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Profitability of Banks in India: Impacts of Market Structure and Risk

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Abstract

This paper investigates the impacts of market structure and risk on profitability of Indian banks after controlling the influences of some bank specific and macroeconomic determinants. Employing two-step Generalized Method of Moments (GMM) system estimator on a data set of 40 listed Indian commercial banks over a period of 15 years (2002 – 2016), our results suggest that there is a moderate degree of persistence of profit in Indian banking sector during the study period. We find significant negative impact of bank risk on profitability in the Indian banking Industry. With regard to the influence of market structure, the study observes negative association between concentration and profitability and thus, our finding does not support the traditional SCP hypothesis. Regarding the other explanatory variables, the findings show that diversification and capitalization positively influences profitability of Indian banks. In contrary, employee productivity and growth in GDP have negative influence on profitability. On the other hand, the study fails to discern any significant impact of liquidity and bank size on the profitability of Indian banks.

JEL classification numbers: G21, D4
Keywords: Market Structure; Structure-Conduct-Performance Hypothesis; Efficient-Structure Hypothesis; Bank Risk; Bank Profitability; Generalized Method of Moments.

1. Introduction

The growth and development of any economy depends upon its stable and sound

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banking system. Due to the several financial crises observed in different countries, impacts of risk and market structure on bank profitability have evoked much interest among the regulators and scholars in recent times [1, 2]. Empirical literature provides two contrasting hypotheses relating to the association between market structure and profitability of banks. The traditional structure-conduct-performance (SCP) hypothesis states that market structure influences the competitive behaviour which further affects the bank profitability. This is because highly concentrated banking structure encourages banks to collude with each other to earn more profit. The SCP hypothesis, thus, advocates that bank profitability is derives from market structure and in a highly concentrated market or in a less competitive market banks can earn higher profit as compared to banks working in a competitive market irrespective of their efficiency. Market concentration and profitability according to this hypothesis is positively associated. As an alternative to SCP hypothesis, the efficient-structure hypothesis (ESH), developed by Demsetz [3], advocates that bank profitability is derived from the degree of efficiency rather than concentration. Plethora of empirical studies has examined the influence of market structure on the profitability of banks; the results are however mixed supporting both the hypotheses [2,4,5,6].

On the other hand, risk management has long been a focal point for policy makers and academicians as the extent of risk affects the profitability of banks at the micro level and viability of the economy at the macro level. Credit risk is the oldest risk of banks and it is the combined outcome of default risk and exposure risk [7]. However, banking sector all over the world has witnessed sea change due to growing competition and fast changes in the operating environment under the impact of deregulation, technological advancement, and innovation in financial products and services in recent past and banks are compelled to encounter various types of risk like liquidity risk, operational risk and market risk apart from credit risk. Due to the interrelationship between the various types of risk, failure of managing one risk may invite another risk and ultimately banks face the risk of insolvency [8]. The recent financial crisis has refocused attention on the importance and impact of banks' insolvency risk [2, 9, 10]. Large number of researchers has investigated the impact of risk on the profitability of banks and barring a few cases the researchers have advocated the significant influence of risk on profitability [2, 11, 12, 13].

Against this backdrop, the present study is a modest attempt to investigate the impacts of market structure and risk on the profitability of listed Indian commercial banks after controlling the influences of some bank-specific and macro-economic factors. The selection of Indian banks for the present issue is of interest for several reasons. First, Indian banks play a vital role for the development of Indian economy as evident from the various economic survey reports of the Government of India. Second, several rounds of banking reforms in India since 1991 pertaining to introduction of capital regulation, deregulation of interest rates, emergence of new private sector banks, opening up of branches of foreign banks and increasing use of technology have aimed to create a competitive

structure in the sector and to improve the bank performance. Third, the empirical literature indicates that the degree of competition in the Indian banking sector has increased during the last two decades [10, 14]. Indeed, as per the Bank-Scope data at the end of 2015, five bank concentration ratio based on assets in India (45.32%) is considerably less than other emerging markets like Brazil (80.47%), China (52.52%), Russian Federation (53.26%), South Africa (98.99%), Pakistan (63.22%) and Malaysia (73.56%). Thus, the concentration in the banking sector is relatively less in India and quite similar to United States (46.53%). However, the empirical evidence on the influence of market competition on profitability of banks in India is scanty. Fourth, Indian Economic Survey report of 2014-15 states that India has witnessed a credit boom in terms of bank lending in recent past, with the share of credit to GDP increasing from 35.5 percent in 2000 to 52 percent in 2015. Since the interest on loan is the main source of bank income, by increasing loan growth banks can enhance net cash flow, which in turn improve the profitability of banks. Alternatively, as [15] observed, loan growth is positively associated with loan loss which may influence profitability negatively. It is, thus, imperative to examine the consequence of high bank lending on the profitability of Indian banks. Finally, several measures have been undertaken by RBI and the Central Government to minimize credit risk of Indian banks, such as setting up of Board for Industrial and Financial Reconstruction (BIFR), Securitization and Reconstruction of Financial Assets and Enforcement of Security Interest (SARFAESI), The Debts Recovery Tribunal (DRTs), The One Time Settlement Policy (OTS) etc. Nevertheless, the Economic Survey report of 2016-17 has clearly indicates the increase in NPAs in recent times as the alarming factor for the financial stability of the banks in India.

The rest of the paper is organized as follows. Section 2 provides the review of empirical literature. Section 3 is devoted to data and methodology adopted in this study. Results and discussion are resented in Section 4, followed by concluding remarks in Section 5.

2. Review of Literature

2.1 Empirical measurement of bank profitability, market structure and risk

Plethora of empirical studies has investigated bank profitability in both emerging and developed countries. The empirical literature can be grouped into two categories. One group has given importance on the determinants of bank profitability of a single country [2, 16, 17, 18, 19], while the other group focuses on the examination of bank profitability in several countries [1, 20, 22]. However, return on assets (ROA), return on Equity (ROE) and net interest margin (NIM) are the commonly used measures of bank profitability in the literature. ROA has become the key indicator of bank profitability and it measures the efficiency of banks' in utilizing its resources for generating profit [22, 23]. As an alternative measure of bank profitability, ROE is also widely used in the empirical literature

that emphases how efficiently bank utilizes shareholder's fund in generating return. The third measure of bank profitability is the NIM, which is defined as the difference between interest earned on loans & advances and interest paid on deposits divided by interest earning assets. While ROA focuses on the profit earned per amount of investment in total assets, NIM reflects the efficiency of the bank in utilizing its investment resources [24].

A number of methods have been used in the empirical literature to estimate the market structure in the banking sector that can be categorised into two major streams: structural approach and non-structural approach. The structural approach is based on the structure-conduct-performance (SCP) hypothesis, which assumes that market structure affects banks' behaviour, which in turn determines their performance. Hirschman-Herfindahl Index (HHI) and concentration ratio (CR) are the two widely sued measures of bank concentration [2, 10, 13, 19]. HHI and CR as the measure of market structure is based on the idea that a highly-concentrated banking sector (with a few banks occupying significant market shares) can weaken competition and higher concentration in the market leads to greater market power resulting in collusive behaviour and excess profits for banks. In an industry with n banks, the maximum possible value of the HHI is 1, while its minimum possible value is 1/n. The higher value of HHI indicates greater market concentration or lower level of competition. On the other hand, CR ranges from 0 to 1, with higher value indicates lower competition or greater concentration. On the other hand, non-structural approaches have been developed by the New Empirical Industrial Organization (NEIO) studies. The Panzar-Rosse approach, which is widely known as H-statistic [25] and Lerner index are two commonly used non-structural measures of competition.

For measuring bank risk, empirical literature has given importance on credit and insolvency risks of bank. Since the genesis of credit risk is the lending activates of banks, non-performing assets (NPAs) ratio is widely used in the empirical literature to measure banks' credit risk [10]. Recent research in banking literature emphasizes on measuring insolvency risk of banks that takes into consideration the impact of credit risk and other risks faced by the banks. The popular measure of bank insolvency risk in the literature is Z-statistic suggested by [26] and subsequently used by many researchers [9, 10]. Z-Statistic is employed to describe bank's distance-to-default by encompassing three important factors - banks' return on assets, volatility of return and the capital base. The higher Z- Statistic indicates lower insolvency risk and vice versa.

2.2 Empirical literature on impacts of market structure and risk on bank profitability

In the empirical literature, bank profitability is considered as a function of internal and external factors, although a large part of the studies have explored the influence of the internal determinants on bank performance [22]. Among the external factors, researchers have considered industry-specific and macroeconomic determinants of bank profitability. Market structure is an

important industry-specific determinant of bank profitability. However, the influence of market structure on bank profitability is a controversial issue in the extant literature as it is derived from two contrasting hypothesis. According to SCP hypothesis, in a concentrated market or when the competition is low, banks can offer lower rate of deposit and charge higher rate of interest on loans and advances. Thus, banks have the ability to extract higher economic rent, which in turn leads to earning monopolistic or abnormal profit [2]. According to this hypothesis, there is a positive association between market concentration and bank profitability. Plethora of empirical evidences provides support in favour of SCP hypothesis [4, 5, 27, 28].

But the efficiency school of thought challenges the SCP theory that higher concentration leads to higher profitability. The efficient structure hypothesis (ESH) [3] states that higher profits generated by firms due to higher efficiency and not due to the concentrated market. The basic idea of this proposition is that if the efficiency of a firm is higher than its competitors, the firm is able to maximize profits and enhance its market share [4]. Empirically [29] in case of banks in Latin America and [30] for banks in Sri Lanka find evidence in support of efficient structure hypothesis. Likewise, the findings of [17] in the context of banks in Japan also observe inverse association between concentration and profitability using two-step system GMM model. [2] also in case of banks in China conclude that the findings do not support the traditional SCP hypothesis and the efficient structure hypothesis may be prevailed in the sector.

In Indian context, many researchers have examined the influence of capital regulation on the financial soundness of banks [31, 32] and also the competition in the Indian banking sector [13, 14]. On the other hand, some researchers have considered only the influence of internal factors on profitability [like18]. But the empirical investigation on the determinants of profitability of Indian banks considering both internal and external factors is scanty. [19] have investigated the influence of both internal and external factors on profitability of Indian commercial banks and the findings of the study support the traditional SCP hypothesis. However, the study considers only one measure of competition (HHI) and fails to check robustness of the results. Further, due to the dynamic nature of the market more empirical evidences are required to get idea about the influence of the changing behaviour of market structure on the profitability of Indian banks.

On the other hand, the association between bank risk and profitability is an extensively investigated research topic in the extant literature. However, empirical literature relating to the association between bank risk and capital can be divided into two streams. One group focuses on the influence of profitability on the risk of banks based on the logic that in the event of sound financial condition banks try to decrease the risk by not indulging into risky projects and hence there is an inverse association between profitability and risk. Empirical results, however, show contradictory findings. For instance, [11] in case of Nigerian banks, [12] in the banking sectors of Bangladesh and [10] in case of Indian banks find inverse association between profitability and credit risk. In contrary, the findings of [33]

for the banks in Ghana indicate positive association between profitability and credit risk. On the other hand, [34] for the banks of Palestine find insignificant association between profitability and credit risk. Another group investigates the impact of bank risk on profitability on the logic that higher risk reduces the interest spread and consequently leads to decline in bank profitability. Empirically many researchers [17, 2, 30 and 5] observe negative influence of risk on profitability. In Indian context also some researchers [18, 19] find evidence on the inverse association between bank risk and profitability. However, in both the cases researchers focuses on the credit risk of banks. Since the recent empirical literature gives more emphasis on the insolvency risk of banks, the present study is a modest attempt to enrich the empirical literature by providing evidence of the influence of both credit risk and insolvency risk on profitability of Indian banks.

Empirical literature also indicates that other bank specific factors like bank size, liquidity, capital ratio, diversification and employee productivity are the well explored internal factor affecting profitability in the empirical literature [2, 16, 17, 22, 35]. However, the researchers observe mix results relating to the influence of all these variables on bank profitability. Among the macroeconomic determinants of bank profitability, GDP growth rate is widely used in the empirical literature. During the period of growth in GDP or sound economic conditions the demand for lending increases and since the inflow of money is high, the repaying ability of borrowers is also increases, which increases the net earnings of banks. Thus there is a positive association between growth in GDP and bank profitability. However, empirical literature provides mixed results. While [2, 16] observe positive impact of growth in GDP and bank profitability, [17, 36] find negative association.

3. Data and Methodology

3.1 Data and study period

The study is based on secondary data on 40 listed Indian commercial banks (24 public sector banks and 16 private sector banks) for a period of 15 years from 2002 to 2016. While bank specific data are collected from Capitaline Plus Corporate database, macroeconomic data are collected from various economic survey reports of Government of India. We have considered all listed Indian commercial banks over the study period except Standard Chartered Bank, which is the only foreign bank listed in India. These listed banks hold more than 90% of the assets of Indian commercial banks. We use a balanced panel data in this study.

3.2 Variable selection

3.2.1 Response variable

Since the main aim of this paper is to investigate the impacts of market structure and risk on the profitability of Indian commercial banks after controlling the influence of other bank-specific and macro-economic variables, profitability is the response variable of this study. Three profitability indicators are considered in this

study: return on assets (ROA), return on equity (ROE) and net interest margin (NIM). These three measures are widely used in the empirical literature [2, 16, 17, 18]. ROA is defined as the ratio between operating profits to total assets. On the other hand, ROE is measured by dividing net profit by shareholder's equity and NIM is the ratio of net interest income to earning assets, where net interest income is the difference between interests earned and interest expenses.

3.2.2 Bank-specific determinants of profitability

Risk: We use the ratio of net non-performing assets to net advances (NNPA) as a proxy for banks' credit risk. As already explained, this measure is widely used by the researchers for measuring credit risk. As the recent literature provides emphasis on the measurement of insolvency risk to capture the overall risk exposure of banks, we use the Z-statistic as the measure of bank insolvency risk. Z-statistic is suggested by [26] and subsequently used by many researchers for measuring bank's insolvency risk [2, 9, 10]. Z-statistic takes into consideration three important factors: return on assets, capital base and volatility of return. It is a measure of safety index and higher Z- statistic indicates lower insolvency risk and vice versa. Z statistic is computed based on the following:

$$Z - statistic = Ln\left[\frac{ROA + CTA}{\sigma_{ROA}}\right] \ldots . (i)$$

Where, ROA is the return on assets; CTA is the capital to asset ratio and σ_{ROA} is the rolling standard deviation of ROA of three years *t, t-1* and *t-2.* Since the observed Z-score is found to be positively skewed, natural logarithm of Z score is used to obtain symmetric distribution [9]. Since the empirical literature exhibits negative influence of risk on profitability, we also expect that the influence of risk on profitability is negative in Indian context.

Bank size (SIZE): The natural logarithm of total assets is used to measure the bank size. This measure is widely used in the empirical literature [2, 10, 16]. Since the extant literature provides evidence in support of both positive as well as negative influence of size on bank profitability, we have no prior expectation on the influence on size on profitability of Indian banks.

Liquidity (LR): We use the ratio of total loans to total assets for measuring liquidity [1, 2, 17]. Since the empirical literature indicates that the association between liquidity and profitability can be positive as well as negative [2, 35], we have no prior expectation about this variable.

Diversification (DIVR): The ratio of non-interest income to gross revenue to measure this variable. This measure is used by [2, 17]. Alternatively [1] has used the ratio between non-interest income and total assets. Although there is an alternative argument relating to the influence of diversification on profitability based on the competition in the market, we expect this relationship to be positive as higher the share of non-interest income in total revenue, the higher is the profitability.

Capitalization (CAP): We use the ratio between equity capital to total assets as a proxy for capitalization [2, 16, 17]. Although the impact on capitalization on profitability is a debatable issue in the empirical literature, large part of the earlier studies provide evidence in support of positive association between the two [17, 21, 22, 35]. Hence, we expect positive influence of capitalization on bank profitability.

Employee productivity (EP): We measure this variable by the ratio of business per employee, where business is defined as the summation of deposits and loans. Although profit per employee is used in the earlier literature to measure this variable [2], we consider two main activities of the banks performed by the bank employees i.e. deposit mobilization and issue of loans and advances. Generally, higher the business per employee, higher should be the profitability of banks. However, the actual profitability depends upon the efficient utilization of the resources productively and in the event of high non-performing loans, the association can be negative. So, we have no prior expectation about this association.

3.2.3 Industry-specific and macroeconomic determinants of bank profitability

Market structure: We employ Herfindahl– Hirschman Index (HHI) and concentration ratio (CR), which are widely used in the empirical literature for measuring market structure [2, 10]. We compute HHI based on total assets, known as Herfindahl– Hirschman Asset Index (HHI_{TA}), by employing the following formula:

$$HHI_{TA} = \sum_{i=1}^{n} S_i^2 \quad \ldots (ii)$$

Where S_i is the market share of firm *i* in the market and *n* is the number of firms. In an industry with *n* banks, the maximum possible value of the HHI is 1, while its minimum possible value is 1/*n.* The higher value of HHI indicates greater market concentration or low level of competition.

For computing concentration ratio, we use three bank concentration ratio based total assets ($CR3_{TA}$) by employing the following formula:

$$CR3_{TA} = \sum_{i=1}^{3} S_i \quad \ldots (iii)$$

Where S_i is the market share of i^{th} largest banks in terms of total assets. Concentration ratio ranges from 0 to 1, with higher value indicates lower competition or greater concentration.

Since the empirical literature provides two contrasting views about the influence of market structure on the profitability of banks, we do not have any prior expectation on the sign of this variable.

Growth in GDP (GGDP): We collect the data on growth in GDP during the study period from the various economic survey reports of the Government of India. As already discussed, empirically researches observe both positive and negative

influence of growth in GDP on bank profitability [2, 16, 17, 36], we do not have any prior expectation about this association.

3.3 Empirical model

In the empirical literature, many researchers have used panel data model employing fixed effects or random effects. However, bank profits tend to persist over time [17, 27] and hence static panel model based on least square estimation would produce biased and inconsistent result. Thus, we adopt a dynamic specification model by incorporating a lagged dependent variable among the covariates. The model is specified as:

$$\pi_{i,t} = \alpha_i + \delta\pi_{i,1-1} + \beta_1 X_{i,t}^{j} + \beta_2 X_{i,t}^{k} + \beta_3 X_{i,t}^{m} + v_{i,t} + \mu_{i,t} \quad \ldots(1)$$

Where i refers to an individual bank (i = 1,…..,N) and t indicates time (t = 1,…., T). $\pi_{i,t}$ represents profitability of bank i at period t. $\pi_{i,1-1}$ is one period lag of profitability. This makes the specification dynamic and the coefficient δ indicates the speed of adjustment. The value of δ ranges from 0 to 1 with a higher value indicates lower adjustment speed and less competition in the market, while a value close to 0 demotes higher adjustment speed and greater competition [2]. $X_{i,t}^{j}$ represents bank specific determinants of profitability. In this study bank specific determinants are risk (NNPA and Z-statistic), bank size (SIZE), liquidity (LR), diversification (DIVR), capitalization (CAP) and employee productivity. $X_{i,t}^{k}$is the industry specific determinant, which is market structure (HHI_{TA} and $CR3_{TA}$) in the present context. Again, $X_{i,t}^{m}$ represents macroeconomic determinant, i.e. growth in GDP (GGDP). $v_{i,t}$ and $\mu_{i,t}$ are the unobserved bank specific effect and the idiosyncratic error.

Two regressors in the model, namely capitalization and risk, may potentially suffer from endogeneity. This is because bank can increase its profitability by enhancing capital base and its reverse causality can also be true in the sense that in the event of higher profitability bank can improve its capital base through retained earnings. On the other hand, high NPAs or high credit risk may affect profitability negatively. Alternatively, when the financial condition is sound or profitability is high, bank may try to reduce its risk by not investing into risky project. Thus, in order to address the problems of endogeneity, unobserved heterogeneity and profit persistence we adopt two-step System Generalized Method of Moments (System GMM) estimator to conduct our analysis based on the work of [37].We use System GMM as this model permits to use more instruments and can produce more precise estimation [38]. In order to test the validity of the model we conduct second-order autocorrelation test and to ensure the validity of the instrumental variables we conduct Sargan test of over identifying restrictions.

4. Results and Discussion

4.1 Summary statistics

In order to explore the features of empirical distribution of the response and covariates used in the study, univariate descriptive and robust statistics are computed and the results are shown in table 1. The maximum and minimum values of the three profitability measures (ROA, ROE and Spread) indicate the existence of both profitable and non-profitable banks in the data set. Further, near equality of mean and median values in case of spread and ROA indicates that the distribution of the variables is almost symmetrical. The observed values of skewness also demonstrate the same. However, in case of ROE the distribution is found to be relatively more skewed. A look into the explanatory variables, the assumption of symmetry may be tenable in all the cases except for capital ratio (CAP). The longer right tail in case of CAP (skewness is 1.743) indicates that some banks have maintained very high capital ratio. The mean values of HHI_{TA} and $CR3_{TA}$ are respectively 0.0716 and 0.3371. As per the general interpretations of HHI and CR, the market structure of Indian banks during the period is found to be less concentrated. On the other hand, the observed mean and maximum values of NNPA implies that the percentage of net NPAs is still quite high for Indian banks.

Table1: Descriptive statistics

Variables	Minimum	Maximum	Mean	Median	Skewness
ROA	-0.0318	0.0408	0.0092	0.0094	-0.723
ROE	-0.4410	0.3726	0.1390	0.1407	-1.026
NIM	-0.0037	0.0529	0.0253	0.0254	-0.050
Z Statistic	-1.099	6.5290	3.4595	3.4348	-0.034
NNPA	0.0100	16.310	2.2913	1.8905	1.084
HHI_{TA}	0.0617	0.0918	0.0716	0.0706	0.983
$CR3_{TA}$	0.3040	0.3829	0.3371	0.3452	0.098
SIZE	7.0734	14.976	11.334	11.371	-0.171
LR	0.3479	0.8464	0.6729	0.6932	-0.592
DIVR	0.0475	0.3472	0.1408	0.1327	0.656
CAP	0.0035	0.3485	0.0593	0.0530	1.743
EP	1.2500	26.210	7.7595	7.0201	0.901
GGDP	3.8800	9.5700	7.1729	7.2400	-0.349

Since the prime objective of this study is to examine the influence of the market structure and risk on the profitability of Indian banks, apart from summary statistics, we have explored in details the movement of three profitability measures along with the two main covariates of the study. Figure 1 shows the movement of ROA and NIM of listed Indian commercial banks during the period 2002 to 2016. ROA has increased during 2002 to 2004, remained more or less constant during

2005 to 2011 and then declined gradually over the years. In case of NIM also, an increasing trend is noticed during the initial years and remained almost constant during 2004 to 2015. However, it has declined in the year 2016 as compared to the previous year. For ROE (figure 2) the observed trend is quite similar to that of ROA. The downward movement of ROE is very obvious since 2011 and it is close to zero at the end of 2016. The movement of three profitability indicators of Indian banks clearly indicates that in recent times average profitability shows a declining trend although it was remained stable during the middle periods of the study.

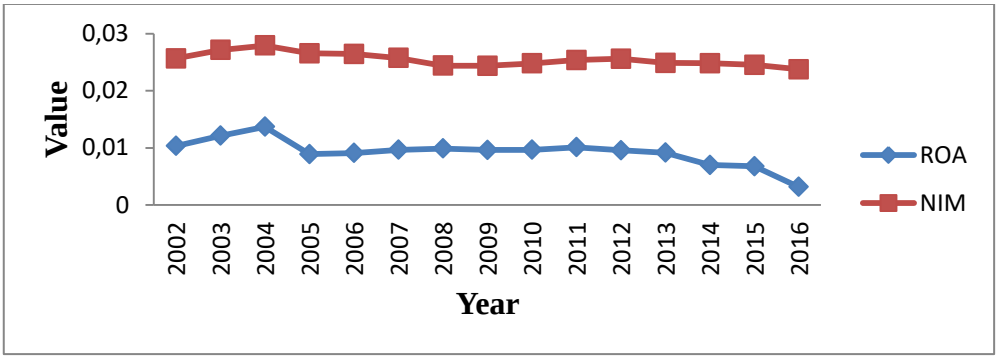

Figure 1: Movement of ROA and NIM

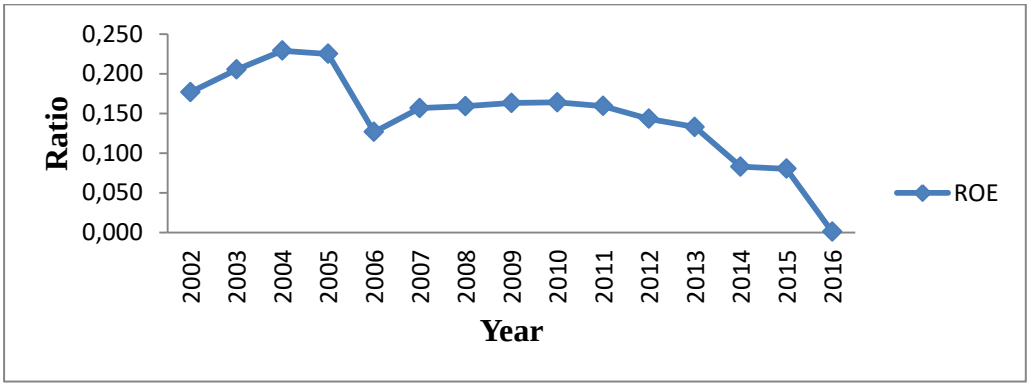

Figure 2: Movement of ROE

Now we look at the movement of bank risk and market structure during the study period. To look into the distribution of bank risk over the years during the study period, we use box plots. It is a standardized pictorial representation of data distribution based on minimum, first quartile, median, third quartile and maximum. Further, the size of the box for each group is very useful for understanding the group differences. Here year is used as a group to see the movement of the variable over the years. Figure 3 shows the box plots of NNPA for the periods 2000 to 2016 (with a gap of one year for proper display). The upper boundaries of the box over the years exhibit a U-shape pattern showing a declining trend till

2010 and increasing thereafter. Interestingly the range of NNPA at the end of 2016 is almost equal to that of in the year 2002. The figure 3 clearly shows that in recent times there is a sharp increase in the credit risk of Indian commercial banks. The NPA of Indian banks has increased by more than four times during March 2010 to March 2016. The Economic survey reports of 2014 and 2016 have categorically mentioned about the sharp deterioration of asset quality of the banking sector, which is a major concern for the financial health of the banks. This increase is true for both public sector and private sector banks, although it is comparatively more for public sector [13]. Further, the larger size of the box, which contains middle fifty percent data, in the year 2016 implies that the spread is more. Likewise, the distance of the upper boundaries of the box from the middle fifty percent data in the year 2016 indicates the existence banks with high NNPA. This figure is quite similar to the figure obtained in the year 2002. Thus, in spite of some improvement in terms of asset quality during the study period, the present scenario of bank credit risk is as it was in the year 2002.

The box plots of the Z-statistic (figure 4) also exhibit the same. Since, Z-statistic is a measure of safety index, the higher the value, the lower is the bank risk. A look into the upper boundaries of the box over the years depicts an inverted U-shape figure, which implies that bank insolvency risk has declined up to 2008 and gradually increased thereafter. Although the size of the box has remained more or less same throughout the study period, the range indicates the existence of some outperforming and nonperforming banks. However, the position of the median in the box apparently indicates that the distribution of Z-statistic over the years is less skewed. The distribution of NNPA and Z-statistic of Indian commercial banks shows an increasing trend in bank risk since the year 2010. This may be due to the introduction of system-based identification of NPAs along with aggressive lending by banks in the past when the situation was relatively favorable.

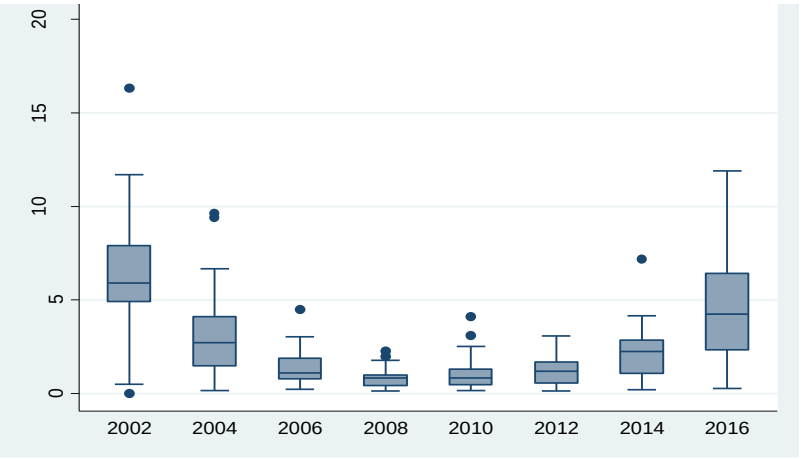

Figure 3: Box Plot of NNPA

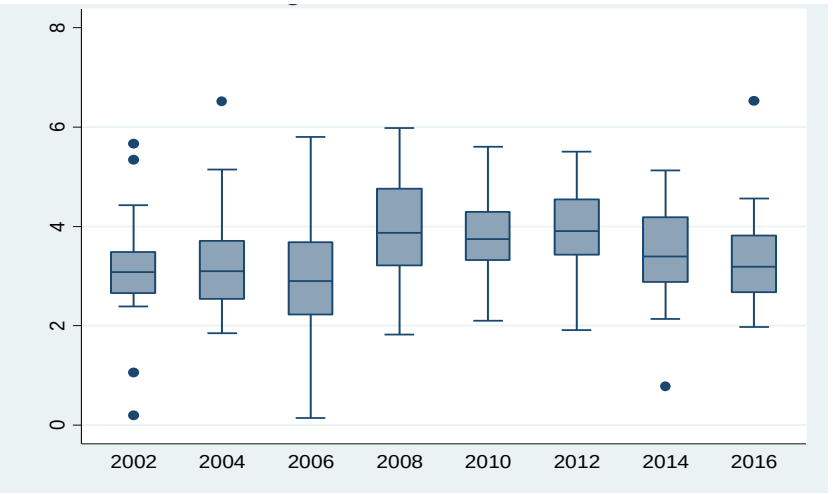

Figure 4: Box Plot of Z-Statistic

Figure 4 exhibits the competitive condition of Indian banking sector over the study period based on CR3 and HHI index. The average value of these two indicators (shown in table 1) depicts lower concentration in the market. Over the years movement of CR3, as reflected in fig. 2, indicates that CR3 has gradually declined from 2002 to till 2012 and has increased slightly thereafter. Due to several rounds of banking reforms in India, the degree of competition has increased in India. Extant literature on Indian banking sector also advocates that the degree of competition has increased after the banking sector reforms [13, 14]. However, in recent times, a slight increase in concentration is contemplated. Values of HHI based on total assets also demonstrate the same.

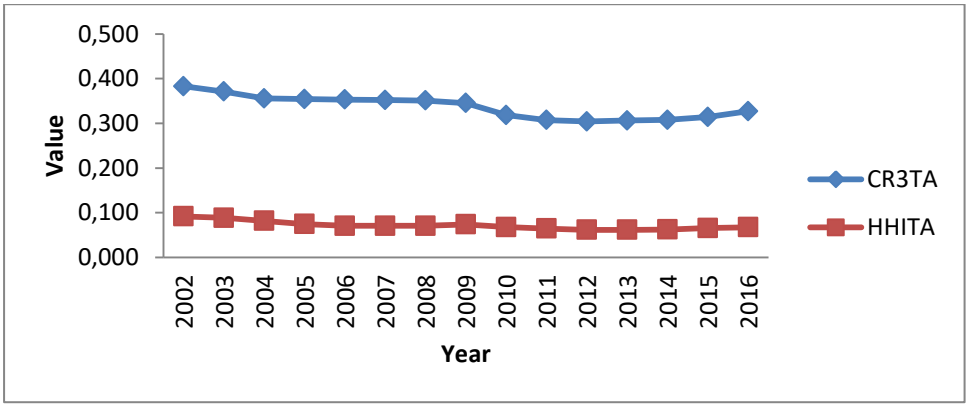

Figure 5: Movement of CR3 and HHI

4.2 Empirical results

Table 2 presents the impact of risk (NNPA) and market structure (HHI) on the three indicators of bank profitability (ROA, ROE and NIM) after controlling the influence of some bank specific and macroeconomic variables. The Wald chi-square test indicates the overall significance of the model. Sargan test shows that there is no evidence of over-identifying restrictions in the GMM dynamic model estimation. Although first-order autocorrelation is present but there is no evidence of second-order autocorrelation. Hence, the estimates are consistent [39]. The estimated coefficient of lagged dependent variable is significant for all the three measures of profitability. This confirms the appropriateness of the dynamic model specification. The coefficients of δ are 0.4191, 0.4443 and 0.5273 respectively for ROA, ROE and NIM, which pronounce the moderate degree of persistence of profit in Indian banking sector during the study period. This indicates that Indian banking industry is moderately competitive. The coefficient estimate of NNPA is negative for all the three measures of profitability, but significant in case of ROA and ROE. This implies that risk and profitability are negatively associated in Indian banking sector. Theoretically, the higher the values of NPAs, the lower is the net income and consequently profitability will be less. From the distribution of NNPA it is evident that inspite of reduction of NNPA for some years during the study period, the average value of NNPA is quite high, which is adversely affecting the average profitability of Indian banks. Further, in recent time average NNPA of Indian commercial banks has increased considerably. The finding of the study is consistent with [2, 5, 11, 30] in the context of emerging markets. On the other hand, the coefficient estimates of HHI based on total assets is found to be negative and significant expect in case of NIM. The inverse association between HHI and profitability implies that when concentration increases profitability of banks decreases. In other words, increase in competition leads to increase in profitability. This is contrary to the traditional SCP hypothesis. This is in line with the findings of [2, 29, 30] in emerging markets.

Among the bank specific determinants, the results indicate bank size (SIZE) is insignificantly associated with profitability. The insignificant association is contrary to the findings of [22], but in line with [16] for Greek banking sector and [2] in case of China. As [16] observe this negative influence may be due to diseconomies of scale. Likewise, liquidity (LR) is found to be insignificantly associated with profitability for all the three indicators of profitability. This implies that by increasing the share of loan in total assets Indian banks could not improve its profitability significantly, which may indicate that the banks do not have efficient system of risk management [2]. However, we find that diversification (DIVR) has positive and significant impact on ROA and ROE. This implies that through diversification banks have earned more non-interest income, which in turn improves the profitability. This is in line with the findings of [36] in case of China, [1] for South Asian banking sector and [19] in case of Indian banks. But the impact of diversification on NIN is found to be negative. This may be due to the fact that when banks give more emphasis on earning non-interest income

through diversification, the net interest margin may decline.

As expected, we empirically observe significant positive impact of capitalization (CAP) on all the three indicators of profitability. The findings are consistent with [19, 22, 35]. Capitalization may influence profitability positively due to several facts, such as a well-capitalized bank can grasp more profitable business opportunities and can also reduce the cost of borrowings. Employee productivity (EP) is negatively associated with profitability for all the three indicators and the coefficients are significant for ROE and NIM. This is contrary to the theoretical expectation and also the empirical findings of [2, 16, 36]. Indeed, the earlier researchers have used revenue per employee to measure this variable. However, we use total business per employee (BPE). BPE can enhance profitability when banks can efficiently utilize its resource base for generating revenue. But if the NPAs are more, business per employee can affect negatively the profitability of banks. To gauge into deeper in this issue we have analyzed the business per employee (BPE) and profit per employee (PPP) for the study period in figure 6 and 7 respectively. A look into the figures reveal that BPE has increased over the years during the study period, however PPP shows an increasing trend in the initial years and declining thereafter. The decline in PPE after 2010 is due to increase in NPAs during this period (as observed in figure 3), which negatively influence the earnings. This clearly indicates banks' inefficiency in utilizing its resource base productively and hence, the negative association between EP and profitability is observed. Finally, the influence of growth in GPD (GGDP) is found to be negative. In the context of overall Japanese banking sector, Liu and Wilson [17] observe negative impact of growth in GDP and profitability. This may happen because growth in GDP encourages competition and increased competition dampens banks' profitability [17]. Likewise, Tan and Floors [36] also observe negative impact of growth in GDP on bank profitability and conclude that sound economic condition improves the business environment and lowers the entry barriers. Consequently, increase in competition declines bank profitability. Alternatively, if the growth in GDP fluctuates over the years, profitability of banks may also be affected negatively.

In table 3 we present the results of model 1 considering Z-statistic as risk indicator and CR3 as measures of competition. We find positive influence of Z-statistic on the three indicators of profitability. Since, high Z-statistic is the indicator of lower insolvency risk, the observed positive association between Z –statistic and bank profitability impels that bank risk and profitability are inversely associated. Thus, both the measures of bank risk provide evidence on the negative impact of risk on profitability. On the other hand, our results show that CR3 has negative impact on profitability. This implies that concentration and profitability are negatively associated, or in other words, there is positive association between competition and bank profitability. Thus, both the measures of market structure provide similar results. The findings of the study, therefore, do not support the traditional SCP hypothesis in Indian context. It is imperative to note here that [19] finds evidence in support of SCP hypothesis in Indian banking sector during the period 2000 to

2013. Indeed, we observe significant changes in Indian banking sector after 2013 in respect of bank risk, profitability and market structure. For instance, net NPAs of scheduled commercial banks in 2015-16 have gone up by more than 150% as in comparison to 2012-13. The same is also evident in this study. Further, after 2013, a clear declining trend in profitability is observed. Again, we find increase in concentration during the same period as compared to prior to 2013. The negative association between concentration and profitability may be due to the dynamic nature of these factors. For other explanatory variables, we find almost similar results as observed in table 2.

Table 2: Empirical Results (NNPA as risk indicator and HHI as competition indicator)

Variables	ROA		ROE		NIM	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
lag of dep. Variable	0.4191	4.575***	0.4443	4.629***	0.5273	7.143***
Constant	0.0159	2.887***	0.4194	3.681***	-0.0014	-0.167
NNPA	−0.0011	−6.017***	-0.0199	-4.663***	-0.0004	-0.417
HHI	−0.0099	−2.008**	-0.2537	-2.584***	-0.0004	0.056
SIZE	-0.0006	-0.194	-0.0023	-0.436	0.0005	1.064
LR	0.0017	1.619*	0.0125	0.707	0.0024	1.251
DIVR	0.0040	3.064***	0.0799	2.761***	-0.0027	-2.372**
CAP	0.0482	2.599***	0.5404	2.711***	0.0864	4.934***
EP	-0.0006	-0.995	-0.0129	-1.901**	-0.0033	-3.229***
GGDP	-0.0003	-4.778***	-0.006	-4.398***	-0.0009	-1.209
Wald Chi-square	351.404***		263.416***		870.466***	
AR(1)[1]	Z = -2.321	p = 0.021	Z = -2.331	p = 0.019	Z = -3.609	p = 0.000
AR(2)[2]	Z = -1.093	p = 0.274	Z = -0.912	p = 0.361	Z = 0.228	p = 0.819
Sargan test[3]	35.828		38.016		38.182	

Note:***, ** and * indicate significant at 1%, 5% and 10% respectively.

[1] Arellano-Bond first order autocorrelation test (H_o: no autocorrelation)

[2] Arellano-Bond second order autocorrelation test (H_o: no autocorrelation)

[3] Test for over-identifying restrictions in GMM dynamic model estimation

Table 3: Empirical Results (Z statistic as risk indicator and HHI as competition indicator)

Variables	ROA		ROE		NIM	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
lag of dep. Variable	0.4762	6.342***	0.4793	7.624***	0.5425	7.330***
Constant	0.0161	1.681*	0.3035	1.305	0.0093	1.051
Z Stat.	0.0013	3.305***	0.0353	2.531**	0.0003	1.093
CR3	-0.0266	-1.836*	-0.3215	-0.961	-0.0268	-1.847*
SIZE	0.0002	0.766	0.0037	0.523	0.0003	1.090
LR	0.0003	0.403	-0.0075	-0.443	0.0036	1.944*
DIVR	0.0045	3.871***	0.0756	2.719***	-0.0015	-1.360
CAP	0.0228	1.667*	-0.7992	-2.785***	0.0793	4.990***
EP	-0.0003	-3.880***	-0.0046	-3.126***	-0.0004	-3.904***
GGDP	-0.0009	-1.053	-0.0015	-8.337	-0.0001	-1.584
Wald Chi-square	349.966***		211.231***		752.128***	
AR(1)[1]	Z = -2.594	p = 0.009	Z = -2.512	p = 0.012	Z = -3.578	p = 0.003
AR(2)[2]	Z = -0.972	p = 0.330	Z = -0.831	p = 0.405	Z = 0.105	p = 0.916
Sargan test[3]	33.528		36.621		37.462	

Note: ***, ** and * indicate significant at 1%, 5% and 10% respectively.

[1] Arellano-Bond first order autocorrelation test (H_o: no autocorrelation)

[2] Arellano-Bond second order autocorrelation test (H_o: no autocorrelation)

[3] Test for over-identifying restrictions in GMM dynamic model estimation

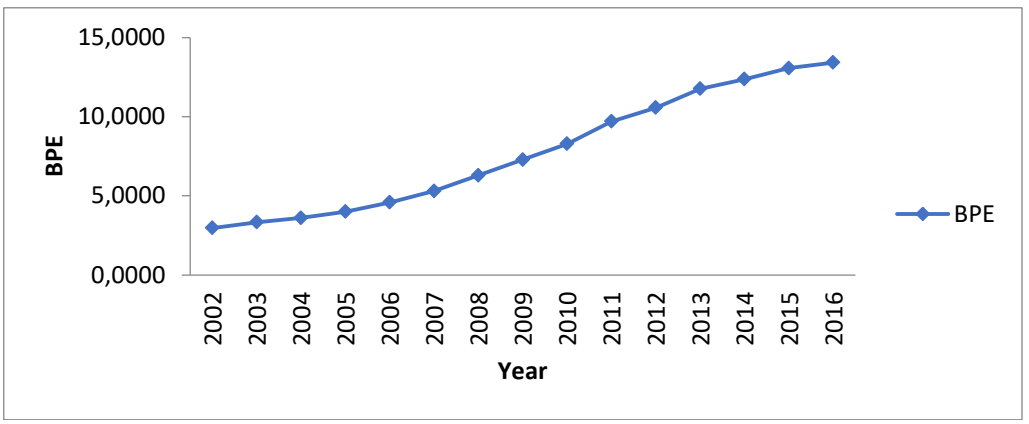

Figure 6: Movement of business per employee

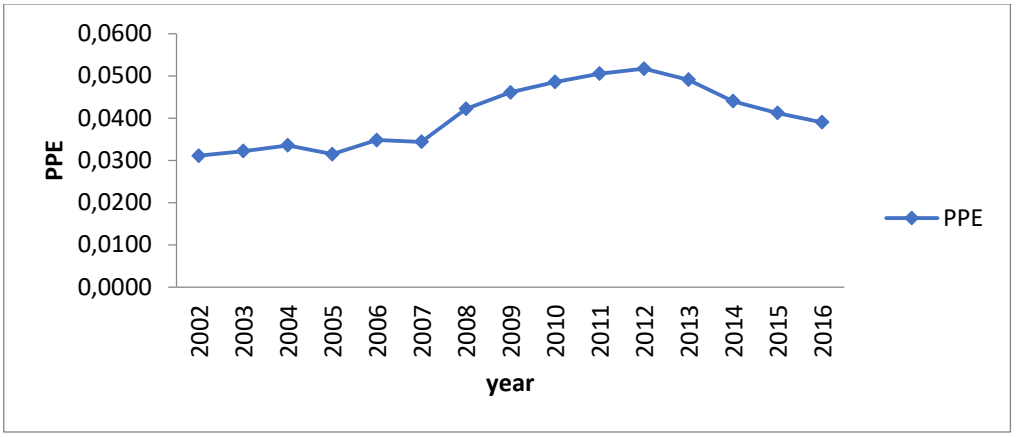

Figure 7: Movement of Profit per employee

5. Conclusion

The present study is a modest attempt to investigate the impacts of market structure and risk on profitability of Indian banks after controlling the influences of some bank specific and macroeconomic determinants. We use different measures of risk, market structure and profitability to check the robustness of our results. We use two-step system GMM estimator to estimate the coefficients in a dynamic set up. Our results suggest that there is a moderate degree of persistence of profit in Indian banking sector during the study period. We find significant negative impact of bank risk on profitability in the Indian banking Industry. With regard to the influence of market structure, the study observes negative association between concentration and profitability, which implies that the impact of competition on bank profitability is positive. Our findings do not support the traditional SCP hypothesis. This finding is in line with the findings of [17] in the contest of Japanese banking sector and [2] in case of Chinese banking sector. This may be due to the fact that the efficient-structure hypothesis is prevailed in the Indian banking sector. Since, we have not used any direct measure to test this hypothesis, future study can be conducted using efficiency as an explanatory variable in the model to test the acceptability of efficiency-structure hypothesis. Regarding the other explanatory variables, the findings show that diversification and capitalization positively influences profitability (ROA and ROE) of Indian banks. In contrary, employee productivity and growth in GDP have negative influence on profitability. On the other hand, the study fails to discern any significant impact of liquidity and bank size on the profitability of Indian banks.

The findings have several policy implications to the regulatory authority and managers to improve the profitability of banks. First, reduction of NPAs is the crucial aspect for the banks to improve profitability. Banks and also the regulatory

authority should take appropriate steps to reduce the NPAs. Recapitalization or restructuring loans may be the short term remedy, but such plans may devastate the financial health of banks in the long run. Second, in a competitive environment banks can improve profitability by improving efficiency in utilizing resources. Since bank employees are the most critical assets, banks should acquire more knowledgeable and productive staffs, provide adequate training to the existing staffs for improving productivity and should build an atmosphere for proper dissemination of knowledge and skill among the employees. The report of the National Skill Development Corporation of India (2010)[1] also indicates bank employees as key resources and states that the success of Indian banks depends upon the efficiency of bank employees. Third, the results suggest that banks should try to diversify their revenue streams in order to enhance profitability. Finally, the study indicates that the efficient-structure hypothesis may be prevailed in the Indian banking sector. If this is true then banks can enhance profitability by reducing cost and expanding market share.

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