

IMPACT OF ABSOLUTE AND SYSTEMIC SIZE OF BANKS ON PERFORMANCE AND BUSINESS MODEL: EMPIRICAL EVIDENCE FROM INDIA

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Abstract *This article attempts to analyse the impact of bank size, both absolute and systemic, on performance in terms of returns and risk and business model in terms of activity mix. The sample includes 550 firm year observations of commercial banks in India between 2006 and 2016, spanning a time period of 11 years. On the performance front, the results indicate that neither of the size measures affects the return on assets or ROE of either public or private sector banks. On the other hand, the absolute size reduces the risk of bank insolvency. At the business model level, the proportion of fee-based and net-interest income decreases with increasing absolute size and increases with increasing systemic size. Conversely, the proportion of interest income increases with increasing absolute size and decreases with increasing systemic size. This highlights the banks' increasing reliance on non-traditional sources of income with increasing systemic size in the Indian context.*

Keywords: *Bank Size, Systemic Size, Absolute Size, Performance, Return, Risk, Business Model, Activity Mix, India*

INTRODUCTION

Banking system, through the decades, has emerged as the main source of finance to the economies and provides the cushion to support and stabilise the financial systems. In the previous decades, banks around the world have significantly increased in size. In addition to various functions like accepting deposits, lending and payment facilitation (online and offline) carried out by banks, they are perceived as crucial in an economy's financial ecosystem (Biswas & Bhattacharya, 2020). Among the financial institutions, banks are perceived as the largest credit suppliers in the economy (Ali & Dhiman, 2019). Banks, due to their ability of credit intermediation, have the potential to accelerate financial growth in the economy or even weaken it (Sharma & Dey, 2022). Many financial institutions have become enormous in absolute terms as well as in relation to their national economies. In the latter case, banks are assumed to become systemically important; a point that has become a crucial topic of discussion since the sub-prime crisis of 2008. The crisis had many causes, but the one relevant to our discussion is the systemic risk emanating from the large-sized banks.

According to the Financial Stability Board, financial institutions are classified as systemically important if their distress or disorderly failure would cause significant disruption to the financial system and economic activity due to their size, complexity and systemic interconnectedness. It is something that was seen during the 2008 financial crisis. Many analysts disagree on a concrete definition of systemic importance; however, the concept specifically revolves around determining a financial institution's relationship with the financial system.

In the aftermath of the US sub-prime financial crisis of 2008, it appeared that nations with large banks faced a greater threat to their public finances. Prior to this crisis, banks were trying to aggressively increase their assets with a subdued focus on asset quality, which ultimately led to crisis. The distress not only affected the national economy but also the world as a whole. As a result, international organisations and national governments came forward to address the immediate need to stabilise global and domestic financial systems and to minimise the risks involved. The initial impact of the financial crisis seemed to have a negligible impact on the least developed countries (LDCs). However, it

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was later established that the crisis of 2008 had a significant bearing on the LDCs, although the extent of its impact was much lower than that in the USA and Europe (Bhattacharya & Dasgupta, 2012). Regulatory bodies such as the Bank for International Settlements faced the challenge of putting in place strong new regulatory measures to protect financial systems from another collapse (Suresh & Paul, 2014). The United Kingdom, for example, has been in talks about splitting or downsizing large banks (Kunt et al., 2013). The Bank of England declared in 2015, that by 2019, large banks like HSBC, Barclays, RBS, etc., will have to run their retail banking arm separately from the investment banking arm. In the US, the Dodd-Frank Wall Street Reform and Consumer Protection Act was passed in 2010 in pursuit of this goal of preventing the occurrence of an oversized bank.

India, too, has been active on this front and has witnessed alertness in catering to the risks associated with large banks. The Indian banking sector also felt the brunt of the global financial crisis in terms of reduced efficiency scores in 2008–09 as compared to the score in 2007–08 but in general, they were able to withstand the crisis and showed improvement from 2009–10 onwards (Bapat, 2012). In July 2014, the Reserve Bank of India (RBI) came up with a framework to deal with domestically systemically important banks (D-SIBs). D-SIBs are banks that are too big to fail. According to the RBI, some banks, because of their size, complexity, cross-jurisdictional activities, low interconnectedness and substitute, may become systemically important. Banks with assets surpassing the threshold of 2% of the gross domestic product (GDP) will fall under the category of D-SIBs. Currently, there are three D-SIBs in India, as declared by the RBI namely State Bank of India (SBI), ICICI Bank Ltd. and HDFC Bank Ltd.

The RBI states that the failure of any D-SIB would cause major disruption to the entire banking system as well as to the nation as a whole. The ‘too big to fail’ status provided to these banks means that the government is expected to aid them in case of any distress. Due to this support, these banks enjoy subsidies and several benefits in terms of funding. However, to mitigate the risk emanating from their size, they are required to hold additional capital depending upon the bucket they fall in. Thus, too big to fail remains a key financial regulation problem, as when banks expect the government to bail them out every time they get into trouble; they are more likely to take on greater risk. This is what economists call the problem of a moral hazard, which can be countered by giving away fewer benefits to these banks (Kunt & Huizinga, 2010).

Notwithstanding, there are scenarios when some banks have, to some extent, become “too big to save.” This is especially true for small nations or those going through worsening public finances.

All these developments have led to the size of the bank being an extremely crucial factor in the regulation of the financial systems globally and domestically, as well as in the prevention of yet another collapse. Contrary to the general belief, an empirical analysis pointed out that a large bank does not necessarily imply that it is more systemically important and measures should be applied to gauge systemically important financial institutions (Zhou, 2009). Various researchers have tried to study this aspect, but most of the studies have been limited to developed countries.

Relevance of Bank Size in the Indian Context

There is a need to look at this from India’s perspective as well. There are many reasons as to why one needs to understand things from the Indian perspective. To start with, India is outperforming some of the best economies in the world in terms of growth, which in some way or another has been fuelled by the growth of the banking sector and the emergence of a few institutions at systemically important levels. To add, India has witnessed strong fundamentals when it comes to the banking sector, as evidenced by the fact that it was not hit hard by the global financial crisis as compared to other developed economies. It was not only the fundamentals that differentiated India from the other economies but also the way things worked out for it. Thirdly, the Indian banking industry has witnessed consolidation driven majorly by market factors, leading to the creation of very large banks whose failure can create havoc in the financial set up, especially due to the high level of interconnectedness of the institutions.

In this study, Indian banks, both in the public and private sector are examined over a period of 11 years, from 2006 to 2016, to decipher the relationship between bank size, performance and choice of business model. While many other similar studies have been conducted in an international setting, to the best of our knowledge, the literature remains grossly deficient in the Indian context. Hence, this article aims to fill this significant research gap in the Indian context.

As the regulators in India have progressed to classify banks based on their systemic size in order to formulate suitable policies to mitigate the risks associated with them, the relevance of this research work gets all the more amplified. This work has practical as well as academic significance, as it would reveal how size is influencing bank performance, especially in an emerging market context.

LITERATURE REVIEW

In advanced economies, large banks have shown considerable growth in their size since 1990 (Goldstein & Véron, 2011).

Many researchers have tried to address this issue of increasing bank size affecting the performance and business models of banks in various ways (Bertay et al., 2013; De Jonghe et al., 2015; Kunt & Huizinga, 2013). However, the majority of the studies have been limited to developed countries. With associations such as BRICS, emerging economies have become a strong force in the international setup, and a close examination is needed for them as well.

Bank Size and Performance

From the 1980s, the global financial system has witnessed unprecedented changes due to a large number of financial innovations that have taken place. It is important to study the performance of banks as it has a bearing on the economic growth of a nation (Ramesh, 2019). Literature provides evidence that the performance of a bank is impacted by its size, liquidity and cost, thereby highlighting the importance of encouraging banks to become large entities in order to positively influence their performance (Eljelly, 2013). In the Ghanaian banking industry, bank size is seen to have a significant positive impact on the performance metrics of profitability and profit efficiency (Duho et al., 2020).

The absolute size of a bank is defined as the natural logarithm of total assets, while systemic size is referred to as relative size in the context of the national economy (Kunt & Huizinga, 2012; Laeven et al., 2014). It has been found that larger the size of the bank's assets, greater is the contribution it makes to systemic risk (Laeven et al., 2014). Various researchers support the 'too big to fail' argument based on their findings. They find that bank size has an important overall impact and support the idea that 'too big to fail' phenomenon of banks exists (Qin & Zhu, 2014). The reason why this argument has emerged is the fact that as a bank increases its assets, its size in absolute terms also increases. With increasing absolute size, it subsequently reaches a point where it gets closely associated with the financial market and becomes systemically important. Once it becomes systemically large, any failure impacts the entire market as whole and small players in particular. In a study on BRICS countries, it was observed that as the size of banks increased, their cost efficiency also increased. However, bank profitability as measured by net interest margin tends to fall with an increase in bank size (Moudud-Ul-Huq, 2021).

The previous studies provide evidence in terms of how size, both in absolute and systemic terms, affects the performance of the banks including risk and return outcomes. Bertay et al., 2013, examine the impact of bank size on risk and return by considering 1922 publicly-listed banks in 90 nations over the years 1991–2011. They find that the returns of a bank rise with its absolute size, but fall with increasing systemic

size. Thus, for a global sample, banks with a larger absolute size tend to have a higher return on assets (ROA), return on equity (ROE) and profitability. On the other hand, banks with large systemic size are less profitable due to lower ROA and ROE. In their work, it was concluded that the volume of non-performing loans is negatively associated with systemic importance, implying that greater the systemic size of a bank, the lower its bad loans would be (Moore & Zhou, 2012). The effects of liquidity and capital ratios have varying impact on the performance of the banks according to their size, which in turn determines a bank's profitability, as per a study carried out for European banks for the period 2005–2012 (Terraza, 2015). It has been argued that during the financial crisis of 2008, some banks, because of their size, were recognised as too big to fail, and that this might be a reason for the creation of incentives to undertake more risks than socially optimal (Fahlenbrach, 2012). Due to the tendency of large banks to engage more in risky activities, they are said to be a major contributor to systemic risk (Laeven et al., 2016). The size of the banks impact the bank stock returns as well as risk-adjusted returns and there is a significant anomaly between the large and small-sized banks (Gandhi & Lustig, 2015). Based on the above review, the following testable hypotheses were framed:

H₁: Increasing absolute bank size has a positive impact on profitability.

H₂: Increasing systemic bank size has a positive impact on profitability.

H₃: Increasing absolute bank size reduces the bank risk.

H₄: Increasing systemic bank size increases the bank risk.

Bank Size and Business Model

An extensive study has also been carried out by many researchers to ascertain the interconnectedness between a bank's size and its business strategies or models in the international context of developed countries. A sample of 1,334 banks in 101 countries over the period 1999–2007 was considered and observed that banking models that emphasise more heavily on generating non-interest income are regarded as unsafe and risky, and hence, banks that tend to have such a business model are systemically more important than the others (Kunt & Huizinga, 2010). Apart from this, they also find that an increase in non-interest income-generating activities causes an increase in the banks' rate of ROA. An investigation was made to find (in the European context) whether banks that are diversified in their functions have any comparative advantage with respect to their long-term performance. They conclude that diversification or broadening of revenue sources from different financial

activities leads to an increase in the systematic risk of the banks (Baele et al., 2007). Taking a sample of 1,237 banks from all around the world during 2011–2017, Lagasio and Quaranta (2022) highlight the relationship between a bank's choice of business model among the five specified in the study and its size. They also observe a higher preference for the retail form of the banking model, followed by the traditional banking model, with both of them being the most profitable among others. In another work, it was observed that the influence of non-interest income on systemic risk changes with the size of the bank and the institutional setting of the country (Jonghe et al., 2015). Also, non-interest income leads to a decrease in systemic risk exposures in the case of large banks, whereas it increases for small banks. Owing to the structure of ownership in Indian banks, private sector banks are observed to have a higher proportion of fee-based income in relation to public sector banks. Fee-based income seemed to reduce bank's risk (Pennathur et al., 2012).

The basic finding from the literature is that the increasing reliance of a bank on non-traditional sources of income contributes more towards systemic risk. There is support for the above findings and the argument that greater the degree of engagement of the banks in non-traditional activities, the more systemically important they become (Moore & Zhou, 2013). There is evidence that banks that primarily prefer traditional interest-based income will be less systemically important than those that involve more into fee-based and other non-traditional activities (Moore & Zhou, 2012). Thus, they support the idea that banks with a higher proportion of non-interest income contribute more to systemic risk than their counterparts. Through the interaction of bank size and scope, the impact on systemic risk has been studied. The findings reveal that entering into non-traditional banking activities is less detrimental for systemic risk in the case of large and medium-sized banks (Jonghe et al., 2015).

Leverage, that is, the ratio of total assets to common equity, has an important role in determining the systemic risk of a financial institution (Acharya et al., 2017). Prior to 2008, it was seen that banks earned a significant portion of their profits from non-interest income rather than interest income, and one of the studies pointed out that the impact of non-interest income in the form of its relationship with bank's risk is higher for large-sized as well as small banks (Brunnermeier et al., 2019). In addition to diversification of activities in terms of traditional or non-traditional banking activities, bank size acts as one of the most important variables in the determination of the riskiness of a bank (Jonghe, 2010). As per empirical evidence from an analysis of Italian banks, the relationship between risk-adjusted return and non-interest income seems to be more profound

in case of large banks. Also, large Italian banks were found to be better able to manage their operating risk associated with fee-based transactions than small banks (Chiorazzo et al., 2008). Based on the above review, the following testable hypotheses were framed:

H₅: Increasing bank size has a negative impact on net interest income.

H₆: Increasing bank size has a positive impact on interest income.

H₇: Increasing bank size has a negative impact on fee income.

The examination of extant literature clearly indicates that the relevance of bank size and its impact have been the areas of investigation in the recent past, especially post the US financial crisis of 2008. Specifically, the study aims to examine the association of bank size (absolute and systemic) with its performance in terms of risk and return. Further, it analyses the relation between bank size and its business model, that is, its activity mix. Most of the studies examine the banks in the developed markets and report contradictory results. Our study attempts to fill this significant research gap and analyse the impact of size, especially due to the recognition of the systemic size of banks in India.

RESEARCH METHODOLOGY

Sample Size

This study includes a sample of 50 commercial banks (with 550 firm-year observations) from India. Out of the total number of banks considered, 24 are public sector banks and 26 belong to the private sector. The time period for the sample has been restricted to 2016, as major consolidation in the banking industry had been anticipated as spelled out in the budget speech of 2016–17 (Gandhi, 2016). Eventually, the consolidation phase started with the merger of associate banks of SBI with SBI itself in April 2017 (Bhuyan, 2022) and other public sector banks later. These consolidations are expected to have a significant impact on the stability of banks. Thus, to mitigate their effect on our findings, the empirical analysis has been conducted for a period of 11 years, starting from 31st March 2006 to 31st March 2016. This period also marks the advent of Basel II and Basel III norms. The data for empirical analysis is primarily collected from the ACE Equity[®] database and the banks' official websites. Macroeconomic data related to the Indian economy is taken from the World Bank database. Furthermore, for better comparability, all the data obtained are in Indian National Rupees (INR). Stata 14[®] has been used to perform the panel regression.

Model Development

Absolute Size and Systemic Size

The main proxies for a bank's absolute size and systemic size have been developed with the help of information from banks' balance sheets. Accordingly, a bank's absolute size has been defined as the logarithm of total assets in rupees. On the other hand, a bank's systemic size has been measured by the ratio of its liabilities to GDP. This ratio represents a country's maximum expenditure relative to its GDP in case of a bank bailout.

Performance – Return and Risk

As this study attempts to analyse the impact of bank size on performance, two return-related metrics, namely ROA and ROE have been considered. These two measures capture the profitability of a bank both from the perspective of the total assets employed as well as the return generated to the equity shareholders of the bank. Along with profitability, the performance is also gauged through the risk exposure of a bank. Z-score has been considered as a proxy for bank risk, which is a widely used measure in literature (Kunt & Huizinga, 2010; Saeed et al., 2020; Gupta & Kashiramka, 2020; Islam, 2023). A higher Z-score indicates a lower probability of bank insolvency and vice versa. It is defined as the sum of the expected ROA and the expected equity to assets ratio, divided by the standard deviation of the ROA. This method of measuring the z-score has been proposed by Boyd and Graham (1986) and depicts a firm's stability by measuring the distance from insolvency (Laeven & Levine, 2009). It signals the number of standard deviations that a bank's ROA can fall in a given period before becoming insolvent.

Business Model

One of the most common methods of capturing the business model of a bank is by analysing the composition of its income. There are several proxy measures used in the context, namely *fee income*, which is the proportion of commission, exchange and brokerage in total income; *interest income*, which is the ratio of interest income to assets; *net interest income*, which is interest income minus interest expense divided by assets; and *other non-interest income*, which is proportion of non-interest income (net profit/loss) on sale of investments, profit on sale of fixed assets, foreign exchange gains, income earned from subsidiaries or joint venture, rent or lease income, etc.) to total assets. Based on the above considerations, three models are developed for analysis (Fig. 1).

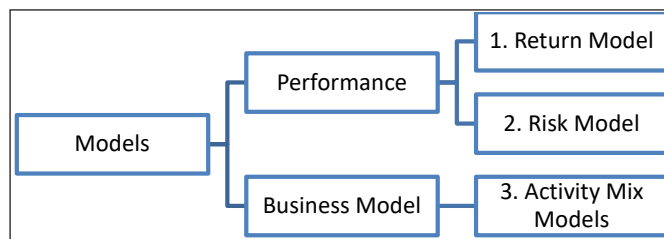


Fig. 1: Models Developed

Variables Used in the Study

Based on the above models, the following dependent and independent variables are employed to achieve the objectives of the study. The following table (Table 1) explains the same.

Table 1: Variables Considered in the Study

Dependent Variables		Independent Variables	
Measure	Proxy	Measure	Proxy
Returns	Return on Assets	Absolute Size (S_A)	Log (Total assets)
	Return on Equity	Systemic Size (S_S)	Total Liabilities to GDP
Risk	Z-Score $= ROA + CAR / (SD_{ROA})$	Advances	Total credit to Total assets
Business Model	Fee Income (FI)= Fee Income/ Total Income	Borrowings	(Debt + borrowings) to Total Assets
	Interest Income (II)=Interest Income/Total Assets	Asset Quality (AQ)	Net NPA to Net Advances
	Net Interest Income (NII)= (Interest Income less Interest Expense) by Total assets	GDP Growth (Annual)	Annual percentage change in GDP
	Other non-interest income (ONI)= Other non-interest income by Total Assets	Capital Assets Ratio (CAR)	Equity to Total Assets

To analyse the impact of bank size on performance and choice of business model, the following regression equations

were constructed.

Impact of Bank Size on Performance (Profitability)

$$ROA = f\left(S_A, S_S, \frac{D+B}{TA}, \frac{Net\ NPAs}{Net\ Adv}, GDP_{Gr}, CAR\right) \quad (1)$$

$$ROE = f\left(S_A, S_S, \frac{D+B}{TA}, \frac{Net\ NPAs}{Net\ Adv}, GDP_{Gr}, CAR\right) \quad (2)$$

Impact of Bank Size on Performance (Risk)

$$Z - Score = f\left(S_A, S_S, \frac{D+B}{TA}, \frac{Net\ NPAs}{Net\ Adv}, GDP_{Gr}, CAR\right) \quad (3)$$

Impact of Bank Size on Business Model

$$FI = f\left(S_A, S_S, \frac{Credits}{TA}, \frac{D+B}{TA}\right) \quad (4)$$

$$\Pi = f\left(S_A, S_S, \frac{Credits}{TA}, \frac{D+B}{TA}, \frac{Net\ NPAs}{Net\ Advances}\right) \quad (5)$$

$$NII = f\left(S_A, S_S, \frac{Credits}{TA}, \frac{D+B}{TA}, \frac{Net\ NPAs}{Net\ Advances}\right) \quad (6)$$

$$ONI = f\left(S_A, S_S, \frac{Credits}{TA}, \frac{D+B}{TA}\right) \quad (7)$$

RESULTS AND DISCUSSION

This section presents the descriptive data of the variables used in the study, followed by the regression results obtained. The regression analysis is performed for the combined sample of all banks as well as a disaggregated sample based on ownership of banks to capture the ownership-specific effects.

Descriptive Statistics

Table 2 presents the descriptive statistics of the variables used in the study for the public sector banks and the private sector banks separately.

Table 2: Descriptive Statistics

Variables	Bank	Obs.	Mean	Std. Dev.	Min	Max
ROA (%)	Public*	264	0.88	0.006	-1.82	2.32
	Private**	286	1.92	0.016	-4.29	11.34
ROE (%)	Public	264	16.02	0.114	-38.49	35.67
	Private	286	16.61	0.111	-50.05	36.06
Z-Score	Public	264	12.798	7.252	4.433	45.57
	Private	286	20.375	15.168	3.601	104.79
Fee Income/Total Income (%)	Public	264	4.55	0.024	0.71	13.35
	Private	286	8.86	0.059	0.44	34.63
Interest Income/Total Assets (%)	Public	264	7.56	0.008	5.90	9.52
	Private	286	7.35	0.014	3.50	10.86
Net Interest Income/Total Assets (%)	Public	264	2.34	0.005	0.43	3.61
	Private	286	2.96	0.008	0.99	6.32
Other Non-Int Income/Total Assets (%)	Public	264	0.52	0.002	0.00	1.40
	Private	286	0.87	0.010	-1.82	11.61
Absolute Size	Public	264	11.871	0.866	9.870	14.673
	Private	286	10.397	1.290	6.886	13.515
Systemic Size (%)	Public	264	2.22	0.025	0.44	14.58
	Private	286	0.72	0.011	0.01	6.62
Credits/Total Assets (%)	Public	264	61.29	0.040	46.90	70.61
	Private	286	52.55	0.161	0.23	100.00
Debt plus Borrowing/ Total Assets (%)	Public	264	90.06	0.024	81.65	94.35
	Private	286	80.49	0.104	24.80	93.12
Net NPAs/Net Advances (%)	Public	264	1.91	0.018	0.00	11.89
	Private	286	1.01	0.014	0.00	10.92

Variables	Bank	Obs.	Mean	Std. Dev.	Min	Max
Equity/Total Assets (%)	Public	264	5.50	0.010	3.26	8.77
	Private	286	11.76	0.072	4.08	73.37
GDP Growth Rate	Public	264	7.53	0.018	3.89	10.26
	Private	286	7.53	0.018	3.89%	10.26

* Public: Public Sector Banks; **Private: Private Sector Banks.

Empirical Results

This section presents the empirical results examining the impact of bank size on performance and business model. A disaggregated analysis has been performed for public and private sector banks, respectively.

Table 3 presents the results of panel regression for the entire sample of banks taken together. However, as can be gauged

from the descriptive statistics, there is a wide difference both in the characteristics and performance of public sector banks and private sector banks in India. Hence, it becomes relevant to analyse the effects of size on the two sub-groups separately. Table 4 presents the results of panel regression for the public sector banks, while Table 5 gives the panel regression result for the private sector banks for the time period 2006–2016.

Table 3: Impact of Bank Size on Performance, Risk and Business Model for All Banks (2006-2016)

Model	Bank Size and Returns		Bank Size and Risk	Bank Size and Business Model			
Dependent Variables	ROA ¹	ROE ²	Z-Score ³	FI ⁴	II ⁵	NII ⁶	ONI ⁷
Absolute Size	-0.0001	-0.0003	0.8006**	-0.0142**	0.0058**	-0.0011**	-0.0005
Systemic Size	0.0726	0.5534	-61.1079	0.6948***	-0.2102**	-0.1905**	0.1786**
Credit/Total Assets	-	-	-	-0.0411**	0.0256**	0.0244**	-0.0297**
(Debt+Borrowing)/Total Assets	-0.0361**	-0.1743**	-4.5711	0.0719***	0.0304**	-0.0021	-0.0642**
Net NPA/Net Advances	-0.2304**	-4.0313**	0.1693	-	0.0713**	-0.0115	-
GDP Growth Rate	-0.0094	-0.0082	-6.3282	-	-	-	-
Equity/Assets	0.1162	-0.3330**	81.1443**	-	-	-	-
Model Applied	Fixed Effect	Random Effect	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect
Adj. R ²	0.5660	0.4071	0.0138	0.0700	0.2991	0.0004	0.2310

*** Significant at 10%, ** Significant at 5%, * Significant at 1%

Regression Equations:

$${}^1ROA = f(S_A, S_S, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances}, GDP_{Gr}, CAR);$$

$${}^5II = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances})$$

$${}^2ROE = f(S_A, S_S, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances}, GDP_{Gr}, CAR)$$

$${}^6NII = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances})$$

$${}^3Z-Score = f(S_A, S_S, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances}, GDP_{Gr}, CAR)$$

$${}^7ONI = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA})$$

$${}^4FI = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA})$$

Table 4: Impact of Bank Size on Performance, Risk and Business Model for Public Sector Banks (2006-2016)

Model	Bank Size and Returns		Bank Size and Risk	Bank Size and Business Model			
Dependent Variable →	ROA ¹	ROE ²	Z-Score ³	FI ⁴	II ⁵	NII ⁶	ONI ⁷
Absolute Size	-0.0011	-0.0108	-0.1855	-0.0164**	0.0093**	-0.0016	-0.0011**
Systemic Size	-0.0748	-1.4745	-0.3935	0.6496**	-0.5906**	-0.1987***	-0.0027
Credit/Total Assets	-	-	-	-0.0070	0.0425**	0.0115	-0.0098***
(Debt+Borrowing)/Total Assets	0.0376***	0.4217	13.6124***	-0.0039	-0.0014	-0.0100	0.0105

Model	Bank Size and Returns		Bank Size and Risk	Bank Size and Business Model			
Dependent Variable →	ROA ¹	ROE ²	Z-Score ³	FI ⁴	II ⁵	NII ⁶	ONI ⁷
Net NPA/Net Advances	-0.2710**	-5.0595**	1.9479	-	0.0237	-0.0060	-
GDP Growth Rate	0.0013	0.0699	-0.6974	-	-	-	-
Equity/Assets	0.1236**	-1.2072***	240.2106**	-	-	-	-
Model Applied	Fixed Effect	Fixed Effect	Random Effect	Random Effect	Fixed Effect	Fixed Effect	Fixed Effect
Adj. R ²	0.4800	0.5029	0.0176	0.3508	0.2143	0.0170	0.0464

*** Significant at 10%, ** Significant at 5%, *Significant at 1%

Regression Equations:

$${}^1ROA = f(S_A, S_S, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances}, GDP_{Gr}, CAR); \quad {}^5II = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances})$$

$${}^2ROE = f(S_A, S_S, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances}, GDP_{Gr}, CAR); \quad {}^6NII = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances})$$

$${}^3Z-Score = f(S_A, S_S, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances}, GDP_{Gr}, CAR); \quad {}^7ONI = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA})$$

$${}^4FI = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA})$$

Table 5: Impact of Bank Size on Performance, Risk and Business Model for Private Sector Banks (2006-2016)

Model	Bank Size and Returns		Bank Size and Risk	Bank Size and Business Model			
Dependent Variable →	ROA ¹	ROE ²	Z-Score ³	FI ⁴	II ⁵	NII ⁶	ONI ⁷
Absolute Size	0.0000	-0.0073	0.6913***	-0.0135**	0.0052**	-0.0007	-0.0012
Systemic Size	0.1479	1.5457	-43.4191	1.3317*	0.0494	-0.0851	0.1950
Credit/Total Assets	-	-	-	-0.0475	0.0182***	0.0272**	-0.0348**
(Debt+Borrowing)/Total Assets	-0.0421**	-0.1741	-5.3933	0.0836*	0.0334**	0.0001	-0.0710**
Net NPA/Net Advances	-0.1652**	-1.9320**	1.2500	-	0.0796***	0.0060	-
GDP Growth Rate	-0.0272	-0.3517	-13.0926	-	-	-	-
Equity/Assets	0.1153**	-0.1596	77.2435**	-	-	-	-
Model Applied	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect	Fixed Effect
Adj. R ²	0.4539	0.1335	0.0190	0.0200	0.3048	0.0408	0.2483

*** Significant at 10%, ** Significant at 5%, * Significant at 1%

Regression Equations:

$${}^1ROA = f(S_A, S_S, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances}, GDP_{Gr}, CAR); \quad {}^5II = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances})$$

$${}^2ROE = f(S_A, S_S, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances}, GDP_{Gr}, CAR); \quad {}^6NII = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances})$$

$${}^3Z-Score = f(S_A, S_S, \frac{(D+B)}{TA}, \frac{Net\ NPAs}{Net\ Advances}, GDP_{Gr}, CAR); \quad {}^7ONI = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA})$$

$${}^4FI = f(S_A, S_S, \frac{Credits}{TA}, \frac{(D+B)}{TA})$$

Impact of Bank Size on Performance

Results in Table 3 indicate that in the Indian context, absolute size and systemic size do not have any significant impact on bank performance when considering all banks together. This is further true for both public and private sector banks when considered separately, as seen in Tables 4 and 5. Based on these findings, H_1 and H_2 are rejected. Although insignificant, the absolute size seems to have a negative impact on bank performance on an overall basis. This could be an indicator of the inefficiencies that banks in India tend to develop as they scale up their operations and their inability to reap the scale economies. This seems to be true for public sector banks both in the case of systemic and absolute size.

Nevertheless, we see that other independent variables, such as borrowings and the ratio of Non-Performing Assets (NPA), have a significant negative impact on bank performance. Apart from performance, a bank's ability to survive and make profits in the long run is also dependent on how well its NPAs are managed (Chaudhary & Kumar, 2023). This implies that an increase in bank debt and borrowings causes a negative impact on ROA as well as ROE, and vice versa. At the same time, larger investments in equity (as may be required by banks under Basel compliance) lead to having more expensive source of capital on their balance sheets, thereby depleting the returns to equity shareholders. The large external borrowings (as can be observed from Table 2) seem to help the public sector banks gain tax advantages, thereby leading to higher ROA. While considering the impact of NPAs on bank profitability, the results are similar for both public and private banks. The Indian banking industry has been grappling with the problem of NPAs that have eaten into its margins significantly (Rizvi et al., 2018), which is evident from our results as well.

Impact of Bank Size on Risk

Analysing the impact of bank size on risk, measured through z-score, it can be observed from Table 3 that, for the sample Indian banks, absolute size has a significant positive impact on z-score, which implies that a larger absolute size leads to a lower probability of bank insolvency. A deeper analysis suggests that this is true for private sector banks, as also seen in Table 5, wherein absolute size has a significant positive impact on z-score. So H_3 stands for the overall sample size and the private sector banks. Contrary to this, the public sector banks experience a negative impact (although insignificant) on the z-score, indicating that the risk of insolvency increases with growing assets (Table 4). Furthermore, although systemic size has an insignificant coefficient, it is worth noting that relationship between

z-score and systemic size is negative in case of both public sector and private sector banks. This means that greater the systemic size, the higher is the probability of insolvency. Another interesting relationship can be seen between the z-score and the capital-to-assets ratio. Across categories, a significant positive relationship is observed between the two, implying that higher the capital asset ratio, the safer are the banks as their capacity to absorb losses increases. This is because adequate for equity capital provides a cushion for the banks to absorb shocks from the environment.

Impact of Bank Size on Business Model

The regression models 3–7 indicate the impact of bank size on choice of business model as proxied through the four different indicators. While considering the proportion of fee income in the total income of the bank, the results indicate that absolute size and total credit provided affect the fee income negatively; at the same time, systemic size and external borrowings have a significant positive impact. The results indicate that H_7 is accepted in the context of bank absolute size in all the three cases considered. The inference that can be drawn from here is that fee income as a proportion of total income increases with decreasing absolute size and increasing systemic size. On further analysing the results for public and private sector banks separately (Tables 4 and 5), the same relationship holds true. Conclusively, we can say that both absolute and systemic size play an important role in explaining variations in fee income/total assets. Further analysis shows that credit/total assets have a significant negative impact on fee income; it is evident that as firms lend more, their revenue generation from other sources tends to decline.

Analysing the impact of bank size on interest income, the absolute size has a significant positive impact on interest income across all categories as banks in India tend to make more loans as their asset sizes expand. This leads us to conclude that H_6 gets accepted in the context of bank absolute size across all the three categories of samples considered. On the contrary, the systemic size has a significant negative impact on interest income, except in the case of private sector banks (although insignificant). On an overall basis, credit to total assets, the proportion of NPAs and external borrowing positively influence the proportion of interest income earned by banks. These relationships are quite evident and, hence, get corroborated through our results.

Examining the relationship between proportion of net interest income and bank size, both absolute size and systemic size have a negative impact on net interest income, with the relationship being significant for the total combined sample and systemic size in the case of public sector banks. Thus, H_5 gets accepted for the overall sample. This implies that banks

are not able to generate similar amount of interest income with increasing sizes of assets and liabilities, resulting in a reduced net interest income margin. This must be a cause of concern for banks in the long run. India has been witnessing a falling trend in interest rates that might be explained by the results obtained here (negative association). At the same point in time, the larger are the credits given by the banks (credit to total assets), the more will be the capacity to generate interest income and hence a positive relationship is quite evident. Thus, size is an important factor in explaining variations in net interest income, although negatively, indicating the increasing competition in the financial markets and the (relative) inability of the banks in India to cope with the same.

Results further indicate that the systemic size positively influences the other non-interest income of banks in India, although the absolute size shows a significant negative impact in case of public sector banks. These results are aligned with the very nature and characteristics of public and private sector banks in India. Public sector banks are more dependent on traditional sources of income (interest income) as compared to the modern, private sector banks that have diversified their revenue sources better than public sector banks (refer Table 4.1); although for private sector banks (Table 4.4), none of the size measures significantly explain any changes. The size of external borrowings and credit has a negative impact across both categories of banks.

From the results obtained, it can be concluded that Indian banks tend to go for more traditional sources of income with increasing absolute size, whereas, with increasing systemic size, they tend to go for more non-traditional sources of income. This corroborates the fact that as the financial leverage of banks increases, the focus on non-fund-based activities also increases. Thus, the relevance of systemic and absolute size should not be undermined and the regulators must take cognizance of these factors while formulating policies for the banking sector.

CONCLUSION

The intent behind this study was to obtain empirical evidence on how bank size measures, namely absolute size and systemic size, impact the performance of banks, both in terms of returns and risks, and the business models adopted by banks. The concept of bank size has gained importance like never before, especially after the global financial crisis of 2008. Although the existing literature provides a ready reference on these factors from the perspective of developed countries, the evidence is non-existent (to the best of our knowledge) in the Indian context. At the same time, regulators in India have started to recognise the importance

of size, and policies and guidelines have been laid down for better monitoring and ensuring stability in the financial sector. All these factors further emphasise the need to examine the impact of bank size from the Indian perspective and be in a better position to formulate policies tailored as per the Indian scenario.

Our results indicate that although both size indicators have no effect on bank profitability, absolute size does influence the stability of the banks positively. Literature indicates that absolute size and systemic size have an effect on profitability, and our findings lend some credence to that. These findings reveal the underlying differences in the banking sector in India vis-à-vis developed countries, where the banking systems are larger and more advanced. Thus, policies by the regulators in India must be tailored to meet Indian requirements. With respect to the business models, the results are aligned with the fundamental relation between bank lending and generation of income. With loans making up more than 50% of total assets on an average, their absolute size impacts interest income positively for banks in India. However, systemic size negatively influences the interest income. This may be due to the fact that banks tend to deploy resources to generate non-traditional sources of income, leveraging their external sources of borrowing. This is also evident from the results as the increasing absolute size has a negative impact on the net interest margins. At the same point of time, our results highlight the banks' reliance on non-traditional sources of income with increasing systemic size in the Indian context to diversify their risk. Our findings are aligned with literature where banks resort to traditional sources of revenue with increasing absolute size (Laeven et al., 2014), and tend to opt for non-traditional sources with increasing systemic size (Moore & Zhou, 2012).

Our results can have significant implications for both banks as well as for regulators and policymakers. Diversification of business activities may be the need of the hour as banks foresee declining net interest margins and increasing non-performing assets. This article is an important contribution to the existing body of literature as to the best of our knowledge, empirical investigation with respect to bank size (absolute and systemic) remains non-existent.

Although this article focuses on an important emerging aspect in the banking domain, it suffers from some limitations. Commercial banking in India is not just limited to listed and mainstream banks. As the banking sector has witnessed significant consolidation in the last five years, an extended analysis can be conducted by taking a sample of consolidated banks to examine the impact of changes in size on the variables under consideration in this study. Also, the existence of foreign banks can be considered in future investigations. The scope can be extended to systemically

important non-banking finance companies and other financial institutions that have a significant role to play in the Indian financial system.

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