

‘Does Bank Competition Affect Financial Stability in Banking Sector : Some Empirical Evidence from India’

Tapas Kumar Parida¹ and Debashis Padhi²

Abstract

Since, the global financial crisis, the link between Bank competition and Financial Stability is widely discussed and debated among policy makers all over the world. It is quite understanding that the degree of competition among credit institutions will increase the risk taking activities to acquire new market and improve profitability. In this backdrop, now the question arises, what is present state of competition in the Indian banking industry? & whether the financial stability of the banks deteriorate due to competition? Further, with the recent consolidation, what will happen the level of competition in the industry? In this study, we made an attempt to answer the above questions in the post financial crisis period (2007-08 to 2016-17). The post crisis period has chosen as the Indian banks’ balance sheet has increased in a robust manner. To do the analysis, a sample of 55 major nationalised and private sector banks has been selected, based on their balance sheet figures as published by RBI.

To test the degree of competition in the banking industry, the study used HHI, CR3, CR5, CR10 and GRS index. For measuring the Financial Stability of individual bank, scores were obtained for the Solvency Risk, and Credit Risk based on their asset portfolio. A panel regression model build by taking Financial Stability as the dependent variable (Solvency Risk, and Credit Risk), and level of competition (based on market share of individual banks), size of the banks (total assets), Net Interest Margin, interest rate, WPI inflation and GDP growth rate as explanatory variable. Further, a dummy variable is used to examine the impact of ownership structure on financial stability. The preliminary result suggests the level of concentration in the banking industry is low but it is increasing in the post crisi period. Indian Banking system has also achieved quite satisfactory performance in terms of financial stability post financial crisis, this is particularly due to strong regulatory measures taken by the regulator. Credit Risk has increased substantially whereas Solvency has remained in the comfort zone.

Keywords: Bank Competition, Solvency, Liquidity, Credit Risk

¹ Economist at SBI, Mumbai Cell: 9867625115 E-mail: tapas.parida@sbi.co.in

² Economist at SBI, Mumbai Cell: 96505606658 E-mail: debashis.padhi@sbi.co.in

1. Introduction

The impact of bank competition on financial stability has been a focus of academic and policy debate over the last two decades and particularly in the post financial crises (*Beck, 2008; Carletti, 2008; Careletti, 2010; Acharya and Richardson, 2009; Beck et al., 2010; OECD, 2011*). In literature, it is quite evidence that the degree of competition among credit institutions will increase the risk taking activities to acquire new market and improve profitability. Earlier studies also confirmed that greater concentration fosters financial fragility, whereas lower pricing power also induces bank risk exposure. In Indian context, the banks have achieved new heights by acquiring new customers, new business areas and also adopting better technology to acquire market in almost all business areas. However, in the post crisis period, the asset quality of the Indian banks has been deteriorated, profits declined and credit growth also stagnated at the historical low level. This may be due to higher risk taking than their capacity, to remain intact in their business operations and profitability.

In this backdrop, now the question arises, What is present state of competition in the Indian banking industry; and Whether the financial stability of the banks has deteriorate due to increased level of competition?. Further, Government has targeted to create 6/7 big size banks, by consolidating the public sector banks (PSBs), to meet the credit needs of the economy. If the agenda of consolidation perceived then what will be the level of concentration in the Indian banking industry. In this paper, we tried to answer these questions. The rest of the paper is organized as follows. Section 2 provides a review of the literature on competition and stability in the banking sector. Section 3 discusses the methodology, data set used and the estimated model. Section 4 presents the empirical results and Section 5 are the conclusions.

2. Review of Literature

The debates on the relationship between banking competition and the overall stability of the financial system is emerged recently. In literature, there are primarily two views have emerged: *competition-fragility and competition-stability*. The competition-fragility view suggests a negative relationship between bank competition and financial stability, while the competition-stability view proposes a positive relationship. Many authors have tested these relationships in various countries & regions and have obtained contrasting results. However, as far as we know, no such study has been done for the Indian banking industry.

There is vast literature which suggests that greater bank competition produces financial instability by decreasing the degree of market power in the sector, which consequently erodes

profits and reduces assets value, supporting the competition-fragility view. Thus, banks are encouraged to take on more risks to increase their returns, deteriorating the quality of their portfolios (Marcus, 1984; Keeley, 1990 and Carletti and Hartmaan, 2002). There are various empirical studies that are supporting this relationship. Some of the studies are: Keeley (1990) finds that increased banking competition and deregulation in the US during the 1990s decreased monopoly rents and contributed to bank failures. Hellmann, Murdock and Stiglitz (2000) concluded that the removal of interest rate ceilings, and thus generating more competitive prices, decreases franchise value and encourages moral hazard behaviour in banks. Jimenez, Lopez and Saurina (2007) studied that the banking sector in Spain and the results indicate that greater banking competition is associated with a higher risk loan portfolio (increased non-performing loans). Berger et al. (2008) has studied 23 developed nations and concluded in favour of the competition-fragility view, suggesting that higher market power reduces the risk exposure of banks. However, they also found that greater market power increases loan portfolio risks which could be interpreted as some evidence supporting the competition-stability view. Vives (2010) reviews the theoretical and empirical literature on the competition-stability relationship and argues that although competition is not a determinant of instability, it may exacerbate instability problems.

While, some studies have argued in favour of a positive relationship between bank competition and financial stability. Beck, Demirguc-Kunt and Levine (2006) studied a group of 69 countries and the results indicate that the countries who are experiencing less market concentration are less likely to suffer a financial crisis. Boyd and De Nicolo (2005) suggest that greater market power in the loan markets increases bank risks since higher interest rates charged on consumers are harder to repay. This may exacerbate moral hazard problems and, at the same time, higher interest rates attract riskier borrowers due to adverse selection problems. Moreover, in highly concentrated markets, financial institutions may believe they are “too-big-to-fail” and this may lead to riskier investments (Berger et al., 2008). Empirically, there are several studies in the post crisis period who have supported this hypothesis. Boyd, De Nicolo and Jalal (2006) and De Nicolo and Loukoianova (2006) both find an inverse relationship between higher market concentration and financial stability suggesting that the risk of bank failures increase in more concentrated markets. They estimate financial stability by the Z-index (an inverse measure of bank risks) and market concentration by the Herfindahl-Hirschman index. Schaeck, Cihak and Wolfe (2006) study the banking sectors of a group of countries by applying a Logit model and duration analysis. Furthermore, they estimate the Rosse-Panzar H-statistic as a measure of

competition. Their main findings argue that more competitive banking sectors have a lower likelihood of bank failure (they are more stable than in monopolistic systems).

Other studies have applied the Lerner index of competition and bank stability measures to examine the competition-stability relationship in banking. *Berger et al. (2008)* study a sample of over 8,000 banks in 23 countries by employing the Generalised Methods of Moments (GMM) dynamic panel data framework. They include measures of market concentration, Herfindahl-Hirschman index, as well as the Lerner index of competition to account for market power. Moreover, they include the Z-index as a proxy for bank stability and non-performing loans over total loans as a measure of bank portfolio risks in order to test both the competition-stability and competition-fragility relationships respectively. Their main results indicate that banks with a higher degree of market power have less overall risks supportive of the competition-fragility hypothesis; on the other hand, they also find evidence of a positive relationship between competition and stability, implying that market power increases total loan risks. *Turk-Ariss (2010)* studies how the degree of market power affects both bank efficiency and financial stability in the banking sector for a group of emerging economies and applied three different specifications of the Lerner index of competition and uses a Z-index to proxy for financial stability. The results indicate that the increased market power results in greater bank stability, although with a significant loss in cost efficiency. *Liu, Molyneux and Wilson (2013)* analysed the competitive conditions in 11 EU countries for the period 2000-2008 in order to examine the competition-stability relationship in banking. They employ the Lerner index of competition and the Z-index in order to proxy for bank competition and bank stability respectively. Their results suggest that a non-linear relationship between competition and stability exists in European banking. More specifically, they find risk-shifting effects in highly concentrated markets, where an increase in banking competition lowers net interest margins (higher deposit rates and lower loan rates) and increases bank stability. However, they find that marginal effects exist in highly competitive markets, where increased competition reduces loan interest payments and the provisions for non-performing loans.

Liu et al. (2012) has introduced a variety of bank-specific risk indicators (the ratio of loan-loss provisions to total loans, loan-loss reserves to total loans, after-tax ROA volatility, and the natural logarithm of the Z-index) to investigate similar relationships for banks operating in South East Asia (Indonesia, Malaysia, the Philippines and Vietnam) between 1998 and 2008. They find that competition measured using the Panzar Rosse H-statistic is inversely and significantly related to most risk indicators except the natural logarithm of the Z-index, which

suggests that competition does not erode bank stability. The researchers also find that concentration is negatively associated with bank risk, whereas regulatory restrictions positively influence bank fragility.

The overall cross-country evidence yields a mixed results regarding the relationship between bank concentration, competition, and stability. Meanwhile, the findings do confirm that concentration and competition can co-exist and may influence financial stability through different channels.

3. Data, Methodology & Model Used

3.1 Data Used & Sample Period

In this study, we investigate the level competition in the Indian banking industry in the post financial crisis period (20007-08 to 2016-17). The post crisis period has chosen as the Indian banks' balance sheet has increased in a robust manner during this period. To do the analysis, a sample of 55 major public sector, private sector and foreign banks has been selected, based on their balance sheet figures as published by RBI. The selected 55 banks represent 99% of the banking industry in terms of assets as of end-March 2017 and are listed in the annexure 1.

3.2 Methodology

3.2.1 Measuring Concentration

To measure competition in a market, it is a well-accepted practice to use the concentration ratios mainly due to their ability to capture structural features of the market. In industrial economics, concentration ratio is a measure of the total output produced in an industry by a given number of firms in the industry. This ratio reflects the changes in market concentration as a result of the entry or exit of a company into the market or caused by a merger. In literature, there are mainly two approaches to measure competition in any market economies are: (a) Structural Approach and (b) Non-Structural Approach.

The concentration ratios are often used in structural models to explain the competitive behaviour in the insurance and banking industry. In general, the concentration indices (CI) exhibiting the following form:

$$CI = \sum_{i=1}^n Si Wi \quad \dots\dots (1)$$

Here, Si is the market share of the firm/company, wi is the weight attached to the market share and n is the number of firms/companies in the industry.

Before going ahead, a theoretical foundation of the various market concentration indices is needed. So, the mathematical formulae and the basic properties of each of the measures are discussed below (Bikker and Haaf; 2000).

⊕ **The K-Concentration Ratio (CR_k)**

In empirical literature, k-concentration coefficient is being used mainly due to its simplicity and limited data requirements. The ratio is defined as the sum of market shares of n largest insurer in the market and it takes the form:

$$CR_k = \sum_{i=1}^k S_i \dots\dots\dots (2)$$

Where, S_i is the market share of insurer i and k is the number of insurance companies in the industry ($i = 1, 2, \dots, k$). Under this method, the concentration ratio gives equal emphasis to all the ‘k’ leading insurers and neglects the effect of many small companies in the market. There is no general rule determining the optimal value of ‘k’. However, in the empirical analysis, ‘k’ is generally determined to be 3, 4 or 5. The ratio ranges between 0 and 1. It approaches zero, if there is an infinite number of very small insurance companies in the system and it equals 1, if there is a single insurer in the market. If the industry consists of ‘k’ equally sized insurance companies, then $CR_k = \sum_{i=1}^k S_i = \sum_{i=1}^k \frac{1}{n} = k/n$, which is a decreasing function of the number of insurance companies in the market.

To estimate the index, by and large, the market shares of the insurer, in ‘total premium’ & ‘first year premium’ are being used. The index provides information only about shifts in market shares between the top n insurers and the remaining small insurance companies, but does not capture changes in distribution within these two groups. Moreover, it ignores the structural changes in the part of the industry which is not included in concentration ratio and also neglects the competitive influence of small companies on the decisions of the large banks in the market (Bikker and Haaf; 2002).

⊕ **Herfindahl-Hirschman Index (HHI)**

The HH Index is defined as the sum of the squares of the relative sizes (expressed as proportions of the total size of the market) of the firms/companies in the market. The formula takes the form as:

$$HHI = \sum_{i=1}^n s_i^2 \dots\dots\dots (3)$$

Where, S_i stands for the market share of the i^{th} company in the industry. HHI stresses the importance of larger firms by assigning them a greater weightage than smaller firms, and it incorporates each firm individually, so that random cut-offs and insensitivity to the share distribution are avoided. This index ranges between 0 to 1 (0 to 10,000, if market shares are expressed in terms of percent rather than in fractions). The values of 0 and 1 represent perfect competition and monopoly respectively. Usually, a value in the range 0 to 0.10 indicates highly competitive market (non-concentration), a value within 0.10 to 0.20 indicates that there is no adverse effect on competition. However, the value above 0.20 is a concern and needs to increase competition further in the industry.

In empirical literature and also in practice, HHI is the most common measure to measure concentration in the industry, largely due to its simplicity. While, the flip side of HHI is that it assigns higher weight to the bigger firms and smaller weights to the smaller firms. This not only raises the importance of the larger firms in the index, it is also reduces the effects of the smaller firms even if they are very large in number, giving a distorted measure of market concentration.

⊕ **GRS Index**

The GRS Index suggested by Ginevicius and Cirba (2009) is an attempt to overcome the weighting problem and thereby to provide a more accurate measure of market concentration. In this index, the weights to different firms are assigned in such a way that (i) the value of the index ranges from 0 to 1, i.e., $0 \leq GRS \leq 1$, (ii) if all firms in the industry have equal market share, i.e., if $s_i = \frac{1}{n}$, $GRS = \frac{1}{n}$, and (iii) it gives a more accurate measure of market concentration. Accordingly, the index is defined as,

$$GRS = \sum_{i=1}^n \left(\frac{n^2 s_1 + 0.3 s_i^2}{n^2 + 0.3 n s_1 s_i} s_i \right) \dots\dots\dots(4)$$

Where, s_1 stands for market share of the largest firm in the industry.

Among the different approaches to measure the concentration in an industry, the choice of the concentration index is mainly dependent on the policy makers'/researchers' perception of the relative influence on competition attached to large and small firms or companies. The HHI and the K-concentration ratio appear most frequently, both in theory and practice, due to their simple structure and the limited data requirement. By following the *Ginevicius and Cirba (2009)* criterion, *Parida & Acharya (2015)* found that the GRS index is the most accurate index to measure concentration in the life insurance sector in India. A study by *Mishra and Rao*

(2014) also concluded that the GRS index is the best index to measure the market concentration in case of the Indian manufacturing sector. In this study, we also used GRS index to measure the level of concentration in the Indian banking industry.

3.2.2 Empirical Model

The empirical work analyzes the effects of bank competition on the stability of financial intermediaries at the institution-level. The stability of a bank can be evaluated with regard to different sources of risk: *the solvency risk, the liquidity risk, and the credit risk of the asset portfolio*. This classification is useful in order to reconcile those views which seem to be contradictory but which, in fact, refer to distinct types of bank risk. Moreover, this can also be helpful for policy purposes in order to provide more case-specific recommendations, based on the peculiarities of specific banking systems, and on the types of risk under consideration. In the baseline specification, we estimate the following panel regression:

$$\mathbf{Bank\ Risk} = f(\mathbf{Competition, Bank\ Controls, Regulatory\ Controls, Macro\ Controls})..(4)$$

For each type of bank risk (solvency, liquidity, and credit), we should estimate different specifications for panel regressions. However, we have not considered the liquidity risk in this study, due to the high variation in the individual banks data.

⊕ **Solvency Risk:** defines the risk that a bank cannot meet maturing obligations because it has a negative net worth; that is, the value of its assets is smaller than the amount of its liabilities. This may happen when a bank suffers some losses from its assets because of the write-offs on securities, loans, or other bank activities, but then the capital base of the institution is not sufficient to cover those losses. In such a case, the bank unable to meet its obligations defaults. In order to avoid such risk, banks need to keep an adequate buffer of capital, so that in case of losses, the bank can reduce capital accordingly and remain solvent. The indicator of bank solvency we use the Z-score which is widely used in the literature as a stability indicator (see, for instance, Boyd and Runkle, 1993; Lepetit et al., 2008; Laeven and Levine, 2009). Using accounting information on asset returns, its volatility and leverage, the Z-score is calculated as follows:

$$Z_{it} = \frac{ROA_{it} + E_{it}/TA_{it}}{\sigma(ROA)_{it}} \dots\dots\dots(5)$$

Where, ROA is the return on assets, E/TA is the equity to total assets ratio, and σ (ROA) is the standard deviation of return on assets.

The Z-score is inversely related to the probability of a bank's insolvency. A bank becomes insolvent when its asset value drops below its debt and the Z-score shows the number of standard deviations that a bank's return has to fall below its expected value to deplete equity and make the bank insolvent. Thus, in order to study the relationship between competition and solvency and to formulate our hypotheses for the empirical analysis, we need to investigate whether, and how, price competition may affect these two components of bank solvency.

⊕ **Credit Risk:** is the risk that a borrower will not be able to repay the debt to a bank. Given the main focus of banking activity on credit provision, we analyze the effects of price competition on the quality of bank lending, by investigating the credit risk of the loans extended to customers. In general, an increase in price competition implies a decrease in the lending rates charged by banks to borrowers. However, this may affect the credit risk of the loan portfolio in two different ways. In one case, corresponding to the argument in Boyd and De Nicolò (2005), the reduction in lending rates may improve the credit conditions for borrowers by making it easier for them to repay bank loans and then by reducing the probability of default on bank credit. If this improvement in credit quality is extended to the whole portfolio of a bank, then an increase in price competition may reduce the average credit risk of the loan portfolio. In the other case, the decrease in lending rates may contract the profit margins from the provision of credit, thereby potentially reducing the franchise value of the financial intermediary. As a consequence, if managers are interested in increasing bank profitability, banks may increase risk-taking by extending more credit also to riskier borrowers, with a consequent rise in the average credit risk of the loan portfolio.

These two effects may not be mutually exclusive, since they concern two distinct aspects of credit risk determination. In the first case, price competition directly affects the risk from the borrower's side, by reducing the adverse selection problems in the credit market between lenders and borrowers. In the second case, price competition has an effect on the amount of risk that the lender is willing to take, in order to achieve a given target for bank profitability.

Moreover, if banks are able to screen and differentiate borrowers with respect to their credit risk, we may also expect that market power may be used by some banks to exercise price discrimination across loan applicants on the basis of their creditworthiness. As a consequence, banks with large market power would be able to charge different lending rates as a function of the borrower's credit risk, while banks with limited market power would be constrained to apply low lending rates to all applicants. In such a case, high-risk borrowers would have an incentive to get credit from banks with little market power because they apply lower interest rates. This could also explain why banks with large market power may have an advantage in terms of the credit quality of their loan portfolio.

The credit risk is the risk related to the quality of bank assets and it mainly includes the credit risk of the loans extended by the bank and of the securities held on balance sheet. Provided that the major component of on-balance-sheet assets is given by loans, a good measure for the asset portfolio risk is the Non-Performing Loans (NPLs) ratio, which is taken from RBI.

⊕ **Other Control Variables:** The degree of competition in the banking market can be analyzed through different measures that are related to three different concepts: price competition, market contestability, and market concentration. In particular, we use as key explanatory variables in our analysis. We measure competition at the bank level by computing the market share of the individual banks, , which may be representative of the banks' position in terms of market concentration. The rationale for that is the structural distinction between market power and market concentration; for instance, *Claessens and Laeven (2004)* have shown that even if market concentration may be a good indicator for market structure, highly concentrated markets can also be quite competitive, either because banks price loans and deposits as in a competitive setting or because the market is open to new entrants.

Following *Schaeck and Cihak (2008)*, *Laeven and Levine (2009)* and *Uhde and Heimeshoff (2009)*, we also include a range of bankspecific variables. A bank's asset size (SIZE) is defined as the logarithm of its total assets. The net interest margin (NIM) is employed to track the profitability of a bank's investing and lending activities. Further, GDP and WPI inflation has been taken as control variables to see the macro economic impact on financial stability of the banks.

Further, to examine the impact of ownership structure on financial stability, we have used dummy variable, where 1 is assigned for Government owned and 0 is for private and foreign banks.

The notes on our dependent, explanatory and instrumental variables are presented in table 4 below.

Table 1: Description of the Variables	
<i>Variable</i>	<i>Definition</i>
<i>Dependent variables</i>	
Credit Risk (GNPLs)	Individual Bank-level NPLs
Solvency Risk (ZS)	Bank-level Z-score
<i>Independent variable</i>	
SIZE	Natural logarithm of Total Assets
NIM	Bank's net interest income as a share of its total earning assets
MS	Bank Level Market Share (Measure of Competition)
IR	Interest rate (credit)
WPI	Rate of inflation
GDP	Nominal GDP growth rate
GOWN	Measure of ownership: 1 if Government owned; 0 otherwise

We have formulated the following 2 panel regression models to examine the financial stability of the Indian banking sector by using the variables listed in table 4.

$$GNPL_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 NIM_{it} + \beta_3 MS_{it} + \beta_4 IR_{it} + \beta_5 WPI_{it} + \beta_6 GDP_{it} + \beta_7 GOWN_{it} + U_{it} + V_{it} \dots\dots\dots(6)$$

$$ZSCORE_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 NIM_{it} + \beta_3 MS_{it} + \beta_4 GBTA_{it} + \beta_5 LTA_{it} + \beta_6 IR_{it} + \beta_7 WPI_{it} + \beta_8 RGDP_{it} + U_{it} + V_{it} \dots\dots\dots(7)$$

Where, $\beta_1 \dots \beta_6$ are coefficients and U_{it}, V_{it} are the two error terms

In panel data analysis, generally two approaches namely *Fixed Effect (FE)* model and *Random Effect (RE)* model, followed. The FE model allows the intercept in the regression model to differ cross-sectionally, while all the slope estimates are fixed both cross-sectionally and over time. Under fixed effects model, the error term U_{it} , can be decomposed into an individual specific effect, U_{it} and the 'remainder disturbance', V_{it} , that varies over time and across

sections (capturing everything that is left unexplained about Y_{it}). Here U_{it} encapsulates all of the variables that affect Y_{it} cross-sectionally but do not vary over time (equation 1).

An alternative to the FE model is the RE model, which provides for different intercept terms for each unit of cross-section but these intercepts remain constant over time. In RE model, the relationships between explanatory and dependent variables assumed to be same both cross-sectionally and temporally. Under the RE model, the intercepts for each cross-sectional unit are assumed to arise from a common intercept α (which is the same for all cross-sectional units and over time), plus a random variable that varies cross-sectionally but is constant over time. To identify which model (FE/RE) best suites to our data, the *Hausman test* statistic would be tested.

4. Empirical Results & Discussions

4.1 Measuring Competition

There are an enormous academic writings on the aspect of competition in the banking sector of different countries. To our knowledge, there are a few number of \studies are available who have measures market power of Indian commercial banks. Prasad and Ghosh (2005) estimated the Panzar and Rosse (1987) H-statistic of Indian banks in the period 1997-2004 for 64 banks and in turn found monopolistic competition equilibrium. In another study by Datta () analysed the degree of competition in Indian commercial banking sector for the period 1996-97 to 2004-05, by using the model containing first order condition for profit maximization, coupled with cost function and inverse demand function. The study supports that the competitive environment of Indian banking sector has improved during the regime of ongoing liberalization and competition has become more severe in during 2003-04 to 2004-5.

The cross country empirical evidence supports that in concentrated markets banks charge higher rates on small business loans and pay lower rates on retail deposits (Berger and Hannan, 1989, 1997; Hannan1991). Researchers found that in more concentrated markets deposit rates are sticky or slow to respond to changes in open market interest rates, and the sticky character is greater with respect to increases than decreases, consistent with market power (Hannan and Berger, 1991; Neumark and Sharpe, 1992: Jackson, 1997).

In Indian context, it is widely perceived that competition in the Indian banking sector has increased since the inception of the financial sector reforms in 1992. In a speech by Rajan (2014) at the Annual day of Competition commission of India (CCI) highlighted that there is

enough competition in the Indian banking sector and also suggested that the best approach to increase efficiency and competition in the PSBs, without sacrificing their “public” character.

In this study, we examine the competition in the Indian banking sector in the post reform period. We have used 5-concentration indices, say CR3, CR5, CR10, HHI and GRS index, to see the structure of the Indian banking sector, in the post reform period. The results are highlighted in the table 3.

Year	HHI	CR3	CR5	CR10	GRS
FY05	0.059	0.309	0.407	0.562	0.181
FY06	0.056	0.312	0.408	0.562	0.166
FY07	0.054	0.308	0.403	0.560	0.158
FY08	0.052	0.295	0.386	0.548	0.158
FY09	0.057	0.295	0.390	0.565	0.177
FY10	0.054	0.278	0.375	0.562	0.170
FY11	0.054	0.280	0.383	0.568	0.168
FY12	0.053	0.283	0.380	0.565	0.164
FY13	0.053	0.282	0.377	0.562	0.167
FY14	0.055	0.289	0.389	0.573	0.169
FY15	0.055	0.289	0.390	0.580	0.169
FY16	0.056	0.287	0.389	0.581	0.175
FY17	0.060	0.304	0.405	0.595	0.185
Avg. (FY05-17)	0.055	0.293	0.391	0.568	0.170
Source: Computed; ^based on Total Business					

The HHI index value over the years is in the range 0 to 0.10, indicates a highly competitive market (non-concentration) but the trend shows that the concentration in the market is increasing during the post-crisis period. The CR index indicate that the top 3-banks in the sector hold around 30% of the market, top 5 banks holds around 40% and the top 10 banks holds 60% of the market in terms of total business. All the 3 CR indices indicates a similar trend that the concentration in the sector is increasing though slowly. Further, the GRS index also shows the same increasing trend. As both HHI and Cr indices faced with a number of challenges, we have taken into consideration the GRS number, which is also termed as best index to measure the market concentration in the market. The GRS index varies in the range of 0.15-0.18, which indicate that the Indian banking sector is less concentrated, or more competitive in nature.

The calculated 5-concentration indices are showing a similar upward trend in index value, i.e, concentration is increasing. So, there is a need for RBI to look the trend carefully and try to foster regulation in the sector, which will push competition and bring efficiency in the sector.

4.2 Panel Regression Results

Before empirically testing the model, we have tried to find out the structure of each variable through summery statistics and their degree of relationship with each other. Total number of observation in the data set is 550, as the study considered 55-banks for the period of 6-year, starting 2007-08 to 2016-17. The arithmetic mean and standard deviation of GNPL is 4.0 and 4.1 respectively which indicate that the dependant variable has low variation in the study period. In the similar lines, the independent variables have low variations. The dependent variable ZS varies from negative 49% to 307%, showing a very high std. dev of 46. This is mainly as banks varies from small to large.

Table 3: Descriptive Statistics					
Variables	Obs	Mean	Std. Dev.	Min	Max
GNPL	550	4.0	4.1	0.0	28.8
ZS	550	33.3	46.0	-48.8	307.5
NIM	550	2.8	0.8	0.6	6.3
MS	550	0.0	0.0	0.0	0.2
IR	550	8.4	0.8	6.8	9.3
WPI	550	4.7	3.9	-3.6	9.6
GDP	550	13.5	2.8	10.0	19.6
SIZE	550	13.4	1.5	8.4	17.1

To examine the possibility of high correlation among the independent variables, the Pearson's correlation coefficient was estimated and the results are given in the table below. The results confirm that there is no multi-collinearity in the models among fiscal variables as the values of correlation do not exceed from cut point of 0.5. However, there is a slightly higher correlation among GDP and WPI, Size and Market share, which is expected.

	GNPL	ZS	NIM	MS	IR	WPI	GDP	SIZE
GNPL	1							
ZS	-0.43	1						
NIM	-0.22	0.17	1					
MS	0.05	0.02	-0.13	1				
IR	-0.46	0.16	0.13	0.00	1			
WPI	-0.38	0.17	0.15	0.00	0.71	1		
GDP	-0.34	0.15	0.11	0.00	0.43	0.62	1	
SIZE	0.13	-0.03	-0.22	0.65	-0.11	0.14	-0.18	1

Dependent Variable	FE Model Results		Random Effects Model Results	
	GNPLs	ZS	GNPLs	ZS
	Model-1	Model-2	Model-1	Model-2
C	16.27 (2.62)	38.12 (1.48)	25.78 (7.39)	36.19* (1.43)
SIZE	0.73 (1.85)	-5.61* (-3.41)	-0.15 (-0.80)	-4.77* (-3.00)
NIM	-0.12 (-0.37)	4.88* (3.61)	-0.15 (-0.63)	4.76* (3.55)
MS	-169.53* (-4.03)	465.12* (2.67)	-6.51 (-0.63)	423.4* (2.93)
IR	-1.92* (-7.70)	4.37* (4.23)	-1.95* (-7.73)	4.41* (4.26)
WPI	0.001 (0.18)	0.63* (2.57)	-0.001 (-0.02)	0.64* (2.63)
GDP	-0.20* (-2.66)	0.66** (2.25)	-0.27* (-4.06)	0.73* (2.49)
GOWN	-	-	2.08* (2.72)	-20.16*** (-1.68)
R ²	Within: 0.31 Between:0.01 Overall: 0.03	Within: 0.34 Between:0.01 Overall:0.03	Within: 0.28 Between:0.29 Overall: 0.28	Within: Between: Overall: 0
F Test/ Wald Chi ²	36.69	42.16	218.55	254.18
Prob>F/ Chi ²	0.0000	0.0000	0.0000	0.0000
Hausman Test Statistic :- H0: Random Effects Model is Appropriate, H1: Fixed Effects Model is Appropriate				
Chi ²	19.00	4.91		
Prob. >Chi ²	0.0000	0.17		
Note: Figures in (#) implies t-statistics for FE and z-statistics for RE model, Wald Chi ² for RE model; * Significant at 1% level, ** at 5% level, *** at 10% level				

Under FE model, there are 2 variables, i.e. 'MS', GDP and IR', is significant in Model 1, while 'Size', 'MS', 'IR' and 'GDP' are significant in Model 2. The results of the 2 random effects (RE) models are presented in table 6. In both the RE models, the IR and GDP' are significant. To choose the appropriate model, the Hausman (1978) specification test is employed and the results prefer fixed effects (FE) to random effects in Model 1 and RE to FE in Model 2. In the model 2 RE, all the variables are significant but a very few variables has the same sign as expected.

5. Conclusions

This paper analyzes the relationship between bank competition and financial stability for banks in India. The banking system in India indicate a low level of market concentration but the concern is that it is increasing in the post crisis period. At the same time, it has achieved a quite satisfactory performance in terms of financial stability, as shown during the global financial crisis. Given this motivation, we investigate how the nexus between competition and stability works for the banks in India. In particular, we provide two main contributions with respect to the previous literature. First, we explore whether and how competition may affect stability with regard to three different types of bank risk at the institution level—solvency, and credit risk—and we show that the heterogeneous effects observed in the existing literature may be explained in terms of different types of risk. Second, we examine how market entry, bank regulation, and bank supervision may shape, or change, the impact of competition on different sources of bank risk.

The empirical results suggest that the effects of bank competition on stability may differ depending on the type of risk. In particular, we observe that competition has a positive effect on bank liquidity, while it may have a potentially negative impact on solvency and credit quality. Price competition improves the liquidity position of a bank by inducing a self-discipline mechanism on the choice of bank funding sources. If banks are subject to strong competition, they get lower profit margins and are then unable to afford costly funding sources; for this reason, they prefer to keep larger buffers of liquid assets. Capital regulation may strengthen the liquidity-enhancing effect of price competition, while deposit insurance may reduce such incentives.

Also, price competition may reduce bank profits and then imply a possibly negative effect on solvency. In general, if banks pursue active management of their capital, they may respond to a decrease in profitability by increasing their capital base so as to improve their resilience. In such a case, competition may have a positive effect on bank solvency if the increase in bank capital is sufficiently large to compensate for the reduction in bank profits. Then, a country's regulatory framework may affect the incentives of banks in various ways. On one hand, the presence of a deposit insurance scheme reduces the opportunity cost of a potential insolvency for competitive banks and so the rationale for a capital increase. On the other hand, prudential requirements may provide an effective mechanism for banks with market power to safely manage their additional profit margins and increase their capital buffers.

Price competition may increase the credit risk of the loan portfolio if banks are induced to take on additional risks to improve their profitability. In such a case, the effect of an increase in bank risk taking from the lender's side would be more relevant than the effect of a potential decrease in credit risk from the borrower's side. As also observed for solvency, capital regulation may provide the appropriate incentives for prudent management of banks with market power.

References

- Aigner, D., Lovell, C. A. K., and Schmidt, P. (1977). "Formulation and Estimation of Stochastic Frontier Production Function Models". *Journal of Econometrics*, 6, 21-37.
- Baltagi, B. H. (2008). *Econometric Analysis of Panel Data*. 4th edition, Chichester: John Wiley and Sons Ltd.
- Baltagi, B. H. (2013), "Econometric Analysis of Panel Data" 5th Edition, Chichester, UK: Wiley.
- Beck, T. (2008). "Bank competition and financial stability: Friends or foes?". World Bank Policy Research Working Paper No. 4656.
- Beck, T., De Jonghe, O., and Schepens, G. (2010). "Bank Competition and Stability: Reconciling Conflicting Empirical Evidence". Cass Business School Working Paper.
- Beck, T., Demirguc-Kunt, A., and Levine, R. (2006). "Bank concentration, competition, and crises: First results". *Journal of Banking and Finance*, 30(5), 1581-1603.
- Berger, A., Klapper, L., and Turk-Ariss, R. (2008). "Bank competition and financial stability." World Bank Policy Research Working Paper No. 4696.
- Berger, A.N., Hannan, T.H., 1997. Using measures of firm efficiency to distinguish among alternative explanations of the structure-performance relationship. *Managerial Finance* 23, 6-31.
- Prasad. A and Ghosh. S, 2005, Competition in Indian Banking, IMF Working Paper, WP/05/141.
- Berger, A.N., Hannan, T.H., 1989. The price-concentration relationship in banking. *Review of Economics and Statistics* 71, 291-299.
- Boyd, J., and De Nicolo, G. (2005) "The theory of bank risk taking revisited". *Journal of Finance*, 60(3), 1329-1343.
- Boyd, J., De Nicolo, G., and Jalal, A. M. (2006). "Bank risk taking and competition revisited: New theory and evidence". IMF Working Paper No. 297.
- Carletti, E. and Hartmann, P. (2002). "Competition and financial stability: What's special about banking?". ECB Working Paper No. 146.
- Cihak, M., Maechler, A., Schaeck, K., and Stolz, S. (2009). "Who disciplines bank managers?". IMF Working Paper Series No. 272.

- Claessens, S., and Laeven, L. (2004). "What drives competition? Some international evidence". *Journal of Money, Credit and Banking*, 36(3), 563-583.
- De Nicolo, G., and Loukoianovam, E. (2006). "Bank ownership, market structure, and risk". IMF Working Paper No.215.
- Ginevicius R. and Cirba S. (2009), "Additive Measurement of Market Concentration", *Journal of Business Economics and Management*, Volume 10, Issue 3, 2009, pp 191-198.
- Guerrero, R. and Negrin, J. L. (2006) "Eficiencia del sistema bancario mexicano 1997-2004: una estimación dinámica." *Monetaria*, Centro de Estudios Monetarios Latinoamericanos, 0(3), pp. 235-259.
- Guerrero, R. and Villalpando, M. (2009). "Rentabilidad, concentración y eficiencia en el sistema bancario mexicano". *El Trimestre Económico*, 76(1), 237-263.
- Hellmann, T. F., Murdock, K., and Stiglitz, J. (2000). "Liberalization, moral hazard in banking and prudential regulation: Are capital requirements enough?" *American Economic Review*, 90(1), 147-165.
- Hernandez-Murillo, R. (2007). "Experiments in financial liberalization: The Mexican banking industry". *Federal Reserve Bank of St. Louis Review*, 89(5), 415-432.
- Jimenez, G., Lopez, J., and Saurina, J. (2007). "How does competition impact bank risk taking?". *Banco de España Working Papers* No. 1005.
- Keeley, M. (1990). "Deposit insurance, risk and market power in banking". *American Economic Review*, 80(5), 1183-1200.
- Liu, H., Molyneux, P., and Wilson, J., (2013). "Competition and stability in European banking: A regional analysis". *Manchester School*, 81(2), 176-201.
- Liu, H., Molyneux, P., Nguyen, Linh.H., 2012. Competition and risk in South East Asian commercial banking. *Applied Economics* 44, 3627-3644.
- Marcus, A. J. (1984). "Deregulation and bank financial policy". *Journal of Banking and Finance*, 8(4), 557-565.
- Mishra P. and Parimal (2014), "Concentration vs Inequality Measures of Market Structure: An Exploration of Indian Manufacturing", *Economic & Political Weekly*, Vol. XLIX, No 33, pp. 59-65, August 16, 2014.

Mishra P., Divesh M. and Parimal (2011), “Market Concentration in Indian Manufacturing Sector: Measurement Issues”, *Economic & Political Weekly*, Vol. xlvi, No 49, 03 December 2011, pp. 76-80.

Molyneux, P., and Nguyen-Linh, H. (2008). “Competition and risk in the South East Asian banking”. Bangor Business School Working Paper, Bangor, Wales.

Parida T K (2017), ‘Measuring Competition in Indian Non-life Insurance Industry: Some Evidences in the Post-reform Period’, *Bimaquest, The Journal of Insurance, Pension and Management*, Vol. 17, Issue 1, pp 60-78, January 2017, National Insurance Academy (NIA), Pune, ISSN 0974-0791.

Parida T K and Acharya D. (2016), ‘Competition in Indian life insurance industry: Post Liberalisation Evidence’, *The International Journal of Business Competition and Growth*, Vol. 5, Nos. 1/2/3, 2016, pp.110 - 136. Print ISSN: 2042-3845, Online ISSN: 2042-3853.

Parida T K and Acharya D. (2017), ‘The Life Insurance Industry in India: Current State and Efficiency’, Springer Singapore, 1st Ed. 2017, XXII, ISBN: 978-981-10-2232-6 (Print) 978-981-10-2233-3 (Online).

Rajan R. (2014), ‘Competition in the Banking Sector: Opportunities and Challenges’, Annual Day Lecture of the Competition Commission of India, New Delhi. <http://pib.nic.in/newsite/mbErel.aspx?relid=105110>

Ruiz-Porras, A. (2008). “Banking competition and financial fragility: Evidence from panel-data.” *Estudios Economicos*, 23(1), 49-87.

Ruiz-Porras, A., Vasquez-Quevedo, N., and Nuñez Mora, J. A. (2006). “Efectos de la globalización financiera en la administración y regulación de riesgos bancarios en México”. *Contaduría y Administración*, 219, 115-141.

Schaeck, K., Cihak, M., and Wolfe, S. (2006). “Are more competitive banking systems more stable?”. IMF Working Paper No. 143.

Turk-Ariss, R. (2010). “On the implications of market power in banking: Evidence from developing countries”. *Journal of Banking and Finance*, 34(4), 765-775.

Vives, X. (2010). “Competition and stability in banking”. IESE Working Paper No. 852.

Yacaman, J. M. (2001). "Competition and consolidation in the Mexican banking industry after the 1995 crisis in the banking industry in the emerging economies: Competition, consolidation and systemic stability". BIS papers No. 4.
