Microfinance Resilience: The Role of Organizational Characteristics in Navigating Post-Crisis Sustainability Challenges

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ABSTRACT

The microfinance sector in India has witnessed remarkable growth, marked by the proliferation of Microfinance Institutions (MFIs) of varying ages. This research endeavors to unravel the multifaceted dimensions through which the age of Indian MFIs contributes to their sustainable growth. In this paper, we empirically assess the performance and efficiency changes of 65 Indian MFIs during the period from 2010 to 2018. We employ a Data Envelopment Analysis (DEA) approach to evaluate three key aspects of efficiency: social efficiency (SE), financial efficiency (FE) and overall efficiency (OE). Additionally, we utilize the Malmquist index to gauge changes in MFIs' efficiency over time (Khan & Gulati, 2022). Efficiency estimated for the individual MFIs are regressed on a set of explanatory variables (Debt to Equity ratio, Return on Assets, Portfolio at Risk 90 Days, Capital to Total Assets Ratio, Cash to Total Asset and institute specific variable i.e. Age and Size) employing the fixed effect OLS regression model. We find a strong association between a Organizational Age and its financial and social efficiency. The results suggest that the size of MFIs are strongly affecting the technical efficiency of the firm. By examining the distinct trajectories of MFIs at different stages of maturity, this study aims to provide valuable insights that can inform strategic decisions, policy formulations, and sustainable development initiatives in the microfinance landscape.

Keywords: Microfinance Institutions; data envelopment analysis (DEA); overall efficiency; financial efficiency; social efficiency and Malmquist index.

1. INTRODUCTION:

The emergence of Microfinance Institutions (MFIs) in India is a testament to the efforts to address financial inclusion and empower the economically vulnerable sections of society. While facing challenges, the sector has played a crucial role in providing access to financial services and fostering socio-economic development in the country (Hoque et al., 2011). Lack of access to financial services stands out as the primary factor contributing to the impoverishment of the underprivileged (Narwal and Yadav, 2015; Samanta and Nanda, 2018). Due to their limited capacity to meet loan repayment requirements, the formal financial system is often reluctant to extend credit facilities to those in poverty. The emergence of Microfinance Institutions (MFIs) signifies a broader acknowledgment of the diverse financial needs within the target demographic.

It is imperative to comprehend how the age and size of these organizations impact their sustainable growth, as this knowledge is crucial for developing strategies that support long-term viability and positive societal outcomes (Wijesiri et al., 2017). This research aims to address this critical gap by delving into the specific needs and rationales behind conducting a thorough age-wise and size-wise performance evaluation of Indian MFIs. This knowledge is crucial for

strategic planning, enabling these institutions to adapt their approaches, governance structures, and operational models as they mature.

This study aims to explore the significance of analyzing age-wise and size-wise efficiency and performance metrics in the context of Indian MFIs. Different age groups may exhibit varying levels of risk tolerance and financial behaviors (Bibi et al., 2017). Analyzing the performance of Indian MFIs across age and size categories allows for a deeper understanding of portfolio quality and risk management strategies. An age-wise and size-wise performance evaluation equips investors with a nuanced understanding of how the age and size of an MFI correlates with its financial sustainability, impact, and risk profile, aiding them in making more informed investment decisions. The age and size of an MFIs can positively influence its network effects, leading to enhanced outreach, client retention, and community impact, which is valuable asset for sustainable growth. The efficiency and performance of these institutions are critical factors that determine their ability to fulfill their mission of poverty alleviation and financial inclusion (Awaworyi Churchill, 2018). Understanding the age-wise dynamics of MFIs in India is essential for designing targeted policies and strategies to enhance their effectiveness.

The subsequent sections of the paper follow this structure: Section 2 presents a review of relevant literature, while Section 3 outlines the research methodology, detailing data, variables, and study hypotheses. Section 4 presents findings and discussions, and the final section, Section 6, draws conclusions.

2. REVIEW OF LITERATURE

Gonzalez (2007) highlights age and size as critical factors affecting the efficiency of microfinance operations, among other potential determinants. Despite numerous studies on Microfinance Institutions (MFIs) and their efficiency drivers, there is limited information on how age influences the efficiency of Indian MFIs, particularly in their mission to serve the economically disadvantaged sustainably. Recent anecdotal evidence suggests that older MFIs outperform younger ones (Paxton, 2007), while other studies indicate the opposite (Hermes et al., 2011). Despite inconclusive findings from previous studies, it's essential to examine how organizational age affects the financial and social efficiency of MFIs in this research.

While various methods are commonly employed, there is a lack of consensus on the standardized specification for assessing and quantifying the performance of financial institutions (Paradi and Zhu, 2013). Common methods for evaluating MFI performance include traditional ratio analysis (e.g., Hartarska, 2005), the performance evaluation framework proposed by Yaron (1992), and production frontier-based techniques (Gutierrez-Niéto et al., 2007; Hermes et al., 2011; Servin et al., 2012; Piot-Lepetit and Nzongang, 2014; Wijesiri et al., 2015; Wijesiri, 2016). Techniques such as stochastic frontier analysis (SFA) and data envelopment analysis (DEA) are widely used to assess MFI performance by measuring efficiency against benchmarks (Fall et al., 2018; Berger & Humphrey, 1997; Berger & Mester, 1997; Pal, 2010; Bharti & Chitnis, 2016; Mohini and Vilvanathan, 2020).

To date, only a limited number of studies have specifically addressed the impacts of age and size on both the financial and social efficiency aspects of MFIs. This research seeks to empirically investigate how age and size influence MFI performance, gauged by the dual objectives of financial sustainability and social outreach.

The study's objectives are outlined as follows.
1.   To assess the performance of Indian microfinance institutions (MFIs) by using the DEA model.
2.   To study the impact of organizational age and size on both financial and social efficiency dimensions.

After conducting an extensive literature review, we establish our hypotheses as follows:

$H_1 1$: The age of an MFI significantly affect its performance.

$H_1 2$: The size of an MFI notably impact its efficiency.

3.   RESEARCH METHODOLOGY

The research methodology relies on Data Envelopment Analysis (DEA), a non-parametric technique capable of comparing the relative efficiency of multiple decision-making units by assessing their inputs and outputs. The study utilizes a dataset comprising financial and social performance metrics sourced from the MIX Market database. Additionally, it employs fixed-effect regression analysis to examine efficiency estimates for individual MFIs against a set of explanatory variables. These variables include the Debt to Equity ratio, Return on Assets, Portfolio at Risk 90 Days, Capital to Total Assets Ratio, Cash to Total Assets, and institution-specific variables such as Age and Size. The age of an

MFI, measured in years since its inception, serves as an indicator of its experience and managerial capabilities in microfinance programs. MFIs are categorized into three groups based on operational years: Mature (over 8 years), Young (5 to 8 years), and New (1 to 4 years) (Bibi Uzma et al., 2017; Wijesiri et al., 2017; Sohn & Ju, 2023).

Existing literature on bank and MFI efficiency underscores the significance of size as a determinant of efficiency, reflecting a firm's market competitiveness (Gonzalez, 2007; Staub et al., 2010). Moreover, institutional size accounts for variations in technology, diversification, investment opportunities, and other size-related factors. Consequently, size is included as an exogenous variable to investigate its relationship with efficiency estimates (Berger and di Patti, 2006). MFI size is measured in terms of total assets due to data availability (Khan & Shireen, 2020; Sohn & Ju, 2023). The study categorizes MFIs into three groups based on their asset levels: large (assets exceeding INR 10,000m), medium (assets ranging from INR 1,000m to INR 10,000m), and small (assets below INR 1,000m) (Wijesiri et al., 2017; Bharti & Malik, 2020).

To account for the strategic niche of MFIs and potential influences on efficiency estimates, various variables are integrated. These variables encompass Return on Assets (ROA) as a proxy for Profitability (Qayyum & Ahmad, 2006), Debt to Equity ratio (DER) as a proxy for MFI leverage intensity (Qayyum & Ahmad, 2006), Portfolio at Risk 90 Days (PAR90) as a proxy for MFI risk coverage (Roy & Pati, 2016), Capital to Total Assets Ratio (CAPTA) as a proxy for financing structure (Bardhan et al., 2021), and Cash to Total Asset (CASHTA) as a proxy for liquidity management. The study utilizes secondary data from 65 Indian MFIs over a 9-year period (2010 to 2018), selected from a total of 250 MFIs operating in India. The sample consists of 37 Mature MFIs, 21 Young MFIs, and 7 New MFIs. Data collected from the MIX market website undergoes cleaning and analysis using Microsoft Excel, with regression models run using Stata software.

The following table shows the description about the input-output combination and all the explanatory variables.

Table 1: DEA Input-Output Variables

Input	Initial	Unit
Total Assets	TA	USD
Borrower Per Loan Officer	BPLO	Number
Cost Per Borrower	CPB	USD
Operational Expenses	OEXP	USD
Number of Personnel	PRSL	Number
Output (Financial Sustainability)		
Financial Revenue	FR	USD
Operational Self-Sufficiency	OSS	%
Output (Social Outreach)		
Gross Loan Portfolio	GLP	USD
Number of Active Borrowers	NAB	Number
Number of Loan Outstanding	NLOUT	Number/Clients
Explanatory Variables		
Return on Assets	ROA	USD
Debt to Equity Ratio	DE	%
Portfolio at Risk at 90 days	PAR90	%
Capital to Total Assets Ratio	CAPTA	%
Cash to Total Asset	CASHTA	USD
Control Variable (MFIs Characteristics)		
Firm Age	A	No. of years since its Inception
Firm Size	S	Total Assets (USD)

Source: World Bank, MIX Market

The research employs technical efficiency as a measure of Indian MFIs' performance, using input-output combinations. Inputs include Total Assets (TA), Borrower per Loan Officer (BPLO), Cost per Borrower (CBP), Number of Personnel (PRSL), and outputs include Financial Revenue (FR), operational self-sufficiency (OSS), number of active borrowers

(NAB), number of Loan outstanding (NLOUT), and Gross loan portfolio (GLP). These indicators draw upon the works of Gutierrez-Niéto et al. (2009), Ahlin et al. (2011), Hermes et al. (2011), Servin et al. (2012), Louis et al. (2013), and Wijesiri et al. (2016).

4. DATA ANALYSIS & INTERPRETATION

This section delineates the utilization of Categorical Output-Based Data Envelopment Analysis (DEA) and provides a succinct overview of the input and output variables utilized in our research framework. A descriptive statistics table is provided for all efficiency variables. The measures include mean, median, standard deviation, skewness, kurtosis, minimum, and maximum values. The variables represent various aspects of financial efficiency, productivity changes, social efficiency, establishment characteristics, financial performance, and risk metrics.

Table 2 shows mean values of FETEC, FETFPC, SETEC, SETFPC, OETEC, and OETFPC suggest that, on average, there are positive changes in both technical efficiencies and total factor productivity efficiencies across financial and social dimensions.

Table 2: Descriptive Statistics of variables

Variables	Mean	Median	Std. Dev.	skewness	kurtosis	min	max
FETEC	0.926	1	0.54	6.504	1.894	0	9.44
FETFPC	0.964	0.979	0.703	6.616	1.474	0	10.156
SETEC	0.906	0.923	1.071	1.136	3.402	0	24.418
SETFPC	1.147	0.994	2.719	1.93	4.114	0	62.483
OETEC	0.89	1	0.354	-1.429	5.096	0	1.9
OETFPC	0.982	0.98	0.729	4.864	2.645	0	8.742
AGE	9.985	9	5.04	0.891	3.792	1	29
TA	112200000	11780517	42871.635	1.111	1.829	0	6762000000
ROA	0.618	1.63	7.183	-5.148	3.675	-63.54	12.02
ROE	4.481	3.16	19.664	8.475	2.195	-183.21	364.67
PAR30	3.12	0.2	18.054	5.673	3.391	0	373.18
PAR90	2.7	0.11	17.521	5.847	3.448	0	362.96
CAPTA	23.087	20	24.358	-2.986	4.637	-277.98	100
CASHTA	13.261	10.63	11.601	1.235	4.621	0	64.43

Note: FETEC=Financial Efficiency Technical Efficiency Change; FETFPC= Financial Efficiency Total Factor Productivity Change; SETEC=Social Efficiency Technical Efficiency Change; SETFPC= Social Efficiency Total Factor Productivity Change; OETEC= Overall Efficiency Technical Efficiency Change; OETFPC= Overall Efficiency Total Factor Productivity Change; Age= Number of years of Establishment; TA= Total Asset; ROA= Return on Assets; ROE= Return on Equity; PAR30= Portfolio at Risk at 30 Days; PAR90= Portfolio at Risk at 90 Days; CAPTA= Capital to Assets Ratio; CASHTA= Cash to total Assets ratio
Source: Authors own calculation through Stata using MIX Market Data

The relatively low standard deviations in these variables indicate a degree of consistency in efficiency changes. Age, representing the number of years of establishment, has a mean of 9.985 years, with a moderate standard deviation of 5.04, suggesting a moderate variability in the age distribution of the entities under consideration. Total Assets (TA) exhibit a wide range, with a mean value of 112,200,000 and a maximum value of 6,762,000,000. The skewness value of 1.111 indicates a slight positive skew, suggesting a distribution with a tail extending towards higher values. Return on Assets (ROA) and Return on Equity (ROE) exhibit means of 0.618 and 4.481, respectively. The negative skewness in ROA (-5.148) suggests a distribution with a tail extending towards lower values, while the positive skewness in ROE (8.475) suggests a distribution with a tail extending towards higher values.

Portfolio at Risk at 30 Days (PAR30) and Portfolio at Risk at 90 Days (PAR90) indicate potential risk exposures, with mean values of 3.12 and 2.7, respectively. Both variables exhibit positive skewness, indicating a right-skewed distribution with a tail extending towards higher values. The Capital to Assets Ratio (CAPTA) has a mean of 23.087, and its negative skewness (-2.986) suggests a left-skewed distribution with a tail extending towards lower values. Cash to total Assets ratio (CASHTA) has a mean of 13.261, with positive skewness (1.235), indicating a right-skewed

distribution. In summary, the descriptive statistics provide insights into the central tendency, variability, and skewness of the key financial and operational variables. These findings contribute to a better understanding of the characteristics and performance of the entities under study.

Table 3 displays the pairwise correlations among various dependent and independent variables. The correlation coefficients are presented in the upper triangle, while significance levels are denoted in the lower triangle.

Table 3: Pairwise Correlation analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) FETEC	1													
(2) FETFPC	0.800*	1												
(3) SETEC	0.185*	0.132*	1											
(4) SETFPC	0.089*	0.064	0.922*	1										
(5) OETEC	0.706**	0.574*	0.302*	0.150*	1									
(6) OETFPC	0.386**	0.426*	0.156*	0.298*	0.546*	1								
(7) AGE	0.121*	0.139*	0.086*	0.077	0.257*	0.202*	1							
(8) TA	0.041**	0.103*	0.078	0.069	0.121*	0.081	0.235*	1						
(9) ROA	0.023*	0.031	0.049	0.026	0.059	0.028	-0.026	0.016	1					
(10) DE	0.010*	0.011	-0.013	-0.006	0.002	-0.003	0.009	0.002	0.092*	1				
(11) PAR30	0.014	-0.005	0.006	-0.006	0.028	-0.008	0.079	0.058	-0.194*	-0.078	1			
(12) PAR90	0.012*	-0.005	0.005	-0.008	0.024	-0.008	0.076	0.05	-0.193*	-0.081	0.998*	1		
(13) CAPTA	0.029*	0.009	0	0.01	0.042	0.024	-0.131*	-0.186*	0.133*	-0.073	-0.075	-0.073	1	
(14) CASHTA	0.021**	0.007	-0.032	-0.048	0.054	-0.045	-0.064	0.336*	-0.187*	0.015	-0.026	-0.032	0.076	1

*** p<0.01, ** p<0.05, * p<0.1*

Note: DE= Debt to Equity Ratio and other variables description are given in Table 1 note.
Source: Authors own calculation through Stata from MIX Market Data

FETEC exhibits a strong positive correlation with Financial Efficiency Total Factor Productivity Change (FETFPC) (r = 0.800, p < 0.01) and a moderate positive correlation with Overall Efficiency Technical Efficiency Change (OETEC) (r = 0.706, p < 0.01). There is a weak positive correlation with Social Efficiency Technical Efficiency Change (SETEC) (r = 0.185, p < 0.1). FETFPC shows a moderate positive correlation with OETEC (r = 0.574, p < 0.01) and Overall Efficiency Total Factor Productivity Change (OETFPC) (r = 0.426, p < 0.01). SETFPC has a strong positive correlation with SETEC (r = 0.922, p < 0.01).

OETEC shows a strong positive correlation with FETEC (r = 0.706, p < 0.01) and a moderate positive correlation with FETFPC (r = 0.574, p < 0.01) and OETFPC (r = 0.546, p < 0.01). There is a weak positive correlation with SETEC (r = 0.302, p < 0.1). OETFPC exhibits a strong positive correlation with FETFPC (r = 0.426, p < 0.01), OETEC (r = 0.546, p < 0.01), and SETFPC (r = 0.998, p < 0.01). Age, Total Assets, Return on Assets (ROA), Debt-to-Equity Ratio (DE), PAR30, PAR90, Capital to Assets Ratio (CAPTA) and Cash to Total Assets Ratio (CASHTA) exhibits weak positive correlations with various efficiency and productivity variables, including FETEC, FETFPC, SETEC, SETFPC, OETEC, and OETFPC. In summary, the correlation analysis reveals significant associations among the studied variables.

Notably, there are strong positive correlations within the efficiency and productivity variables and certain weak associations with other financial, risk and operational metrics.

Table 4 examines efficiency differences among Indian Microfinance Institutions (MFIs) categorized by age using the Malmquist Index from 2011 to 2018. The analysis focuses on Financial Efficiency (Panel A), Social Efficiency (Panel B), and Overall Efficiency (Panel C), aiming to shed light on temporal variations in technical efficiency change (TEC) and total factor productivity change (TFPC) across different age groups of MFIs.

Table 4: Age wise Malmquist Index Summary of Indian MFIs (N=65)

year	Mature (N=37)		Young (N=21)		New (N=7)	
	TEC	**TFPC**	**TEC**	**TFPC**	**TEC**	**TFPC**
Panel A: Financial Efficiency						
2011	1.207	0.988	0.982	0.955	1.029	0.811
2012	0.997	1.117	0.942	0.928	0.709	0.623
2013	0.993	0.971	1.045	0.757	1.444	1.221
2014	0.879	1.172	1.029	1.356	1.015	1.132
2015	1.071	1.065	0.974	0.922	0.93	0.745
2016	1.036	0.865	1.016	1.053	1.052	1.115
2017	1.049	1.273	0.928	0.966	1.022	1.191
2018	0.867	0.819	1.094	0.901	1	0.816
mean	**1.007**	**1.024**	**1**	**0.968**	**1.009**	**0.931**
Panel B: Social Efficiency						
2011	0.954	1.037	0.998	0.444	1.01	0.945
2012	1.025	1.103	0.894	0.928	0.946	0.976
2013	0.934	1.126	1.101	0.957	0.986	1.039
2014	0.951	1.153	1.002	2.144	1.017	1.148
2015	1.042	0.965	0.944	0.359	0.874	1.072
2016	0.979	0.731	1.069	0.859	0.932	0.976
2017	0.875	1.639	0.968	1.639	0.774	0.842
2018	0.768	0.961	1.021	0.787	1.184	1.197
mean	**0.937**	**1.065**	**0.998**	**0.873**	**0.959**	**1.019**
Panel C: Overall Efficiency						
2011	1.041	0.932	1	0.699	0.979	0.834
2012	1.017	1.114	0.984	1.023	1.016	0.968
2013	0.979	1.029	1.016	0.795	0.987	0.945
2014	0.931	1.171	1	1.127	1	1.104
2015	1.046	0.984	0.974	0.698	0.979	1.114
2016	1.036	0.83	1.025	1.084	1.015	0.995
2017	1.024	1.491	1.001	1.257	1.028	1.019
2018	0.883	0.879	1	0.765	0.956	0.983
mean	**0.993**	**1.037**	**1**	**0.909**	**0.995**	**0.991**

Note: technical efficiency change (TEC), Total factor productivity change (TFPC) and N= no. of firms, New MFIs= 1 to 4 years of establishment, Young MFIs= 5 to 8 years of establishment & Mature MFIs= More than 8 years of

establishment.

Source: Author's own calculation through DEA based on the data from MIX Market

Panel A, B and C indicate variations in financial efficiency, social efficiency and overall efficiency respectively across the three age group MFIs. The Mature MFIs consistently exhibit higher TEC compared to young and New MFIs. Mature MFIs exhibit a mean TEC of 1.007, suggesting an enhancement in financial efficiency over time. Conversely, young and new MFIs display mixed trends, with fluctuations in TEC values. Notably, new MFIs demonstrate higher average TFPC, indicating a more substantial improvement in total factor productivity compared to Mature and Young MFIs.

Again, the mature MFIs experience stable and relatively higher social as well as overall efficiency over the years, with a social mean TFPC of 1.065 and a overall mean TFPC of 1.037. The results suggest that Mature MFIs maintain a more consistent level of efficiency compared to Young and New counterparts.

Figure 1 reveals Legal Status, Profit Orientation and Firm's Age wise variations in overall efficiency metrics among Indian MFIs.
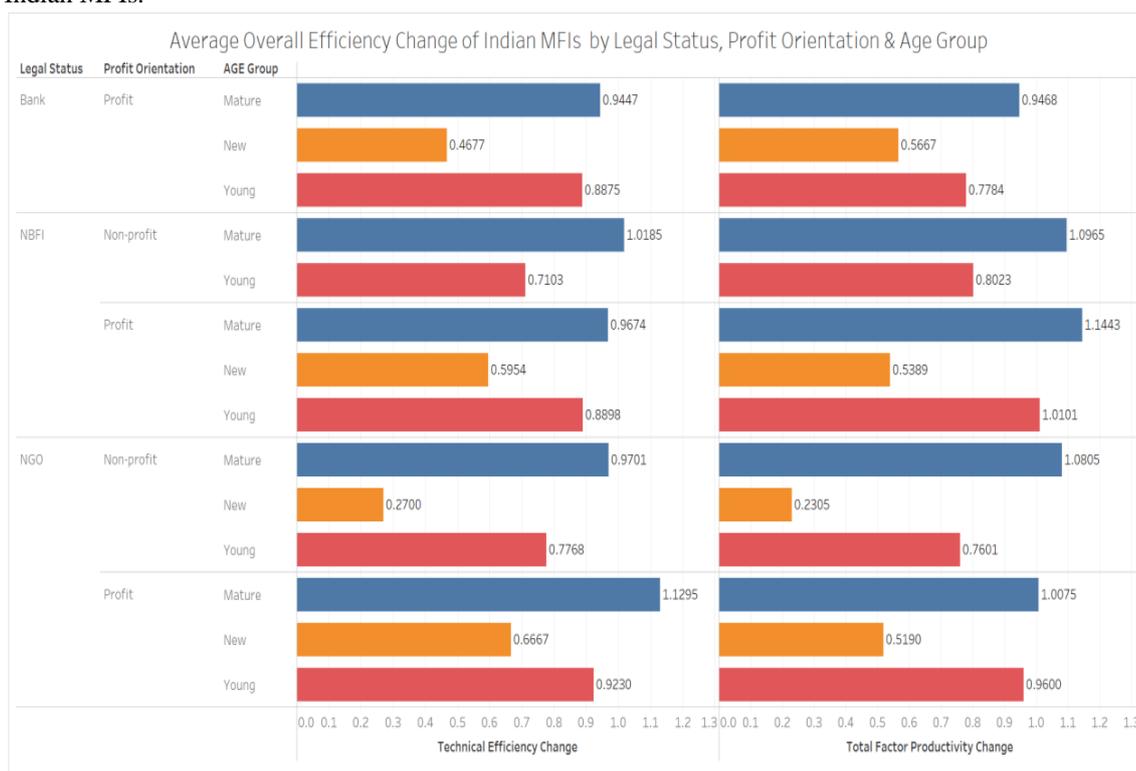
Figure 1: Average Overall Efficiency change of Indian MFIs by Legal Status, Profit Orientation and Firm's Age wise

Source: Author's Compilation through Tableau

Mature MFIs consistently demonstrate higher financial, social and overall efficiency, indicating their established operational stability. Young MFIs showcase a competitive edge in social efficiency, while new MFIs exhibit volatility across efficiency dimensions. Policymakers and stakeholders can use these insights to tailor interventions and support mechanisms based on the specific needs of MFIs at different stages of development.

Table 5 presents findings from regression analyses investigating the connections between Financial Efficiency Total Factor Productivity Change (FETFPC), Social Efficiency Total Factor Productivity Change (SETFPC), Overall Efficiency Total Factor Productivity Change (OETFPC), and specific independent variables. To ascertain the correlation between the efficiency of Microfinance Institutions (MFIs), the age of the firms, and their size, the subsequent regression model is applied to estimate Overall Efficiency measures.

$$OE = \alpha + \beta_1 TA + \beta_2 ROA + \beta_3 DER + \beta_4 PAR30 + \beta_5 CAR + \beta_6 CASHTA + \beta_7 Age\ (Dummy) + \beta_8 Size\ (Dummy) + \mu$$

Table 5: Fixed Effects Regression Analysis Results (Age wise)

Variables	FETFPC	SETFPC	OETFPC
TA	0.021**	0.044**	0.016***
	(1.98)	(2.40)	(2.69)
ROA	0.379***	0.488***	0.381***
	(2.77)	(5.23)	(4.08)
DE	0.058**	0.055*	0.242***
	(2.40)	(1.89)	(3.18)
PAR90	-0.127***	-0.175**	-0.136***
	(-2.72)	(-2.23)	(-2.81)
CAPTA	0.032***	-0.025**	0.037***
	(3.22)	(-2.00)	(5.26)
CASHTA	-0.240***	-0.104***	-0.307***
	(-3.71)	(-2.71)	(-4.96)
AGEDUM			
1. New Firm	Base	Base	Base
2. Young Firm	0.137***	0.124***	0.047***
	(3.40)	(6.29)	(2.72)
3. Mature Firm	0.114***	0.074***	0.045***
	(2.69)	(4.52)	(3.29)
YEAR FE	YES	YES	YES
Constant	-0.227***	-0.770***	-0.255***
	(-10.53)	(8.41)	(-5.63)
N	551	551	551
R^2	0.252	0.359	0.298
Adj. R^2	0.125	0.101	0.178

*Notes: t statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01;*

Source: Authors own calculation through Stata based on the data from MIX Market

The regression analyses conducted on financial and operational variables indicate several significant associations with efficiency or productivity changes. Total Assets (TA) shows a weak positive association with FETFPC and a positive correlation with SETFPC. TA has a weak positive association with OETFPC. Return on Assets (ROA) exhibits strong positive relationships with FETFPC, SETFPC, and OETFPC. Debt-to-Equity Ratio (DE) is positively associated with FETFPC and OETFPC. Portfolio at Risk at 90 Days (PAR90) displays significant negative correlations with FETFPC, SETFPC, and OETFPC. Capital to Assets Ratio (CAPTA) is positively associated with FETFPC and OETFPC, while significantly negatively related to SETFPC. Cash to Total Assets Ratio (CASHTA) is significantly negatively related to FETFPC, SETFPC, and OETFPC.

The analysis controls for the age of firms, categorizing them as New, Young, or Mature, and includes Year Fixed Effects (YEAR FE) to account for time-related variations. Young and Mature firms exhibit significant positive relationships with FETFPC, SETFPC and OETFPC. It means when the age of the firms is changed from New to Young and Young to Mature it seems to affect the efficiency of the firm positively. From the analysis, it is clear that the institution has specific variables i.e. Firm's Age (No. of years of establishment) affecting the efficiency and productivity of the MFIs. Mature firms are more efficient than the Young and New one. The models have moderate explanatory power, with R^2 values of 0.252 for FETFPC, 0.359 for SETFPC, and 0.298 for OETFPC. Adjusted R^2 values are 0.125, 0.101, and 0.178, respectively. Overall, the results highlight the importance of firm age, profitability, leverage, risk exposure, and financial performance indicators as determinants of productivity changes across different dimensions.

Table 6 presents the results of a fixed effects regression analysis examining the relationship between various financial and operational variables and three different dimensions of efficiency or productivity changes: FETFPC, SETFPC, and OETFPC. The analysis includes firm size categories and Year Fixed Effects (Year FE).

Table 6: Fixed Effects Regression Analysis Results (Size wise)

Variables	FETFPC	SETFPC	OETFPC

TA	0.0480***	0.184***	0.085**
	(2.85)	(2.83)	(2.48)
ROA	-0.036***	-0.0364**	-0.0271***
	(-2.83)	(-2.20)	(-2.58)
DE	-0.025**	0.019**	0.095**
	(-2.26)	(2.35)	(2.07)
PAR90	0.014***	-0.053**	0.091***
	(3.39)	(-2.13)	(2.85)
CAPTA	0.290***	0.084***	0.184***
	(6.19)	(4.58)	(5.13)
CASHTA	0.095***	0.013***	0.0424**
	(3.38)	(6.13)	(2.16)
Large	Base	Base	Base
Medium	-0.0687***	-0.123**	-0.130**
	(4.74)	(2.33)	(2.32)
Small	-0.127**	-0.224**	-0.040**
	(-2.10)	(2.48)	(2.33)
Year FE	YES	YES	YES
_cons	0.305***	0.578***	0.453***
	(4.35)	(3.16)	(6.49)
N	693	693	693
R^2	0.580	0.065	0.293
Adj.R^2	0.469	0.078	0.185

t statistics in parentheses; * p<0.10, ** p<0.05, *** p<0.01 (1.65 to 1.96*; 1.96 to 2.58**; 2.58>***)
Source: Authors own calculation through Stata based on the data from MIX Market

The coefficient estimates for Total Assets (TA) indicate statistically significant positive associations with FETFPC (b = 0.0480, t = 2.85, p < 0.01), SETFPC (b = 0.184, t = 2.83, p < 0.01), and OETFPC (b = 0.085, t = 2.48, p < 0.05). Return on Assets (ROA) demonstrates statistically significant negative relationships with FETFPC, SETFPC and OETFPC.

The Debt-to-Equity Ratio (DE) exhibits statistically significant negative associations with FETFPC and SETFPC, while showing a statistically significant positive association with OETFPC. Portfolio at Risk at 90 Days (PAR90) displays significant positive associations with FETFPC and OETFPC, but a statistically negative association with SETFPC. Capital to Assets Ratio (CAPTA) is positively associated with FETFPC, SETFPC, and OETFPC. Cash to Total Assets Ratio (CASHTA) displays positive associations with FETFPC and SETFPC and a significant negative association with OETFPC.

Additionally, the analysis considers firm size categories (Medium and Small) as explanatory variables keeping Large size MFIs as the base. Medium-sized firms show significant negative associations with FETFPC (b = -0.0687, t = -4.74, p < 0.01), SETFPC (b = -0.123, t = -2.33, p < 0.05), and OETFPC (b = -0.130, t = -2.32, p < 0.05). And small-sized firms exhibit significant negative associations with FETFPC (b = -0.127, t = -2.10, p < 0.05) and SETFPC (b = -0.224, t = -2.48, p < 0.05), and a statistically positive association with OETFPC (b = -0.040, t = -2.33, p < 0.05). It means when the size of a firm is changed from Large to Medium and Large to Small it seems to affect the efficiency of the firm negatively. From the analysis it is clear that the institution has specific variable i.e. A firm's Size (Total Assets) affects the efficiency and productivity of the MFIs. Large-sized firms are more efficient than than Medium and Small sized ones.

The inclusion of Year Fixed Effects (Year FE) is consistent across all models. The R^2 values indicate the proportion of variance explained by the models for FETFPC (0.280), SETFPC (0.065), and OETFPC (0.293). The Adjusted R^2 values, adjusting for the number of predictors, are 0.169, 0.078, and 0.185, respectively. In conclusion, the regression results suggest significant associations between the efficiency or productivity changes and various financial and operational variables, with firm size also playing a notable role. These findings provide valuable insights into the determinants of productivity changes in different dimensions within the analyzed datasets. The results suggest that Mature MFIs maintain a more consistent level of efficiency compared to Young and New counterparts.

5. FINDINGS

Based on the results of the MFIs efficiency analysis we got major findings that the Mature MFIs consistently exhibit higher financial as well as social Total Factor Productivity Change compared to Young and New MFIs. It means when the age of the firms is changed from New to Young and Young to Mature it seems to affect the efficiency of the firm positively. From the analysis, it is clear that the institution has specific variables i.e. Firm's Age (No. of years of establishment) affecting the efficiency and productivity of the MFIs. Medium-sized and Small-sized firms show significant negative associations with FETFPC, SETFPC and OETFPC.

It means when the size of a firm is changed from Large to Medium and Large to Small it seems to affect the efficiency of the firm negatively. From the analysis, it is clear that the institution has specific variable i.e. Firm's Size (Total Assets) affects the efficiency and productivity of the MFIs. Large sized firms are highly efficient than the Medium and Small sized ones.

6. CONCLUSION

This research underscores the necessity of conducting a systematic Size and Age wise performance evaluation of Indian MFIs. The insights generated from such an evaluation hold the potential to drive positive change, ensuring the continued growth and impact of microfinance in India, and contributing to the broader goals of financial inclusion and sustainable development. In conclusion, the age and size of microfinance institutions in India is a multifaceted determinant of their sustainable growth. It encompasses a range of factors, from experience and network effects to financial stability and adaptability, all of which contribute to the institution's ability to navigate challenges and achieve long-term impact.

Recognizing and leveraging the strengths associated with MFI age and size is essential for fostering a resilient and sustainable microfinance sector in India. Studying the age-wise efficiency and performance of MFIs in India is essential for fostering targeted and effective financial inclusion strategies. The insights gained from such analyses can contribute to the development of policies that address the unique needs of diverse age groups, ultimately promoting inclusive economic growth and social empowerment. As India continues to strive for comprehensive financial inclusion, this study serves as a crucial step towards optimizing the impact of microfinance interventions across different segments of the population.

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