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Total Factor Productivity of Microfinance Institutions in India Using Malmquist Approach

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Abstract

The micro finance institutions (MFI) are the key drivers in the development of a country as they provide financial services to poor and unbanked on a sustainable basis. The rationale of this paper is to measure productivity changes selected in MFIs from 2011 to 2017 post sector crisis period, using the Malmquist productivity index (MPI) method. Further the study also aimed to examine the reasons for decline in total factor productivity of sample MFIs in India. The empirical findings indicate that the sample MFIs total factor productivity change was found to be fluctuating throughout the period of the study and reported overall productivity regress in the study period. The study reveals also that the decline in total factor productivity of selected MFIs in India was mainly due to the technological change. Hence findings revealed that there is a need for technological up-gradation and good management practices overall, to increase the productivity in course of time.

Keywords: Micro Finance Institutions, Productivity, Malmquist Productivity Index

Introduction

Microfinance is the provision of financial serves offered to the poor people with very small business or business projects (Otero, 1999 cited in Marzys, 2006). Avery small proportion of the world population has access to financial instruments, mainly because commercial banks consider the poorest of the poor people as un-bankable due to their lack of collateral and information asymmetries. It is evident from the above that microfinance is a tool to serve the poor and to alleviate poverty and it acts as a means to provide access to financial services to the poor and vulnerable sections of the society. So many developing countries across the globe were benefited with this tool including India by contributing to socio economic development of the country through its efforts in alleviation of poverty, supporting in establishment of microenterprises and their development and in empowering women. Bangladesh pioneered in microfinance with the efforts of Muhammad Yunus. Since then the concept of microfinance was introduced in so many developing countries including India. Microfinance was introduced in the country more than three decades before. With the ongoing progress in the sector, several microfinance institutions were established and were actively indulged in providing access to financial services to the poor, rural farmers in general and with a special focus on poor women in particular. The tool of Microfinance helps the poor by enabling them to take up some income generating activities which eventually leads to their empowerment. At present many Microfinance Institutions were operating in the country. The sector was stuck with a crisis in the year 2010, followed by which the operations of MFIs were put under close observation. In India wide range of research was conducted in the area of microfinance particularly on assessment of impact of microfinance (studies eg) on poor and a good number of studies are available on microfinance and its role in women empowerment. This study is an attempt to measure the productivity of

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selected MFIs in India from 2011 to 2017 after the sector being stuck with the crisis. This study particularly focuses on measuring productivity of MFIs in India using the Malmquist total factor productivity index. Therefore, this study provides empirical analysis of productivity of sample microfinance institutions in India.

Objectives of the study

The objective is to analyze the productivity of sample microfinance institutions in India during the period 2011 to 2017

The specific objectives of the study are as follows:

1. To determine the total factor productivity change of microfinance institutions in India.
2. To examine the reasons for decline in total factor productivity of sample MFIs in India.
3. To suggest measures to improve the productivity of sample MFIs in India.

Method

According to (Sufian, 2009), there are three alternate methods which are in use for measuring the productivity changes of financial institutions which are Malmquist index, Tornqvist index and Fisher index. Among them Malmquist index is most popularly used for measuring the productivity change (Casu etal; 2004). Malmquist idex is advantageous over fisher index and tornqvist index. The Malmquist index has advantages like firstly assumptions of profit maximization or cost minimization are not required, secondly Malmquist index does not require input and output prices information and also if the study involves using panel data (as in this study), the productivity change can be decomposed in to technical efficiency change which is otherwise called as catch up and technology change(or changes in the best practice).The degree in which a DMU or a firm improves or worsens efficiency can be considered as catch up or recovery , while frontier shift is the shift in the efficient frontier of the DMUs between two time periods(Cooper et al 2007). The productivity change or efficiency change overtime can be measured with Malmquist Index and the productivity change of MFIs is mainly due to either technical efficiency change or technology change. Hence the product of technical efficiency change and technology change gives the total productivity of MFIs. Technical efficiency change is further divided in to two components pure technical efficiency and scale efficiency change.

Total factor productivity change between two time periods or two data points can be done by calculating the ratio of the distances of each data point with respect to a common technology, and for calculating this, the inputs and outputs from one time period should be mixed with the technology of another time period. The study employs output oriented Malmquist productivity index as output oriented Malmquist productivity index focuses on maximizing the outputs, at a given level of inputs. The equation for Malmquist productivity index (output oriented) is expressed in the following form

$$M_0\left(y_{t+1}, x_{t+1}, y_t, x_t\right) = \left[\frac{d_0^t(x_{t+1}, y_{t+1})}{d_0^t\left(x_t, y_t\right)} \times \frac{d_0^{t+1}(x_{t+1}, y_{t+1})}{d_0^{t+1}\left(x_{t+1}, y_{t+1}\right)}\right]^{1/2}$$

The productivity of production point (x_{t+1}, y_{t+1}) relative to the production point (x_t, y_t) is shown in the equation. If the value of productivity is greater than one (>1) it shows that there is a positive growth in total factor productivity from period t to t+1. This index is the geometric mean of two output based malmquist total factor productivity indices. In this index, the input employs distance functions from two time periods or technologies, $d_0^t(x_t, y_t)$ and $d_0^t(x_{t+1}, y_{t+1})$; and two pairs of input-output vector (x_t, y_t) and (x_{t+1}, y_{t+1}) are taken. Caves et al (1982) made an assumption that $d_0^t(x_t, y_t) = d_0^t(x_{t+1}, y_{t+1})$ which means that own period observations are technically efficient according to Farell(1957). The MFI is the product of two components, namely technical efficiency change (EFFCH) and technology change (TECHCH), expressed in the form of following equation.

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$$M_0\left(y_{t+1}, x_{t+1}, y_t, x_t\right) = \frac{d_0^t(x_{t+1}, y_{t+1})}{d_0^t\left(x_t, y_t\right)}\left[\frac{d_0^t(x_{t+1}, y_{t+1})}{d_0^{t+1}\left(x_{t+1}, y_{t+1}\right)} x \frac{d_0{}^t(x_{t,} y_t)}{d_0{}^{t+1}(x_t, y_t)}\right]^{\frac{1}{2}}$$

Where the component within the bracket represents the geometric mean of two productivity indices, which indicates a shift from t to t+1 in case of production technologies, while the component outside the bracket indicates the technical efficiency change from time period t to t+1. Also technical efficiency change can be further subdivided in to pure technical efficiency change and scale efficiency change.

$$EFFCH = \frac{d_0{}^t(x_{t+1,} y_{t+1})}{d_0{}^t(x_t, y_t)}$$

$$TECHCH = \left[\frac{d_0^t(x_{t+1}, y_{t+1})}{d_0^t\left(x_t, y_t\right)} \times \frac{d_0^{t+1}(x_{t+1}, y_{t+1})}{d_0^{t+1}\left(x_{t+1}, y_{t+1}\right)}\right]^{1/2}$$

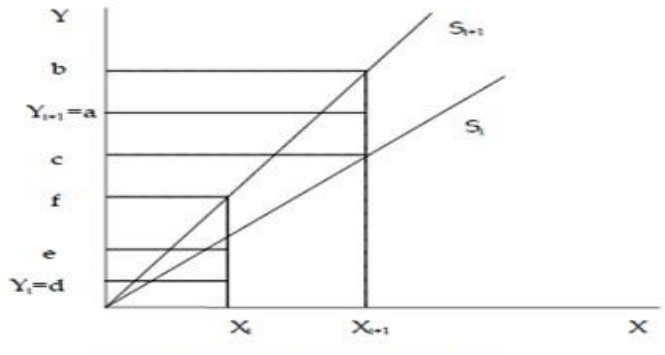
The following figure is presented to explain the Malmquist productivity index. Here S_t denotes the technology in period t, while s_{t+1} represent technology during the time period t+1. From the figure, it can be explained that input output vectors (x_t, y_t) and ($x_{t+1,}$ y_{t+1}) are feasible in their own periods, but ($x_{t+1,}$ y_{t+1}) does not belong to S_t. It is evident from the Figure 1 that

$$d_0{}^t\left(x_{t+1,} y_{t+1}\right) = \frac{Oa}{Ob}$$

$$d_0{}^t\left(x_t, y_t\right) = \frac{Od}{Oe}$$

If substituted the above values in eq the component outside the bracket becomes

$$EFFCH = \frac{Oa}{Ob}\frac{Oe}{Od}$$



Source: Hossaian and Bhuyan (2002)

Figure 1: Malmquist Output Based TFP Index

For the component within the bracket, if the values are substituted as represented in the Figure 1 above, it becomes

$$TECHCH = \left[\frac{Oa}{Oc}\frac{Ob}{Oa}\frac{Od}{Oe}\frac{Of}{Od}\right]^{\frac{1}{2}} = \left[\frac{Ob}{Oc}\frac{Of}{Oe}\right]^{\frac{1}{2}}$$

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The above equation measures the shift in technology from t to t+1 which indicates technical or technology change as the geometric mean of two shifts, just like in Fisher Ideal Index (Hossain & Bhuyan, 2002). If Total factor productivity value is greater than one (>1), it indicates efficiency and technological improvement, while value less than one (<1) represents decrease in efficiency and technology improvement.

Selection of inputs and outputs

Berger & Humphrey (1997), in their study suggested three approaches which are very much relevant and can be used for selection of inputs and outputs in the process of efficiency analysis. The three approaches are namely the production approach, the intermediation approach and the assets approach. Financial Institutions are considered as producers of deposits and loans under production approach. The number of staff, physical capital and operating costs incurred are considered as inputs; while the number of accounts opened can be taken as an output measure. In the intermediation approach, the financial institutions are those institutions which are actively engaged in mobilizing the resources and transferring the resources from the savers to borrowers or investors. Hence under this approach loans and deposits collected from lenders and funds borrowed from financial markets can be taken as inputs while the loans and investments made are considered as outputs. Under the assets approach financial institutions are assumed to be the institutions whose main function is to create loans. Hence the total value of assets possessed by an institution can be considered as an output. Unlike any other financial institution, the subject of our study i.e. microfinance institutions are financial institutions have different motive. MFIs prime focus is on poor and vulnerable who were incapable of fulfilling any collateral requirements and the main motive of Micro Finance Institutions is not to maximize their profits but to strive for the well being of poor.

The inputs and outputs for this study were mainly selected on the basis of two important objectives of micro finance institutions viz outreach and sustainability framework which is in line with the prior study of (Gutierrez-Neito et al. 2007; Bereket Zerai and Rani 2012). The two inputs selected for the study include the number of employees, and operating expenses/administrative expenses while the three outputs include interest and fee income, gross loan portfolio, and number of loans outstanding (number). Table 1 presents descriptive statistics of the inputs and outputs used in the study.

Table 1: Malmquist Index Summary Of Annual Means (output oriented)

Year	Efficiency change	Technological change	Pure technical efficiency change	Scale change	Total factor productivity change
2011-12	1.09	1.012	1.024	1.065	1.103
2012-13	1.057	0.854	1.002	1.054	0.903
2013-14	1.122	0.919	1.08	1.039	1.031
2014-15	0.964	0.968	0.965	0.999	0.933
2015-16	1.175	0.734	1.204	0.975	0.862
2016-17	0.796	1.211	0.814	0.977	0.964
Mean	1.026	0.939	1.008	1.018	0.963

From the Table 1, the following observations are made. It is evident from the analysis that the selected microfinance institutions in India have experienced a fall in productivity growth during the period. It was 1.103 in 2011-12, but decreased 0.903 during 2012-13, this is due to decrease in technology change. Further in the year 2013-14 , the total factor productivity was increased to 1.031 due to improvement in technology change. In the following year i.e. in 2014-15, again the total factor productivity change has dropped to 0.933 due to inefficient management practices and the firms not being operated at optimum scale. Further in the year 2015-16, further drop was observed in total productivity change i.e. 0.862 which was due to fall in technology change, management practices were improved but firms found to be operated at less than optimum scale. Finally in the

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year 2016-17,the total factor productivity change was found to be increased to 0.964 which was mainly due to improvement in technological change to 1.211 .

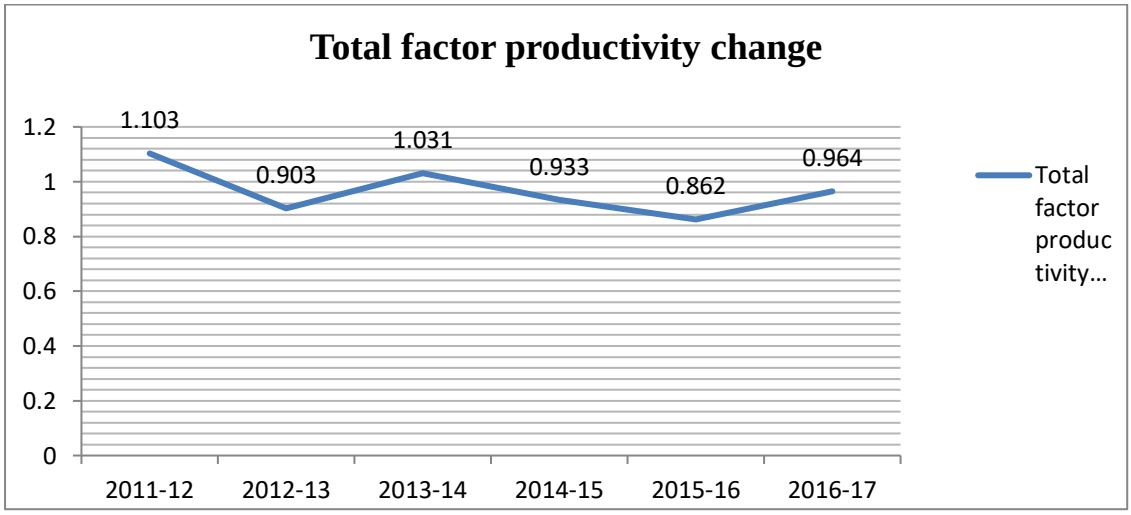

Figure 2: Total factor productivity change of sample MFIs

It is evident from the analysis and observed from the above Figure 2, that the sample MFIs total factor productivity change was found to be fluctuating throughout the period of the study. It was found to be high i.e.1.103 in 2011-12 and found to be least during 2015-16 i.e. 0.862. The firms recorded a productivity growth of 0.903, 0.933, 0.862 and 0.964 in the years 2012-13, 2014-15,2015-16 and 2016-17 which implies regress in productivity growth by 9.7%,6.7%,13.8% and 3.6% respectively. The selected MFIs registered productivity growth of 1.103 and 1.031 in the years 2011-12 and 2013-14 which means a progress in productivity growth by about 10.3% and 3.1% respectively.

The result of the analysis shows that the main source of decline in total factor productivity of selected MFIs in India was mainly due to technological change. It can be observed that the mean technical efficiency change is increased by 2.6% where as there was a decline of 6.1% in the mean technological change. This implies that the overall regress in total factor productivity of the selected MFIs during the period of study was mainly due to technological change, while the MFIs overall technical efficiency is increased by 2.6%.

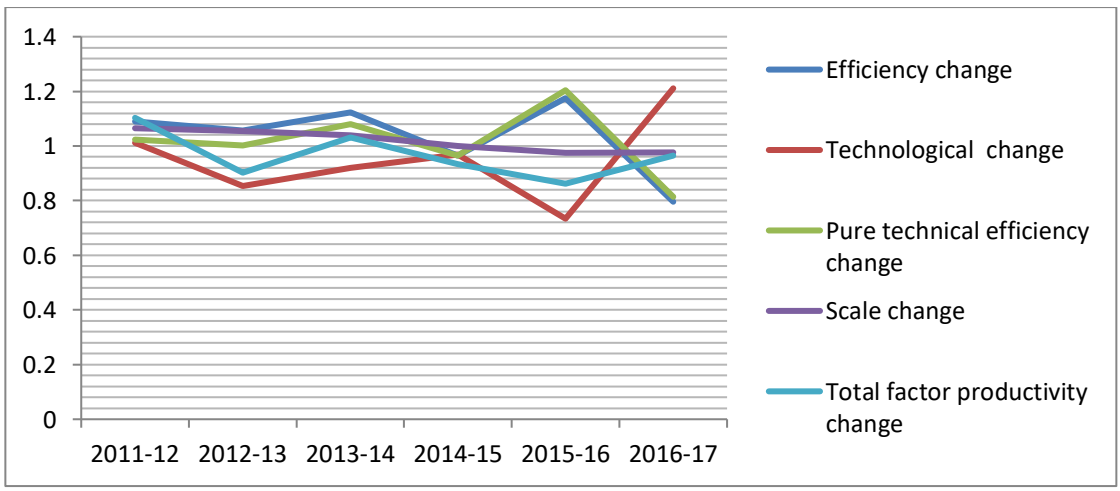

Figure 3: Malmquist Total Factor Productivity Index and its Components

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It was evident from the Figure 3, that 13 out of 22 MFIs have shown improvement in technical efficiency change while only 2 out of 22 MFIs have exhibited improvement in technological change. This shows that the most of the sample MFIs have showed deteriorated performance due to lack of innovation in technology and lack of effective implementation of technology. The increase in technical efficiency of 2.6% was offset by the average technological change showing a decline of 6.1% and there was an overall decline in the productivity gain of the sample MFIs by 3.7% during the period of the study.

Further technical efficiency change i.e. 2.6% can be decomposed in to pure technical efficiency change and scale change. It can be observed that the analysis that there was an increase in pure technical efficiency change by 0.8% whereas increase in scale efficiency change by 1.8% which implies that the firms showed improvement in optimum size during the period of study but the firms are not that much efficient in terms of their management practices.

MFIs Fusion, Navachetana, Saija, Satin, Smile, Sonata and Spandana have recorded a total factor productivity growth of 3.2%,0.2%,25.6%,2.2%,8.7%,1.2% and 10.3% respectively. The TFP growth of Fusion Navachetana, Saija, Satin, Smile and Sonata is due to technical efficiency change (TEC) only. The TFP growth of Spandana is due to technological change (TC) only. While 15 MFIs have showed malmquist index scores of less than one (<1) indicating deterioration in productivity over time. 9 out of 22 MFIs have showed regress in pure technical efficiency (<1). The average pure technical efficiency change score for the entire sample is 1.008, implying that pure technical efficiency change score has increased technical efficiency change by only 0.8%. Turning to scale efficiency change (SEC),16 out of 22 MFIs i.e. about 72.7% of sample MFIs have registered a positive scale efficiency change score greater than one (>1) . Only 3 MFIs have scale efficiency change score equal to one (=1) which means that MFIs Sanghamitra, SKDRDP and Spandana does not contribute to the total factor productivity from Table 2.

Table 2 Malmquist Index Summary Of Firm Means (Ouput Oriented)

S.No	Firm	Effch(TEC)	Techch(TC)	Pech(PTE)	Sech(SEC)	Tfpch(TFP)
1	Fusion	1.112	0.927	1.112	1.001	1.032
2	Guardian	1.002	0.921	1.031	0.972	0.922
3	IDF Financial services	0.861	0.921	0.852	1.011	0.793
4	Lok Biradari Trust	1.042	0.892	1	1.042	0.93
5	Madura	1	0.924	0.978	1.023	0.925
6	Mahasemam	1.04	0.914	1.012	1.027	0.951
7	Navachetana	1.116	0.898	1.109	1.007	1.002
8	Prayas	0.941	0.935	0.931	1.01	0.879
9	Sahara Utsarga	1.012	0.927	0.949	1.066	0.938
10	Saija	1.347	0.932	1.34	1.005	1.256
11	Samhita	0.977	0.888	0.985	0.992	0.868
12	Sanghamithra	1	0.912	1	1	0.912
13	Sarvodaya Nanofinance	0.842	1.038	0.816	1.031	0.874
14	Satin	1.04	0.982	1.015	1.025	1.022
15	SKDRDP	1	0.975	1	1	0.975
16	SMGBK	0.974	0.926	0.99	0.984	0.902
17	SMILE	1.109	0.98	1.068	1.039	1.087
18	Sonata	1.097	0.925	1.028	1.068	1.014

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19	Spandana	1	1.103	1	1	1.103
20	Suryoday	1.027	0.94	0.989	1.038	0.965
21	Uttarayan Financial services	1.091	0.898	1.08	1.01	0.979
22	Village financial	1.037	0.917	0.994	1.044	0.951
Mean		1.026	0.939	1.008	1.018	0.963

Discussion

Since the main source of decline in total factor productivity of selected MFIs in India was mainly due to technological change, the sample microfinance institutions should make use of latest available technology to the maximum extent possible at the grass root level and adopt some technology related best practices to increase outreach and to achieve overall efficiency. Further the sample MFIs even though recorded a positive value of pure technical efficiency change , it was found to be very small and hence there is a need for the firms to improve the efficiency by following best management practices, which eventually will lead to lower cost of operations and higher efficiency.

Out of 22 MFIs selected for the study about 15 MFIs have showed malmquist index scores of less than one (<1) indicating deterioration in productivity over time. Hence, there is a need for these firms to follow the best practices relating to technological up-gradation and good management practices overall so as to increase the productivity in course of time.

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