Priority and non-priority sector GNPAS in Indian commercial banks: a comparison between sub-sectors

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Abstract

Purpose – This study aims to examine the impact and contribution of priority and non-priority sectors, as well as their sub-sectors, on the gross non-performing assets of public, private and foreign sector banks.

Design/methodology/approach – The Reserve Bank of India's database on the Indian economy is used to retrieve data over 13 years (2008–2021). Public sector (12), private sector (22) and foreign sector (44) banks are represented in the sample. Two-way ANOVA, multiple regression and panel regression statistical techniques are used in SPSS and EViews to examine the data. Further, the results are also validated by using robustness testing by applying the fully modified ordinary least square (FMOLS) and dynamic least square (DOLS) regression.

Findings – The results showed that, for private and foreign banks, the non-priority sector makes up the majority of the total gross non-performing assets, although both the priority and non-priority sectors are substantial for public sector banks. The largest contributors to the total gross non-performing assets in public, private and foreign banks are industries, agriculture and micro and small businesses. The FMOLS displays robustness results that are qualitatively similar to the baseline result.

Practical implications – Based on the study's findings about the patterns of non-performing assets originating from these specific industries, banks might improve the way in which these advanced loans are managed.

Originality/value – There has not been much research done on the subject of sub-sector-specific non-performing assets and how they affect total gross non-performing assets across the three sector banks. The study's primary focus will be on the issue of non-performing assets in the priority's and non-priority's sub-sectors, namely, agricultural, micro and small businesses, food credit, industries, services, retail loans and other priority and non-priority sectors.

Keywords GNPAs, Priority, Non-priority, Agriculture, MSME, Food credit, Industries, Services, Retail loans

Paper type Research paper

1. Introduction

The non-performing assets (NPA) of public sector banks (PSBs) and the banking industry in India have grown over time (Arora *et al.*, 2018). Banks are continually burdened by rising

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stressed assets and slow loan growth (Gaur and Mohapatra, 2020). Managing gross non-performing assets (GNPAs) has been one of the most pressing issues confronting India's commercial banks since the implementation of revenue recognition, asset categorization and provisioning regulations in the banking sector (Madhvi and Shrivastava, 2017).

To promote holistic development, the Central Bank of India (RBI) has identified banks as priority sector lenders, rather than concentrating only on the financial sector (Nagarajan, Sathyanarayana, and Ali, 2013). The term "priority sector" refers to industries that contribute the most to gross domestic production (GDP) but receive the least financial assistance (Susena *et al.*, 2021; Singh *et al.*, 2023). Priority sector lending's (PSL) fundamental objective is to offer ignored sections of society sufficient and prompt finance at reasonable interest rates (Savitha and Kumar, 2016). Banks are compelled to lend 40% of their total adjusted net bank credit (ANBC) to priority sector loans under the prevailing directed loan regime. Priority sectors include agriculture, micro and small enterprise (MSE), export finance, housing, education, renewable energy, social infrastructure and other major sectors.

To improve loan returns, the bank is more motivated to participate in non-priority industry lending. Apart from PSL, it includes the remainder of the market; currently, food credit, industry, services, retail loans and other non-priority sector categories are the most important.

Priority and non-priority sectors are equally important for the Indian economy, with non-priority sectors, among other things, increasing GDP growth rates through manufacturing and services. The priority sector employs the most people and contributes to the production of food grains, renewable energy and so on. Because rising GNPAs have a detrimental effect on asset quality and profitability, they are a key source of concern for the banking sector. As a result, lending to priority sectors is widely regarded as the primary cause of rising GNPAs, which is frequently regarded as a "bad approach to achieving equality" because it generates GNPAs at the expense of supporting underserved parts of the economy (Susena *et al.*, 2021). The Narasimham Committee II declared in 1998 that credit expansion to the priority sector is directly responsible for the deterioration of Indian commercial banks' asset quality (RBI, 2001).

The growing number of cases of fraud by large borrowers in non-priority sectors, on the other hand, is cause for concern. Because each sub-sector in the priority and non-priority sectors is not equally risky, the impact of each sub-sector on the banks' overall GNPAs must be assessed.

Against these backdrops, the current study will focus on the NPA problem in the priority and non-priority sectors, as well as the impact of each sub-sector on the total GNPA of commercial banks in PSBs, private sector banks (PVBs) and foreign banks (FBs). The study will add to the existing literature in the following ways: Firstly, there has not been much research done on the subject of sub-sector-specific NPA and how they affect total gross NPA across the three sector banks. Therefore, the study's primary focus will be on the issue of NPA in the priorities and non-priority's sub-sectors, namely, agricultural, micro and small businesses, food credit, industries, services, retail loans and other priority and non-priority sectors. Secondly, the study will be helpful in identifying the sectors where loans should be provided. Thirdly, the finance minister in India has announced a policy proposal of recapitalization for public-sector bank mergers to reduce the burden of NPA on public sector banks. After the recapitalization of PSBs, the capital adequacy of SCBs improved in 2019. However, this was only for the short term, despite a fall in the commercial banks' GNPA and NNPA ratios, the financial condition of the banks does not improve much because the decrease in the ratio is related to write-offs. Finally, the findings of the study will be of

immense use to policymakers and banking officials in formulating strategies related to the quality of loans and expediting the recovery of loans.

2. Review of literature

'Not all debt is bad, from time to time we should get into debt when there's a good reason for that," –Dan Ariely, Professor of Psychology and Behavioral Economics at Duke University and a founding member of the Centre for Advanced Hindsight.

In today's scenario, non-performance of assets is a very serious problem that banks across the globe are dealing with. In India, the government's policy framework and targets established for various sectors also influence bank lending. Various authors have examined NPA in various sectors, for example, to know the collision of priority sector lending on banks assets for the period 2003–2012 and 2001–2013, respectively, According to the findings of Nagarajan *et al.* (2013) and Goyal *et al.* (2016), public sector banks suffered worse than private sector banks when it came to non-performing loans for both PSBs and PVBs as a result of lending to the priority sector. By analysing five years' worth of data from different sector banks, Satpal (2014) discovered that large borrowers, not small borrowers, were the true cause of recovery problems in the Indian context. While public sector banks have more NPA than private sector banks do, both sectors' NPA levels are nonetheless high when compared to foreign banks. A study conducted in Malaysia examined the influence of three factor such as consumer income, the economy of the country and bank interest rate on the NPAs of banks; Murthy *et al.* (2017) discovered that the bank interest rate has the biggest impact on the rate at which non-performing loans are added to the NPL total.

By using data from eight selected BSE-listed banks, Madhvi and Shrivastava (2017) investigate the relationship between NPA and bank share price movement within two days of NPA declaration of banks. They conclude that NPA may not be a suitable or exclusive criterion for assessing a bank's health and making investment decisions solely based on it. Using BSE Bankex information from 2014 to 2017, Desai (2017) discovered that lending to the industrial, personal, and agricultural sectors all had a positive association with NPAs in the priority sector, whereas lending to the service sector had a negative link with NPAs. To know the aftermath of priority and non-priority's NPAs, Ganesan *et al.* (2019) and Dahiya and Bhatia (2016) conducted comparisons between the years 2007–2018 and 2009–2014, respectively, and found that non-priority sector NPAs were greater than priority sector NPAs in PSBs and other sector banks. To determine the sector's share of ICICI Bank's overall NPAs from 2014 to 2019, Swamy and Gopinathan (2020), conducted a study and conclude that the non-priority sector makes up roughly 93.27% of the NPAs, whereas the priority sector only makes up 6.76%. Gaur and Mohapatra (2020) the repercussions of NPA provided by various private and public sector banks to various priority sectors for the period 2012–2017 and revealed that lending to priority sectors boosts GDP while having no effect on the NPA ratio. By using panel data analysis, Susena *et al.* (2021) found that PSL and GDP have a positive link and a causal relationship that goes both ways. Using panel least square regression and ICICI Bank data over a 10-year period, Desai (2021) compares the sub-sectors within the priority sector and concludes that bank profitability is significantly impacted negatively by agriculture finance, whereas lending to other sectors and personal credit have no discernible influence. To assess the correlation between PSL and the 21 public sector banks' profitability, Bag, Ray, and Roy (2022), also came to the same conclusion that there is no meaningful correlation between the profitability of India's public sector banks and advances to priority sector credit. Using certain public and private sector banks' data from 2011 to 2021, Javheri and Gawali (2022), revealed that ICICI Bank has a far higher proportion of gross NPA than HDFC and AXIS Bank, the other two private

sector banks. PNB has the highest NPA rate among banks in the PSBs and PVBs. Through the development of a structural satellite version of the financial macro econometric model of India, Mani *et al.* (2023) discovered that increases in the price of domestic fuel and global food were the real cause of the most recent increase in NPAs, rather than macroeconomic shocks. By contrasting the period from 2003–2012 with 2013–2022, Deshmukh and Bhide (2023) found that the decade between 2013 and 2022 has a greater rate of NPA than the earlier decade and that there have been more NPAs in the non-priority sector than in the priority and public sectors. According to Jain and Singhal (2023) study of the priority sector lending policy, there is a conflict between the financial and social goals of priority sector lending, yet PSL generally has a positive influence on those who are underprivileged.

3. Research gap and conceptual model

A conceptual model (Figure 1) is developed based on the review, highlighting the key elements found in the literature. It is clear from a survey of the pertinent literature that the majority of studies examined the effect of NPAs on bank profitability and performance. Other research showed that PSL had a considerable impact on banks' profits (Ganesan, 2003; Pandya, 2015). The PSL NPA issue in certain states like Karnataka and Andhra Pradesh is the focus of a few studies (Savitha and Kumar, 2016; Madhvi and Shrivastava, 2017). Existing studies have primarily focused on the overall priority and non-priority sector NPAs without delving into the specific sub-sectors within these categories. There is a need to conduct a more granular analysis to identify variations in NPA trends among different sub-sectors, such as agriculture, MSE, priority's other sectors, food credit, industries, services, retail loans and other non-priority sectors and analyse the impact of sub-sectors NPAs on the total NPAs of the banks. As a result, the current study will look into this issue.

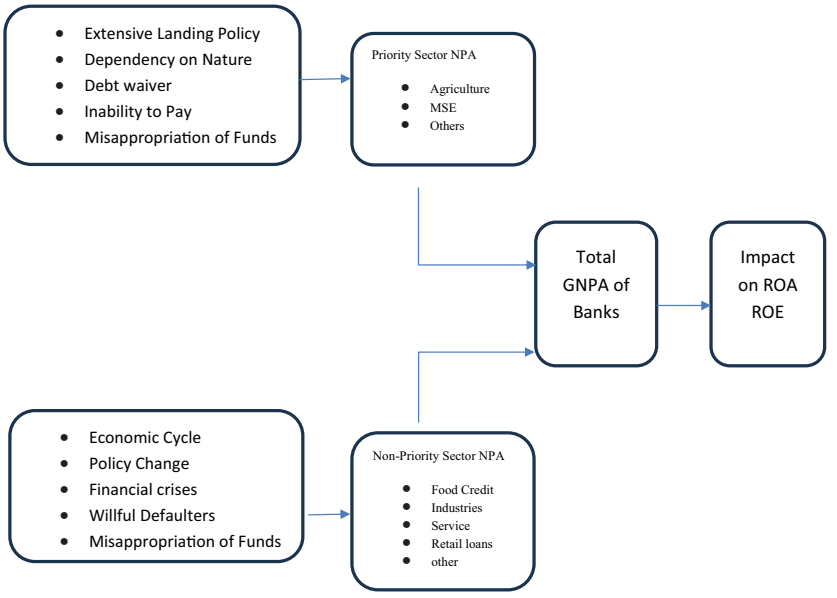

Figure 1.
Conceptual model

Source: Conceptual model developed by authors

The study will primarily concentrate on the NPA problem in the priority's and non-priority's sub-sectors, namely, agricultural, micro and small businesses, food credit, industries, services, retail loans and other priority and non-priority sectors. It also compares the priority and non-priority sectors NPAs and their significant contribution to total NPAs. The study's final section looks at how the three sector banks' return on assets (ROA) is affected by total NPA, priority and non-priority debt. Few studies directly compare the performance of priority sector sub-sectors with their non-priority sector counterparts in terms of NPAs. Conducting a comprehensive comparative analysis would provide insights into whether the priority sector is more or less susceptible to NPAs and why.

4. Objectives

- to examine the impact of the priority and non-priority sectors NPA on the GNPAs of domestic, private and foreign banks;
- to analyse the impacts of sub-sectors NPAs on GNPA of public, private, and foreign banks; and
- to analyse the impact of priority NPA, non-priority NPA and total NPA on the Return on Assets of all the three sector banks.

5. Research methodology

5.1 Sample selection, data collection and hypotheses

A comparison between priority sector GNPAs and non-priority sector GNPAs was done to see how they affected the overall GNPA of PSBs, PVBs and FBs. It was investigated how each priority's and non-priority's sectors and sub-sectors affected the banks total GNPAs in PSBs, PVBs and FBs, as well as all three sector banks combined. The sample for the current study includes all scheduled commercial banks in India, including PSBs (12), PVBs (22) and FBs (44). The information was gathered during the time frame from April 2008 to March 2021 for the first and second objectives and seven years of duration from April 2014 to March 2021 for last objective. The RBI's trend and progress report, RBI publications, and the RBI Database on the Indian Economy serve as the main sources for data collection. Based on the goals, subsequent hypotheses are created and examined.

H01.1: The priority and non-priority sector GNPAs have no significant impact on the total GNPAs of public sector banks.

H01.2: The priority and non-priority sector GNPAs have no significant impact on the total GNPAs of private sector banks.

H01.3: The priority and non-priority sector GNPAs have no significant impact on the total GNPAs of foreign banks.

H02.1: The GNPAs of sub-sectors (agriculture, MSE, priority's others sector, food credit, industries, services, retail loans and non-others priority's sector) have no significant impact on public sector banks' total GNPAs.

H02.2: The GNPAs of sub-sectors (agriculture, MSE, priority's other sector, food credit, industries, services, retail loans and non-other priority's sector) have no significant impact on private sector banks.

H02.3: The GNPAs of sub-sectors (agriculture, MSE, priority's other sector, food credit, industries, services, retail loans and non-other priority's sector) have no significant impact on foreign banks.

H03.1: Agriculture GNPAs have no significant impact on the total GNPA of banks.

H03.2: MSE GNPAs have no significant impact on the total GNPA of banks.

H03.3: Priority's other sectors GNPAs have no significant impact on the total GNPA of banks.

H03.4: Food credit GNPAs have no significant impact on the total GNPA of banks.

H03.5: Industry GNPAs have no significant impact on the total GNPA of banks.

H03.6: Service GNPAs have no significant impact on the total GNPA of banks.

H03.7: Retail loan GNPAs have no significant impact on the total GNPA of banks.

H03.8: Non-priority's other sector GNPAs have no significant impact on the total GNPA of banks.

H04.1: Total GNPAs have no significant impact on the ROA of banks.

H04.2: Priority NPAs have no significant impact on the ROA of banks.

H04.3: Non-priority NPAs have no significant impact on the ROA of banks.

5.2 Variables

The research variables used in the study include total GNPAs, GNPAs in priority sectors, GNPAs in non-priority sectors, GNPAs in sub-sectors and return on assets of banks. Four sections make up the analysis. The GNPAs in the priority and non-priority sectors are the independent variables for the first objective, and the total GNPA of the bank is the dependent variable. GNPAs in the eight sub-sectors are independent variables, whereas the overall GNPA is dependent on the second objective. GNPAs for eight subsectors are independent variables in a panel regression model, whereas GNPAs for all commercial banks are dependent variables. In second last part total GNPA, priority and non-priority sector NPAs are the independent variables and return on assets is the dependent variable. For the robustness of the regression results, fully modified ordinary least square (FMOLS) and dynamic least square (DOLS) models are applied in the last section of the research.

5.3 Tools for data analysis

The two-way ANOVA model is used to compare the GNPAs in the priority and non-priority sectors and to determine how much each contributes to overall GNPAs. The two-way ANOVA equation is as follows:

$$SS_{TGNPA} = SS_{PSGNPA} + SS_{NPSGNPA} + SS_{PSGNPA,NPSGNPA} + SSerror$$

5.3.1 Method of multiple regression. A linear regression model is used in this study to assess the overall relationship between the GNPA of eight sub-sectors and total GNPA of banks. The regression equation is as follows:

$$(\text{Total}_{\text{GNPAs}}) = \alpha + \beta_1 \text{AGR}_{\text{GNPAs}} + \beta_2 \text{MSE}_{\text{GNPAs}} + \beta_3 \text{PSOTH}_{\text{GNPAs}} + \beta_4 \text{FCR}_{\text{GNPAs}} + \beta_5 \text{IND}_{\text{GNPAs}} + \beta_6 \text{SRV}_{\text{GNPAS}} + \beta_7 \text{RTL}_{\text{GNPAs}} + \beta_8 \text{NPSOTH}_{\text{GNPAs}} + €$$

5.3.2 Panel regression model. To evaluate the overall effect of sub-sectors GNPAs on the aggregate GNPAs of all commercial banks, and to assess the impact of total GNPA, priority and non-priority sector NPAs on ROA, the panel regression model is used. Regression equations used for this are as follows:

$$(\text{Total}_{\text{GNPAit}})_{=} \alpha + \beta \text{AGR}_{\text{NPAit}} + €_{\text{it}}$$

$$(\text{Total}_{\text{GNPAit}})_{=} \alpha + \beta \text{MSE}_{\text{NPAit}} + €_{\text{it}}$$

$$(\text{Total}_{\text{GNPAit}})_{=} \alpha + \beta \text{PSOTH}_{\text{NPAit}} + €_{\text{it}}$$

$$(\text{Total}_{\text{GNPAit}})_{=} \alpha + \beta \text{FCR}_{\text{NPAit}} + €_{\text{it}}$$

$$(\text{Total}_{\text{GNPAit}})_{=} \alpha + \beta \text{IND}_{\text{NPAit}} + €_{\text{it}}$$

$$(\text{Total}_{\text{GNPAit}})_{=} \alpha + \beta \text{SRV}_{\text{NPAit}} + €_{\text{it}}$$

$$(\text{Total}_{\text{GNPAit}})_{=} \alpha + \beta \text{RTL}_{\text{NPAit}} + €_{\text{it}}$$

$$(\text{Total}_{\text{GNPAit}})_{=} \alpha + \beta \text{NPSOTH}_{\text{NPAit}} + €_{\text{it}}$$

$$(\text{ROA}_{\text{it}})_{=} \alpha + \beta \text{Total}_{\text{GNPAit}} + €_{\text{it}}$$

$$(\text{ROA}_{\text{it}})_{=} \alpha + \beta \text{Priority}_{\text{NPAit}} + €_{\text{it}}$$

$$(\text{ROA}_{\text{it}})_{=} \alpha + \beta \text{Non} - \text{priority}_{\text{NPAit}} + €_{\text{it}}$$

5.3.3 Fully modified ordinary least square and dynamic least square model. For validating the above regression results, the FMOLS and DOLS are applied. The regression coefficient of the regression model is estimated using the fully modified ordinary least squares model. The FMOLS model solves the endogeneity and serial correlation issues in variables, making it better than other regression models. The technique ensures that the results are resilient and makes use of trustworthy estimations for small sample sizes. The FMOLS and DOLS equations are identical to those used in panel and multiple regression.

6. Data analysis and results

The analysis of the present study is divided into four sections. The first section compares the priority and non-priority sectors using a two-way ANOVA to examine how they impact the overall GNPAs of PSBs, PVBs and FBs. The impact of eight sub-sector GNPAs on the overall GNPAs of banks was evaluated in the study's second section using a multiple regression model. The third section of the study examines how the combined GNPAs of various sub-sectors impact the overall GNPAs of all commercial banks. The influence of overall GNPA, non-priority sector NPA, and priority sector NPA on the banks' return on assets is examined

in the study's second last part. In the end, for the robustness of regression result FMOLS and DOLS models are used.

6.1 Two-way ANOVA result

Table 1 presents the findings of descriptive statistics in PSBs, PVBs and FBs. The mean GNPA for public sector banks is the greatest of the three sectors due to the substantial branch expansion and extensive lending to achieve socio-economic goals; foreign sector banks have the lowest mean GNPAs, although private sector banks have higher mean GNPAs than foreign banks. Foreign banks have very low GNPAs in the priority sector, but non-priority sector GNPAs are greater than priority sector GNPAs. Public sector banks have the highest GNPA, followed by private sector banks, for both priority and non-priority sectors.

A two-way ANOVA is performed to determine how GNPAs in the priority and non-priority sectors affect overall bank GNPAs. The two-way ANOVA findings for banks in the public, private, and foreign sectors are shown in Table 2. The p-value for priority sector GNPAs (0.009) and non-priority sector GNPAs (0.008) for public sector banks is less than 0.05, demonstrating that both priority and non-priority sector GNPAs significantly affect the overall GNPAs of these institutions. *H01.1* is therefore disregarded.

The p-value for priority sector GNPAs in private and foreign banks is greater than 0.05, they have no significant impact on total GNPAs. The p value for GNPAs in non-priority sectors is less than 0.05, so the null hypothesis is thus rejected, and we draw the conclusion

Table 1.
Descriptive statistics (in billion rupees)

Banks	Variables	Mean	SD	Minimum	Maximum
PSBs	GNPA	4353.25	3430.47	441.86	9553.1
	PSNPA	1253.02	884.14	243.18	3156
	NPSNPA	3100.22	2682.91	198.68	7678
PVBs	GNPA	880.41	772.27	184	2174
	PSNPA	168.56	143.43	41	506
	NPSNPA	711.84	636.47	139	1680
FBs	GNPA	108.42	40.34	50.15	179.95
	PSNPA	13.35	5.87	4.91	24.25
	NPSNPA	95.07	35.87	42.52	157.34

Source: Authors' calculation and compilation based on data collected from RBI Database

Table 2.
Results of two-way ANOVA

Banks	Total GNPA of PSBs	Sum of squares	df	Mean square	F	Sig (p)
	Priority GNPAs	8	1	8	36	0.009
PSBs	Non-priority GNPAs	29.417	4	7.354	33.094	0.008
	SSerror	0.667	3	0.222		
	Priority GNPAs	0.5	1	0.5	1.667	0.266
PVBs	Non-priority GNPAs	26.633	4	6.658	22.194	0.005
	SSerror	1.2	4	0.3		
	Priority GNPAs	0	1	0	0	1
FBs	Non-priority GNPAs	23.682	5	4.736	28.418	0
	SSerror	1	6	0.167		

Source: Authors' calculation and compilation

that non-priority sector GNPAs significantly affect the overall GNPAs of private and foreign sector banks.

6.2 Regression result

Table 3 shows the result summary of the multiple regression model. The adjusted R^2 value indicates that the independent variable (agriculture, MSE, priority's other sectors, food credit, industries, services, retail loans and others) explains all variation in the dependent variable (total GNPAs of PSBs, PVBs and FBs). The coefficient table for PSBs indicates $p = 0.000$ in all cases where p is less than 0.05. As a result, in all the sub-sectors, we reject the null hypothesis and find that the total GNPAs of public sector banks are significantly impacted by the GNPAs of sub-sectors in each of the eight sectors. This suggests that credit provided to the various sectors of Indian economy are contributing to enhance the gross NPA in the public sector banks. The agriculture, MSE, industrial, and service sectors contribute the most to total GNPAs in PSBs, with the industrial sector being the key contributor. On the other hand, food credit, retail loans, and other sectors in both priority and non-priority have very little impact on the dependent variable. This signifies that credit provided for domestic purpose such as for consumption and retail sector are less compelling the NPA while credit provided to micro, small and various large industries are more compelling the NPA in the public sector banks. In the case of PVBs, the p-value indicates that in the case of priority's other sectors and food credit, we accept the null hypothesis and conclude that other sectors and food credit have no significant impact on the total GNPAs of private sector banks in all the other cases. In the case of agriculture, MSE, industries, services, retail loans and non-priority's other sectors, we reject the null hypothesis and reach the conclusion that all these sectors have a significant impact on the total GNPAs of private sector banks. The industrial and service sectors are the major contributors. Other sectors, such as agriculture, MSE, retail loans and non-priority's other sub-sectors, have very little influence on the total GNPA. Because there are no GNPAs for food credit in foreign banks, excluding food credit, we reject the null hypothesis and come to the conclusion that all sub-sectors, with the exception of food credit, significantly affect the overall GNPAs of foreign banks. Industry, service, retail loans, non-priority's other and priority's other sectors play major roles, whereas agriculture and MSE have very little influence on the total GNPAs of foreign banks. The p value indicates the auto-correlation between total GNPAs and sub-sectors GNPAs in all three sector banks.

6.3 Panel regression result

Tables 4 and 5 present the findings of regression models using total GNPA as a dependent variable and GNPAs for sub-sectors (agriculture, MSE, food credit, industry, service, retail loans and others) in priority and non-priority sectors as an independent variable. Because the study is based on panel data, any cross-sectional or temporal variation is determined using the fixed and random effect models. The Hausman chi square test is used to evaluate model adequacy.

The panel regression results for the priority sectors of agriculture, MSE and others are shown in Table 4. As a result, we reject the null hypothesis for each of the three sectors and come to the conclusion that NPA in the priority sectors of agriculture, MSE and others has a significant and positive impact on total bank GNPAs. According to the Hausman test, the random effect model is more suitable in each of the three scenarios.

Table 5 shows the results of the regression for the non-priority's sub-sectors of food credit, industries, services, retail loans and others. The industry sector has more NPA because it is the main engine of economic growth, and banks depend on it to extend credit and earn higher interest rates (GNPAs). More than 53% of India's GDP comes from the service sector. Stable growth, rising demand for high-quality services, technical advancement and a skilled

Table 3.
Regression model summary

Parameters		Agri.	MSE	Others	FC	Ind.	Service	RL	Others
For PSBs									
Coefficient	–	0.121	0.105	0.036	0.002	0.659	0.175	0.023	0.089
t-value	–	1188576.3	3501204.3	986473.2	84178.0	41561426.0	3627550.0	192630.6	4988980.1
sig.	–	0	0	0	0	0	0	0	0
R-Square	1	–	–	–	–	–	–	–	–
Adj. *R*-Square	1	–	–	–	–	–	–	–	–
Durbin–Watson	2.599	–	–	–	–	–	–	–	–
For PVBs									
Parameters		Agri.	MSE	others	FC	Ind.	Service	RL	Others
Coefficient	–	0.074	0.088	0.025	−0.001	0.596	0.255	0.07	0.052
t-value	–	10.0	16.4	1.5	−0.2	173.9	21.7	11.0	20.2
sig.	–	0.001	0	0.2	0.839	0	0	0	0
R-Square	1	–	–	–	–	–	–	–	–
Adj. *R*-Square	1	–	–	–	–	–	–	–	–
Durbin–Watson	2.928	–	–	–	–	–	–	–	–
For FBs									
Parameters		Agri.	MSE	others	FC	Ind.	Service	RL	Others
Coefficient	–	0.031	0.078	0.142	–	1.137	0.369	0.275	0.642
t-value	–	709388.5	1797437.3	4588168.3	–	18720804.4	6254140.6	11993944.1	16291009.0
sig.	–	0	0	0	–	0	0	0	0
R-Square	1	–	–	–	–	–	–	–	–
Adj. *R*-Square	1	–	–	–	–	–	–	–	–
Durbin–Watson	2.913	–	–	–	–	–	–	–	–

Source: Authors' calculation and compilation

	Fixed effect	Random effect
(Using agriculture as Independent variable)		
Intercept	396.6540 (1.796517)***	307.7913 (1.556819)
Agri.	7.185283 (9.827981)*	7.646616 (14.60471)*
Adjusted *R* Square	0.847669	0.851132
F Statistics	71.48539*	218.2601*
Durbin–Watson	0.526620	0.531685
Hausman Test	$\chi^2 = 0.817358$	
(Using MSE as independent variable)		
Intercept	−2.116224 (−0.010655)	95.10725 (0.567560)
MSE	8.669518 (12.636050)*	8.196735 (18.24406)*
Adjusted *R* Square	0.897041	0.899178
F Statistics	111.3592*	399.9013*
Durbin–Watson	0.818827	0.740222
Hausman Test	$\chi^2 = 0.831527$	
(Using Priority Others as Independent variable)		
Intercept	−3.325999 (0.9914)	87.08348 (0.354617)
OTH	22.31668 (7.711896)*	21.18573 (11.96724)*
Adjusted *R* Square	0.787822	0.794245
F Statistics	48.03164*	147.6854
Durbin–Watson	0.494711	0.451562
Hausman Test	$\chi^2 = 0.244090$	

Notes: Levels of significance at 1, 5 and 10% are indicated by the symbols *, ** and ***, respectively. Values for the *T*-statistic are in parenthesis
Source: Authors' calculation and compilation based on data collected from RBI Database

Table 4.
Regression output

workforce are the main success drivers for Indian services. Included are loans for housing, cars, education, credit cards and other sorts of retail borrowings. We then reject the null hypothesis for each of the five sectors and come to the conclusion that the independent variables related to food credit, industry, service, retail loans and other sectors have a discernable impact on the overall GNPA of banks. According to the Hausman test, the fixed effect model is more appropriate in cases involving food credit, industry, services and other sectors, whereas the random effect model is more appropriate in cases involving retail loans.

The primary source of revenue for banks that produce interest is lending money to borrowers. The timely repayment of loans by borrowers is the primary factor that determines a bank's profitability; a high default rate causes the bank to suffer significant losses. The ROA measures a bank's profitability in relation to its total assets and the efficiency with which its management converts its holdings into new ones. The regression findings for the overall GNPAs, priority sector and non-priority sector NPA are displayed in Table 6. While the priority sector has a negative but insignificant effect on banks' return on assets, the total GNPAs and non-priority sector NPAs have a negative and significant influence on bank return on assets. Therefore, in the case of priority sector NPA, we accept the null hypothesis, whereas in the situations of total GNPA and non-priority sector NPAs, we reject it.

Our findings regarding the repercussions of NPA on bank return on assets are in line with the earlier work such as Gaur and Mohapatra (2020), Ganesan *et al.* (2019). Gaur and Mohapatra (2020) argued that non-performing lending to priority sectors by various private and public sectors might be attributed to typers and patterns of lending In the context of the priority and non-priority sectors, lending to the priority sector resulted in a significant increase

	Fixed effect	Random effect
(Using food credit as independent variable)		
Intercept	1411.474 (4.931055)*	1276.828 (3.992457)*
FC	245.4326 (4.075577)*	334.9363 (6.016558)*
Adjusted *R* square	0.611606	0.398405
F Statistics	20.94623*	26.16540*
Durbin–Watson	0.561238	0.554017
Hausman Test	$\chi^2 = 15.188276$*	
(Using Industries as independent variable)		
Intercept	568.0581 (4.675677)*	392.0599 (3.392687)**
IND	1.4502140 (18.24525)*	1.660609 (25.30583)*
Adjusted *R* square	0.945513	0.916017
F Statistics	220.8049*	415.4728*
Durbin–Watson	0.485670	0.465500
Hausman Test	$\chi^2 = 22.028157$*	
(Using services as independent variable)		
Intercept	501.7498 (2.935734)**	295.4071 (1.834242)***
SRV	5.061721 (12.77750)*	5.878372 (18.08425)*
Adjusted *R* square	0.898897	0.866615
F Statistics	113.6180*	247.8904
Durbin–Watson	1.374032	1.242357
Hausman Test	$\chi^2 = 13.008255$*	
(Using retail loans as independent variable)		
Intercept	−1440.547 (−3.229521)**	−127.948 (−2.051290)**
RL	29.27055 (8.034443)*	27.76580 (8.704966)*
Adjusted *R* square	0.798647	0.664702
F Statistics	519.24105*	76.33189*
Durbin–Watson	0.634487	0.566733
Hausman Test	$\chi^2 = 0.730756$	
(Using non-priority others as independent variable)		
Intercept	2244.658 (6.382600)*	1643.208 (4.480190)*
Others	−4.550012 (−2.580065)***	1.348283 (0.889106)
Adjusted *R* square	0.518801	−0.016746
F Statistics	14.65649*	0.374127
Durbin–Watson	0.321529	0.090012
Hausman Test	$\chi^2 = 42.928672$*	

Table 5.
Regression output

Notes: Levels of significance at 1, 5 and 10% are indicated by the symbols *, ** and ***, respectively. Values for the *T*-statistic are in parenthesis
Source: Authors' calculation and compilation based on data collected from RBI Database

in non-performing loans for both PSBs and PVBs, with public sector banks experiencing a worse position than private sector banks (Nagarajan *et al.*, 2013; Goyal *et al.*, 2016). According to Satpal (2014), in the Indian context, large borrowers were the real source of the recovery problem rather than small borrowers. While the amount of NPA in public sector banks is higher than in private sector banks, both public and private sector banks' NPA levels remain high when compared to overseas banks. According to Murthy *et al.* (2017), the rate at which non-performing loans are added to the total number of non-performing loans is mostly determined by the bank interest rate. Madhvi and Shrivastava's (2017) provided that NPA may not be a reliable or exclusive criterion for evaluating a bank's health and basing investment

	Fixed effect	Random effect
(Using GNPA as independent variable)		
Intercept	1.524935 (8.024486)*	1.584845 (18.27956)*
GNPA	−0.000234 (−3.803759)*	−0.000254 (−12.73214)*
Adjusted *R* square	0.888413	0.899422
F Statistics	54.07767*	179.8504*
Durbin–Watson	1.512512	1.497600
Hausman Test	$\chi^2 = 0.125511$	
(Using PSNPA as independent variable)		
Intercept	0.900621 (5.024828)	1.405413 (12.69238)*
PSNPA	−7.79005 (−0.356712)	−0.000782 (−8.215064)*
Adjusted *R* square	0.794977	0.675601
F Statistics	26.85008*	42.65244*
Durbin–Watson	1.209625	0.914260
Hausman Test	$\chi^2 = 12.827974$*	
(Using NPSNPA as independent variable)		
Intercept	1.478602 (9.369595)	1.582807 (19.56442)
NPANPA	−0.000272 (−4.345598)*	−0.000316 (−13.66701)*
Adjusted *R* square	0.902144	0.909378
F Statistics	62.46093*	201.6965*
Durbin–Watson	1.610386	1.578038
Hausman Test	$\chi^2 = 0.591490$	

Notes: Levels of significance at 1, 5 and 10% are indicated by the symbols *, ** and ***, respectively. Values for the *T*-statistic are in parenthesis. PS NPAs = Priority sector NPAs, NPS NPAs = Non-priority sector NPAs
Source: Authors' calculation and compilation based on data collected from RBI Database

Table 6.
Regression output

decisions entirely on it. By using BSE Bankex data, Desai (2017) argued that lending to the agricultural, industrial, and personal sectors all has a positive relationship with NPAs in the priority sector, while lending to the service sector has a negative relationship with NPAs. Ganesan *et al.* (2019) and Dahiya and Bhatia (2016) concluded that non-priority sector NPAs outweighed priority sector NPAs in PSBs and other sector banks. Desai (2021) concludes that bank profitability is significantly impacted negatively by agriculture finance, whereas lending to other sectors and personal credit have no discernible influence. Bag *et al.* (2022) also came to the same conclusion that there is no meaningful correlation between the profitability of India's public sector banks and advances to priority sector credit. Mani *et al.* (2023) discovered that the increase in NPAs are not caused by macroeconomic shocks, but rather by increases in the price of domestic fuel and global food.

6.4 Fully modified ordinary least square and dynamic least square result

For validating the above results, the FMOLS and the DOLS techniques are applied. The FMOLS and DOLS results are displayed in Table 7, where the GNPA and all eight subsectors – aside from food credit – indicate a strong and positive correlation. The adjusted *R* square, *p*-value and results from every other test indicate that there is a substantial correlation between the variables throughout the whole model. The FMOLS approach yields trustworthy estimates and support the multiple regression results. The outcome confirms the regression findings, which indicate that every one of the eight subsectors – aside from food credit – contributes significantly to the rise in bank GNPAs.

The FMOLS results for GNPA, PSNPA, NPSNP, and ROA – the dependent variable – are displayed in Table 8. The outcome suggests a substantial and robust link. The model's tests all demonstrate a strong correlation and a significant impact of the independent variables GNPA, PSNPA and NPSNPA on the dependent variable ROA. The panel regression results are corroborated by the FMOLS data as well. At the 1% level, every explanatory variable is significant, and the explanatory value is negative.

6.5 Robustness testing using fully modified ordinary least square and dynamic least square

Some additional analyses are carried out to bolster the evidence derived from the base line regression. Tables 7 and 8 display robustness result that is qualitatively comparable to the baseline result. These findings demonstrate that, with the exception of food credit, all other seven sub-sectors in the priority and non-priority sectors have a positive and significant influence on the three sector banks' total GNPA. Similarly, the three sector banks' ROA is significantly impacted

Table 7. FMOLS and DOLS output: *(using agriculture, MSE and others food credit, industry, service, retail loans and others as independent and GNPA as dependent variable)*

Intercept	FMOLS	DOLS
		1.001584 (34.49469)*
Agri	0.998807 (51.13631)*	1.000546 (55.30471)*
MSE	0.998001 (74.95732)*	1.039946 (8.980946)*
Oth	1.025725 (13.64617)*	3.644978 (0.555137)
FC	2.940354 (0.706950)	0.999911 (1009.831)*
IND	1.000078 (1301.460)*	10.998822 (103.8311)*
SRV	1.000500 (142.6083)*	0.988905 (42.40006)*
RL	0.993726 (57.84147)*	1.004595 (155.4841)*
Other	1.003883 (235.6848)*	0.999926
Adjusted *R* square	0.999964	25.84243
S.E. regression	18.47820	2616.808
Mean dependent var	2808.792	3011.798
S.D. dependent var	3059.129	12020.96
Sum squared resid	5463.104	
Long-run variance	0.182608	0.465942

Notes: Levels of significance at 1, 5 and 10% are indicated by the symbols *, ** and ***, respectively. Values for the *T*-statistic are in parenthesis
Source: Authors' calculation and compilation based on data collected from RBI Database

Table 8. FMOLS output: (using GNPA, PSNPA and NPSNPA as independent and ROA as dependent variable)

	GNPA	PSNPA	NPSNPA
	0.003689	0.030753	0.004181
	(13.02134)*	(11.38730)*	(13.20951)*
Adjusted *R* square	−382.3268	−1907.40	−322.520523
S.E. regression	17.58980	39.24749	16.0.15947
Mean dependent var	0.769444	0.769444	0.769444
S.D. dependent var	0.898413	0.898413	0.898413
Sum squared resid	5259.818	26186.21	4439.185
Long-run variance	0.272581	0.433987	0.240212

Notes: Levels of significance at 1, 5 and 10% are indicated by the symbols *, ** and ***, respectively. Values for the *T*-statistic are in parenthesis. PS NPAs = Priority sector NPAs, NPS NPAs = Non-priority sector NPAs
Source: Authors' calculation and compilation based on data collected from RBI Database

negatively by total GNPAs, PSNPA and NPSNPA. Our major results regarding the influence of all sub-sectors on total GNPAs (Table 7) and the impact of NPAs on ROA (Table 8) of the banks are thus supported by our empirical findings, which are also resistant to other proxies.

7. Conclusion of the study

Crop output, duration, loan term, farm size, weather and other factors all contribute to GNPAs in priority sectors and make it difficult for banks to collect their loans and advances. The non-priority sector is also affected by issues such as the economic cycle, policy shifts, depression and factor shifts. As a result of these issues, the borrower's credit stability suffers. When borrowers are unable or unwilling to repay their loans, NPA are created.

According to the current study findings, the non-priority sector, as opposed to the priority sector, is the major cause of the high level of GNPA in private and foreign sector banks. Priority and non-priority sectors both play a significant role in the case of public sector banks. Multiple regression analysis reveals that the industrial sector is the leading and primary contributor to the growing GNPAs in all three sector banks, followed by agricultural, MSE and the service sector, whereas food credit, retail loans and other sectors in both priority and non-priority have a very little or negligible impact on the total GNPAs in all three sector banks. Nagarajan *et al.* (2013) and Ganesan *et al.* (2019) reached similar conclusions in the case of priority sector GNPAs in PSBs. Swamy and Gopinathan (2020) in the case of ICICI and Desai (2017) in some selected banks based on BSE Bankex arrived at the same conclusion: agriculture and industry loans are the major contributors.

According to the panel regression results, each sub-sector has a major impact on the aggregate GNPAs of all commercial banks collectively, where adjusted R square suggests that food credit and other sectors of priority and non-priority have little impact, whereas industries, service, agriculture, and MSE have a large impact on the total GNPAs of commercial banks. Further, the results are also validated by the FMOLS and the DOLS technique. The study's last section demonstrates that, while priority sector NPAs have no appreciable effect on the return on assets of the banks, total GNPA and non-priority sector NPAs have a negative and considerable impact. The similar finding was reached by Bag *et al.* (2022) who concluded that advances to priority sector credit have no discernible relationship with the profitability of India's public sector banks.

Thus, the empirical results designates that the credit provided by public sector banks to non-priority sectors such as household consumption are proving to be riskier and more burdensome while the credit provided to priority sectors are less riskier.

The finance minister's policy proposals for public-sector bank mergers have resulted in some favorable changes. SCBs' credit growth had accelerated as PSBs' credit growth approached double digits. After the recapitalization of PSBs, the capital adequacy of SCBs improved in 2019. However, this was only for the short term, despite a fall in the commercial banks' GNPA and NNPA ratios, the financial condition of the banks does not improve much because the decrease in the ratio is related to write-offs. In 2020–2021, write-off was the most common method of reducing GNPAs, as it has been since 2018. The non-priority sector, particularly the industrial sector is the primary culprits for the declining health of the banking system. Satpal (2014) came to a similar conclusion. Industries, agriculture and MSE are other major contributors. However, food credit, retail lending and other sectors contribute very little.

8. Implication of the study

The analysis demonstrates that there are notable differences in priority sector NPAs and non-priority sector NPA for public sector banks. It suggests that a greater proportion of credits provided by the public sector banks are being defaulted by the borrowers from various priority

and non-priority sector but the defaulting credits are higher in case of non-priority sector. Many policy implications can be drawn from the empirical findings. Each sub-sector has a major impact on the aggregate GNPAs of all public banks collectively. Therefore, the government of India has launched programmes like Start up India to improve the priority sector. A crucial factor in the effective execution of these programmes is the formal credit that banks give. Based on the study's findings about the patterns of NPAs originating from these specific industries, banks might improve the way in which these advanced loans are managed. However, loan repayment needs to be stressed in addition to enticing banks to lend to the priority sector. Rather than just meeting the sector's target numbers, loans should be given after taking the borrowers' creditworthiness and performance metrics into account. Both priority and non-priority sectors are crucial for GDP growth and economic development. Lending to priority sectors enhances the production of food grains, the highest employment, etc. On the other hand, lending to non-priority sectors supports the formation of new industries and boosts manufacturing. Further, the industrial sector is the primary contributor to the mounting NPAs, which harm bank profitability and have a negative effect on GDP growth. Before making a loan, banks should thoroughly analyse every aspect of the borrower. They should also maintain sufficient oversight to prevent situations like the ABG Shipyard and Nirav Modi's PNB scams, among others.

As lending to MSE and agriculture results in the largest NPAs among the priority sectors, this may be because policymakers set a higher PSL target, which has a detrimental impact on the bank's profitability. Therefore, the goals set for lending to the priority sectors should be reconsidered by the government and RBI. Banks may consider diversifying their lending portfolios across sub-sectors to spread risk. Understanding which sub-sectors are less vulnerable to NPAs can guide banks in diversifying their loan portfolios while maintaining a healthy balance between risk and return.

According to the empirical results, it is possible to infer that to reduce the high level of NPAs, attention should be shifted away from the agricultural and industrial sectors and towards more lucrative industries like service, retail lending, food credit and others. Banks can enhance their monitoring and early warning systems based on the study's insights. By identifying the unique risk factors for each sub-sector, they can implement more proactive measures to detect potential NPAs and take timely corrective actions.

9. Limitations and future scope of the study

The research includes PSBs, PVBs and FBs. Cooperative banks and regional rural banks, on the other hand, are excluded because they operate in a defined territory, have a separate ownership structure, and are governed by different acts. The availability and quality of data related to NPAs in Indian banks, particularly at the sub-sector level, may be limited. Research relied on publicly available data, which may not capture all relevant variables or provide a comprehensive picture of the problem. Although the study spans thirteen years, the RBI database only contains a few years' worth of data. The regulatory environment in the Indian banking sector is subject to change. New policies and regulations can significantly impact NPAs, and the study may not fully account for these regulatory changes. The study looked at distinct bank groupings within the country. It is also possible to make an inter-country comparison of NPA levels with those of other countries, such as China and Russia. As a result, there is room for future research by widening the cross-country comparison.

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