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Review

Technical efficiency of microfinance banks in South-West, Nigeria: Input and output oriented measures

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ABSTRACT

Against the backdrop of poor performance of Nigerian microfinance banks (MFBs), this paper investigates their technical efficiency between 2006 and 2010, after the launch of the microfinance policy of 2005. The growth in outreach of the MFBs, in terms of their average number of clients grew between 10.57 and 21.99% over the study period. The depth of financial services offered by the MFBs showed little innovation and ingenuity on the part of the MFBs as micro-credit was the only product generic to all the MFBs. The MFBs mean annual technical efficiency score was obtained as 0.4643 under the input oriented measure and was higher than their mean annual efficiency score of 0.4112 under the output oriented measure. The technical efficiency estimates under the input oriented measure further revealed that at full efficiency over the study period, the sampled MFBs could have increased their number of borrowers per staff member by 30,408 clients and number of savers per staff member by 17,810 clients, while slacks estimation under the output oriented measure at full efficiency of the sampled MFBs revealed 5,425 clients and 1,432 clients as possible increase in number of borrowers per staff member and number of savers per staff member respectively.

Keywords: Microfinance banks, outreach, technical efficiency.

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INTRODUCTION

Microfinance though not a sufficient condition for economic development remains a necessary pre-requisite for meaningful growth and development. Microfinance Institutions (MFIs) provide a range of financial services (loans, savings, micro-insurance, micro-leasing, funds transfer, pension services etc) to poor households. Their worldwide growth in numbers has had a positive impact by providing the poor with microfinance services and has helped create an encouraging socio-economic environment for many households of these developing countries. The nature of these institutions is quite different from traditional financial institutions (Deposit Money Banks - DMB) as they are smaller in size, limited in their services towards the poor households and often provide small collateral-free group loans.

In recognition of the important roles of Microfinance in the overall development of the Nigerian economy, the Federal Government of Nigeria launched a Microfinance Policy for Nigeria in the year 2005. The Microfinance Policy, Regulatory and Supervisory Framework for Nigeria was one of the key innovations adopted to diversify the supply axis of the financial market with a major policy thrust of significantly enhancing the latent capacity of the poor for entrepreneurship through the provision of microfinance services to enable them engage in economic activities and be more self-reliant, increase employment opportunities, enhance household income and create wealth (CBN, 2005). The policy described Microfinance to be all about the provision of financial services to the poor who are traditionally not served by the conventional financial institutions.

The performance of the financial sector in providing financial intermediation for small and medium size enterprises can be evaluated in three vital dimensions: financial sustainability, outreach, and welfare impact

(Zeller and Meyer, 2002). They concluded that this microfinance triangle is the main policy objective of these microfinance institutions which are aimed towards development. Donor organisations and governments differ in the microfinance objective which is of prominence to them; that is, financial sustainability, depth of outreach, and welfare impact. This influences their perceptions on the relative efficiency of the different microfinance institutions and how financial policies are designed and evolve (Stiglitz, 1992; Krahnen and Schmidt, 1994).

The main objectives of microfinance institutions are prioritised differently by different authors. Rhyne and Otero (1994) and Christen et al. (1995) argued that increasing access to reach the poorest of the poor (depth of outreach) and sustainability are compatible objectives. Hulme and Mosley (1996), with some others argued that there may be a trade-off between augmenting outreach to the poorest and attaining financial sustainability. This trade-off is as a result of the fact that Microfinance Institution (MFI) transaction costs have a high fixed cost element which makes unit cost for smaller savings and smaller loans high as compared to larger financial transactions. This rule of reducing unit transaction costs with larger transaction size generates the trade-off between better outreach to the poor and financial sustainability, regardless of the borrowing technology used (Zeller and Meyer, 2002). The financial sustainability of the financial institutions and outreach to the poor are two of the three policy objectives of the contemporary developments in the field of microfinance. This study therefore investigates the performance of south west microfinance banks as it relates to their outreach measured by technical efficiency.

METHODOLOGY

Farrell (1957) defined technical efficiency as the ability of a producer to produce maximum output given a set of inputs. Measurement of technical efficiency is important for the following reasons: firstly, it is a success indicator of performance measure to evaluate production units. Secondly, measurement of causes of inefficiency explores the sources of efficiency differentials and elimination of causes of inefficiency. A comparison between observed and optimal values of inputs and outputs is behind the concept of a producer's technical efficiency (Fried et al., 2008). Irrespective of the mode of comparison, that is, made with a maximization-of-output (output oriented) or with a minimization-of-input (input oriented) approach, the optimum is defined in terms of production possibilities and efficiency is technical. Explicitly put, an increase in technical efficiency takes place when a producer can produce the same outputs with less of at least one input (input oriented) or when a producer can use the same inputs to produce more of at least one output (output oriented) (Koopmans, 1951).

Using *frontier* analysis to measure relative technical efficiency sophisticatedly benchmarks the relative performance of production units. In this case, evaluating whether a financial institution is close to a "best-practice" frontier serves as a general numerical efficiency indicator that allows the ranking of firms. To analyze the relative technical efficiency of any sort of financial institution, it is necessary to define the approach that will be adopted in order to measure the flow of services provided by the institution. Microfinance institutions are either analysed using the production approach (analyses a MFB as a production unit utilizing inputs to produce outputs) or the intermediation approach (analyses a MFB as a financial intermediation unit involved in channeling credit from areas of surplus to areas of deficit). Using the production approach, output is best measured by the number and type of transactions (or by the number of participants/outreach) processed over a given period of time. Nevertheless, as information on the flow of transactions is not usually available, data on the stock of the number of deposit or loan accounts or the number of insurance policies outstanding as of a given date are used as a substitute proxy (Fried et al., 2008). Several efficiency studies of commercial banks and bank branches, such as Sherman and Gold (1985), Ferrier and Lovell (1990), Berg, FØrsund and Jansen (1991), have used different production outputs keeping the input (such as labor, fixed assets, capital) remaining the same. Sherman and Gold (1985), for example, used the number of transaction as the output while Ferrier and Lovell (1990) used the total number of accounts and account size as the output. Berg et al. (1991) measured activity in total loan and savings balances along with average size and number of accounts. Oral and Yolalan (1990) used five inputs (in physical term) and four outputs to measure the time expended on various activities.

Study data and sources

The study examined the operational activities of 118 MFBs in South-West, Nigeria with emphasis on their outreach from 2006 to 2010. For the purpose of this paper, MFBs were restricted Unit Microfinance Banks. This restriction is expected to create a fair platform to assess the operations of firms on a similar operational level.

Data envelopment analysis

This study followed similar works by Martinez-Gonzalez (2008) and Haq et al. (2009) in its estimation of the efficiency scores of MFIs under the production approach. Technical efficiency (input and output oriented measures) was estimated using the production approach as emphasis is on the bank as a production unit and hence outreach as the MFBs' objective.

Suppose we have n productive units, each unit produces u outputs while consuming v inputs. The input matrix v is given as, $V = \{v_{ij}, i = 1,2,\ldots,m, j = 1,2,\ldots,n\}$

Output matrix u is given as, $U = \{u_{ij}, i = 1,2,\ldots,s, j = 1,2,\ldots,n\}$

For the production approach; let v_1 = MFB's cost per borrower (₦); v_2 = MFB's cost per saver (₦);

v_3 = MFB's number of staff; u_1 = MFB's number of borrowers per staff member

u_2 = MFB's number of savers per staff member

For each MFB, we obtained a measure of the ratio of all outputs over all inputs, such as $u'y_i/v'x_i$

where u is a Mx1 vector of output weights and v is a Kx1 vector of input weights. To select optimal weights, we specified the mathematical programming problem as:

$\max_{u,v} (u'y_i/v'x_i)$,

st $u'y_j/v'x_j \leq 1$, $j = 1, 2,\ldots,N$; $u, v \geq 0$. (1)

RESULTS AND DISCUSSION

Over the survey period of 5 years, the total number of active borrowers across the sampled MFBs stood at 64,321 clients in 2006. This figure grew by 16.95% in

2007, 19.0% in 2008, 15.18% in 2009 and 10.44% in 2010. The mean value of active borrowers ranged from 748 clients in 2006 to 1,464 clients in 2010 (representing a growth rate of 95.70%). The total number of women borrowers increased from 40,118 clients in 2006 to 79,801 clients in 2010, with annual percentage increases of 18.65% in 2007, 20.28% in 2008, 15.42% in 2009 and 8.36% in 2010. The active savers were 156,621 clients in 2006, the figure rose by 13.15% in 2007, 17.60% in 2008, 14.38% in 2009, 9.17% in 2010, while the mean active savers ranged from 1,821 in 2006 to 3, 272 in 2010. The average number of female savers represented 56.73% of the total average number of savers, which further corroborated the general saying that microfinance is more focused on women (Table 1).

Depth of financial services rendered by MFBs

Outreach is a function of the products and services offered by the MFBs to the clients. A broad spectrum of activities were specified as products and services that can be offered by MFBs to customers in the Microfinance Regulatory and Supervisory Framework. The provision of micro-credit was a generic product to all the sampled MFBs, also the provision of business development services was offered by 90.7% of the sampled MFBs. However, only 68.6% of the MFBs offered business advisory services, 1.16% offered market outlet services, 32.56% are involved in money transfer options, 9.3% provided micro-insurance services and 16.28% provided micro-leasing services. None of the sampled MFBs provided any form of health advisory services.

Technical efficiency estimates under the production approach: Input and output oriented measures

The production approach considers MFBs as firms that provide services for their clients; hence their outputs could be best measured by the number of clients. This paper employed both input and output oriented approaches under the variable returns to scale measure (VRS). The constant returns to scale (CRS) is appropriate only when a MFB operates at an optimal scale and as such not suitable for those MFBs that operate at sub-optimal level, a condition best captured by the VRS. The Nigerian microfinance terrain is considered to be at its infancy stage with enormous growth potentials, so it could be erroneous to assume that the MFBs are all operating at an optimal level. Input oriented measure emphasizes the reduction of inputs to improve overall efficiency while output oriented measure stresses output augmentation to achieve efficiency. Coelli (1996) and Sharma et al. (1996) posited that both the input and output oriented measures will identify the same Decision Making Unit (DMU) as being efficient but the efficiency scores will differ across each measure.

The result showed inconsistencies in the growth pattern of the MFBs over the study period. The mean technical efficiency score (input oriented) of the sampled MFBs grew from 0.467 in 2006 to 0.525 in 2007. It dropped to 0.408 in 2008; climbed to 0.477 in 2009 and further declined to 0.445 in 2010. The output oriented measure showed a similar trend with a mean technical efficiency score of 0.396 in 2006, which rose to 0.438 in 2007, declined to 0.345 in 2008, grew to 0.432 in 2009 and reached 0.444 in 2010. It is however interesting to note that the mean technical efficiency score of the sampled MFBs under both approaches collapsed around the same value in 2010 as shown in Figure 1. These inconsistencies could also be adduced to the fact that microfinancing is evolving and the MFBs are still perfecting their understanding of the microfinance concept.

The input oriented estimates further revealed that only 20.93% of the sampled MFBs were on the efficiency frontier in 2006. The number grew to 26.74% in 2007, slumped to 18.61% in 2008, grew to 24.42% in 2009 and declined marginally to 23.26% in 2010. The output oriented measure revealed lesser MFBs on its efficiency frontiers with 13.95% in 2006, 19.76% in 2007, 11.63% in 2008, 22.09% in 2009 and 18.61% in 2010. Under the input oriented measure, only 8.14% of the sampled MFBs had a technical efficiency score of between 0.71 and 0.99. This percentage dropped to 4.65% in 2008 and 1.16% in 2010. The technical efficiency score range of 0.71 to 0.99 had more MFBs under the output oriented measures with 9.3% in 2006, declined to 5.81% in 2008 and rose to 10.47% in 2010. This sequence showed that more MFBs were becoming more technically inefficient over time and it was further corroborated by the increase reported in the percentage of MFBs rated within the technical efficiency range of 0.01 to 0.50. The input oriented measure reported values of 58.14% in 2006, it rose sharply to 75.58% in 2008, though fell to 65.11% in 2009; and recovered to 74.42% in 2010. The pattern was similar under the output oriented measure, with 70.93% in 2006, rose to 75.58% in 2008 and dropped to 66.28% in 2010.

The VRS estimates showed that the MFBs were operating at different levels. Under the input oriented measure, the decreasing returns to scale (drs) stage had 4 MFBs in 2006, the value rose to 10 MFBs in 2008 and fell to 7 MFBs in 2010. Under the constant returns to scale category, the study reported 11 MFBs in 2006, fell to 6 MFBs in 2008 and rose to 15 MFBs in 2009 and later had 12 MFBs in 2010. The study also revealed that 71 MFBs were operating at increasing returns to scale in 2006; the value fell to 70 MFBs in 2008 and later to 67 MFBs in 2010. However, the output oriented measure revealed a contrasting trend across the 3 operational scales. The measure reported 64 MFBs under decreasing returns to scale in 2006, the number rose to

Table 1. Descriptive statistics of key variables and indicators of the sampled MFBs (2006 - 2010).

Concept	2006	2007	2008	2009	2010
Active borrowers					
Sum	64,321	77,449	95,620	112,731	125,875
Mean/MFB	748	901	1,112	1,310	1,464
Women borrowers					
Sum	40,118	49,312	61,858	73,133	79,801
Mean/MFB	467	573	719	850	928
Active savers					
Sum	156,621	180,333	218,842	255,597	281,393
Mean/MFB	1,821	2,097	2,545	2,972	3,272
Women savers					
Sum	86,548	100,558	129,015	145,324	158,437
Mean/MFB	41,006	1,169	1,500	1,690	1,842

Source: Field survey (2013).

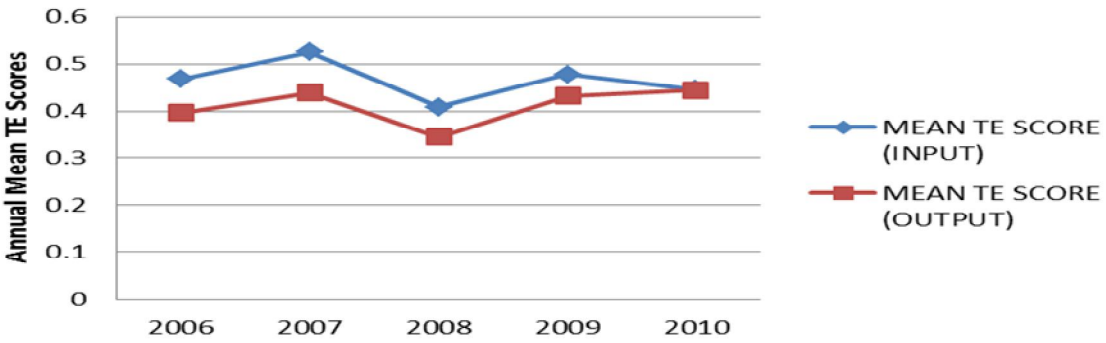

Figure 1. Trend in mean TE scores for input and output oriented measures (2006 to 2010).

73 MFBs in 2008 and declined to 68 MFBs in 2010.

The number of MFBs operating at constant returns to scale was 17 MFBs in 2006, slumped to 12 MFBs in 2008, recovered back to 17 MFBs in 2009 and again declined to 15 MFBs in 2010. The number of MFBs operating at increasing returns to scale ranged between 1 and 6 MFBs over the study period. The value stood at 5 MFBs in 2006, grew to 6 MFBs in 2007, slumped to 1 MFB in 2008 and 2009 and later rose to 3 MFBs in 2010.

Input and output slacks

Slacks represent inefficiencies and hence it expresses the extra amount by which an input (output) can be reduced (increased) to attain technical efficiency after all inputs (outputs) have been reduced (increased) in equal proportions to reach the production frontier. Sharma et al. (1996) explained that the input oriented models generate information on how much cost can be saved to produce at least the existing output level, while output oriented models give information on how much additional output can be produced from no more than the existing resources if all DMUs operates at the efficiency frontier.

Input slacks represents how much inputs can be reduced to attain the same level of output if all DMUs were technically efficient while output slacks depicts the possible increase in outputs given the same levels of inputs if all DMUs were technically efficient.

Tables 2 and 3 shows the annual and total inputs and output slacks for the sampled MFBs over the study period. Under the input oriented measure, at full efficiency over the study period, the sampled MFBs would have increased their total outreach by 30,408 borrowers per staff member and 17,810 savers for each staff member. Also, they could have reduced their cost per borrower by ₦1,966.28, reduced cost per saver by ₦20,925.74 and also saved the remuneration expenses

Table 2. Depth of financial services provided by MFBs (2006-2010).

S/No.	Products/services	No. of MFBs	Percentage
1	Micro-credit	86	100
2	Business development services	78	90.7
3	Business advisory services	59	68.6
4	Market outlet	1	1.16
5	Money transfer	28	32.56
6	Insurance	8	9.3
7	Leasing	14	16.28
8	Health advisory services	0	0

Source: Field survey (2013).

Table 3. Summary of the DEA technical efficiency result: Input and output oriented measures.

Concept	2006	2007	2008	2009	2010
Mean VRS technical efficiency score					
Mean (input oriented)	0.467	0.525	0.408	0.477	0.445
Mean (output oriented)	0.396	0.438	0.345	0.432	0.444
VRS technical efficiency score (range): Input oriented					
1	18	23	16	21	20
0.71 - 0.99	7	5	4	0	1
0.51 - 0.70	11	6	1	9	1
0.0 - 0.50	50	52	65	56	64
VRS technical efficiency score (range): Output oriented					
1	12	17	10	19	16
0.71 - 0.99	8	7	5	4	9
0.51 - 0.70	5	3	6	5	4
0.0 - 0.50	61	59	65	58	57
Scale of operation: Input oriented					
drs	4	8	10	9	7
crs	11	11	6	15	12
irs	71	67	70	62	67
Scale of operation: Output oriented					
drs	64	63	73	68	68
crs	17	17	12	17	15
irs	5	6	1	1	3

Source: Field survey (2013).

on 2,060 staff members. At full efficiency under the output oriented measure, MFBs total outreach could have increased by 5,423 and 1,432 in terms of their number of borrowers per staff and number of savers per staff respectively. Their total cost per borrower could have reduced by ₦5,870.84, while their total cost per saver could have decreased by ₦67,067.31. They could also have used 5,918 fewer staff to attain their present level of outreach.

The input oriented measure showed better outreach potentials for the MFBs at full efficiency as they could attract more clients and help reduce the number of Nigerians that are financially excluded (Tables 4 and 5).

CONCLUSION

The study revealed that the growth in outreach of the MFBs, in terms of their average number of clients grew between 10.57 and 21.99% over the study period of 2006

Table 4. Inputs and outputs slacks of sampled MFBs (input oriented measure).

Variable	2006	2007	2008	2009	2010	TOTAL
Number of borrowers per staff	81.941	2574.561	17523.22	4607.18	5621.484	30408.39
Number of savers per staff	72.23	1504.284	10297.84	3407.94	2527.308	17809.6
Cost per borrower	154.023	253.705	934.776	485.371	138.404	1966.279
Cost per saver	4136.284	5959.961	6446.631	289.208	4093.658	20925.74
Number of staff	840.149	66.787	321.883	759.83	71.612	2060.261

Source: Field survey (2013).

Table 5. Inputs and outputs slacks of sampled MFBs (output oriented measure).

Variable	2006	2007	2008	2009	2010	Total
Number of borrowers per staff	1854.967	588.997	2147.681	365.808	467.433	5424.886
Number of savers per staff	102.12	216.427	279.798	105.511	727.646	1431.502
Cost per borrower	151.479	766.748	2338.039	2311.143	303.428	5870.837
Cost per saver	12216.72	22728.57	6391.628	10487.36	15252.03	67076.31
Number of staff	1438.256	779.362	1251.016	758.854	1690.878	5918.366

Source: Field survey (2013).

to 2010. The MFBs total number of active borrowers increased from 64,321 clients in 2006 to 125,875 clients in 2010 (representing a growth rate of 95.70%), while their total number of active savers rose from 156,621 clients in 2006 to 281,393 clients in 2010 (representing a growth rate of 79.67%). This could be an indication of the MFBs' weak financial intermediation strategy as they have not been able to channel the savings mobilized into credit and other forms of loans for their clients. The study also re-affirmed the bias of microfinance for the female gender as the women folks constitute 56.73% of the total savers and 63.91% of the total borrowers, while 58.17% of the total savings mobilized were also from women. The MFBs witnessed monotonic increases in their type of customers with a positive growth trend in their borrowers and savers over the study period.

The depth of financial services offered by the MFBs showed little innovation and ingenuity on the part of the MFBs. This might be partly due to poor capacity of the microfinance operators to design unique products and services for their clients and also due to poor financial literacy on the part of the clients to demand for specific products that will suit their individual needs and hence MFBs can ultimately strive towards achieving a one-stop shop status in the provision of microfinance products and services. Micro-credit was the only product generic to all the MFBs though 90.7% of them also offer business development services. Business advisory services were being provided by 68.6%; 32.56% were involved in electronic money transfer; 16.28% offered micro-leasing; 9.3% provided support for micro-insurance while only 1.16% offered market outlet services.

The production approach examines the outreach objective of MFBs with the estimation of technical efficiency under the variable returns to scale measure, as all the MFBs were not expected to be operating at optimal level. The paper reported a mean annual technical efficiency of 0.464 and only 19.02% of the sampled MFBs were on the efficiency frontier and 66.74% reported technical efficiency range of between 0 and 0.5. The study also reported that 78.37% of the MFBs were operating at increasing returns to scale, a good indication that the MFBs could get it right if they continue adopting best-practices. The observed trend in technical efficiency further supports the earlier positions on the MFBs' inconsistency but also underscores the need for MFBs to increase their outreach and explore the enormous opportunities offered by the huge potential client base. The MFBs had better efficiency scores under the input oriented measure as compared to the output oriented measure and hence gives an indication that the MFBs are better efficient when they focus on reduction of inputs used (input oriented) as compared to tending towards continuous increase in output (output oriented). The MFBs mean annual technical efficiency score of 0.4643 under the input oriented measure was significantly higher than their mean annual efficiency score of 0.4112 under the output oriented measure. The technical efficiency estimates under the input oriented measure further revealed that at full efficiency over the study period, the sampled MFBs could have increased their number of borrowers per staff member by 30,408 clients, number of savers per staff member by 17,810 clients, while they could have also enjoyed savings of ₦1,966.28, ₦20,925.74 and 2,060 in terms of their cost per borrower, cost per saver and number of staff employed respectively. Slacks estimation under the output oriented measure at full efficiency of the sampled

MFBs revealed 5,425 clients and 1,432 clients as possible increase in number of borrowers per staff member and number of savers per staff member respectively. It also showed potential savings of ₦5,870.83, ₦67,076.31 and 5,918 in terms of the MFBs cost per borrower, cost per saver and number of staff members employed respectively.

RECOMMENDATIONS

1. It was revealed that micro-credit is the only generic product/services offered by all MFBs. Microfinance Banks should deepen the depth of products and services rendered to their clients. Regulatory authorities can help enhance the knowledge base of microfinance practitioners through capacity building that will translate to the development and delivery of more products and services.
2. The paper also showed that more MFBs are further away from the efficiency frontier than those closer to it. Hence, MFBs should embark on aggressive marketing of their products and services with the objective of bringing more clients into the microfinance fold.
3. MFBs should concentrate more on minimizing their input usage to produce same level of output (input oriented) as they are better positioned to enhance their outreach under this measure than focusing on increased outreach with increased input usage (output oriented).

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