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Total Factor Productivity Change of Ethiopian Microfinance Institutions (MFIs): A Malmquist Productivity Index Approach (MPI)

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Abstract

By employing the Malmquist productivity index this study attempts to examine the total factor productivity change in the Ethiopian micro finance institutions (MFIs) using a balanced panel dataset of 114 observations from 19 micro finance institutions over the period 2004-2009. The selection of inputs and outputs for the study is based on the dual objectives of MFIs viz outreach and sustainability framework which is in line with the prior study of (Gutierrez et al 2007, 2009). Consequently, we specify two inputs and three outputs; the number of employees, and operating expenses are specified as inputs whereas the outputs are interests and fee income, gross loan portfolio, and number of loans outstanding (number). The result of the study indicated that over the period the malmquist productivity change experienced by the micro finance industry as a whole has averaged 3.8 % annually. With the exception of the year 2004-2005 (slight decline in productivity, which was 0.2 percent) the micro finance industry has reported productivity progress in the study period(i.e productivity rose of 5.5 percent, 5.8 percent,0.3 percent and 7.7 percent in the years 2005-2006, 2006-2007, 2007-2008 and 2008-2009 respectively. It is apparent from the analysis that the main source of total factor productivity (TFP) growth for the MFIs was attributed to the technical efficiency change(10.1 percent increase) as the result depicted that 16 out of 19 MFIs (about 84 %) has shown improvement in technical efficiency changes. In contrast, only 5 out of 19 (26.3%) MFIs have shown improvement in technological change but still the industry as a whole has exhibited a decline in technological change (5.8 percent decrease over the period) and suggested that there has been a deterioration in the performance of the best practicing micro finance institutions. Further the result showed that pure technical efficiency increased by 8.9 percent while scale efficiency contributed on average 1.1 percent increase and hence suggested that during the study period the Ethiopian MFIs have experienced mainly an increment of pure technical efficiency(improvement in management practices) rather than an improvement in optimum size(scale efficiency change). Generally, an important implication for the Ethiopian micro finance industry is that they need to pursue a technological progress in order to meet the dual objectives of reaching many poor people and financial sustainability.

Key words: Productivity Change, Malmquist Productivity Index, Ethiopian MFIs,

1. Introduction

Microfinance Institutions (MFIs) are essential ingredients in the development processes of a country. MFIs provide financial services to low-income households in developing countries around the world. Historically microfinance institutions predominantly originated with a mission of a social objective, i.e., poverty reduction. However, in the last two decades there has been a major shift in emphasis from the social objective of poverty reduction towards the economic objective of sustainable and market based financial

services (Rauf and Mahamood, 2009). Indeed, the mission of all microfinance institutions (MFIs) is to provide banking services to the poor, that is, to lend very small sums to very poor borrowers(Mersland and Strøm, 2009). To that end, it is undoubtedly true that the sustainability of micro-financing is very important for these purposes. According to Hartarska (2005) micro finance institutions face unique challenges because they must achieve a double bottom line: provide financial services to the poor (outreach) and cover their costs (sustainability). Otero (1998) reveals that MFIs need to generate profit, but at the same time, they are required to balance the social objectives of reaching low-income entrepreneurs with generating a return for their investors.

In addition to this, in recent years, there has been an increase in internal and external pressures for the MFIs to decrease dependency on subsidized or grant funding and to become financially sustainable (Bogan et al, 2007). However, serving the poor and being financially self sufficient seem contradictory. Closely looking the challenges that MFIs are facing currently, there seem to be a need in dynamism that improve costs effectiveness and productivity performances. More specifically, an efficient operation of the micro finance industry might be a necessary condition for the well functioning of MFIs in the long run in meeting the dual objectives (outreach to the poor and financial sustainability). Apparently, studies aiming at investigating efficiency and productivity of these institutions have become appealing in an effort to improve their outreach performances, remain competitive and becoming sustainable.

An important contribution in studies of performances of MFIs probably, in recent years, a few studies have tried to investigate the efficiency of micro finance institutions (Nghiem 2004;Gutierrez-Nieto et al 2005, 2007; Abdul Qayyum and Munir Ahmed 2006; Hamiza Haq et al 2007; Bassem 2008; Hermes et al 2008; Kabir Hassan and Benito Sanchez2009).However, at least to the best of our knowledge there are no analysis that have been done specifically to investigate the productivity change of micro finance institutions. Thus, this study aims to investigate the productivity change Ethiopian micro finance industry during the period 2005-2009 by employing Malmquist index and is expected to show managers, practitioners and policy makers the performance of Ethiopian microfinance institutions and thereby contribute to the absence of literature in areas of MFIs.

The rest of the paper is organized as follows. In section 2, the paper puts brief background of the Ethiopian micro finance industry. Section 3 provides data and methodology including input and output specifications. Section 4 presents results and discussions. Finally, Section 5 ends up with conclusions.

2. Overview of Micro Finance Industry in Ethiopia

Considering the importance of microfinance to the development the country's economic growth and poverty reduction, the Ethiopian government has paved a way to establish micro finance institutions. The formal microfinance industry began in Ethiopia in 1994/1995 with the government's "the Licensing and Supervision of Microfinance Institution Proclamation" designed to encourage Microfinance Institutions (MFIs) to extend credit to both the rural and urban poor of the country.

As far as the financial products they provide is concerned, many of the Ethiopian MFIs offer similar financial products and mainly use the group lending methodology, while individual lending is employed to a limited extent (Amaha, 2008). Some of the loan products provided by MFIs include agricultural loans, micro-business loans, micro and small enterprise loans (micro-bank loans), employee loans, package loans (food security loans), and housing loans (Amha, 2008). At present, there are 30 MFIs working through 433 branch offices and 598 sub-branches and are serving over 2.3 million clients (AEMFI, 2010). They provide financial service, mainly credit and saving and, in some cases, loan insurance. Almost all MFIs in the country have poverty alleviation as an objective. They are, thus, meant to address the lower strata of micro-entrepreneurs including those engaged in activities that are started and operated just for survival (Berihun et

al, 2009). As of 2009 the industry has pulled a total asset of 7.2 billion Birr (55.1 million USD[3]11), with 5.1 billion birr (38.9 million USD) in outstanding loans and mobilized a total deposit of 2.4 billion birr (18.4 Million USD) (AMFI, 2009). Indeed, the four largest MFIs namely, ACSI, DECSI, OCSSCO and Omo are backed by the governments of the four most populous regional states and account for 81 per cent of client outreach and 85 per cent of total loans outstanding(IFAD,2011). The two largest MFIs (also the two largest in Africa), ACSI in Amhara and DECSI in Tigray, account for over half (55 per cent) of total outreach and for almost two thirds (63 per cent) of loans outstanding (ibid). According (Pfister et al, 2008), Ethiopian microfinance has made remarkable progress over the past decade, reaching almost two million clients in a country of 77 million people. Nevertheless, financial services for the low-income population, poor farmers and MSMEs are still characterized by limited outreach, high transaction costs for clients, a generally weak institutional base, weak governance and a nominal ownership structure as well as dependence on government and mother NGOs (ibid).

3. Data and Methodology

The study is mainly based on secondary data. It is based on the annual data covering the period from 2004-2009 for the 19 micro finance institutions operating in Ethiopia. In fact, there are 30 MFIs currently operating in Ethiopia; however, data cannot be generated from all the MFIs as some lack sufficient data while others are new to be included in the analysis. The data is extracted from the financial statements provided by the Association of Ethiopian Microfinance Institutions (AEMFI), National Bank of Ethiopia (NBE) and Mix market.

In financial institution literature there are three alternative methods which have been used for measuring the productivity changes, namely Fisher index, Tornqvist index and the Malmquist Index (Sofian, 2007). Of these, indeed, the Malmquist TFP index is the most widely used measure of productivity change (Casu et al,). Grifell-Tatje and Lovell (1996) noted that the Malmquist index has three main advantages relative to the Fischer and Tornqvist indices. Firstly, it does not require the profit maximization, or the cost minimization, assumption. Secondly, it does not require information on the input and output prices. Finally, if the researcher has panel data, it allows the decomposition of productivity changes into two components (technical efficiency change or catching up, and technical change or changes in the best practice). Its main disadvantage is the necessity to compute the distance functions. However, the Data Envelopment Analysis (DEA) technique can be used to solve this problem

The Malmquist productivity index (MPI) evaluates the productivity change of decision making units (MFIs studied) between two time periods. It can be defined as the product of Catch-up and Frontier-shift terms. Catch-up or recovery is related to the degree in which a decision making unit (DMU) improves or worsens efficiency frontier shift (or innovation) is a term which reflects the change in the efficiency its frontiers between the two time periods (Cooper et al 2007).

As discussed above the 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.

The Malmquist index measures total factor productivity (TFP) change between two data points by calculating the ratio of the distances of each data point relative to a common technology and it requires the

[3] Commercial banks currency exchange rate of 13 ETB to 1 USD has been used

inputs and outputs from one time period to be mixed with the technology of another time period. Following Fare et al. (1994), this paper adopts the output-oriented Malmquist productivity change index, referring the emphasis on the equi-proportionate increase of outputs, within the context of a given level of input. The output-oriented Malmquist productivity change index can be expressed as follows:

$$M_O\left(x^{t+1}, y^{t+1}, x^t, y^t\right) = \frac{D_r^{t+1}(x^{t+1}, y^{t+1})}{D_o^t(x^t, y^t)} \left[\frac{D_o^{t+1}(x^{t+1}, y^{t+1})}{D_o^{t+1}(x^{t+1}, y^{t+1})} \frac{D_o^t(x^t, y^t)}{D_o^{t+1}(x^t, y^t)}\right]^{1/2} \quad (1)$$

Where the ratio outside the brackets is equal to the change of technical efficiency between time t and t+1, representing the change in the relative distance of the observed production from the maximum potential production; while the component inside the brackets is the geometric mean of the two productivity indexes, representing the shift in production technologies (technical change) between time t and t+1. The product of the two components (efficiency change and technical change) is the Malmquist productivity change (total factor productivity change). In addition, technical efficiency change can be further decomposed into pure technical efficiency change and scale efficiency change.

Therefore, the two terms in equation (1) are:*;*

Efficiency change

$$= \frac{D_o^{t+1}(x^{t+1}, y^{t+1})}{D_o^t(x^t, y^t)} \quad (2)$$

Technical change

$$= \left[\frac{D_o^t(x^{t+1}, y^{t+1})}{D_o^{t+1}(x^{t+1}, y^{t+1})} \frac{D_o^t(x^t, y^t)}{D_o^{t+1}(x^t, y^t)}\right]^{1/2} \quad (3)$$

The Malmquist productivity index can be interpreted as a measure of total factor productivity (TFP) growth. Improvement in productivity, as well as improvement in efficiency and technology, is indicated by values greater than one, whereas value less than one indicate regress.

Selection of inputs and outputs

In measuring the technical efficiency and productivity of financial institutions, the most serious problem lies and in fact, remains a controversial issue in literature in defining outputs and inputs of such institutions (see Berger and Humphrey (1997). Commonly there are three approaches to this problem, namely; the

production approach, the intermediation approach, and the assets approach (Berger and Humphrey 1997, Athanassoupoululo, 1997)

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Under intermediation approach financial institutions are considered as institutions transferring resources from savers to investors. In this approach, inputs are measured by the volume of loans and deposits collected and funds borrowed from financial markets whereas outputs are the loans and investments. Under production approach financial institutions are producers of deposits and loans. In this approach, the number of accounts opened or transactions processed is the best measure output, while the number of employees, physical capital and other operating costs used to perform those transactions are considered as inputs. Finally under the assets approach it is assumed that the basic function of any financial institution is the creation of credit (loan). And hence the value of assets of financial institutions acts as output in this approach. Microfinance institutions are also financial institutions but their approach and motive differs from other financial institutions. They target mainly poor persons often without any collateral requirements and their motive is not only to maximize profit (Gutierrez-Neito et al. 2007).

The selection of inputs and outputs for this study is based on the dual objectives of micro finance institutions viz outreach and sustainability framework which in line with the prior study of Gutierrez et al (2007). consequently we specify two inputs and three outputs; the number of employees , and operating expenses/administrative expenses are specified as the two inputs whereas the outputs are interests and fee income, gross loan portfolio, and number of loans outstanding(number). Table 1 presents descriptive statistics of the inputs and out puts.

4. Results and Discussion

Table 1 reports the descriptive statistics of the variables included in the analysis of productivity changes including their mean, standard deviation, minimum and maximum values for the sample of 19 MFIs during the period 2004-2009. It can be observed that the variables used in the study vary greatly among the sample MFIs and suggested that the sample observation composed of large and small micro finances as well, as measured in terms of gross loan portfolio and number of loan outstanding among others.

Changes in productivity over the period of study are summarized in table 2. It should be noted all that values for total factor productivity (TFP) or any of its components that are greater than 1 indicate progress in efficiency and values less than 1 regress. The Malmquist productivity change experienced by the micro finance industry as a whole has averaged 3.8. % per year and suggest improvement in performance of MFIs from 2004-2009. As the result showed over the sample period, the average annual rate of technical efficiency change is 10.1% while the rate of technological change is -5.8%.

As indicated in (table 2) the analysis of the change in efficiencies (Malmquist indices) shows that productivity has been increasing during the period 2004-2009. With the exception of the year 2004-2005 (slight decline in productivity, which is 0.2 percent) the MF industry has reported productivity progress in the study period (productivity rose of 5.5 percent, 5.8 percent,0.3 percent and 7.7 percent in the years 2005-2006, 2006-2007, 2007-2008 and 2008-2009 respectively).

By decomposing the Malmquist index, it is possible to determine the sources of productivity growth. As explained previously, technical efficiency change (TEC) and technological change (TC) are the efficiency changes (movement of micro finances towards the frontier -catching up) and technological changes (frontier shift) respectively. In this regard, the sources of growth or decline in Ethiopian micro finance industry are due to TEC, TC, or both. However, from table 2 and table 3, it is apparent that the main source of TFP growth for the MFIs was attributed to the technical efficiency change(10.1 percent increase) as the result depicted that 16 out of 19 MFIs (84 %) have shown improvement in TEC. On the

contrary, only 5 out of 19 (26.3%) MFIs have shown improvement in TC but still the industry as a whole has exhibited a decline in technological change (5.8 percent decrease over the period) and suggested that there has been a deterioration in the performance of the best practicing micro finance institutions. Furthermore, during the study period the improvement in productivity as the result of an average efficiency increase of 10.1 percent was offset by the average technological decrease of 5.8 percent and turn the industry to exhibit a 3.8 percent overall productivity gains. Furthermore, technical efficiency change can be decomposed into its pure technical efficiency and scale efficiency. Accordingly, the result showed that pure technical efficiency increased by 8.9 percent while scale efficiency contributed on average 1.1 percent increase and hence suggested that during the study period the Ethiopian MFIs have experienced mainly an increment of pure technical efficiency(improvement in management practices) rather than in improvement in optimum size(scale efficiency change).

5. Conclusion

By employing the Malmquist productivity index this study attempts to examine the total factor productivity change in the Ethiopian micro finance institutions (MFIs) using a balanced panel dataset of 114 observations from 19 micro finance institutions over the period of 2004-2009. The selection of inputs and outputs for the study is based on the dual objectives of MFIs viz, outreach and sustainability framework. Consequently, we specify two inputs and three outputs; the number of employees, and operating expenses are specified as inputs whereas the outputs are interests and fee income, gross loan portfolio, and number of loans outstanding (number).

The result of the study indicated that over the period the malmquist productivity change experienced by the micro finance industry as a whole has averaged 3.8 % annually. From the analysis it is apparent that the main source of TFP growth for the MFIs was attributed to the technical efficiency change. Though few MFIs (5 out of 19 MFIs) have shown improvement in technological change, the industry as a whole has exhibited a decline in technological change (5.8 percent decrease over the period) and suggested that there has been deterioration in the performance of the best practicing micro finance institutions. By decomposing the Malmquist index, it is possible to determine the sources of productivity growth. Accordingly, the result showed that during the study period the Ethiopian MFIs have experienced mainly an increment of pure technical efficiency (improvement in management practices) rather than an improvement in optimum size. In sum, an important policy/strategic implication for the Ethiopian micro finance industry is that they need to pursue a technological progress in order to meet the dual objectives of reaching many poor people and financial sustainability.

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Table 1.Descriptive statistics of Variables (inputs and Outputs) in dollars

			2004	2005	2006	2007	2008	2009
Output	**Gross loan portfolio**	**Average**	6328424.85	9744770.55	13766157.37	18844364.53	23339095.90	20927300.10
		Std dev	12797557.82	20163130.28	25564762.22	36565166.93	46163287.85	38405984.36
		Max	46365572	77918547	85266397	118766535	155668558	131184763
		Min	103480	170229	263382	280132	427230	786650
	Number of loans	**Average**	1088873.05	68101.30	81526.45	98452.95	108202.85	120616.70
		Std dev	3560694.682	130002.942	145643.921	170817.514	189609.428	197968.151
		Max	15622650	434814	536804	597723	108202.85	120616.70
		Min	1153	1365	1917	1924	2984	2800
	Interest & fee income	**Average**	766112.75	1176197.55	1784483.84	1784483.84	3168793.15	3252691.95
		Std dev	1531603.59	2394933.57	3333634.44	4602177.50	6408038.59	6325184.72
		Max	5458600	8022074	11671356	16947735	25368310	25152802
		Min	18806	32860	38236	74535	101127	152918
Input	**Operating expenses**	**Average**	338073.07	456196.20	661512.40	839407.10	1116844.00	1121145.55
		Std dev	483416.053	677295.702	890280.763	1188215.847	1799420.306	1522281.266
		Max	1865700	2687450	3216371	4336629	7394112	5422833
		Min	25894	34499	51585	63465	72290	132600
	Number of employees	**Average**	238.00	314.40	378.75	432.35	490.60	515.95
		Std dev	408.790	529.080	604.587	684.013	754.046	802.781
		Max	1670	1915	2065	2363	2590	2732
		Min	17	18	27	28	38	37

Table 2: Malmquist Index Summary of Annual Means

Year	Technical efficiency change (TEC)	Technological change (TC)	Pure Technical Efficiency Change	Scale efficiency	Total Factor Productivity Change (Malmquist)
2004-2005	1.139	0.876	1.195	0.953	0.998
2005-2006	1.193	0.885	1.140	1.047	1.055
2006-2007	1.147	0.923	1.042	1.101	1.058
2007-2008	0.967	1.037	0.989	0.978	1.003
2008-2009	1.075	1.002	1.092	0.984	1.077
Mean	**1.101**	**0.942**	**1.089**	**1.011**	**1.038**

Table 3: Malmquist Index Summary of Ethiopian MFI's Means

Micro finance	Technical Efficiency Change (TEC)	Technological Change (TC)	Pure Technical Efficiency Change	Scale Efficiency Change	Total Factor Productivity Change (Malmquist)
ACSI	1.045	0.983	1.000	1.045	1.027
ADCSI	1.002	0.974	1.000	1.002	0.976
AVFS	1.126	0.926	1.138	0.989	1.042
BGMFISC	1.283	0.921	1.260	1.018	1.182
Buusaa Gonofaa	1.159	0.961	1.116	1.039	1.114
DECSI	1.000	0.953	1.000	1.000	0.953
Eshet	0.959	1.064	0.986	0.973	1.020
Gasha	1.107	1.043	1.181	0.937	1.155
Metemamen	1.536	0.804	1.456	1.055	1.234
OCSSCO	1.091	0.929	1.094	0.997	1.014
OMO	1.249	0.840	1.244	1.004	1.049
PEACE	0.939	0.703	0.950	0.988	0.660
SFPI	1.052	0.986	1.031	1.021	1.037
Wasasa	1.127	0.959	1.069	1.055	1.080
Wisdom	0.995	0.988	0.988	1.006	0.983
Meklit	1.037	1.001	1.076	0.964	1.037
Sidama	1.286	0.835	1.269	1.013	1.074
SEYAMFI	1.175	1.049	1.000	1.175	1.232
Agar I	0.927	1.082	0.971	0.954	1.003
Mean	1.101	0.942	0.971	0.954	1.038