA*	*South Asia*	***Total***
Bank	0.79		0.86	0.81
Cooperative/Credit Union	0.75		1.00	0.78
Non-Bank Financial Institution	0.71	0.83	0.81	0.73
Non-Profit (NGO)	0.67	0.68	0.73	0.69
Other	0.71	0.61	0.88	0.76
Total	0.70	0.69	0.78	0.72

Source	Sum of Squares	Df	Mean Square	F	Sig.
Type	0.33	4	0.08	3.05	0.02
Region	0.30	2	0.15	5.68	0.00
Type * Region	0.22	6	0.04	1.34	0.24
Error	5.39	201	0.03		
Total	116.16	214			

Panel B. Average Pure technical efficiency (VRS) and two-way ANOVA

	Region			
Type of Institution	*Latin America*	*MENA*	*South Asia*	***Total***
Bank	0.87		0.95	0.89
Cooperative/Credit Union	0.79		1.00	0.81
Non-Bank Financial Institution	0.74	0.83	0.85	0.76
Non-Profit (NGO)	0.74	0.78	0.76	0.75
Other	0.74	0.63	0.90	0.78
Grand Total	0.75	0.77	0.82	0.77

Source	Sum of Squares	Df	Mean Square	F	Sig.
Type	0.25	4	0.06	2.13	0.08
Region	0.24	2	0.12	4.19	0.02
Type * Region	0.25	6	0.04	1.44	0.20
Error	5.88	201	0.03		
Total	133.69	214			

Table 3 (continued)

Panel C. Average Scale efficiency and two-way ANOVA

	Region			
Type of Institution	*Latin America*	*MENA*	*South Asia*	***Total***
Bank	0.91		0.91	0.91
Cooperative/Credit Union	0.95		1.00	0.95
Non-Bank Financial Institution	0.96	0.99	0.94	0.96
Non-Profit (NGO)	0.92	0.87	0.95	0.92
Other	0.96	0.97	0.99	0.97
Grand Total	0.93	0.91	0.96	0.94

Source	Sum of Squares	Df	Mean Square	F	Sig.
Type	0.09	4	0.02	2.44	0.05
Region	0.01	2	0.00	0.44	0.64
Type * Region	0.04	6	0.01	0.73	0.62
Error	1.84	201	0.01		
Total	189.21	214			

Consistent with Lafourcade et al (2005) findings for African MFIs, formal MFI (banks and cooperative/ credit unions) are more efficient than non-formal MFIs (NGO and non-bank MFI). The average bank has 81 percent technical efficiency, whereas the average NGO has 69 percent. This means that an average NGO could increase its productivity more than 30 percent using the same level of inputs (or it could reach the same level of output and still reduce the level of inputs). We find no interaction effect between type of MFIs and region.

We decompose technical efficiency into pure technical efficiency and scale efficiency to trace the source of inefficiencies. Panel B in Table 3 shows pure technical efficiencies and Panel C shows scale efficiencies. Scales efficiencies are on average higher than 90 percent across regions and types of MFI, which implies that on average MFIs are operating at close to optimal scale. As a matter of fact, there is no significant difference in scale efficiencies among regions. Moreover, even though there is significant scale efficiency difference among types of MFIs, they are not economically significant because all types have average scale efficiency higher than 90 percent.

If MFIs are working at a relatively optimal scale, the sources of inefficiencies discussed above is either a poor use of the available resources or MFIs do not reach their potential in providing services. The results for pure technical efficiencies are similar to the ones discussed above. Formal MFIs tend to be more efficient than non-formal MFIs. We also find significant statistical differences among regions and among types, but no interaction effect.

We also calculate efficiencies under the production approach. The results are presented in Table 4. The average technical efficiency is extremely low: lower than 50 percent. Furthermore, MENA countries have the higher average (70 percent), which means that they are more efficient in reaching borrowers, particularly NGOs. We also find that there is no significant difference among types of MFIs with few exceptions. Finally, there is an interaction effect given the fact that MENA

NGOs have higher efficiency (79 percent) than their Latin American and South Asian counterparts and than other types of MFIs.

We also note again that scale efficiencies do not seem to be a problem because they are relatively high. Thus, pure technical efficiency (the right use of resources without wasting) accounts for the majority of high overall efficiency. We also find significant interaction effect in scale efficiencies. More importantly, formal MFIs (bank and credit unions) have lower scale efficiency than non-formal MFIs under production approach. Thus, formal MFIs have better size to accomplish the role of intermediation but they do not have better size for the role of reaching more low-income citizens.

Table 4. Micro Financial Institutions Efficiencies using Production Approach (by regions and by type)

The Table presents average efficiencies by region and type and reports two-way analysis of variance (ANOVA) to test whether there are significant differences in efficiencies among regions, among type of institutions, and whether there is interaction effect.

Panel A. Average Technical efficiency (CRS) and ANOVA

	Region			
Type of Institution	*Latin America*	*MENA*	*South Asia*	***Total***
Bank	0.48		0.42	0.46
Cooperative/Credit Union	0.41		0.47	0.42
Non-Bank Financial Institution	0.39	0.58	0.53	0.42
Non-Profit (NGO)	0.46	0.79	0.50	0.52
Other	0.56	0.45	0.40	0.46
Total	0.44	0.70	0.48	0.48

Source	Sum of Squares	Df	Mean Square	F	Sig.
Type	0.27	4	0.07	1.57	0.18
Region	0.24	2	0.12	2.73	0.07
Type * Region	0.48	6	0.08	1.85	0.09
Error	8.68	201	0.04		
Total	60.41	214			

Panel B. Average Pure technical efficiency (VRS) and two-way ANOVA

	Region			
Type of Institution	*Latin America*	*MENA*	*South Asia*	***Total***
Bank	0.69		0.52	0.64
Cooperative/Credit Union	0.47		0.92	0.52
Non-Bank Financial Institution	0.44	0.59	0.56	0.47
Non-Profit (NGO)	0.53	0.86	0.54	0.58
Other	0.62	0.46	0.41	0.49
Grand Total	0.51	0.76	0.54	0.55

Source	Sum of Squares	Df	Mean Square	F	Sig.
Type	0.57	4	0.14	2.46	0.05
Region	0.24	2	0.12	2.03	0.13
Type * Region	1.02	6	0.17	2.94	0.01
Error	11.65	201	0.06		
Total	79.31	214			

Table 4 (continued)

Panel C. Average Scale efficiency and two-way ANOVA

	Region			
Type of Institution	*Latin America*	*MENA*	*South Asia*	***Total***
Bank	0.72		0.88	0.77
Cooperative/Credit Union	0.91		0.51	0.87
Non-Bank Financial Institution	0.89	0.98	0.95	0.90
Non-Profit (NGO)	0.89	0.91	0.93	0.90
Other	0.91	0.98	0.98	0.96
Grand Total	0.88	0.93	0.92	0.89

Source	Sum of Squares	Df	Mean Square	F	Sig.
Type	0.39	4	0.10	6.79	0.00
Region	0.02	2	0.01	0.55	0.58
Type * Region	0.41	6	0.07	4.74	0.00
Error	2.90	201	0.01		
Total	174.96	214			

Regarding pure technical efficiencies shown in panel B, the results are similar to those observed for technical efficiency. MENA non-profit MFIs have high efficiency. Nevertheless, as observed in panel B, the main conclusions derived from the overall descriptive statistics remain.

Table 5 shows the change of productivity from 2001 to 2005 for each region suing efficiencies derived under the intermediation approach. Latin America and MENA countries have average declines in total productivity of 2.5 percent per year during the period, whereas South Asia has an average increase in productivity of 8 percent per year. This increase in productivity is due to an average increase in technological change (progress of 9 percent per year). Nevertheless, the rest of efficiencies across regions have hardly changed; the efficiencies are around 99 percent, which implies that the average decline is 1 percent per year. Thus, there has been little change in technical efficiencies, pure technical efficiencies and scale efficiencies, which emphasize the need for mechanisms (either managerial or political) leading to minimization of inputs and/or maximization of outputs.

Table 5. Malmquist Indexes by regions (2001 – 2005)

(intermediation approach)

Malmquist index measures productivity growth (change). An MFI's productivity change could be due to either change in *technical efficiency* or change in the *technology* – technological progress in the industry– or both. The total factor productivity change is the product of *technical efficiency* change and *technological* change. *Technical efficiency* change is decomposed into *pure technical efficiency* and *scale efficiency* change.

	Technical Efficiency change	Technological change	Pure Technical Efficiency change	Scale Efficiency change	Total Factor Productivity change
Panel A. Latin America					
2002	1.019	0.918	1.013	1.006	0.936
2003	0.862	1.835	0.894	0.964	1.581
2004	1.090	0.626	1.045	1.043	0.682
2005	1.067	0.836	1.047	1.019	0.891
Average	1.005	0.969	0.998	1.008	0.974
Panel B. MENA					
2002	1.049	1.169	1.027	1.022	1.226
2003	1.000	1.080	1.000	1.000	1.080
2004	1.000	1.034	1.000	1.000	1.034
2005	0.920	0.711	1.000	0.920	0.654
Average	0.991	0.982	1.007	0.984	0.973
Panel C. South Asia					
2002	0.996	1.557	0.988	1.008	1.551
2003	0.997	0.715	1.022	0.976	0.713
2004	0.888	1.315	1.005	0.884	1.168
2005	1.098	0.990	0.964	1.139	1.087
Average	0.992	1.097	0.994	0.998	1.089

6. Conclusion

DEA has been used to trace sources of inefficiencies in many studies of bank productivity (e.g. Isik and Hassan, 2002, Aly et al., 1990). This study applies DEA to micro financial institutions in Latin America, MENA and South Asia countries with the objective of tracing source of inefficiencies. The main finding is that technical efficiency is higher for formal MFIs. Moreover, South Asian MFIs have higher efficiencies than their counterpart in Latin America and MENA countries. The source of inefficiency is pure technical rather than scale, suggesting that MFIs are either wasting resources or are not producing enough outputs (making enough loans, raising funds, and getting more borrowers). Given the low level of pure technical inefficiency, scale efficiency is

not an immediate problem to be focused in the short run. Any managerial action or government policy should be targeted to improve pure technical efficiency. That is, to use more efficient current resources.

Further analysis of the change in efficiencies (Malmquist indices) shows that technical efficiencies have not increased (instead they have slightly decreased) during the period 2001-2005. Thus, MFIs have been wasting resources (or have no reached their highest outcome) and this situation has not improved. South Asian MFIs show the significant increases in their total productivity, due solely to their higher technological progress during the period.

The results suggest that those MFIs need to increase their pure technical efficiencies in order to maximize social wealth. Since MFIs play an important role in helping to reduce poverty, the results in this paper entail a challenge for both managers and policy makers.

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