Regulation and the Performance of Microfinance Institutions in India

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Abstract

This study examines the regulatory status and the performance of 183 Microfinance Institutions (MFIs) in India from 2004-05 to 2019-20, using the latest available unbalanced panel data set, compiled from the Mix market database published by World bank. MFIs are vital in providing financial services to underserved populations. In response to concerns over aggressive lending practices and borrower exploitation, the Reserve Bank of India (RBI) has implemented stringent guidelines on interest rates, loan sizes, and borrower eligibility. While these regulations are intended to promote financial inclusion and maintain the ethical and financial stability of the sector, their effects on MFIs' operational efficiency, financial sustainability, and outreach capabilities remain ambiguous. Using the Generalized Method of Moments (GMM) technique, this empirical study examines the relationship between regulatory interventions and MFI performance across three key models: operational self-sufficiency (OSS), the number of active borrowers (NAB), and average loan size per borrower. The findings indicate that RBI-regulated MFIs have higher OSS and breadth of outreach, as regulated MFIs demonstrating improved operational sustainability and a greater capacity to attract and retain borrowers. However, the study also highlights challenges, such as high loan default rates and reduced loan sizes, particularly in response to macroeconomic factors like inflation and economic growth.

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1. Introduction

Microfinance institutions (MFIs) have been playing a crucial role in developing countries like India, as they provide financial services to people who are often isolated from the mainstream banking system. These institutions have characteristics of both formal banking and non-banking financial intermediations, with diverse array of organizations such as Cooperatives, Credit Unions (CU), Non-Banking Financial Companies (NBFCs), Nongovernment Organizations (NGOs), Small Banks, etc. These MFIs provide banking services to the poor people. Initially, MFIs started as an institutional innovation in the credit market aimed at alleviation of poverty (Armendariz and Morduch, 2004; 2010; Olsen, 2017). However, later due to popularity and commercialisation of MFIs, the industry began to grow tremendously, which often led to crises in the industry (Rozas et al., 2015).

The microfinance industry in India has grown tremendously, both in gross loan portfolio and in the numbers of borrowers with higher total loan size, which indicates multiple loans per borrower. The microfinance industry in some regions in India reported higher default rates during 2005 and 2010, including high loan defaults in the Andhra Pradesh region (Mader, 2013; Sa-Dhan, 2016). This shed light into the need for a regulatory framework for the Indian microfinance industry. Thereafter, the regulation of MFIs in India has been evolved significantly, particularly following the Andhra Pradesh crisis of 2010, which highlighted issues of aggressive lending and borrower exploitation (Mader, 2013; De Quidt et al., 2012). These measures aimed to enhance institutional transparency and borrower protection by regulating loan size limits, capping interest rates, and setting eligibility criteria for borrowers based on household income (RBI, 2012).

Recent regulatory developments have focused on harmonizing guidelines across different types of lenders to ensure fair opportunities to various types of MFIs, and also helps to reduce regulatory arbitrage in the industry. Additionally, the RBI has emphasized the importance of financial inclusion, responsible lending practices, and the integration of digital lending platforms into the regulatory framework to address the sector's dynamic challenges (PwC, 2019).

These measures aim to balance the dual objectives of promoting financial access for the underserved and maintaining the sector's ethical and financial stability. Scholars and practitioners alike argue that without proper regulation, the sector's commercialization could undermine its mission to support the poor (Hudon & Sandberg, 2013). The need for enhanced regulation is underscored by the recurring ethical challenges faced by MFIs, which often arise from a conflict between profit motives and social objectives (Lauer & Staschen, 2013).

In this context, it is imperative to examine the evolving landscape of microfinance, the impacts of commercialization, and the necessity for regulatory reforms that can safeguard the sector's integrity and ensure that it continues to serve its targeted section of the underbanked people. The evolution and commercialization of MFIs in India, although aimed to enhance financial inclusion of underserved populations, have led to significant operational challenges, including high loan default rates and ethical concerns regarding aggressive lending practices.

The regulatory measures introduced by the RBI, particularly post-2010 Andhra Pradesh crisis, aimed to mitigate these issues by enforcing stringent guidelines on ceiling of interest rates, loan sizes, and borrower eligibility. However, the effect of these regulations on the overall performance and operational sustainability of MFIs remains ambiguous. There is a pressing need to empirically investigate whether these regulatory frameworks have effectively improved the operational efficiency, financial stability, and outreach capabilities of MFIs, or if they have constrained their growth and innovation.

This study aims to fill this gap by examining the relationship between regulatory interventions and the performance metrics of MFIs in India, thereby providing insights into the effectiveness of the current regulatory environment in balancing financial inclusion (as measured by breadth and depth of outreach to borrowers by MFIs) with ethical and sustainable lending operations of MFIs in India.

2. Evolution, Structure and Regulatory framework of the Indian Microfinance Sector

The foundation of microfinance in India lie in Self-Help Groups (SHGs), promoted by NGOs and development agencies in the 1970s and 1980s. Self Employed Women's Association (SEWA) in Gujarat is one of the first such organisations. During this period, various NGOs began to engage in microcredit lending, following the modern microfinance lending practices such as group lending and joint liability, enforcing peer and social pressures.

In India, the microfinance sector has evolved widely since the early 1990s, with the launching of NABARD's SHG-Bank linkage programme in 1992. This programme connected informal SHGs with formal banks in India, and banks began to lend SHGs under NABARD's refinance scheme, without regulatory supervision of the RBI (Muneer Babu, 2013). During the late 1990s, a diverse array of organizations such as Cooperatives, Credit Unions (CU), and Non-Banking Financial Companies (NBFC)-MFIs began to operate and scale up in the microfinance sector, meeting the large unmet demand.

The early 2000s witnessed the rise of MFIs as specialized entities providing individual and group-based microcredit. Among these, MFIs registered as NBFC-MFIs had access to commercial funds. Similarly, private investments and donor funding increased tremendously, leading to high growth in outreach, but also issues of over-lending and coercive recovery, culminating in the Andhra Pradesh crisis (2010). Over the years, the RBI has progressively refined its regulatory framework to ensure sectoral stability, customer protection, and sustainable growth, especially after the 2010 crisis. Before 2010, microfinance institutions (MFIs) largely operated under the legal status of NBFCs or Societies, Trusts, and Cooperatives. RBI had limited direct oversight except for NBFC-MFIs. There was absence of uniform standards, leading to over-lending.

In response to the 2010 crisis, the RBI's Malegam Committee Report (2011) introduced a clear regulatory framework for NBFC-MFIs as a distinct category, defining qualifying loans, borrower

income limits, interest caps and margin, and fair practices, and mandating transparency in loan pricing and loan recovery. RBI also took steps to prohibit coercive recovery and directed requirement of grievance redressal systems. These steps created prudential and consumer protection architecture.

This formalized supervision brought stability and accountability. Simultaneously, large MFIs transformed into Small Finance Banks (SFBs) (e.g., Bandan, Ujjivan, Equitas, ESAF), further integrating microfinance with mainstream banking. However, these steps also have cost implications on MFIs, as many steps also involve additional cost outlay to comply with the above regulatory and supervisory measures (RBI, 2022).

The RBI's 2022 Regulatory Framework for Microfinance Loans harmonized rules across all lenders such as banks, NBFCs, SFBs, and cooperatives. This removed interest rate caps, defined microfinance loans by household income (less than or equal to ₹3 lakhs annually), and emphasized transparency, household indebtedness limits, and responsible lending. The sector now integrates digital platforms, credit bureaus, and fintech-based micro-lending models for efficiency and scale. However, Mix Market data on the performance measures and MFI specific variables used in our current analysis have not been available since 2020 for inclusion in the empirical analysis (NABARD, 2023; RBI, 2022).

3. Review of Literature

Regulation, as defined by Baldwin and Cave (1999) and Chavez and Gonzalez (1992), refers to the binding rules governing the behaviour of organizations, which influence the actions of executives, managers, and stakeholders. The rules are set by government or RBI, other agencies such as NABARD, and self-imposed by the industry, which limit their activities and operations of financial institutions (Llewellyn, 1986). Regulation encompasses legal and judicial processes that aim to ensure secure transactions, enforce contracts, manage bankruptcy procedures, address tax and accounting standards, and grant permission to undertake financial operations (Armendariz & Labie, 2011).

The RBI enforces prudential regulation on public deposit-accepting NBFC-MFIs, which include reserve and other requirements to ensure the soundness and stability of financial institutions (Christen et al., 2003; Ledgerwood & White, 2006). These measures aim to ensure liquidity and solvency, thus protecting the financial system. NBFC-MFIs and Sec-25 NBFC-MFIs have to follow non-prudential norms of the RBI, whereas cooperative bank-MFIs and rural bank-MFIs have to follow the banking regulatory requirements. However, NGO-MFIs and Credit Union (CU)-MFIs are still unregulated.

Non-prudential regulation includes consumer protection measures such as promoting transparency, ensuring accountability, disclosing interest rates, preventing financial crimes, establishing credit information services, securing transactions, setting interest rate limits, and addressing accounting matters (Christen et al., 2003; Rosengard, 2011). These measures aim to create

an accountable and transparent industry with fair market practices, ensuring client protection and safeguarding against abusive practices of financial institutions.

Financial organizations face various risks, including operational, managerial, governance, political, credit, industry, and deposit risks (Berenbach & Churchill, 1997). Credit risk arises from non-repayment of loans, but MFIs can mitigate this by assessing the creditworthiness of borrowers. Industry risks due to high growth and competition in the industry, and macroeconomic and microeconomic failures, are also significant concerns (Rosengard, 2011). Identifying and managing these risks are crucial for financial organizations (Davis & Harper, 1991).

Deposit risk occurs when depositors massively withdraw funds due to panic or loss of confidence, affecting the liquidity and solvency of financial organisations, and potentially collapsing the financial system (Diamond & Dybvig, 1983; Heffernan, 1996). However, this risk is low in Indian MFIs, as most are non-deposit-taking NBFCs.

Harlow and Rawlings (1997) argue that regulation restricts behaviour and prevents undesirable activities. This is evident in Indian MFIs, where regulatory status influences financial behaviour, operational freedom, and decision-making. The regulation of MFIs impacts their financial behaviour, freedom of operation, and decision-making power, which often hinders innovation to reduce risks. A robust regulatory framework is vital for protecting and promoting stakeholders' interests in the Indian microfinance industry. Regulation ensures the safety and soundness of financial institutions, essential for financial system stability. Disclosure norms, information dissemination, and ensuring product quality and quantity are crucial for customer protection, though the cost and design of mandatory disclosure are debated (Moloney, 2010).

To assess the impact of regulation on Microfinance Institutions (MFIs), it is essential to clarify the key performance indicators frequently used in the microfinance literature. Return on Assets (ROA) measures an institution's profitability by evaluating how efficiently its assets are used to generate income. Operational Self-Sufficiency (OSS) reflects the ability of an MFI to cover its operational costs including administrative expenses, loan-loss provisions, and financial costs through its operating revenues. Financial Self-Sufficiency (FSS) extends this concept further by assessing whether an institution can cover operational and financial costs after adjusting for subsidies, inflation, and the cost of capital. These indicators form the basis for evaluating the financial sustainability and outreach of MFIs. An operative regulatory framework is crucial to ensure effective financial operations (Armendariz & Morduch, 2004). Woller and Woodworth (2001) highlight the importance of stable growth, low inflation, and fiscal discipline for effective financial intermediation. Hartarska (2005) found that regulated MFIs tend to have lower ROA and do not necessarily achieve broader outreach.

Cull et al. (2009a; 2011) identified a negative relationship between supervisory (regulatory) variables and the Financial Self-Sufficiency (FSS) ratio. Their findings show that regular supervision is positively associated with average loan size but negatively associated with lending to women. In the microfinance context, this implies that supervised MFIs may emphasize "depth of outreach" serving

fewer but relatively better-off or larger-loan clients rather than "breadth of outreach," which refers to reaching a larger number of poorer or more marginalized borrowers. Cull et al. (2011) further note that profit-oriented MFIs tend to comply with supervisory requirements by reducing services to costlier-to-serve populations, potentially limiting their inclusiveness.

Furthermore, Cull et al. (2009b) found that onsite supervision is positively associated with the average loan size per borrower, while higher capital–asset and labour–asset ratios tend to reduce MFI profitability. In this context, these ratios refer to MFI-level indicators, not borrower-level characteristics. The **capital–asset ratio** measures the proportion of an institution's assets financed through equity rather than debt, while the **labour–asset ratio** reflects the intensity of staffing requirements relative to total assets. These ratios are relevant because they capture aspects of institutional structure and cost-efficiency. A higher capital–asset ratio may indicate conservative financing and lower leverage, which can limit an MFI's ability to scale its loan portfolio. Similarly, a higher labour–asset ratio usually reflects higher operational and administrative costs, important in microfinance, which is inherently labour-intensive due to small loan sizes and frequent interactions with clients. The negative association with profitability suggests that MFIs with more costly organizational structures face tighter margins and reduced financial performance. Cull et al. (2011) extended this analysis and reported that regulated and non-regulated MFIs exhibit broadly similar levels of profitability, despite the higher regulatory compliance costs borne by regulated MFIs. They also observed that regulation can have a positive effect on MFI outreach, indicating that regulatory frameworks may strengthen institutional performance in terms of client coverage.

Mersland and Strøm (2009) report comparable performance outcomes between non-profit and shareholder-owned MFIs, suggesting that ownership type alone does not determine institutional efficiency. Crabb (2008) finds that heavy government intervention tends to reduce the Operational Self-Sufficiency (OSS) of MFIs, and that well-developed institutional environments characterized by robust legal systems, strict regulatory procedures, and formal administrative requirements, can increase operational expenses, thereby negatively affecting MFI performance. The Centre for the Study of Financial Innovation (CSFI, 2009) emphasizes that regulation, management quality, and good governance are key drivers of MFI growth, while investors often view inappropriate or poorly designed regulatory frameworks as major risk factors. Vanroose and D'Espallier (2009) show that MFIs tend to perform better, and serve more active borrowers with larger loan portfolios, in countries with less developed formal financial sectors. Their findings further indicate that inflation undermines both profitability and outreach, whereas lower interest rates have a positive effect on both dimensions.

Studies in the Indian context discuss the regulatory framework of microfinance industries in India (M-CRIL, 2005; Sa-Dhan, 2006; Sane and Thomas, 2012; 2013; Shankar and Asher, 2010; Tripathi and Radcliffe, 2006). RBI's Malegam committee recommended a regulatory framework for Indian microfinance sector, with an interest rate ceiling with a margin cap of 10% to make interest reasonable and affordable for the borrowers, and emphasized the need for transparency and disclosure norms (RBI, 2011; 2022).

The above studies and reports have proposed various regulatory frameworks but have not provided rigorous empirical evidence on the relationship between regulatory status and the performance of MFIs in the Indian context. However, Muneer Babu (2013) offers important insights by demonstrating that regulatory status enhances the number of active borrowers in India. His findings also show that regulation reduces the average loan size, which is consistent with our current results. At the same time, he reports that regulatory status lowers the OSS of MFIs. This decline in OSS was largely due to the relatively **small operational scale of Indian MFIs**, which made the **per-unit cost of regulatory compliance disproportionately high.**

Our research overlaps with studies of Cull et al. (2009a; 2011), Hartarska and Nadolnyak (2007), and Mersland and Strom (2009). This study adds to the existing literature by empirically examining how RBI regulatory frameworks impact the performance of MFIs in India. While previous research has extensively explored the theoretical aspects and implications of regulation, there is a notable lack of empirical evidence on how these regulations affect the outreach capabilities, operational efficiency, and financial stability of MFIs.

This empirical study aims to reveal whether the current regulatory practices have effectively improved the sector's stability and inclusivity, or inadvertently hindered growth and innovation. It will also provide a deeper understanding of the regulatory environment's role in balancing financial inclusion with ethical and sustainable lending practices in the Indian microfinance sector.

4. Methodology

4.1 Data Source

This study utilizes an unbalanced panel data set comprising 183 Microfinance Institutions (MFIs) from 2004-05 to 2019-20. The data was obtained from MIX Market (2024), along with reports from credit rating agencies such as CRISIL and M-CRIL, as well as the websites of various Indian MFIs. These MFIs operate across various states in India and hold a substantial share of the Indian microfinance industry. Although the primary criticism against MIX Market data is that it is self-reported and may be biased, it remains a major source of MFI data globally and has been widely used in previous research (Ahlin and Lin, 2006; Ahlin et al., 2011; Crabb, 2008; Cull et al., 2007; Cull et al., 2009a; 2009b;2011; Hartarska and Nadolnyak, 2007; Mersland and Strom, 2009).

4.2 Models

Given the limitations of static panel data models, this study employs the Generalized Method of Moments (GMM) technique for several reasons. Firstly, the model includes lagged dependent variables, making the GMM technique suitable for handling such dynamics. Secondly, unobserved factors such as a manager's ability and willingness to work for an MFI are likely to be correlated with explanatory variables like regulatory status, indicating the presence of endogeneity. Thirdly, the panel dataset has a short time dimension and a large cross-section dimension. Fourthly, the model accounts

for fixed individual effects. Lastly, the detection of heteroscedasticity and auto-correlation necessitates a robust estimation method.

The GMM method overcomes the methodological difficulties associated with static panel data models by providing consistent, unbiased, and efficient estimators under these conditions. This approach enables a more accurate analysis of the impact of regulation on the performance of MFIs in India. We also did a robustness check by estimating static panel data methods, such as Fixed Effect Model (FEM) and Random Effect Model (REM). Our results confirm that these models are not appropriate, as they provide biased and inconsistent results (see Appendix A3).

4.3 The GMM Estimation Procedure

We find GMM estimator $\hat{\beta}$ by using a weighting matrix (W_N) to find efficient estimators by minimizing the objective function.

$$Q_N(\beta) = [\frac{1}{N}\sum_{i=1}^{N} Z_i(y_i - X_i^{'}\beta)]^{'} W_N [\frac{1}{N}\sum_{i=1}^{N} Z_i(y_i - X_i^{'}\beta)]. \qquad (3)$$

where, Z_i is the matrix of instruments, X_i is the explanatory variables, and y_i is the response variable.

4.4 Variables Used in the Study

The primary aim of our paper is to empirically verify the impact of regulation on the performance of MFIs in India. Additionally, we incorporate firm and macro-level variables that influence MFI performance. The variable of interest is the regulatory status, represented by a categorical variable. Table 1 provides the details of variables used in this study, and Table 2 shows the summary statistics pertaining to the explanatory variables.

Table 1: Variables Employed in the Study

Variable	Definition
Dependent variable	
OSS	$OSS = \dfrac{\text{Operational Revenue}}{(\text{Financial Expense} + \text{Loan Loss Provision Expense} + \text{Operational Expense})}$
Log Number of Active Borrowers (NAB)	This measures logarithm of breadth of outreach (total number of borrowers who have currently drawn loans).
Log Average Loan Size	This measures depth of outreach (logarithm of loan amount per borrower)
Variable of interest	
Regulatory Status	Measured by a dummy variable, taking a value of 1 if the MFI is regulated by the RBI or by any cooperative banking act, and otherwise 0.
Firm level Covariates	
Log Assets	This includes logarithm of all financial assets and non-financial assets of the MFI.

Log Capital	This includes logarithm of funds provided by owners, retained earnings and reserves of the MFI.
Log Labor	This is the logarithm of the number of staff in the MFI.
PAR	This measures the amount of loan on default for at least 30 days.
Log Age	This is logarithm of total number of years of operation of the MFI.
	Macroeconomic variables
Growth Rate of GDP	Rate of growth of GDP in India
Inflation	This measures level of Inflation in the economy, measured by WPI.
Log PCI	This is measured by the logarithm of per capita GDP(at 2004-05 price level).

Table 2: Summary Descriptive Statistics of Explanatory Variables

Variable	Observations	Mean/Percent	Std. Dev.	Min	Max
		Variable of interest			
Regulation	1327	60.28%	0.489	0	1
		Firm level Covariates			
Log Assets	1328	15.79	2.26	4.77	22.81
Log Capital	1288	13.98	2.51	1.38	21.20
Log Labour	1227	5.34	1.67	0.69	10.03
PAR	1089	5.34%	28.23	0	71.14
Log Age	1330	2.38	0.658	1	3.78
		Macroeconomic variables			
Growth Rate of GDP	N.A[*]	6.76	1.53	3.08	8.49
Inflation	N.A	6.97	2.76	3.32	11.98
Log PCI	N.A	1415[+]	397.41	624.10	2050.16

Source: Our calculation from Mix Market data (2024)

* N.A- Not Applicable. + Calculated in US dollar.

5. Results and Discussion

The analysis was conducted using three empirical models.

- o In OSS Model I (see Table 3), we examine the ability of MFI to cover its expenses from its revenue, which is a measure of financial performance of an MFI.

- o In NAB Model II (see Table 4) and Loan Size Model III (see Table 5), we assess the ability of MFI to reach number of borrowers and depth of reaching them, which are the social performance of an MFI.

The instruments used in this study are valid (as shown by the Sargan Test, in Table A1) and we also confirmed the first-order autocorrelation in the first differenced errors, which follows our theoretical expectations.

5.1 The OSS (Model I)

Table 3 shows the regulatory status positively impacts the OSS of the Indian MFIs. This finding contrasts with earlier studies of Hartarska (2005), Hartarska and Nadolnyak (2007), and Cull et al. (2009a; 2011). While regulated MFIs bear compliance costs, such as hiring skilled labour for maintaining accounts, audits, and reports, the regulation provides benefits, which exceed the compliance costs, as regulation helps MFIs to mobilize funds from markets, gain investor's confidence, and enhance their scale of operation and revenue. Regulation provides consumer protection and fraud prevention, which can enhance operational sustainability. This contrasts with arguments that the cost of compliance may outweigh regulatory benefits (Cull et al., 2009a; 2011). Indirect benefits of regulation include ensuring the safety, financial liquidity, and soundness of MFIs (Hartarska and Nadolnyak, 2007).

We found a positive relationship between assets of an MFI and OSS, as large firms explore economies of scale, reducing average operational costs and increase OSS. Additionally, larger MFIs have market power, competitive advantages, higher number of borrowers, and they can mobilize capital at lower costs, all of which positively influence their OSS. Sufficient capital to support assets also improves operational sustainability by enhancing investor confidence. However, a high portfolio at risk (PAR) adversely affects OSS by reducing operational revenue.

We found older MFIs have lower OSS, indicating that as MFIs mature, operational costs likely increase, reducing OSS. We also found that economic growth positively influences OSS, as found by Ahlin and Lin (2006), Henley (2005), and Cull et al. (2009a). There is no reverse causality, as MFIs are too small to influence economic growth in Indian economy. However, finance does affect economic growth, a prominent argument for mainstream financial institutions (Levine, 2005).

Higher rate of inflation reduces the sustainability of Indian MFIs, our result is similar to Ahlin and Lin (2006), Hartarska (2005), and Cull et al. (2009a). Inflation increases the cost of funds to MFIs, since banks are likely to charge higher interest rates during inflationary periods, and thereby negatively affecting the OSS of MFIs in India. Indian MFIs are heavily depend on loans from Indian commercial banks. During inflationary periods, poor borrowers face tighter budget constraints, leading to higher default risks for MFIs, which may reduce the scale of their operations and generate lower revenues.

Higher per capita income can lower the OSS of Indian MFIs, as increased economic activity of people can reduce OSS, since higher incomes may lead poor borrowers to borrow less. Our finding indicates that the negative influence of rising incomes on borrowing outweighs the positive effect of increased economic activity on OSS in the Indian context.

Our robustness check of the result by estimating static panel data methods, such as FEM and REM have been provided in Appendix Table A3, that shows the FE model could not be used in the study, as regulatory status is time-invariant, thus REM estimators provide biased and inconsistent results, due to the correlation between explanatory variables like regulatory status and unobserved factors such as a managerial skills and willingness to work in the regulated MFI indicating the presence of endogeneity, which is also confirmed by Cull et al. (2009a; 2011).

Table 3: OSS Model of Indian MFIs

Variables	Two-Step Difference GMM		Two-Step System GMM	
	Coefficient and Std. Error	Coefficient with WC Robust Std. Error	Coefficient and Std. Error	Coefficient with WC Robust Std. Error
Regulation	5.58***(1.042)	5.58(6.609)	5.947***(0.739)	5.95(9.840)
Lagged OSS	0.22***(0.005)	0.22***(0.063)	0.263***(0.004)	0.26***(0.093)
Log Assets	5.97***(0.213)	5.97 (3.870)	3.385***(0.212)	3.39 (3.932)
Log Capital	6.42***(0.184)	6.42***(2.290)	6.489***(0.140)	6.49***(2.568)
Log Labour	3.03***(0.248)	3.03 (4.613)	-2.70***(0.292)	-2.70 (4.963)
Portfolio at Risk	-0.02***(0.003)	-0.02(0.020)	-0.04***(0.003)	-0.04 (0.034)
Log Age	-14.32***(0.964)	-14.32**(7.286)	8.26***(0.530)	8.68 (12.362)
Growth Rate (GDP)	0.49***(0.052)	0.49 (0.580)	0.87***(0.028)	0.66 (0.547)
Inflation	-1.03***(0.037)	-1.03*(0.570)	-0.89***(0.015)	-0.89 (0.570)
Log PCI	-0.03***(0.001)	-0.03**(0.014)	-0.03***(0.001)	-0.03 (0.020)
Constant	-30.59***(2.736)	-30.59 (36.356)	-3.08***(2.842)	-23.08 (33.711)
Observation = 693 and 917. Number of Groups = 152 and 167.				
Wald chi² (10)= 286631.4*** and 57.02***			Wald chi² (10)=1210000*** and 50.47***	
No. of Instruments =115 and 129				

Source: Our estimation, using Mix market Data (2024).

*,**, and*** shows significance level at 10%, 5% and 1% level.

Note: Standard error (SE) has been provided in parenthesis.

5.2 The NAB (Model II)

Table 4 shows that previous year active borrowers support the MFI to raise the number of clients in the present year, as they inform the potential borrowers in their neighbourhood regarding provision of loan from the MFI. An important finding of our study is the regulation of an MFI raise number of active borrowers in the MFI, as non-prudential norms ensure protection of consumer's interests and thereby helps to gain customers' 'trust', which enhances the number of active borrowers in MFIs in India.

We obtained sign of coefficient similar to the result of Hartarska and Nadolnyak (2007), whose result is however statistically insignificant. The study found a negative effect of the age of an MFI on its breadth of outreach. Our result shows that higher amount of assets, capital, and higher number of staff of MFIs helps them to reach more borrowers. This supports the fact that more staff are essential for mobilizing lending groups and reaching borrowers.

The growth rate of GDP in the Indian economy positively influences the breadth of outreach of MFIs. An increase in per capita income can also increase the number of active borrowers, indicating higher credit requirements among borrowers. Conversely, a higher inflation reduces the number of active borrowers of Indian MFIs.

Table 4: Number of Active Borrowers Model of Indian MFIs

Variable	Two-Step Difference GMM		Two-Step System GMM	
	Coefficient and Std. Error	Coefficient with WC Robust Std. Error	Coefficient and Std. Error	Coefficient with WC Robust Std. Error
Lagged NAB	0.08***(0.002)	0.08 (0.063)	0.09***(0.002)	0.09 (0.063)
Regulation	0.07**(0.028)	0.07(0.087)	0.20***(0.025)	0.20 (0.137)
Log Age	-0.07**(0.029)	-0.06 (0.131)	-0.01 (0.013)	-0.01 (0.129)
Log Assets	0.47***(0.006)	0.47***(0.082)	0.45***(0.003)	0.45***(0.083)
Log Capital	0.01***(0.002)	0.01 (0.029)	-0.02***(0.002)	-0.02 (0.030)
Log Labour	0.58***(0.009)	0.58***(0.172)	0.59***0.004	0.59***(0.150)
Portfolio at Risk	0.001 (0.0003)	0.001(0.0002)	0.001***(0.000)	0.001(0.000)
Growth Rate(GDP)	0.02***(0.001)	0.02***(0.007)	0.03***(0.001)	0.03***(0.007)
Inflation	-0.01***(0.001)	-0.01(0.008)	-0.01***(0.001)	-0.01 (0.009)
Log PCI	0.001***(0.0002)	0.001***(0.000)	0.001***(0.000)	0.001***(0.000)
Constant	-0.15 (0.101)	-0.15 (0.788)	0.03 (0.056)	0.03 (0.755)
	Wald chi² (10) 268990*** and 1218.46***		Wald chi² (10) 1080000***and 1305.71***	

Source: Our estimation, using Mix market Data (2024).

*,**, and*** shows significance level at 10%, 5% and 1% level.
Note: Standard error (SE) has been provided in the parenthesis.

5.3 The Loan Size (Model III)

Table 5 provides the results of the loan size model, indicating that borrowers with a higher loan amount in the previous year tend to borrow a higher amount of loan in the present year. The average loan size per borrower is higher in the regulated MFIs compared to unregulated MFIs. This suggests that despite the constraints imposed by regulators to reduce credit risk, regulated MFIs still manage to offer larger loans.

This finding aligns with Cull et al. (2009a), who found a positive association between regulation and average loan size per borrower, although Cull's study found this relationship to be statistically insignificant. Similarly, Mersland and Strom (2009) found a statistically insignificant positive relationship between regulation and average loan size per borrower.

The positive impact of regulation on the performance of MFIs is further underscored by the influence of MFI assets on providing higher amounts of average loans per borrower. Our findings are consistent with Mersland and Strom (2009), showing a positive correlation between assets and average loan size per borrower. However, the study also reveals that higher MFI labour and capital are associated with lower average loan sizes per borrower. This suggests that while larger and better-capitalized MFIs can offer more significant loans, the efficiency of loan disbursement may decrease with increased labour and capital costs.

Moreover, our study indicates a negative relationship between economic growth and average loan size per borrower, as well as between inflation rates and average loan sizes. An increase in per capita

income also appears to reduce the average loan size per borrower. These findings highlight the complex interplay between macroeconomic factors and MFI performance, suggesting that while economic growth and rising incomes can lead to increased borrowing capacity, they may also reduce the average loan sizes as borrowers transition to more substantial, formal financial services.

Table 5 : Loan Size Model of Indian MFIs

Variables	Two-Step Difference GMM		Two-Step System GMM	
	Coefficient and Std. Error	Coefficient with WC Robust Std. Error	Coefficient and Std. Error	Coefficient with WC Robust Std. Error
Lagged Loan Size	0.42***(0.002)	0.42**(0.103)	0.85***(0.004)	0.85***(0.052)
Regulation	12.36***(2.136)	12.36(14.011)	20.52***(1.217)	20.52(29.127)
Log Assets	42.83***(0.437)	42.83***(6.654)	34.23***(0.509)	34.23***(8.769)
Log Capital	-4.52***(0.683)	-4.52(4.259)	-5.61***(0.641)	-5.61(5.309)
Log Labour	-47.01***(0.883)	-47.01***(17.742)	-41.89***(0.751)	-41.89***(16.111)
Log Age	3.32(4.215)	3.32(20.365)	36.65***(2.095)	36.65(27.856)
Portfolio at Risk	-0.01(0.003)	-0.01(0.050)	0.05***(0.002)	0.05(0.041)
Growth Rate(GDP)	-0.62***(0.136)	-0.62(1.614)	2.13***(0.087)	2.13(1.552)
Inflation	-3.09***(0.101)	-3.09***(1.129)	-0.65***(0.087)	-0.65(1.831)
Log PCI	0.06***(0.003)	0.06**(0.026)	0.01***(0.002)	0.01(0.019)
Constant	-339.49***(7.393)	-339.48***(63.908)	-319.95***(5.988)	-319.95***(79.767)
	Wald chi² (10)= 753228.03*** and 214.33***		Wald chi² (10)=1900000*** and 790.32***	
	No. of Instruments= 115 and 129			

Source: Our estimation, using Mix market Data (2024).
*,**, and*** shows significance level at 10%, 5% and 1% level.
   Note: Standard error (SE) has been provided in the parenthesis.

6. Conclusion

This study investigates the impact of Reserve Bank of India (RBI) regulations on the performance of Microfinance Institutions (MFIs) in India. The establishment of the Non-Banking Financial Company-Microfinance Institution (NBFC-MFI) category in 2011 marked a pivotal shift aimed at mitigating issues such as aggressive lending and borrower exploitation. These regulations were designed to ensure affordable rate of interest, prevent multiple lending, enhance borrower protection, and ensure institutional transparency.

Our analysis addresses the dynamic panel data characteristics and endogeneity issues. Findings from three empirical models—Operational Self-Sufficiency (OSS), Number of Active Borrowers (NAB), and Average Loan Size per Borrower—reveal the multifaceted effects of RBI regulations on MFI performance. The results show that regulatory status positively impacts OSS, with larger MFIs benefiting from economies of scale and market power, although high portfolio at risk (PAR) and

inflation negatively affect OSS. Additionally, regulations enhance the breadth of outreach by increasing the NAB, demonstrating the trust gained through enhanced consumer protection.

The study underscores the dual objectives of RBI regulations: promoting financial access for the underserved while maintaining ethical and financial stability within the microfinance sector. The positive impact of regulations on OSS and NAB highlights the crucial role of regulatory frameworks in improving MFI performance, as it helps them to increase their revenue, to gain customer trust and thereby increase number of active borrowers. Furthermore, regulation reduced average loan size of the MFI, which ensure reduction of PAR and also reduces multiple lending, which was the main reasons of the microfinance crisis in 2010.

Our study recommends a balanced regulatory approach for Indian MFIs that ensures consumer protection and ethical business practices without imposing excessive compliance costs detrimental to operational sustainability. Essential non-prudential norms, such as transparent disclosure of product features and financial service terms, are critical to empower financially literate choices among predominantly financially illiterate MFI customers.

Concurrently, regulatory frameworks like minimum capital requirements and capital adequacy ratios are pivotal to safeguard investor interests amid inherent MFI risks, though they should not stifle innovation or operational flexibility. Delegating risk assessment to experienced funders like major commercial banks, given their substantial role in MFI funding, could enhance risk management and operational efficiency. Facilitating asset mobilization, aligned with MFIs' social mission of financial inclusion, remains imperative, particularly in light of recent RBI restrictions on savings mobilization by MFIs. Ensuring stable macroeconomic conditions further supports MFI performance, underscoring the regulator's role in fostering an enabling environment while balancing the regulatory burden to sustain the industry's growth and integrity.

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Appendix

Table A1 : Sargan Test

Models	Test	Two-Step Difference GMM	Two-Step System-GMM
OSS Model	Chi^2	104.730	121.589
NAB Model	Chi^2	111.188	118.42
Average Loan Size Model	Chi^2	105.99	124.42

Source: Calculated by using Mix Market Data, 2024.

Table A2 : Auto Correlation Test

Models	Test (z)	Two-Step Difference GMM	Two-Step System-GMM
OSS Model	First order	-2.109**	-2.142**
	Second order	0.351	0.409
NAB Model	First order	-2.257**	-2.071**
	Second order	0.1901	0.076
Average Loan Size Model	First order	-3.384***	-3.306***
	Second order	0.591	0.337

Source: Calculated by using Mix Market Data, 2024.

*,**, and*** shows significance level at 10%, 5% and 1% level.

Table A3: Robustness Check of the Result (Fixed Effect Model, Random Effect Model and Hausman Test)

	Fixed Effect Model			Random Effect Model		
Variables	Coefficient and Standard Error			Coefficient and Standard Error		
	OSS Model	NAB Model	Loan size Model	OSS Model	NAB Model	Loan size Model
Regulatory Status				-6.961 (3.135)	0.052 (0.062)	-11.493 (14.757)
Log Assets	3.830 (1.659)	0.586 (0.024)	17.876 (4.691)	3.480 (1.360)	0.567 (0.023)	23.998 (4.666)
Log Capital	5.628 (1.152)	0.001 (0.017)	-2.01 (3.244)	4.585 (0.954)	-0.021(0.016)	0.784 (3.300)
Log Labour	-0.751 (1.817)	0.439 (0.027)	-8.255 (5.106)	-2.533 (1.407)	0.481 (0.024)	-18.004 (5.042)
Portfolio at Risk	-0.080 (0.028)	0.001 (0.001)	-0.109 (0.080)	-0.093 (0.026)	0.000 (0.000)	-0.091 (0.082)
Log Age	3.261 (4.456)	0.136 (0.066)	-4.654 (12.596)	4.557 (2.211)	0.050 (0.043)	1.339 (10.374)
Growth Rate(GDP)	0.182 (0.491)	0.0190 (0.007)	-3.551 (1.401)	0.176 (0.455)	0.0187 (0.007)	-3.696 (1.432)
Rate of Inflation	-0.510 (0.336)	0.003 (0.005)	-2.864 (0.947)	-0.192 (0.297)	0.003 (0.004)	-2.936 (0.958)
Log PCI	-0.017 (0.005)	-0.001 (0.001)	0.090 (0.015)	-0.009 (0.003)	-0.001 (0.001)	0.074 (0.013)
Constant	-2.062 (16.04)	-1.069 (0.241)	-101.99 (45.356)	14.293 (12.938)	-0.717 (0.224)	-161.666 (45.669)
OSS FE Model Sigma u= 39.00, Sigma-e= 23.12 and rho = 0.739. OSS RE Model Sigma u=17.39, Sigma-e=21.61 and rho = 0.393	NAB FE Model: Sigma u= 0.55, Sigma-e= 0.35 and rho = 0.715. NAB RE Model Sigma u=0.42, Sigma-e= 0.35 and rho = 0.597		Loan Size FE Model Sigma u= 158.37, Sigma-e= 65.85 and rho = 0.852. Loan Size RE Model Sigma u= 133.62, Sigma-e= 65.96 and rho = 0.804			
OSS Model: F (8850) =15.34. NAB Model: F (8870) =811.94. Average Loan Size Model F (8870) =37.30			OSS Model: Wald chi²= (9) =139.96. NAB Model: Wald chi²= (9) =8112.21. Average Loan Size Model Wald chi²= (9) = 300.22.			
Hausman Test of OSS Model: Chi²(8)=20.48, *P= 0.0087.* Hausman Test of NAB Model: Chi²(8)=7.27, *P=0.508.* Hausman Test of Average Loan Size Model: Chi²(8) = 53.01, *P=0.000.*						

Source: Our estimation, using Mix market Data (2024).

*,**, and*** shows significance level at 10%, 5% and 1% level. Note: Standard error (SE) has been provided in parenthesis.