

Competitive Dynamics in the Indian Banking Sector: A Comparative Analysis Using Structural and NEIO Approaches

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Abstract

Purpose: The study examines competition in the Indian banking sector by analysing public, private, and foreign-owned banks from 2005 to 2023. It also explores the market structure of the Indian banking industry. **Design/methodology/approach:** The study employs both structural approaches – specifically, the concentration ratio (CR) and the Herfindahl-Hirschman Index (HHI) – and the New Empirical Industrial Organization (NEIO) framework, which includes the Lerner index (LI) and the Panzar-Rosse H statistic, to estimate bank competition. **Findings:** The findings indicate that competition levels vary based on ownership segments and the metrics employed. The HHI reveals that the differences in HHI values based on ownership are negligible, reflecting that the banking sector in India has remained highly competitive throughout the study period. In contrast, the LI, which utilises marginal cost, shows varying levels of market power. When examining total revenue, public sector banks are marginally more competitive than private sector banks, although the difference is minimal. **Originality/Value:** This paper offers new insights into the competitive dynamics of the Indian banking sector, contributing to the existing literature on banking efficiency. The application of structural and non-structural approaches, and a comparative analysis of the results obtained, provides a new perspective on bank competition in India. Policymakers can use the study's findings to enhance competition in the Indian banking industry and implement measures accordingly.

Keywords: Public Sector Banks, Banking Policy, Bank Competition, Lerner Index, Panzar-Rosse H Statistic, Financial Intermediation, Financial Markets

Introduction

India's banking system, forged through decades of development, now stands as a vast and dynamic network crucial to the country's economic engine (RBI, 2013). India's banking system, shaped over decades of development, now functions as a critical driver of the country's economic growth (RBI, 2013). Banks primarily serve to facilitate credit, ensure financial stability, and foster economic expansion (Ramanadh & Rajesham, 2013). The Indian banking sector underwent significant reforms following the Narasimham Committee report of 1991, which marked a pivotal shift in economic policies during the early 1990s. These reforms, driven by competitive pressures in emerging markets, introduced substantial changes in banking models. Key transformations included the privatisation of state-owned banks, a surge in mergers and acquisitions (M&As), and increased participation from foreign banks.

Since the first nationalisation wave in 1969, the sector has witnessed 54 M&As – 14 before the 1991 reforms and 40 thereafter (Leeladhar, 2008; Herwadkar et al., 2022). This consolidation process has yielded both positive outcomes and regulatory challenges for the banking industry. To address these, a second Narasimham Committee was formed in 1998 to oversee the ongoing reform trajectory. The forces of globalisation further fuelled mergers, significantly altering the banking landscape. Nonetheless, these structural shifts raise concerns about their impact on competition within India's banking sector.

Despite the profound changes in the Indian banking structure, prior literature reveals a scarcity of empirical

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studies comparing bank ownership in India using both the structural approach and the New Empirical Industrial Organization (NEIO) framework (Bhuyan, 2022). We aim to fill this gap and contribute to the limited body of research on the subject. The objectives are as follows:

- To assess the concentration and level of competition in the Indian banking sector with respect to total assets, total revenue, net interest income, marginal costs, and deposits using different matrices of measurement.
- To compare how the competitiveness differs across bank ownership segments.

The remaining sections of this study are organised as follows: Section 2 provides a review of the literature; Section 3 describes the data and the methodology; Section 4 presents the findings of the analyses estimating concentration ratio (CR), Herfindahl-Hirschman Index (HHI), Lerner index (LI), and Panzar-Rosse H statistic; and the final section, Section 5, presents the conclusion.

Literature Review

The empirical measurement of competition in the banking sector can be categorised into two main approaches: the structural approach and the non-structural approach (Bikker & Groeneveld, 2000; Tecles & Tabak, 2010; Prayoonrattana et al., 2020). Many studies (Amavilah, 2012; Bikker et al., 2006; Bikker & Haaf, 2002) use the structural approach based on traditional industrial organisation, which states that banking competition stems from the market structure, measured by the concentration ratio (CR) or the Herfindahl-Hirschman Index (HHI).

While these indicators have strengths, they also have limitations. For example, the CR considers only the data of the top n enterprises, neglecting the remaining firms and the internal distribution within the market (Prayoonrattana et al., 2020; Bikker & Haaf, 2002; Lipczynski et al., 2017). The HHI, although widely used, does not distinguish between large banks and small banks and may misrepresent competition trends during bank consolidations (Xu et al., 2014). However, HHI is particularly effective in representing market concentration during structural changes such as M&As (Lipczynski et al., 2017). In addition, many studies have concluded that concentration is not a suitable proxy for competition and

may not be the cause of high profitability (Bikker & Haaf, 2002; OECD, 2010).

The literature on non-structural measures of competition is commonly known as the NEIO approach. In contrast to the structural approach, the NEIO method does not directly rely on information about market structure (Anzoategui et al., 2010). Instead, this approach assesses parameters that consider the degree of competition in specific markets, stemming from bank-level data and certain assumptions about bank conduct, such as demand elasticity and market dynamism (Bikker & Groeneveld, 2000; Bikker & Haaf, 2002; Guevara et al., 2005; Carbo et al., 2009). This literature includes the Brenahan, Lau and Panzar-Rosse approaches, as well as the LI and PE elasticity (Demirguc-Kunt & Peria, 2010; Xu et al., 2014; Bandaranayake et al., 2020).

The LI has key limitations: the need for detailed firm-level cost and demand data and the challenge of calculating marginal costs, as only internal agents know marginal prices (Cetorelli, 1999). These indicators also fail to capture qualitative market factors such as market stability, product differentiation, and entry barriers (Carbo et al., 2009). However, the LI offers a key advantage by being bank-specific and varying over time, enabling the comparison of market power both among different banks and across different periods (Leon, 2015). The Panzar-Rosse H statistic, another NEIO indicator, is widely used globally but less so for Indian banks (Prasad & Ghosh, 2007; Bhuyan, 2022). Its main limitation is the assumption that markets are in long-run equilibrium and that bank products are homogeneous (Xu et al., 2014). Despite this, the Panzar-Rosse H statistic model is advantageous because it utilises bank-level data and accommodates bank-specific differences in production function (Claessens & Laeven, 2004).

Various studies for most countries conclude that market structure can be distinguished as monopolistic competition, a result obtained in many mature markets (Acikalin & Sakinc, 2015; Berger, 1995; Bikker & Groeneveld, 2000). Gelos and Roldos (2003) empirically deduced that the banking industry has become more competitive and argued that foreign bank penetration and competition have helped maintain competitive pressure. However, Yeyati and Micco (2007) inferred that foreign penetration has a negative and significant effect

on competition and that increased concentration has no influence on competition and banking sector stability.

Some studies use both structural and non-structural approaches to determine concentration and measure the degree of competition, further attempting to compare the relationships between structural and non-structural measures (Bikker & Haaf, 2002; Carbo et al., 2009; Claessens, 2009; Guevara et al., 2005). A small or insignificant relationship is observed between the empirical results obtained from the structural and non-structural indicators (Bikker & Haaf, 2002; Carbo et al., 2009; Claessens, 2009; Guevara et al., 2005).

A limited number of empirical studies have investigated competition and concentration in the Indian banking sector. These studies use both approaches to measure bank competition, viz structural (Parida & Padhi, 2018; Rakshit & Bardhan, 2019) and non-structural approaches (Vinod & Azam, 2018; Li et al., 2019; Prasad & Ghosh, 2007; Arrawatia & Misra, 2019; Rakshit & Bardhan, 2019). Some studies empirically conclude that the Indian banking sector is characterised by monopolistic competition (Prasad & Ghosh, 2007; Rakshit & Bardhan, 2019; Li et al., 2019).

Parida and Padhi (2018), on the basis of structural measures, concluded that concentration is increasing and that competition in the Indian banking sector is decreasing. On the other hand, some studies deciphered that the Indian banking sector is competitive and shows an increasing trend in competitiveness (Arrawatia & Misra, 2019; Rakshit & Bardhan, 2019). Rakshit and Bardhan (2019), using the NEIO approach, employed the LI, adjusted LI, and Boone indicator along with the HHI and the CR (structural approach) to assess the degree of market competition (over the period 1996–2016). These findings align with those of Bolt and Humphrey (2010), who demonstrated that the degree of competition is lower in activities that generate non-interest income. The findings also indicated that a higher degree of bank competition erodes market power and decreases profit margins in Indian banking over time. The study does not support the structure-conduct-performance hypothesis. Robust findings also revealed that public sector banks in India exercise relatively less market power than private

and foreign banks. Vinod and Azam (2018) asserted that increasing the number of banks in the banking industry will not lead to enhancing the competition-induced efficiency.

Despite the disadvantages of competition indices, they are significant indicators of concentration and competition in an industry (Maksimovic, 2012; Nuraini, 2019). While various measures have been broadly accepted, there is no consensus regarding the ‘best’ indicator for gauging bank competition (Carbo et al., 2009). Although many studies apply both structural and non-structural approaches to assess competitiveness in the banking sector, these studies predominantly focus on developed economies, particularly in Europe, rather than on developing countries. In addition, the literature measuring bank competition in the Indian banking sector relies on the HHI, CR, and LI. These studies compute the HHI and CR using variables such as total loans and total deposits. Our study offers a different perspective by calculating the LI using the base prime lending rate (BPLR), base rate, and marginal cost of funds based lending rate (MCLR) as proxies for marginal cost across the bank segments and also computing the Panzar-Rosse statistic. A comparison of these findings across different bank ownership segments offers a comprehensive analysis of competition within the Indian banking sector. This study provides new insights into the competitive dynamics, contributing to the broader literature on banking efficiency. As a result, it enhances the understanding of competition in Indian banking.

Data and Methodology

Data

Bank-level data for all variables, except for marginal cost, were obtained from the *Statistical Tables Relating to Banks in India* (STRBI), an annual publication by the Reserve Bank of India. Data on marginal costs were sourced from the interest rate data table provided in the Reserve Bank of India (RBI) database. The sample includes public sector banks, private banks, and foreign banks, covering the period from 2005 to 2023. The data were cleaned for inconsistencies and outliers by excluding certain

foreign and private banks, resulting in an unbalanced panel dataset. A classification table showing the number of banks by ownership type is included in the appendix (Table 1).

Methodology

Methodology is categorised as follows:

Structural

The structural approach consists of two methods:

CR

The CR is the ratio of the sum of the assets of the five largest banks to the total assets of all banks.

$$CR_n = \sum_{i=1}^n \frac{S_i}{S}, n = 1, \dots, 5$$

where n is the number of banks; S_i denotes the market share of bank i ; and S denotes the total market share of all banks in the banking industry.

We calculated the CRs as CR5-TA (total assets), CR5-TD (total deposits), and CR5-TL (total loans), similar to the methodology used by Acikalin and Sakinc (2015). The five largest banks on the basis of the 2020 assets database from the STRBI are the State Bank of India (SBI), HDFC Bank, Bank of Baroda, ICICI Bank, and Axis Bank.

HHI

The HHI is computed by summing the squares of asset shares of all banks in the banking system. The formula for HHI is as follows:

$$HHI = \sum_{i=1}^n [S_i/S]^2$$

where S_i denotes the total assets of bank i , n denotes the number of banks, and S denotes the total assets of all banks in the banking industry. Similar to the CR, we

calculated and categorised the HHI into three types: HHI-TA, HHI-TD, and HHI-TL.

Non-Structural

The non-structural approach consists of the following steps:

LI

The LI measures the market power of a firm, as formalised by the Russian-British economist Abba P. Lerner. The index measures the percentage markup of the price that a firm can charge over its marginal cost. The LI is calculated via the following formula:

$$\text{Lerner}_{it} = (P_{it} - MC_{it})/P_{it}$$

where

P_{it} = ratio of total revenue to the number of advances (in percentage)

MC_{it} = marginal cost of the banks.

Since the marginal cost of banks is not directly observable, many studies use the translog cost function to proxy for the marginal cost (Coccorese, 1998; Prayoonrattana et al., 2020). Here, we take a different approach and use the following variables (values given in Table 2) as proxies for the marginal cost.

Table 2: Values for Proxy for Marginal Costs

MC Proxy	Year
MCLR	2016–2023
Base rate	2010–2016
BPLR	2003–2009

Source: Ratio and rates table (rbi.org.in).

Furthermore, we calculate the LI sector-wise: the public sector, private sector, and foreign sector.

Panzar-Rosse H Statistic

The Panzar-Rosse H statistic, a tool for measuring competition, falls under the NEIO literature. This method

considers the relationship between the revenue and cost of a firm under the assumption of long-run equilibrium (Nathan & Neave, 1989; Wong et al., 2011). It is the sum of the elasticities of total revenue with respect to each input price (Bikker et al., 2012). The generalised least squares method (Models 1 and 2) is applied to estimate the equation using banks as fixed effects on the basis of Bhuyan (2022).

Model 1

$$\log(\text{TR}) = \alpha + \beta_1 \log(\text{AFR}) + \beta_2 \log(\text{WR}) + \beta_3 \log(\text{PFC}) + \gamma_1 \log(\text{CL_TA}) + \gamma_2 \log(\text{CD_CDB}) + \gamma_3 \log(\text{EQ_TA}) + \delta \log(\text{TA}) + \varepsilon$$

Model 2

$$\log(\text{IR}) = \mu + \omega_1 \log(\text{AFR}) + \omega_2 \log(\text{WR}) + \omega_3 \log(\text{PFC}) + \phi_1 \log(\text{CL_TA}) + \phi_2 \log(\text{CD_CDB}) + \phi_3 \log(\text{EQ_TA}) + \rho \log(\text{TA}) + \epsilon$$

H-statistic is the sum of the coefficients of all the input prices used in the model. The formula for calculating the H statistic is as follows:

$$H = \sum_{i=1}^n \beta_i$$

Description of Variables

The dependent variable used in Model 1 is the logarithm of total revenue ($\log(\text{TR})$). The independent variables used are as given in Table 3.

Table 3: List of Variables Used in the Panzar-Rosse H Statistics

Variable Abbreviation	Variable Name	Calculation
AFR	Average funding rate	Percentage ratio of expenses incurred on payment of interest to the total fund (deposits + borrowings)
WR	Wage rate	Percentage ratio of total expenses incurred on employees to the total number of employees
PFC	Price of fixed capital	Percentage of other operating expenses (operating expenses excluding expenses on employees) to the total number of employees
Control variables		
CL_TA	Control variable for customer loans	Ratio of customer loans (total loans excluding inter-bank loans) to the total assets
CL_CDB	Control variable for customer deposits	Ratio of total customer deposits excluding inter-bank deposits to the total of customer deposits and short-term borrowing
EQ_TA	Control variable for equity	Ratio of capital and reserves and surplus to total assets
TA	Total assets	Total assets

Interpretation of Competition by CR, HHI, LI, and Panzar-Rosse H Statistic

The CR indicates the size of firms relative to the industry as a whole. CRs, based on companies' market shares within a given industry, are used to assess market concentration. The CR considers the size distribution of the five largest banks. It can range from '0' to '1', with higher values indicating a more concentrated market, greater market power, and lower competitiveness.

In comparison, the HHI captures the market concentration of all banks, with values also ranging from '0' to '1'. The HHI is interpreted similarly to the CR, where lower values indicate a less concentrated market, lower market power, and greater competitiveness.

The LI measures the percentage markup a firm can charge over its marginal cost. Its values range from '0' to '1', with higher values indicating greater monopoly power. The interpretation of the LI is presented in Table 4.

Table 4: Classifying the Market Power of Industries with the LI

Market Power	Value
Monopoly	L = 1
Perfect competition	L = 0

Source: Prayoonrattana et al., 2020; Lipczynski et al., 2017, p. 74.

The Panzar-Rosse H statistic is the summation of the coefficients of the inputs, representing the percentage variation in equilibrium revenue resulting from a unit percentage increase in the price of all factors used by the firm (Prasad & Ghosh, 2007). The H statistic values are interpreted as given in Table 5.

Table 5: Interpretation of Panzar-Rosse H Statistics

H-Value	Interpretation
$H \leq 0$	Monopoly or perfectly collusive oligopoly.
$H < 1$	Monopolistic competition.
$H = 1$	Perfect competition, natural monopoly in a perfectly contestable market, or sales-maximising firm subject to a break-even constraint.

Source: Anzoategui et al., 2010; Bikker et al., 2012.

Empirical Results

Analysis of Bank Competitiveness and Concentration in India

In this study, the CR is defined as the ratio of the total assets of the five largest banks to the total assets of all

banks. We estimate this CR based on the total assets of the following five banks: SBI, HDFC Bank, Bank of Baroda, ICICI Bank, and Axis Bank. A CR lower than 0.5 indicates a higher level of competition in the market. As illustrated in Fig. 1, the CR values range from 0.32 in 2005 to 0.53 in 2023, suggesting that the banking sector is moderately concentrated.

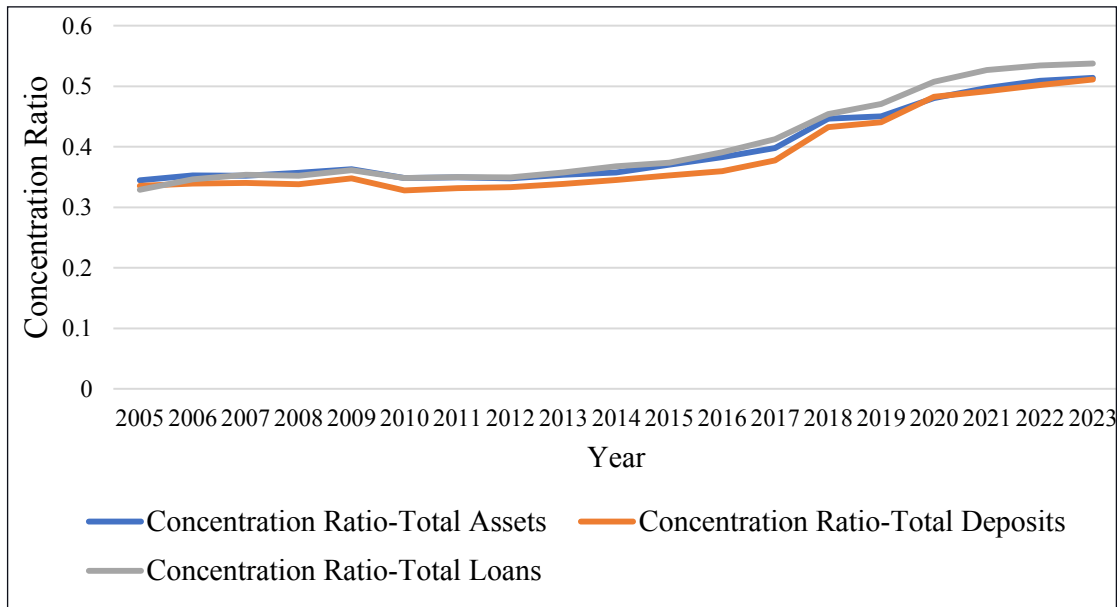


Fig. 1: Concentration Ratio

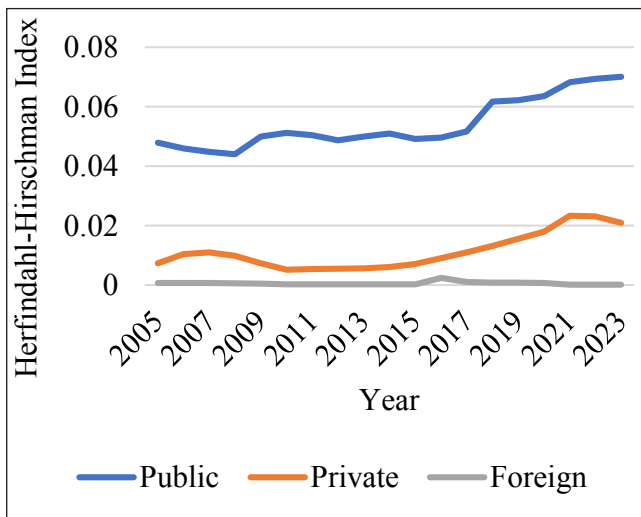
The data for these five banks from 2005 to 2023 show an increasing trend in the CR, implying that their market power is rising over the years. A comparison of CRs for total assets, total deposits, and total advances reveals negligible differences.

In addition, we estimated the HHI based on total deposits, total assets (which consist of cash on hand, balances, investments, advances, fixed assets, and other assets), and total loans and advances. The market approaches a monopoly when HHI values tend towards 1, indicating

a highly concentrated market with low competition. Conversely, when HHI values approach 0, the market aligns more closely with perfect competition and is characterised by low concentration (Bhuyan, 2022).

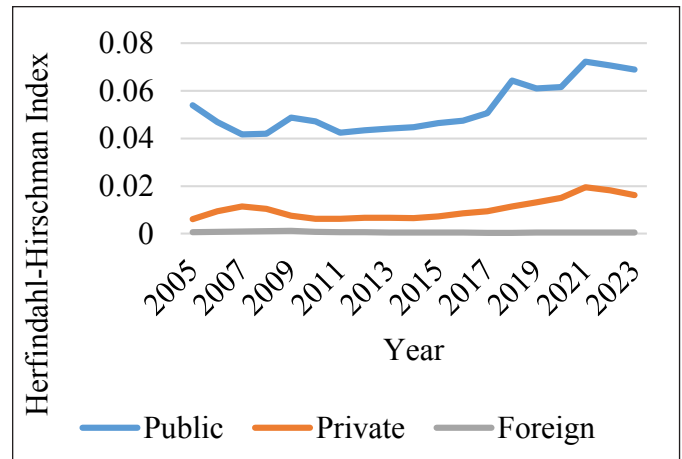
As shown in Fig. 2:

- The HHI for total loans (HHI-TL) for public sector banks ranges from 0.04 in 2005 to 0.07 in 2023, slightly exceeding the values for private and foreign banks. The HHI-TL values for all banks range from 0.0001 (for foreign banks in 2021) to 0.070 (for public banks in 2023).
- When we analyse HHI-TA, as illustrated in Fig. 3, it is evident that the public sector banks' value range is 0.041 in 2007 to 0.070 in 2022; this is slightly more concentrated than the foreign banks (value range is 0.0003 for 2017 to 0.001 for 2008).
- This suggests that the differences in HHI values based on ownership are negligible, reflecting that the banking sector in India has remained highly competitive throughout the study period.



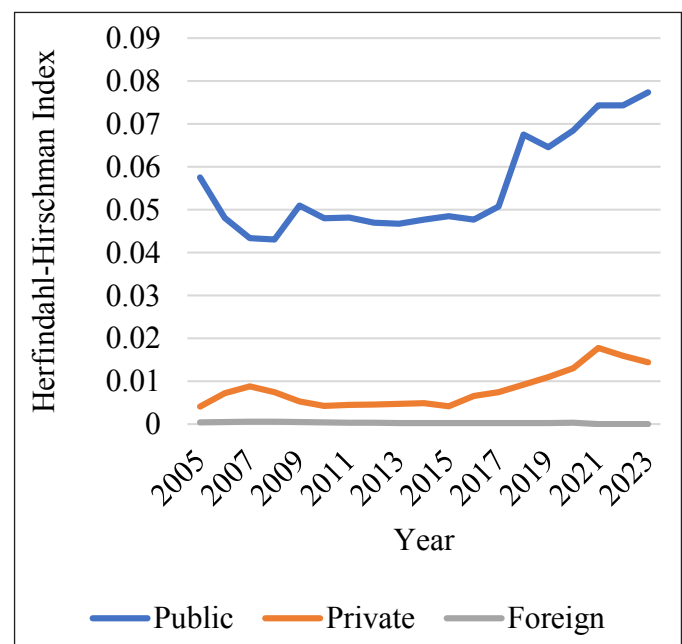
Source: Author's calculation.

Fig. 2: Herfindahl-Hirshman Index (Total Loans) -Ownershipwise



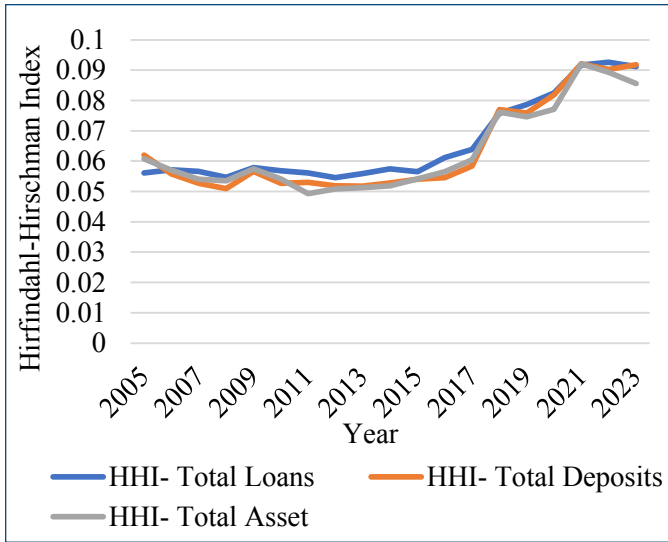
Source: Author's calculation.

Fig. 3: Herfindahl-Hirschman Index (Total Asset) -Ownershipwise



Source: Author's calculation.

Fig. 4: Herfindahl-Hirschman Index (Total Deposits) -Ownershipwise



Source: Author’s calculation.

Fig. 5: Herfindahl-Hirschman Index - (All Banks)

As shown in Fig. 4, the empirical calculation of the HHI for total deposits (HHI-TD) indicates that HHI-TD values for:

- Public sector banks range from 0.043 in 2008 to 0.077 in 2023.
- Foreign banks remain below 0.01 for all years under study.

Fig. 5 presents the HHI for all banks from 2005 to 2023.

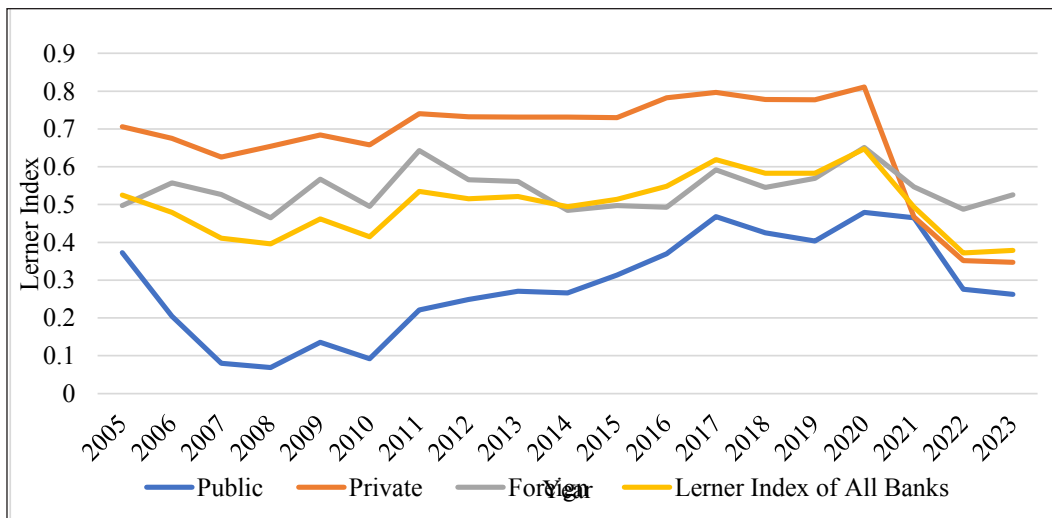
- An upward trend is observed in all three indices from approximately 2014, indicating that although the

market remains highly competitive, concentration has increased in the sector.

- The HHI for total loans was 0.06 in 2005, showing a slight decrease until around 2010; it remained relatively stable from 2010 to 2014 while it significantly increased post 2014, reaching 0.09 in 2023.
- The HHI for total deposits was slightly higher than the total loans index in 2005, at approximately 0.065. It followed a similar trend, decreasing until about 2012, then increasing to a peak close to 0.09 in 2021, with a slight decline in 2022 (0.08).
- The HHI for total assets exhibited a pattern similar to that of total deposits, gradually declining around 2012 (0.05) and then rising steadily.

Thus, all indices peaked at approximately 0.09 in 2021, followed by a slight decline to 0.08 in 2023, possibly due to stabilisation or a minor reduction in concentration. One interesting finding is the evident increase in HHI values after 2012, indicating a rise in concentration in the banking industry. This may be due to an increase in M&As of banks, leading to fewer but larger banks. Conversely, before 2012 all indices exhibited a declining or stable trend, suggesting a decrease or stability in market concentration during this period.

LI: The value of the LI lies between 0 and 1. An LI of ‘1’ denotes a monopoly, whereas an LI of ‘0’ denotes perfect competition.



Source: Author’s calculation.

Fig. 6: Lerner Index

As evident from Fig. 6 the LI for all banks lies in the mid-range, with values of 0.371 for 2022 and 0.646 for 2020. These results indicate that the Indian banking sector is neither perfectly competitive nor monopolistic; rather, it exhibits a moderate competition.

Sectorally, the LI shows that private sector banks demonstrate less competitive behaviour and hold more market power, with LI values ranging from 0.62 in 2007 to 0.81 in 2020. However, after 2021 there was an increase in competition among private banks, as indicated by a significant decline in LI values to 0.49 in 2021.

According to the LI values, public sector banks exhibit the most competitive behaviour, carrying the least market power. The LI for public sector banks shows a general upward trend from 2008 to 2017, increasing from 0.06 to 0.46, which indicates rising market power. This trend suggests reduced competition among public sector banks, possibly due to M&As in 2017, which decreased the number of banks from 22 to 12. Foreign banks are moderately competitive, with LI values of 0.46 in 2008 and 0.65 in 2020.

The LI for public, private, and foreign banks, as well as the LI for all banks, indicates varying levels of market power from 2005 to 2023. Initially, all segments show a declining trend in market power until 2012, followed by a period of stabilisation and a slight increase in 2020. This trend may be attributed to M&As, which led to the consolidation of banks and the formation of larger, fewer institutions. Such changes affect the market structure and conduct, thereby influencing competition (Neuberger et al., 2008; Murthy & Deb, 2013).

Nevertheless, a significant reduction in market power is evident from 2021 to 2023, suggesting an increase in competitive behaviour among banks.

Interpretation of the Panzar-Rosse H Statistic

Contestable market theory, as stated by Baumol, Panzar and Willig (1972), asserts the presence of competition in the market, with conditions of free entry and exit of the firms from the industry without any legal or economic barriers. An H statistic value of '1' indicates

perfect competition, whereas an H statistic value of '0' indicates monopoly. When the H statistic lies between 0 and 1, it indicates a monopolistic market structure due to the competitive nature of the market, supporting contestability theory (Bikker et al., 2012). It is assumed that existing banks set their prices near competitive levels, due to the possibility of new banks entering the market. This means potential competition keeps prices low. Even if the market is not highly competitive overall, the threat of new entrants forces current banks to act competitively (Prasad & Ghosh, 2007).

The value of the H statistic, as shown in Tables 6 and 7, lies between 0 and 1, supporting contestability theory for the Indian banking market structure. This finding is in consistent with the Prasad & Ghosh (2007) study.

The estimated coefficient of the variable AFR is positively significant for both models for all scheduled commercial banks and across all ownership types, which is consistent with the findings of Bikker et al. (2012) and Bhuyan (2022). The impact of TR on PFC is negative for public sector banks and insignificant for all other categories. Similarly, the impact of interest revenue (IR) on PFC is insignificant across categories, aligning with Bikker et al. (2012) and Bhuyan (2022).

The coefficient for WR is negative for Model 1 at the 10% significance level and positive for Model 2 at the 1% significance level. The control variable TA is positively significant for both models across all categories. The impact of TR on CL_TA is positively significant for all scheduled commercial banks and private banks, whereas EQ_TA is positively significant only for all scheduled commercial banks at the 1% significance level. In contrast, CD_CDB is negatively significant for all scheduled commercial banks at the 1% significance level. The impact of IR on CL_TA is positively significant for all categories but varies in significance level (1% for all scheduled commercial banks and foreign banks, 5% significant level for public and private sector banks). EQ_TA is positively significant only for all scheduled commercial banks at the 1% significance level; otherwise, it is insignificant for all other categories. CD_CDB is positively significant for private sector banks and otherwise insignificant.

Table 6: Panzar-Rosse H Statistic – Model 1 Results

<i>Variables (Dependent Variable is IR)</i>	<i>All Scheduled Commercial Banks</i>	<i>Public Sector</i>	<i>Private Sector</i>	<i>Foreign Banks</i>
Constant	-3.364	-5.524	-5.556	-3.268
Log (AFR)	0.253*** (0.045)	0.559*** (0.030)	0.562*** (0.022)	0.098*** (0.022)
Log (PFC)	0.162 (0.107)	0.002 (0.029)	-0.107*** (0.021)	-0.038 (0.054)
Log (WR)	-0.114 (0.904)	-0.028 (0.024)	0.105*** (0.021)	0.014 (0.052)
Log (CL_TA)	0.179*** (0.059)	0.138** (0.065)	0.103** (0.035)	0.131*** (0.036)
Log (CD_CDB)	-0.175 (0.106)	0.256*** (0.084)	0.335 (0.236)	0.013 (0.025)
Log (EQ_TA)	0.530*** (0.118)	0.034 (0.026)	0.020 (0.022)	0.029 (0.032)
Log (TA)	1.009*** (0.031)	1.025*** (0.014)	0.995*** (0.009)	0.954*** (0.019)
R ²	0.850	0.996	0.994	0.935
Adjusted R ²	0.850	0.996	0.994	0.935
S E of Regression	0.308	0.529	0.889	0.578
Prob (F-statistic)	0.000	0.000	0.000	0.000
H-statistic	0.301	0.533	0.560	0.074

Source: Author's estimates.

Note: (i) ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively; (ii) figures in brackets are standard errors of the corresponding estimates of the coefficients.

Table 7: Panzar-Rosse H Statistic – Model 2 Results

<i>Variables (TR as Dependent Variable)</i>	<i>All Scheduled Commercial Banks</i>	<i>Public Sector</i>	<i>Private Sector</i>	<i>Foreign Banks</i>
Constant	-0.1736	-4.990	-4.722	-2.494
Log (AFR)	0.224*** (0.039)	0.496*** (0.024)	0.473*** (0.027)	0.099*** (0.026)
Log (PFC)	0.150 (0.103)	0.048 (0.035)	-0.094 (0.016)	-0.051 (0.075)
Log (WR)	-0.086 (0.089)	-0.062* (0.0319)	0.095*** (0.016)	0.0424 (0.057)
Log (CL_TA)	0.125* (0.676)	0.125* (0.069)	-0.029 (0.033)	0.080 (0.048)
Log (CD_CDB)	-0.194* (0.095)	0.022 (0.140)	0.350 (0.210)	-0.028 (0.021)
Log (EQ_TA)	0.507*** (0.107)	0.037 (0.031)	0.020 (0.022)	0.052 (0.031)
Log (TA)	0.976*** (0.036)	1.014*** (0.016)	0.988*** (0.008)	0.924*** (0.025)

<i>Variables (TR as Dependent Variable)</i>	<i>All Scheduled Commercial Banks</i>	<i>Public Sector</i>	<i>Private Sector</i>	<i>Foreign Banks</i>
R ²	0.843	0.995	0.994	0.922
Adjusted R ²	0.843	0.995	0.994	0.922
S E of regression	0.180	0.361	0.744	0.228
Prob (F-statistic)	0.000	0.000	0.000	0.000
H-statistic	0.288	0.482	0.474	0.009

Source: Author's estimates

Note: (i) ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively; (ii) figures in brackets are standard errors of the corresponding estimates of the coefficients.

The results indicate that the average funding cost significantly contributes to the explanation of both IR and TR, thereby impacting the H statistic. Interestingly, the ratios of interest income to TR and non-interest income to TR do not show significant differences, with public sector banks deriving 87.61% of their revenue from interest income and 12.38% from non-interest income, compared to 84.24% and 15.75%, respectively, for private banks.

In both models, the H statistic for foreign banks is lower than that for private banks, public banks, and all scheduled commercial banks, suggesting that foreign banks are less competitive than other types of bank ownership. When examining TR, public sector banks are marginally more competitive than private sector banks, although the difference is minimal. However, when focusing solely on interest income, private sector banks show a slight edge in competitiveness over public sector banks, with this difference also being relatively small.

Conclusion

During the last few decades, the Indian banking industry has experienced significant transformation, marked by increasing privatisation and the emergence of new challenges. M&As are also reshaping the structure of the banking sector (Neuberger, 1997). Since the nationalisation of banks in India, a plethora of studies have compared public sector and private sector banks. However, there is a lack of literature on bank competition in the contemporary environment that measures competitiveness from various approaches. While various measures of competition are widely accepted, there remains no consensus on the 'best' indicator for evaluating bank competition (Carbo et al., 2009). Therefore, it is essential to assess market power

using multiple indicators and explore the relationships among them. In this context, assessing concentration and competition within the banking sector is essential for informing policymakers and enriching the academic discourse.

This study aims to assess concentration and competition using four key indicators: the CR, the HHI, the LI, and the Panzar-Rosse H statistic. All indicators suggest a monopolistic nature in the Indian banking sector, aligning with the findings of Sinha et al. (2015), which indicate a decreasing trend in competition following deregulation.

Results of this analysis show that despite significant reforms, public sector banks continue to hold substantial market shares, with the SBI accounting for approximately 22% and Punjab National Bank (PNB) around 7% of total assets.

In contrast, the non-structural analysis utilising the LI reveals that public sector banks are more competitive than their private counterparts, which are identified as less competitive. The LI assesses banks' ability to set prices above marginal costs, indicating that public sector banks effectively leverage their pricing power.

Furthermore, the Panzar-Rosse H statistic suggests that private sector banks exhibit slightly higher competitiveness when assessing IR. However, when TR is taken into account, public sector banks appear marginally more competitive, although the difference is negligible. These findings are consistent with previous literature (Bikker & Haaf, 2000; Bikker et al., 2012; Bhuyan, 2022).

This subtle distinction in competitive dynamics – between IR and TR – can be attributed to the differing business models of public and private banks. Private sector banks

typically adopt more aggressive pricing strategies and focus on profit-driven lending, whereas public sector banks follow a more traditional banking model. Their relatively higher total interest income can be linked to a greater emphasis on lending and a wider branch network, which provide them with stability and a broader customer base.

In conclusion, this study highlights notable discrepancies in the competitive dynamics of the Indian banking sector as revealed by different analytical approaches. The structural approach, particularly through the HHI, indicates minimal variation in HHI values across different ownership types, with all values remaining below 0.09. This suggests that the Indian banking landscape is fragmented rather than concentrated, reflecting a competitive environment.—investigating how M&As impact banks' pricing strategies and TR generation could be a fruitful avenue for future research.

Appendix

Table 1: Classification of Number of Banks According to Bank Ownership (Data are from STRBI)

Years	Public	Private	Foreign	All
2005	28	29	31	88
2006	28	28	29	85
2007	28	25	29	82
2008	28	23	28	79
2009	27	22	31	80
2010	27	22	32	81
2011	26	22	34	82
2012	26	20	41	87
2013	26	20	43	89
2014	27	20	43	90
2015	27	20	44	91
2016	27	21	46	94
2017	27	21	44	92
2018	21	21	46	88
2019	20	22	45	87
2020	18	23	46	87
2021	12	21	45	78
2022	12	21	45	78
2023	12	21	44	77

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