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Impact of Bank Efficiency on the Profitability of the Banks in India: An Empirical Analysis Using Panel Data Approach

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Abstract: This study aims to determine the impact of banking efficiency on the profitability of the Indian banking division. The ratios (key variables) used in the study are mentioned by the Reserve Bank of India—RBI (Central bank of India). Through a quantitative approach, pooled panel regression, univariate analysis, correlation, and descriptive statistics models are used by taking annual data of the Indian banking division from 2001 to 2020 available on the Thomson Reuters (Refinitiv) Database. Unbalanced cross-sectional data (panel data) comprising 527 bank-year observations for 33 Indian banks were studied. It was decided to evaluate the impact of efficiency (cost to income ratio and staff expenses to total expenses ratio) on the profitability (return on assets and net interest margin ratio) of the banks from the Indian banking division. The results revealed that the cost to income ratio has a significant negative impact on the bank return on assets and net interest margin ratio. The staff expenses to total expenses ratio has a significant positive impact on the bank return on assets and a positive nonsignificant impact on the bank net interest margin ratio.

Keywords: bank efficiency; RBI; bank profitability; Indian banking; panel data

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1. Introduction

In a developing country such as India, the banking sector plays a crucial role in financial intermediation, in addition to assisting the government in achieving the social goal. This indispensable connection between economic growth and banking has led the development of the entire economy and is associated with the health of the banking industry. The growing technology and competition highlight the significance of the highly efficient banking sector. It stresses the pertinent monitoring and performance assessment of the banks, as this can affect their entire efficiency and consequently on the profitability. Internationally, the performing assets in the banking industry are continuously growing, and higher assets have an influence on the loan price and rate of interest, which consequently impact the shareholders, investor's mindset, creditors, and depositors (Hassan et al. 2022). The high rate of interest has a direct effect on the borrowers, which leads to poor recovery of the funds and consequently to the bank revenue. Here, the efficiency of the bank plays a crucial role as those banks whose efficiency is higher can generate more revenue by offering products at a more affordable rate with additional features (Rabbani et al. 2022; Sun et al. 2020). Bank efficiency can be influenced by many factors; one of the supported studies discusses the influence of bank affiliation on bank efficiency (Boubaker et al. 2020). To secure a static and well-maintained Indian banking sector, the investigation of the banking sector must be carried out so that it can assist the banks to detach from the

probable vulnerabilities and for smooth functioning. The banking sector in India, like other developing countries, plays a crucial role in the financial system. To analyze the efficiency of the Indian banks, this study aims to evaluate the profitability based on the return on assets and net interest margin ratio concerning the staff expenses to total expenses and cost to income.

The hypothesis data has been obtained from the listed banks in the Indian stock market from the period 2001–2020 available on Thomson Reuters Database. To analyze the gathered data, we have utilized the "STATA" software, which has given accurate information and helped in testing the hypothesis more deeply. This study will help in understanding banking efficiency in a better way with more accurate data against the past research and be helpful in the future for more researchers.

Bank efficiency and its impact on profitability have been the subject of study from two perspectives; from an accounting and economics perspective (Olson and Zoubi 2011; Blatter and Fuster 2022). Recently, few studies have combined both approaches and compared the results accounting and economics-based determinants of the bank efficiency and profitability (Koundal 2022; Habibniya et al. 2022). Following the recent strand of literature, the present study used accounting ratios mentioned by the Reserve Bank of India—RBI (Central bank of India). Although the data envelopment analysis (DEA) efficiency approach is one of the popular approaches to measure banking efficiency (Boubaker et al. 2022), the present study is analysed through a quantitative approach; pooled panel regression, univariate analysis, correlation, and descriptive statistics models are used by taking annual data (used to calculate accounting ratios mentioned by the Reserve Bank of India—RBI) of the Indian banking division from 2001 to 2020. The study compared the results obtained with the accounting-based profitability measures such as the ROA, ROE, cost to income ratio and staff expenses to total expenses ratios.

The findings of the various studies suggests that the banking sector plays a key role in the financial development of a country (Alam et al. 2021; Hassan et al. 2020; Jreisat et al. 2021; Karim et al. 2021), which necessitated the researchers and academicians to study the impact of bank efficiency on its financial performance. The findings of our study are in line with the literature and reveal that the cost to income ratio has a significant negative impact on the bank return on assets and net interest margin ratio. The staff expenses to total expenses ratio has a significant positive impact on the bank return on assets and a positive nonsignificant impact on the bank net interest margin ratio. Some other findings include that the staff expenses to total expenses (SE/TE) has a significant and positive impact on profitability (ROA and NIM), cost to income (CI) has a significant and negative impact on return on assets (ROA), staff expenses to total expenses (SE/TE) has a significant and positive impact on return on assets (ROA), and staff expenses to total expenses (SE/TE) has a positive and non-significant impact on net interest margin (NIM).

The present study adds to the existing strand of literature in several ways. First, it is the only study providing empirical evidence on the impact of bank efficiency on the profitability of banks in India. Second, we are the first to use the ratios (key variables) used in the study, as mentioned by the Reserve Bank of India—RBI (Central bank of India), through a quantitative approach, pooled panel regression, univariate analysis, correlation, and descriptive statistics models. The findings of the study are expected to help academicians, practitioners, industry experts and regulators to better understand the efficiency and profitability nexus in Indian banks. The paper can inspire future academic research on the impact of bank efficiency and profitability of banks in India.

The paper is organized as follows. Section 2 presents the related literature and hypothesis development. Section 3 briefly discusses the sample and descriptive statistics. Section 4 explains the variables. Section 5 discusses the research model, followed by the empirical results and analysis in Section 6. Section 7 offers a conclusion.

2. Literature Review and Hypotheses Development

2.1. Indian Banking System

In India, the banking division plays a crucial role in assisting the Indian financial system and contributes majorly to the Indian GDP. The banking sector in India is mainly of public, private, and NBFCs. The banking efficiency assists banks to earn profit and remain competitive. The public sector banks in India need to manage operational costs and control their non-performing assets to enhance their efficiency and thus increase profitability. The banking sector needs to increase its credit facilities on customers' deposits and increase the deposits in the form of investment from the general public to compete with private banks in the market (Thumma 2020). As observed by Mishra (2020), the Indian banking system revolution started even before independence and after that, so many changes have been observed, including the development of the legislative framework, nationalization of banks, branch expansions, the introduction of co-operative and private banks, and modernization. All the phases are subject to operational, market, and regulatory risk (Tran et al. 2022).

As stated by Roy (2020) in her research, the Indian banking industry played a crucial role in the industrialization growth, but not particularly for rural areas. In the absence of a banking system, the local lender is taking advantage by charging high-interest rates from the small farmers who are unable to reach banks for financial assistance. The banks must strengthen their credit and extend their coverage to the rural areas for better banking services. As concluded by Kumari (2020) in his study on "Banker and Customer Relationship", it was the expectations of the customers that brought a major change in the banking industry in India rather than a traditional factor of competition, administration, regulation, and an insulated economy. The bank management mindset towards improving customer services brings a major change in the banking industry.

As per the research conducted by Kalyan (2017), the banking industry is considered as the backbone for the Indian economy, but still needs to take major steps to provide banking service to the mass of the Indian population. She further added that with the introduction of foreign banks, the focus on quality services to the customer has been set as a priority. This is the phase that brings a crucial change in the Indian banking system. As per the research study by Kaur (2017), the E-banking platform is the major step that a banking industry brings in their digitalization process that brings the booster growth in the Indian economy. The use of the digital platform in the last few years changed the whole Indian banking system, which now offers services such as net banking and mobile banking.

Patnaik et al. (2016), in a research paper on 'Indian Banking Industry—Overview', concluded that the absence of management experts and operative scarcity was the primary issue at the early banking stage in India. In the second wave where the focus is on branch expansion, a lack of adequate regulatory control along with frequent industry changes was the reason for the unstable banking system. However, it was the third wave when the banking industry understood the need and adopted modern technologies to improve their efficiency. Most of the research on the banking system focuses on the overall efficiency of banking in India, but research on banking efficiency concerning profitability is scanty. The Indian banking system has been considered as one of the well-governed divisions with strong regulatory bodies that are not subject to political interference in regulations. Now, the presence of foreign and private banks is challenging the old public sector bank, and efficiency plays a more crucial role not only in profitability but also for survival in the market. Additionally, the use of new technologies, new regulatory reforms, and acute financial inclusion force the banks to strictly monitor their efficiency and take immediate action to ensure high profitability (Singh and Thaker 2020).

2.2. Relevance of Profitability in Banking

Al-Homaidi et al. (2018) concluded in his research that Indian banks and major stakeholders including branch managers and finance professionals focus on effective utilization of the bank's resources for maximum profit while keeping the misuse to the lowest for improving the profitability of the commercial bank in India. The major focus should be on macro-economic and bank-specific factors for profitability. As observed by Brahmaiah (2018) in his research, the bank size has no impact on profitability. The identified factors affecting profitability are internal management, regular monitoring of credit risk, flexible operation policy, and effective NPA management. To improve the profitability, the focus should be on cost, credit policies, decision-makers, and serving competitive products in the market. According to Gazi et al. (2021), profitability in a bank indicates the financial performance and growth prospects; that is the reason profit analysis of a bank is important. The profitability of the banks assists in presenting that the financial position is sound and solvent. The strategies and top-level management decisions have a crucial impact on the profitability, which ultimately affects the investor's decision-making, customer mindset, and market position.

As stated by Islam and Nishiyama (2016) in their research, the level of equity and periodic income power of a bank affects the profitability. They observed that in the last few decades, the global financial trouble has seriously impacted the profitability of the South-Asian nations. Lower and unstable bank profitability seriously affects the country's growth rate and development. Profitability in Indian banks plays a crucial role in their business operations, market reputation, and overall performance. However, the reported growing NPA in the banks critically damaged the bank's profitability. Banks need to be careful when designing their products and services, be selective in client selection, should have a good credit appraisal mechanism, and should comply with the RBI norms (Mishra and Pawaskar 2017). As per the research conducted by Singh and Das (2018), crucial decisions such as 'merger' and 'acquisition' in the banking sector affect the existing profitability of the bank in the market. It can either lead to wealth creation for the investors or can destroy the wealth of the investors. The existing profit and capability of earning profit have a huge impact on the investor's decision-making. As observed in the research by Nachimuthu and Veni (2019), banks are the backbone of the Indian economy and help in generating employment and fighting against the poverty problem. Banks assist in continuously reducing the interpersonal and inter-regional imparity in India. The scheduled commercial bank's profitability represents the good performance of the industries that further contribute to national growth.

Mistry et al. (2015) observed in his research that banks being highly ranked does not mean high profitability. The operational competency, management of assets, and size of the bank have a considerable impact on the profitability performance of the private banks in India. He observed that those banks who retain their skilled and experienced workforce with them are having good profitability performance. Goel and Rekhi (2013) concluded in his research study that public sector banks effectively utilize their deposits as mostly they are utilized for loans and advances that further leads to good profitability. To improve their profitability, banks should focus on the debt-equity and capital adequacy ratio along with granting more loans to the public.

According to Bansal et al. (2018), the lower profitability of private sector banks in India is due to the credit deposit ratio (CRDR) and interest expended and interest earned (IEIE) ratio, while the public sector bank's effectiveness is not good due to the quick ratio and interest-earned ratio. He further observed that if we take 'ROA' as a basis of profitability performance measures, the financial ratio does not have any impact on the profitability of the public bank in India. The research study by Vikram and Gayathri (2018) on the Indian banks concluded that investment in information technology leads to better profitability compared to other investments in the form of operating expenses, promotional expenses, and other banking expenditures. He recommended that banks should encourage the use of IT in banking operations such as online banking, debit and credit

cards, mobile banking, etc. As stated by Desai (2013) in his research, the growing non-performance assets issue is the major cause of the lower profitability of Indian banks. He also stated that 'CAMEL' being a rating agency proved to be an effective tool for assessing the risk for profitability. He concluded in his research that banks should take necessary steps to comply with the CAMEL recommendations to improve their profitability. As concluded by Koundal (2022), reforms taken by the government have shown positive effects on all types of Indian banks, but private and foreign banks have shown more profitability and efficiency compared to public sector banks. The identified causes are both external and internal that restrict the bank's operational performance. The government and governing bodies have taken several steps in the form of reforms to improve the bank profitability, but the research study reveals that financial reforms do not have a considerable effect on the bank's profitability. The compliance with the disclosure and global standards proved does not have a positive effect on productivity and profitability (Bhanawat and Kothari 2013).

2.3. Relevance of Efficiency in Banking

As observed by Varadi et al. (2006), public sector banks (PSB) have shown higher efficiency according to income, asset and finance management, and productivity compared to private sector banks. However, foreign banks during the research period have shown more efficiency than private banks. The major benefits in improving efficiency have been taken by public sector units (PSU) from the government reforms and policies. As per the research conducted by Joshi and Bhalerao (2011), both public and private banks in India are equally efficient but the private sector is marginally on the better side compared to public sector banks. Some of the private banks have low efficiency, but in the last few years, they made remarkable improvements in their efficiency leading to higher productivity and profitability.

The nationalized bank OTE (Overall Technical Efficiency) reported a considerable decline, and the identified prime reason for inefficiency was an inappropriate allocation size. However, the allocation of bank resources was the prime concern for all kinds of banks operating in the bank in the research period. In the last decade, the Indian banking system has shown enormous transformation through its performance and financial perseverance that led to steady growth. The research study reveals that government policies, geographic locations, illiteracy, and technological talent have a tremendous impact on the overall efficiency of the banking system (Phanse et al. 2018). Sangeetha (2020) observed in her research study that in the last decade, public sector banks have performed very hard to utilize their complete resources. Public sector banks are under the control of the government and preferred by Indian citizens for business operations. They allow better producibility to maintain higher efficiency. In his research study, Maity (2020) stated that the banking sector plays a crucial role in the economic growth of the country. In his research, he concluded that private sector banks are more efficient than public sector banks in profitability because of different levels of resource utilization by banks. The major identified reason for the variation is the operational scale, inappropriate use of IRS, and resource misutilization. As concluded by Maity and Sahu (2021), the prime reason for low efficiency in the case of public sector banks is the scale rather than managerial failure due to high presence in rural areas compared to other sector banks in the market. They further added that there is a requirement of better resource utilization and growth at scale level followed by technological reformation.

According to Ataullah and Le (2006), the presence of foreign banks in India does not have any impact on the efficiency of the other banks in the market. However, the growing competition between banks in the market has a direct impact on the bank efficiency that directly affects the bank profitability. As concluded by Kalluru and Bhat (2008) in his research the Indian banking profit is not affected only through their efficiency but through external factors such as political disturbance, the trend of industry, and microeconomic factors. It can be concluded that the efficiency of the bank to a great extent is affected by

external factors such as political presence. Singh and Kaur (2016), comparing private and public sector bank efficiency, concluded that PSB is not capable enough to achieve full efficiency while private banks easily achieved 100% efficiency in all the ten years of research. He concluded that the service cost, customer benefits, and overall satisfaction are the key to attaining 100% efficiency.

In a similar study, Narwal and Pathneja (2015) observed that apart from better resource utilization, the diversification policy of the Indian banks plays a significant role in improving efficiency that consequently improves the overall productivity, further leading to better profitability. A 1% change in diversification factors resulted in a 42% hike in the bank profitability. In another study, Manoj (2010) observed that Indian banks should focus more on non-interest revenue by investing more in technology, decreasing their government investment, and increasing their lending services followed by implementation of effective risk management strategies, and more stress should be on a rural branch to boost the overall bank efficiency for better profitability. As observed by Maiti and Jana (2017) in his research study, to improve their efficiency, banks need to make their credit policy stricter, focus on reducing NPA, and improve the quality of the loan products and services. Every bank in the market based on their assessment should correct the policies to improve their efficiency as it directly affects their profitability. In her research, Soni (2012) observed that human resource management has a direct impact on the efficiency of the Indian banking sector. HRM is difficult to manage in public sector banks (PSB) while the position is better in private banks. Indian banks should have comprehensive and flexible HR system policies, supporting infrastructure, and requisite software for effective and efficient management that will improve the efficiency followed by profitability.

2.4. Impact of Efficiency on Profitability in Indian Banking Sector

As observed by Kumbhakar and Sarkar (2003), in their research, for the period 1986–2000, the primary reason at the initial stage for inefficiency was cost-effectiveness. The private sector in the banking industry was found to be more cost-effective than PSB and other operating financial institutions. After the reforms, the private sector showed a significant positive impact compared to other banks with a decline in inefficiency. This is the reason private banks through their efficiency are able to earn more profit than PSB. As per the research conducted by Kumar and Gulati (2008), the reason for inefficiency in Indian banking is bad managerial efficiency and poor scale utilization. Factors such as quality assets, financial gain, and market capturing have no impact on the efficiency of the banks as at the same time banks have reported growth in profits.

Dwivedi and Charyulu (2011) in their research observed that in the year 2010, the banking sector in India demonstrated a rise in efficiency that led to higher profitability. However, it was also concluded that compared to public and private banks, scheduled commercial banks showed a decline in efficiency that led to lower profitability. In his research, Sharma et al. (2012) observed that it is big banks in the market that have shown higher efficiency compared to small banks in the market. The strategy of big banks is to have low deposits while keeping their assets on the higher side, which leads to being more efficient and carrying out traditional banking business. The high efficiency again proves to be a factor of higher profitability.

As concluded by Jayaraman and Srinivasan (2014), the banking inefficiency can be segregated into two parts, allocation and technical, where it is observed that the former one has a serious impact on the profitability while the latter one has a low impact on the profitability. He concluded in his research that banks are required to concentrate on maximum utilization of the resources. According to Bhatia and Mahendru (2015), after the privatization and liberalization, the banking industry in India focuses on the efficiency factor to improve its profitability. Therefore, banks started improving their quality of assets, the efficiency of management, and capital adequacy, which is a factor that directly impacts the efficiency of the banks. However, banks also need to improve their NPA position along with risk assessment capability to maintain higher profitability. Compared to

other country's banks, the Indian banking system is different. The non-core revenue, poor credit appraisal, and poor debt recovery system reduce the banking efficiency. The mindset of the Indian banking system to have higher liquidity is proven wrong, and it is concluded that banks should focus on core income, credit appraisal, and quick recovery of debt that will lead to higher efficiency and that consequently lead to higher profitability (Mohanty and Krishnankutty 2018).

2.5. Hypothesis Development

Sharing similar motivation with Bansal et al. (2018), we decided to test the impact of efficiency (cost to income ratio and staff expenses to total expenses ratio) on the profitability (return on assets and net interest margin ratio) (Habibniya and Dsouza 2018) of the banks from the Indian banking division. However, considering the cost to income ratio as a relevant measure to analyse a bank's profitability, we formulate our first hypothesis as follows:

Hypothesis 1 (H1). *The cost to income ratio has a significant negative impact on the bank return on assets.*

Hypothesis 2 (H2). *The cost to income ratio has a significant negative impact on the bank net interest margin ratio.*

The impact of the staff expenses to total expenses ratio on a bank's profitability also has to be considered to analyse the effect of investment in intellectual capital in a banking organisation. Thus, our second hypothesis is as follows:

Hypothesis 3 (H3). *The staff expenses to total expenses ratio has a significant positive impact on the bank return on assets.*

Hypothesis 4 (H4). *The staff expenses to total expenses ratio has a significant positive impact on the bank net interest margin ratio.*

3. Variables

In this study, the bank's profitability is the dependent variable, measured using the return on assets (ROA) and net interest margin (NIM), while the cost to income (CI) and staff expenses to total expenses (SE/TE) represent the efficiency. The bank-specific control variables are the liquidity ratio and logage (the liquidity ratio is calculated as the liquid assets as a percentage of total assets and logage is the natural logarithm of bank age, defined as the bank's activity period from the foundation date in years). The industry-specific control variables are National and Foreign (National is the proportion of equity ownership by Indian entities, Foreign the proportion of equity ownership by foreign investors). The macroeconomic control variable is GDP (GDP annual growth rate of gross domestic product per capita). The series on ROA and NIM (proxies for bank's profitability) were sourced from the financial statements of all the listed banks in NSE and BSE in 2001–2020 period in the Indian banking division, obtained from Thomson Reuters (Refinitiv) website, while the series' cost to income and staff expenses to total expenses (proxies for efficiency) (mentioned in Table 1), and liquidity ratio, logage, GDP, National and Foreign (proxies for control variables), were sourced from the individual banks' financial statements. The study used an unbalanced panel data from 2001 to 2020.

Table 1. Variables and Measurements.

Category	Variables	Measurements
Dependent variables	Return on Assets (ROA)	Gross Profit/Total Asset
	Net Interest Margin (NIM)	Net Interest Income/Average Earning Asset
Independent variables	Cost to Income (CI)	Cost/Income
	Staff Expenses to Total Expenses (SE/TE)	Staff Expenses/Total Expenses
Control variables	Liquidity ratio (LR)	Liquid assets/Total assets
	Logage (L)	Natural logarithm of bank age
	GDP	GDP annual growth rate of gross domestic product per capita
	National (N)	The proportion of equity ownership by Indian entities
	Foreign (F)	The proportion of equity ownership by foreign investors

4. Sample and Descriptive Statistics

Our sample consists of all listed banks in NSE and BSE in the 2001–2020 period in the Indian banking division available on the Thomson Reuters Database. We pooled the bank-year data from all the public and private sector banks listed on BSE and NSE. We excluded bank-year data that have insufficient or missing financial information for the key variables. After the reductions, we obtained unbalanced cross-sectional data (panel data) comprising 527 bank-year observations for the selected banks. Of the 35 listed banks from BSE and NSE, for the study, 33 were selected as the remaining 2 are discontinued. Considering the listed life of the institution, the sample of 33 comprises 16 banks with 20 years of data, 8 banks with 18 years of data, 1 bank with 16 years of data, 1 bank with 15 years of data, 2 banks with 9 years of data, 2 banks with 6 years of data, 2 banks with 5 years of data, and 1 bank with 4 years of data. The ratios (key variables) used in the study are mentioned by the Reserve Bank of India (RBI 2021). We did not remove outliers; instead, we winsorized all the variables at the 2% (p. 2 98) level. The data were processed using the STATA software package.

Table 2 shows the number of observations, the mean values, the standard deviation, and the highest and the lowest observation of each variable represented as follows: the dependent variable profitability is referred to by the return on assets (ROA) or net interest margin (NIM). The independent variable efficiency refers to the cost to income (CI) ratio or staff expenses to total expenses (SE/TE) ratio. Bank-specific control variables are the liquidity ratio (LR) and logage (L). Industry-specific control variables are national (N) and foreign (F). The macroeconomic control variable is GDP for 2001–2020. The objective is to identify the average and the deviation from the average amongst the variables across the sample.

Table 2. Descriptive Statistics of the Variables.

Variables	Observations (N)	Mean	Std. Dev.	Min	Max
Return on Assets (ROA)	527	0.043082	0.01759	0.019853	0.106383
Net Interest Margin (NIM)	527	0.094205	0.056903	0.001494	0.358031
Cost to Income (CI)	527	0.64471	0.091283	0.385077	0.801271
Staff Expenses to Total Expenses (SE/TE)	527	0.148303	0.048007	0.044671	0.28144
Liquidity ratio (LR)	527	0.090538	0.097767	0.024241	0.643589
Logage (L)	527	4.08621	0.796955	1.386294	4.836282
GDP	527	0.057814	0.038769	−0.07965	0.08498
National (N)	527	0.854996	0.156216	0.4989	0.9997
Foreign (F)	527	0.145004	0.156216	0.0003	0.5011

It can be observed in Table 2 that the mean of the ROA is 0.04, NIM is 0.09, and the standard deviation of the ROA is 0.017 and NIM is 0.056. Having a positive mean on ROA

and NIM indicates that the banks across BSE and NSE both have an upward trend of profitability, and a lower standard deviation of ROA (0.017) and NIM (0.056) indicates a similar level of performance amongst the ROA and NIM of all the banks. The CI mean is 0.644 and the standard deviation is 0.0912. The lower the CI, the better the efficiency of the bank. Having a mean lower than 1 is always a sign of a better efficiency with respect to the cost incurred to earn the income. A lower standard deviation of 0.0912 indicates a similar level of performance amongst the CI across all the banks from BSE and NSE. The mean of SE/TE is 0.148 and the standard deviation is 0.0480. SE/TE indicates the proportion of staff expenses in the total expenses of the banks; a lower mean of 0.148 states that the banks across the BSE and NSE have minimal staff expenses when compared to the total expense of the bank. A lower standard deviation of 0.0480 indicates a similar level of performance amongst the SE/TE across all the banks from BSE and NSE. The mean for LR is 0.090, L is 4.086, GDP is 0.057, N is 0.854, and F is 0.145; all the variables have a lower standard deviation, which for LR is 0.097, L is 0.796, GDP is 0.038, N is 0.156, and F is 0.156.

The pair-wise correlation among the variables is represented as follows: for the dependent variable, profitability is referred to by return on assets (ROA) or net interest margin (NIM). The independent variable efficiency refers to the cost to income (CI) ratio or staff expenses to total expenses (SE/TE) ratio. Bank-specific control variables are the liquidity ratio (LR) and logage (L). Industry-specific control variables are national (N) and foreign (F). The macroeconomic control variable is GDP, as presented in Table 3. The objective is to identify the nature of the relationships amongst the variables. The correlation coefficients between CI and ROA, NIM were negative (−0.6974 and −0.4881, respectively) and statistically significant at 5% with a strong correlation. This means that the variables are related and move in the opposite direction. Additionally, the correlation coefficients between SE/TE and ROA, NIM were positive (0.2317 and 0.181, respectively) and statistically significant at 5%. This means that the variables are related and move in the same direction. The correlation coefficients between LR and ROA, NIM were positive (0.1559 and 0.2898, respectively); L and ROA, NIM were negative (−0.5868, −0.3187); GDP and ROA, NIM were negative (−0.133, −0.1923); N and ROA, NIM were negative (−0.4962, −0.2593); and F and ROA, NIM were positive (0.4962, 0.2593). All were statistically significant at 5%.

The aim of the correlation analysis is to show the extent of the degree of association among the variables used in the analysis and to prevent collinearity among the variables. The effects of the explanatory variables on ROA, NIM were obtained from the regression.

Table 3. Correlation Amongst the Variables.

Variables	Return on Assets	Net Interest Margin	Cost to Income	Staff Expenses to Total Expenses	Liquidity Ratio	Logage	GDP	National	Foreign
Return on Assets (ROA)	1								
Net Interest Margin (NIM)	0.5242 *	1							
Cost to Income (CI)	−0.6974 *	−0.4881 *	1						
Staff Expenses to Total Expenses (SE/TE)	0.2317 *	0.181 *	−0.5442 *	1					
Liquidity ratio (LR)	0.1559 *	0.2898 *	−0.1609 *	0.2072 *	1				
Logage (L)	−0.5868 *	−0.3187 *	0.4085 *	0.025	−0.2469 *	1			
GDP	−0.133 *	−0.1923 *	0.0714	−0.0022	−0.0224	0.0719	1		
National (N)	−0.4962 *	−0.2593 *	0.2903 *	0.3191 *	0.16 *	0.5447 *	0.0042	1	
Foreign (F)	0.4962 *	0.2593 *	−0.2903 *	−0.3191 *	−0.16 *	−0.5447 *	−0.004	−1 *	1

Note: * Statistically significant at 5 per cent level.

5. Research Model

To test our hypothesis, the following regression model was adopted. The study adopted this model in order to depict the significance of the differences across the banks

and the specific effects of the chosen variables within the bank over the period (Ozkan et al. 2014).

PROFITABILITY = f (Efficiency, Bank-Specific Control Variables, Industry-Specific Control Variables, Macroeconomic Control Variable)

$$\text{PROFITABILITY it} = \propto it + \beta 1 Efficiency + \beta 2(Bank - Specific\ Control\ Variables) + \beta 3(Industry - Specific\ Control\ Variables) + \beta 4(Macroeconomic\ Control\ Variable) + Fixed\ Effects + \varepsilon it$$

where **PROFITABILITY** refers to the return on assets or net interest margin of bank i in year t. **Efficiency** refers to the cost to income ratio or staff expenses to total expenses ratio. The **bank-specific control variables** are the liquidity ratio and logage (the liquidity ratio is calculated as the liquid assets as a percentage of total assets and logage is the natural logarithm of bank age, defined as the bank's activity period from the foundation date in years). **The industry-specific control variables are national and foreign** (national is the proportion of equity ownership by Indian entities; foreign is the proportion of equity ownership by foreign investors). **The macroeconomic control variable is GDP** (GDP annual growth rate of gross domestic product per capita). The banking sector (private or public sector unit) and year fixed effects are included in the model. εit denotes the error term.

To obtain our results, we used the following simple regression equations.

$$ROA_{it} = \beta 0 + \beta 1 CI_{it} + \beta 2\ LR_{it} + \beta 3\ L_{it} + \beta 4\ GDP_{it} + \beta 5\ N_{it} + \beta 6\ F_{it} + \epsilon it \quad (1)$$

$$ROA_{it} = \beta 0 + \beta 1 SE/TE_{it} + \beta 2\ LR_{it} + \beta 3\ L_{it} + \beta 4\ GDP_{it} + \beta 5\ N_{it} + \beta 6\ F_{it} + \epsilon it \quad (2)$$

$$NIM_{it} = \beta 0 + \beta 1 CI_{it} + \beta 2\ LR_{it} + \beta 3\ L_{it} + \beta 4\ GDP_{it} + \beta 5\ N_{it} + \beta 6\ F_{it} + \epsilon it \quad (3)$$

$$NIM_{it} = \beta 0 + \beta 1 SE/TE_{it} + \beta 2\ LR_{it} + \beta 3\ L_{it} + \beta 4\ GDP_{it} + \beta 5\ N_{it} + \beta 6\ F_{it} + \epsilon it \quad (4)$$

Pooled OLS regression is utilized to analyze the data. OLS regression is initiated as it gives consistent and unbiased parameters even in the presence of consistent time attributes. It is preferred for studies where the variables are continuous. However, in addition to deriving robust regression results, considering the panel data of our study, we have further adopted panel data regression.

6. Results and Discussion

6.1. Univariate Analysis

Table 4 shows the mean and median of the variables (CI, SE/TE, LR, L, GDP, N and F) the quantiles of ROA. The objective is to identify the quantile wise averages and medians of the independent variables with reference to the dependent variable. The means of the SE/TE, LR, and F show an increasing trend from Q1 to Q4. This indicates direct and positive behaviour with the growth in ROA. The means of the CI, L, GDP, and N show a decreasing trend from Q1 to Q4. This indicates inverse behaviour with the growth in ROA.

Table 4. Results of CI, SE/TE, LR, L, GDP, N and F by the Quantiles of ROA.

Return on Assets (ROA)	Q1		Q2		Q3		Q4	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Cost to Income (CI)	0.7128479	0.7199621	0.6698302	0.6722412	0.6353746	0.6371516	0.5601465	0.5655125
Staff Expenses to Total Expenses (SE/TE)	0.1352846	0.1326135	0.1451915	0.1438195	0.1567236	0.1500146	0.1560691	0.1434689
Liquidity ratio (LR)	0.099924	0.0651168	0.079232	0.0655202	0.0805713	0.0733804	0.1025138	0.0665267
Logage (L)	4.354142	4.564348	4.377726	4.532599	4.206189	4.488636	3.401597	3.258096
GDP	0.0660763	0.06795	0.0534148	0.06795	0.0611523	0.07661	0.0505562	0.06795
National (N)	0.9401765	0.9851	0.9009644	0.9299	0.8659136	0.8958	0.7118435	0.6755
Foreign (F)	0.0598235	0.0149	0.0990356	0.0701	0.1340864	0.1042	0.2881565	0.3245

Table 5 shows the mean and median of the variables (CI, SE/TE, LR, L, GDP, N and F) the quantiles of NIM. The objective is to identify the quantile wise averages and medians of the independent variables with reference to the dependent variable. The means of the SE/TE, LR, and F show an increasing trend from Q1 to Q4. This indicates direct and

positive behaviour with the growth in NIM. The means of the CI, L, GDP, and N show a decreasing trend from Q1 to Q4. This indicates inverse behaviour with the growth in NIM.

Table 5. Results of CI, SE/TE, LR,L,GDP,N and F by the Quantiles of NIM.

Net Interest Margin (NIM)	Q 1		Q 2		Q 3		Q4	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Cost to Income (CI)	0.701721	0.7059487	0.6640001	0.6740474	0.6359162	0.645754	0.5766872	0.5817362
Staff Expenses to Total Expenses (SE/TE)	0.1334258	0.1311606	0.1524847	0.1450966	0.1547937	0.1446932	0.1525378	0.1428764
Liquidity ratio (LR)	0.0872741	0.0682101	0.0894889	0.0711132	0.0852039	0.0807354	0.1002571	0.0581965
Logage (L)	3.925616	4.343805	4.39704	4.532599	4.306558	4.510859	3.712799	3.295837
GDP	0.0623833	0.07661	0.0641533	0.0741	0.0596429	0.0741	0.044978	0.06533
National (N)	0.8684644	0.909	0.9119659	0.9443	0.8807523	0.9299	0.7580656	0.7443
Foreign (F)	0.1315356	0.091	0.0880341	0.0557	0.1192477	0.0701	0.2419344	0.2557

6.2. Regression Results

Table 6 presents the results of OLS regression with reference to the independent and dependent variables. The objective is to identify the impact of the independent variable on the dependent variables. The results in Table 6 show that the coefficient of CI (independent variable) is negative and statistically significant at 1% significance level with respect to ROA and NIM (dependent variables). The CI has the most negative coefficient of −0.12, with year as a dummy variable, with relation to ROA. This indicates that a unit increase in CI by the banks, with all other things being equal, will decrease the banks' ROA by 0.12 units. Additionally, the CI has the most negative coefficient of −0.26, with year as a dummy variable, with relation to NIM. This indicates that a unit increase in CI by the banks, with all other things being equal, will decrease the banks' NIM by 0.26 units. It is evident from the results that the banks practice well-managed cost management policies which boost the bank efficiency. **The cost to income (CI) ratio has a significant and negative impact on profitability (ROA and NIM).**

Table 6. Results of the Effects of CI on ROA and NIM, as per OLS Regression.

Variables	No Dummy	Sector Dummy	Year Dummy	Sector and Year Dummy	No Dummy	Sector Dummy	Year Dummy	Sector and Year Dummy
	Return on Assets (ROA)	Return on Assets (ROA)	Return on Assets (ROA)	Return on Assets (ROA)	Net Interest Margin (NIM)	Net Interest Margin (NIM)	Net Interest Margin (NIM)	Net Interest Margin (NIM)
Cost to Income (CI)	−0.101 ***	−0.1 ***	−0.12 ***	−0.119 ***	−0.241 ***	−0.237 ***	−0.26 ***	−0.257 ***
	(0.008)	(0.009)	(0.01)	(0.01)	(0.038)	(0.04)	(0.049)	(0.051)
Liquidity ratio(LR)	0.009	0.008	0.005	0.004	0.153 ***	0.149 ***	0.157 ***	0.154 ***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.041)	(0.041)	(0.041)	(0.041)
Logage (L)	−0.005 ***	−0.005 ***	−0.005 ***	−0.005 ***	0.002	0.001	0.004	0.004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)	(0.004)	(0.004)
GDP	−0.035 ***	−0.035 ***	−0.002	−0.002	−0.235 ***	−0.235 ***	−0.253 **	−0.252 *
	(0.012)	(0.012)	(0.029)	(0.029)	(0.06)	(0.06)	(0.129)	(0.129)
National (N)		−0.027 ***	−0.021 ***	−0.022 ***		−0.082 ***	−0.079 ***	−0.084 ***
		(0.006)	(0.004)	(0.005)		(0.029)	(0.026)	(0.032)
Foreign (F)	0.025 ***				0.074 ***			
	(0.005)				(0.025)			
_cons	0.127 ***	0.153 ***	0.162 ***	0.163 ***	0.231 ***	0.31 ***	0.308 ***	0.311 ***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.033)	(0.024)	(0.026)	(0.026)
Observations	527	527	527	527	527	527	527	527
R-squared	0.631	0.632	0.683	0.683	0.34	0.341	0.369	0.37
Adj R2	0.628	0.627	0.668	0.668	0.333	0.333	0.341	0.34

Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7 reflects the results of OLS regression with reference to the independent and dependent variables. The objective is to identify the impact of the independent variable on the dependent variables. The results in Table 7 show that the coefficient of SE/TE (independent variable) is positive and statistically significant at 1% significance level with respect to ROA and NIM (dependent variables). The SE/TE has the positive coefficient of 0.15, with year as a dummy variable, with relation to ROA. This indicates that a unit increase in SE/TE by the banks, with all other things being equal, will increase the banks' ROA by 0.15 units. Additionally, the SE/TE has the most positive coefficient of 0.289, with year as a dummy variable, with relation to NIM. This indicates that a unit increase in SE/TE by the banks, with all other things being equal, will increase the banks' NIM by 0.289 units. It is evident from the results that the banks practice a well-managed investment in their intellectual capital, which improves the bank's efficiency. **The staff expenses to total expenses (SE/TE) has a significant and positive impact on profitability (ROA and NIM).**

Table 7. Results of the Effects of SE/TE on ROA and NIM, as per OLS Regression.

Variables	No Dummy	Sector Dummy	Year Dummy	Sector and Year Dummy	No Dummy	Sector Dummy	Year Dummy	Sector and Year Dummy
	Return on Assets (ROA)	Return on Assets (ROA)	Return on Assets (ROA)	Return on Assets (ROA)	Net Interest Margin (NIM)	Net Interest Margin (NIM)	Net Interest Margin (NIM)	Net Interest Margin (NIM)
Staff Expenses to Total Expenses (SE/TE)	0.135 ***	0.132 ***	0.15 ***	0.148 ***	0.279 ***	0.267 ***	0.289 ***	0.278 ***
	(0.014)	(0.015)	(0.017)	(0.017)	(0.056)	(0.059)	(0.067)	(0.074)
Liquidity ratio (LR)	0.012	0.011	0.011	0.01	0.163 ***	0.157 ***	0.172 ***	0.167 ***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.045)	(0.045)	(0.045)	(0.045)
Logage (L)	−0.007 ***	−0.007 ***	−0.007 ***	−0.007 ***	−0.004	−0.004	−0.001	−0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)	(0.004)	(0.004)
GDP	−0.048 ***	−0.048 ***	−0.056	−0.056	−0.265 ***	−0.264 ***	−0.376 ***	−0.374 ***
	(0.013)	(0.013)	(0.039)	(0.039)	(0.062)	(0.063)	(0.14)	(0.14)
National (N)		−0.052 ***	−0.051 ***	−0.052 ***		−0.136 ***	−0.139 ***	−0.146 ***
		(0.007)	(0.006)	(0.007)		(0.026)	(0.022)	(0.025)
Foreign (F)	0.05 ***				0.128 ***			
	(0.006)				(0.023)			
_cons	0.047 ***	0.099 ***	0.096 ***	0.097 ***	0.05 **	0.187 ***	0.166 ***	0.174 ***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.021)	(0.023)	(0.023)	(0.028)
Observations	527	527	527	527	527	527	527	527
R-squared	0.524	0.524	0.549	0.549	0.266	0.268	0.297	0.298
Adj R2	0.519	0.519	0.529	0.528	0.259	0.259	0.265	0.264

Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8 shows the results of panel regression with reference to the independent and dependent variable. The objective is to identify the impact of the independent variable on the dependent variable. Table 8 presents the results of the fixed effects model, which has achieved the objectives of the study in relation to the impact of CI (independent variable) on the ROA (dependent variable) of the banks. Based on the Hausman test statistic (0.0002), only fixed-effects results are interpreted. Thus, the results in Table 8 show that the coefficient of CI is negative and statistically significant at 1% significance level. The CI has a negative coefficient of −0.067, with relation to ROA. This indicates that an additional unit in CI by the banks, with all other things being equal, will decrease the banks' ROA by 0.067 units. **The cost to income (CI) ratio has a significant and negative impact on the return on assets (ROA).**

Table 8. Results of the Fixed Effects of CI on ROA, as per Panel Data Regression.

Variables	Return on Assets (ROA)
Cost to Income (CI)	−0.067 ***
	(0.011)
Liquidity ratio (LR)	−0.004
	(0.005)
Logage (L)	
GDP	−0.037 ***
	(0.013)
National (N)	
Foreign (F)	
_cons	0.089 ***
	(0.007)
Observations	527
R-squared	0.234
Adj R2	0.23
Hausman test (Prob > chi2)	0.0002 ***

Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 9 shows the results of panel regression with reference to the independent and dependent variable. The objective is to identify the impact of the independent variable on the dependent variable. Table 9 presents the results of the fixed effects model, which has achieved the objectives of the study in relation to the impact of CI (independent variable) on the NIM (dependent variable) of the banks. Based on the Hausman test statistic (0.0000), only fixed effects results are interpreted. Thus, the results in Table 9 show that the coefficient of CI is negative and statistically significant at 1% significance level. The CI has a negative coefficient of −0.128, with relation to NIM. This indicates that an additional unit in CI by the banks, with all other things being equal, will decrease the banks' NIM by 0.128 units. **The cost to income (CI) ratio has a significant and negative impact on the net interest margin (NIM).**

Table 9. Results of the Fixed Effects of CI on NIM, as per Panel Data Regression.

Variables	Net Interest Margin (NIM)
Cost to Income (CI)	−0.128 ***
	(0.043)
Liquidity ratio (LR)	0.012
	(0.023)
Logage (L)	
GDP	−0.197 ***
	(0.05)
National (N)	
Foreign (F)	
_cons	0.187 ***
	(0.029)
Observations	527
R-squared	0.087
Adj R2	0.081
Hausman test (Prob > chi2)	0.0000 ***

Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 10 shows the results of panel regression with reference to the independent and dependent variable. The objective is to identify the impact of the independent variable on the dependent variable. Table 10 presents the results of the fixed effects model, which has achieved the objectives of the study in relation to the impact of SE/TE(independent

variable) on the ROA(dependent variable) of the banks. Based on the Hausman test statistic (0.0010), only fixed effects results are interpreted. Thus, the results in Table 10 show that the coefficient of SE/TE is positive and statistically significant at 1% significance level. The SE/TE has a positive coefficient of 0.094, with relation to ROA. This indicates that an additional unit in SE/TE by the banks, with all other things being equal, will increase the banks' ROA by 0.094 units. **The staff expenses to total expenses (SE/TE) ratio has a significant and positive impact on the return on assets (ROA).**

Table 10. Results of the Fixed Effects of SE/TE on ROA, as per Panel Data Regression.

Variables	Return on Assets (ROA)
Staff Expenses to Total Expenses (SE/TE)	0.094 ***
	(0.018)
Liquidity ratio (LR)	−0.006
	(0.006)
Logage (L)	
GDP	−0.046 ***
	(0.014)
National (N)	
Foreign (F)	
_cons	0.032 ***
	(0.003)
Observations	527
R-squared	0.169
Adj R2	0.164
Hausman test (Prob > chi2)	0.0010 ***

Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 11 shows the results of panel regression with reference to the independent and dependent variable. The objective is to identify the impact of the independent variable on the dependent variable. Table 11 presents the results of the random effects model, which has achieved the objectives of the study in relation to the impact of SE/TE (independent variable) on the NIM (dependent variable) of the banks. Based on the Hausman test statistic (0.1148), only random effects results are interpreted. Thus, the results in Table 11 show that the coefficient of SE/TE is positive but statistically not significant. **The staff expenses to total expenses (SE/TE) ratio has a positive and non-significant impact on net interest margin (NIM).**

Table 11. Results of the Random Effects of SE/TE on NIM, as per Panel Data Regression.

Variables	Net Interest Margin (NIM)
Staff Expenses to Total Expenses (SE/TE)	0.097
	(0.111)
Liquidity ratio (LR)	0.057
	(0.041)
Logage (L)	−0.025 *
	(0.013)
GDP	−0.221 ***
	(0.054)
National (N)	−0.039
	(0.062)
Foreign (F)	
_cons	0.227 ***
	(0.056)
Observations	527
Pseudo R2	.z

Adj R2	.z
Hausman test (Prob > chi2)	0.1148

Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

7. Conclusions

The results derived by panel data study revealed that the cost to income (CI) ratio has a significant negative impact on the bank return on assets (ROA) and net interest margin (NIM) ratio. The staff expenses to total expenses (SE/TE) ratio has a significant positive impact on the bank return on assets (ROA) and a positive nonsignificant impact on the bank net interest margin ratio (NIM). The impact of SE/TE on NIM is supported by the conclusion arrived by Budhathoki and Rai (2018); their study on Nepalese commercial banks concludes that staff expenses do not significantly impact net profits. Adhikari (2020), in his study on Nepalese commercial banks, noted that staff costs of banks resulted in a higher positive impact with operational profit, which supports the conclusion of our study with the Indian banking sector. Thus, the results can be beneficial to top management of banks to develop financial and employee policies and while developing budgets for future ventures. The HR policies and the financial budgets towards staff expenses supporting to further planning for proper cost management would influence the present banking operations and would also enhance future performance of the banking industry. This study is limited to the Indian banking sector; therefore, the results may vary for other countries, and as the study is restricted to banking efficiency, further research may be encouraged by considering other banking stability dimensions mentioned by RBI and their impact on profitability. Additionally, a similar study could be performed for developed countries, and comparative analysis between developed and developing countries is encouraged for further discussion.

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