Impact of Bank Size on Conduct of Commercial Banks in India

Abstract

In order to visualize the implications of potential consolidation on competition in Indian banking industry, the current study makes an attempt to study the impact of size of banks on their conduct in the Indian banking industry in order to see. Using conjectural variation model the study finds that the biggest banks charge the lowest mark-up, indicating the increase in bank size through consolidation may not have negative implications in terms of abuse of market power by big banks.

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1. Introduction

Consolidation in the banking industry is one of the most crucial issues facing the Indian financial sector at present. The logic of consolidation in Indian banks is twofold. First, it is generally accepted that India has too many banks of national spread and it will help the cause of a strong banking industry to reduce the number of banks through permitting greater consolidation in the industry. Secondly, going forward, increasing globalization in financial sector and opening up of Indian banking industry progressively to the foreign banks will require Indian banks to be globally competitive wherein size of the banks will be one of the most important dimensions. This becomes clear from views of various committees and working groups enquiring into the Indian banking industry as well as those of the government and the regulator itself.

The Committee on Financial System (GOI, 1991) argued that in view of the emerging trends in the global financial system, mergers between banks and non-banks would make greater economic and commercial sense. The committee recommended a structure of Indian banking consisting of three to four large banks which could be comparable with the global majors in terms of size and business along with eight to ten national level banks. The Committee on Banking Sector Reforms (CBSR) (GOI, 1998) reiterated the benefits of consolidation, questioning the need for 27 public sector banks. In light of the global trends of increasing consolidation in banking, the committee highlighted the importance of consolidation in Indian banking industry through greater M&A activity, advocating the need for banks to be of a size which could offer greater competitive thrust to banking operations.

Reserve Bank of India on its part has already cleared its intentions regarding allowing greater consolidation in Indian banking industry as well as providing greater space to foreign banks in the industry through a document entitled 'Roadmap for Presence of Foreign Banks in India' (RBI, 2005). The document states that:

> "The banking sector in India is robust and its standards are broadly in conformity with international standards. In further enhancing its efficiency and stability to the best global standards, a two-track and gradualist approach will be adopted. One track is consolidation of the domestic banking system in both public and private sectors. The second track is gradual enhancement of the presence of foreign banks in a synchronised manner".

As has been mentioned by various committees and working groups enquiring into Indian banking industry, the opening up of the industry to greater foreign competition will necessitate greater consolidation on part of Indian banks to remain globally competitive. At this juncture, it becomes important to study how the potential changes in banking structure which will accompany the consolidation process will affect the conduct of individual banks. The stakes become clearer from an observation made by Ram Mohan (2005) in a critique of potential consolidation in the banking industry:

> "We need to be wary of mergers not only because their effect on efficiency is uncertain. Mergers can lead to concentration in the banking system, which, in turn, could result in the exercise of market power. The efficiency benefits of mergers must be weighted against the adverse impact on competition".

In this light, the purpose of present study is to examine the impact, if any, of size of a bank, on its competitive behavior or the extent to which size of a bank helps it to use greater market power. Rest of the study is as organized as follows. Section 2 discusses methodology, section 3 details results data and measurement of variables while section 4 provides results and discussion. Section 5 concludes the findings.

2. Methodology

The enquiry in to the behavior of individual firms in an industry regarding their competitive or strategic (non-competitive) behaviour has lead to development of two branches of literature viz. (i) the structure-conduct-performance (SCP) approach or the structural approach, and (ii) the new empirical industrial organization (NEIO) approach also called the non-structural approach. The SCP approach relies on the traditional industrial organization tools and employs a suitable structural model to relate the market structure and performance of an industry through the conduct of individual units. More recently, the NEIO approach has emerged which uses various non-structural models to measure the degree of competition or competitive behavior exhibited by

the firms directly, without relying on the structure of the market. The current study employs the NEIO approach.

There are two non-structural models which have been employed extensively in the literature viz. the Panzer-Rosse (P-R) model and Conjectural Variations (C-V) model. While both the models have been used extensively in literature, in this study, we will employ the C-V model. The basic idea of C-V approach is that in equilibrium, profit-maximising firms will produce at such a level that its marginal cost equals its perceived marginal revenue, which will also coincide with market price under perfect competition, but with industry marginal revenue in the case of perfect collusion (Shaffer, 1993). As given originally, C-V model is applicable to time series data. However, a number of studies including Angelini and Cetorelli (2000) and Uchida and Tsutsui (2005) have adapted the approach for panel data as well.

We begin by assuming an industry producing output Y at a price p. Let y_i be the quantity produced by bank i , i = 1, 2, … n; $\sum_i y_i \equiv Y$. Let $C(y_i, W_i)$ be the cost function for bank i, where W_i is the vector of prices of factor inputs employed by bank i. Thus, bank i solves the following maximization problem:

$$Max\pi_i = p(Y,Z)y_i - C(y_i, W_i)$$

The first order condition is:

$$\frac{\partial \pi_i}{\partial y_i} = p + y_i \cdot \frac{\partial p}{\partial Y} \cdot \frac{\partial Y}{\partial y_i} - \frac{\partial C_i}{\partial y_i} = 0 \qquad (1)$$

Multiplying and dividing the second item of middle term in (1) by Y and re-arranging yields:

$$p - MC_i = \left(-Y \cdot \frac{\partial p}{\partial Y} \right) \cdot \left(\frac{\partial Y}{\partial y_i} \cdot \frac{y_i}{Y} \right) = \frac{\theta_i}{\eta} \qquad (2)$$

Where η measures the semi elasticity of market demand to industry price.[1]

$$\eta = \frac{\partial Y / \partial p}{Y}, \qquad \eta < 0$$

While θ_i captures the conjectural elasticity of industry output with respect to output of bank i.

$$\theta_i = \frac{\partial Y / \partial y_i}{Y / y_i}$$

More specifically θ_i reflects bank i's expectation on how the other banks in industry react to its output change. Value of θ_i reflects the market power with bank i. For example, in case of monopoly, $Y = y$ and $\partial Y = \partial y$, hence $\theta_i = 1$. On the other hand if firms are in perfect competition, $\partial Y / \partial y_i = 0$ and hence $\theta_i = 0$.

There are two approaches to identify the degree of market power from equation (2). One is to estimate θ_i by identifying it separately from η. This requires estimation of a supply equation like (2) along with a demand function from which parameters necessary for identification of θ_i can be recovered (see e.g. Uchida and Tsutsui 2005).

The other approach, as suggested in Appelbaum (1982) and operationalised by Angeleni and Cetorelli (2000) and Kubo (2006), is to estimate the ratio $\theta_i / \eta \equiv \lambda$ as one parameter from equation (2), and then use λ to construct Lerner index. Here λ may be called the conduct

[1] In contrast to commonly defined elasticity that compares a *percentage* change in one variable x with the *percentage* change in the other variable y, i.e., [d log(y)/d log(x)], semi-elasticity compares a *level* change in one variable with a *percentage* change in the second variable, i.e., [d log(y)/dx].)

parameter representing the difference between price and marginal cost. This is the approach used in current study. In this case, dividing both sides of (2) by P we get:

$$L = \frac{p - MC}{P} = \frac{\lambda}{p} \tag{3}$$

The Lerner index Є [0,1] measures the relative mark-up (here after referred to as mark-up) of price over marginal cost, reflecting the market power exercised by bank i. Starting from extreme value of zero in perfectly competitive industry, its value increases as the market power with individual firms increases.

The marginal cost appearing in (2) is unobserved. Therefore we postulate the following translog cost function to calculate the marginal cost.

$$\begin{aligned} LnC_i &= \beta_0 + \beta_1 Lny_i + \frac{\beta_2}{2}(Lny_i)^2 + \gamma_j \sum_j LnW_{ji} \\ &+ \gamma_{jk} \frac{1}{2} \sum_j \sum_k LnW_{ji} LnW_{ki} + \beta_{1+j} Lny_i \sum_j LnW_{ji} + \alpha LnBr_i \end{aligned} \tag{4}$$

Where *Ln* refers to natural log, W_j, j = 1, 2, 3 are factor prices for labour, capital and financial inputs respectively and *Br* is number of branches used as a control variable. Following the standard practice in literature on cost function estimation, we impose symmetry and homogeneity restrictions on (4). Symmetry implies $\gamma_{jk} = \gamma_{kj}$ for all j and k. Homogeneity implies the following restrictions:

$$\sum_j \gamma_j = 1, \quad \sum_j \gamma_{jk} = 0 \ \forall \ k, \quad \sum_j \beta_{2+j} = 0$$

Differentiating (4) with respect to $y_{i,}$ we obtain the marginal cost for bank i:

$$MC_i = \frac{C_i}{y_i}\left(\beta_1 + \beta_2 \ln y_i + \beta_{1+j}\sum_j W_{ji}\right) \tag{5}$$

Inserting (5) in (2) completes the supply equation[2]:

$$p = \lambda + \frac{C_i}{y_i}\left(\beta_1 + \beta_2 \ln y_i + \beta_{1+j}\sum_j W_{ji}\right) \tag{6}$$

In order to gain greater efficiency, we estimate the supply equation (6) together with cost function (4), imposing the cross equation restrictions. Following is the estimated model (homogeneity and symmetry imposed and cross section and tine indexes removed):

$$\begin{aligned} LnC_i &= \beta_0 + \beta_1 Lny + \frac{\beta_2}{2}(Lny)^2 + \gamma_1 LnW_1 + \gamma_2 LnW_2 + (1-\gamma_1-\gamma_2)LnW_3 \\ &+ \frac{\gamma_{11}}{2}(LnW_1)^2 + \gamma_{12} LnW_1 * LnW_2 + \gamma_{13} LnW_1 * LnW_3 + \frac{\gamma_{22}}{2}(LnW_2)^2 + \\ &\gamma_{23} LnW_2 * LnW_3 + \frac{(0-\gamma_{11}-\gamma_{12}-\gamma_{13}-\gamma_{22}-\gamma_{23})}{2}(LnW_3)^2 + \beta_3 LnyLnW_1 \\ &+ \beta_4 LnyLnW_2 + (0-\beta_3-\beta_4)LnyLnW_3 + \alpha LnBr_i + e_i \end{aligned} \tag{7}$$

$$\begin{aligned} p &= \lambda + \beta_1\left(\frac{C}{y}\right) + \beta_2\left(\frac{C*\ln y}{y}\right) + \beta_3\left(\frac{C*W_1}{y}\right) + \beta_4\left(\frac{C*W_2}{y}\right) \\ &+ (0-\beta_3-\beta_4)\left(\frac{C*W_2}{y}\right) + \nu_i \end{aligned}$$

We then divide the estimated λ by average of ex-post interest charged by all the banks to calculate learner index. However, system (7) will only shed light on average market power

[2] We have used firm specific price here which somewhat contradicts with the equilibrium equation (2). However this theoretical contradiction is necessary to identify year specific estimates of level of competition as it allows the use of panel data (See Angelini and Cetorelli, 2000 and Uchida and Tsutsui, 2005)

exercised by all the banks. Therefore, to visualize if there is any difference in the conduct of banks according to their size or whether large sized banks abuse market power (as reflected in higher mark-up) or not, divided the banks into four size classes in order of increasing size.[3] Thus, there are four groups of banks with group Q1 representing the 25 percent banks having the smallest size, Q2 representing the next 25 percent banks by size and so on. To study the impact of size on conduct of banks, we re-estimate the original system (given by 7) after replacing the conduct parameter λ by four size dummies in equation (6). Following is the reformulated equation:

$$p = \lambda_1 S_1 + \lambda_2 S_2 + \lambda_3 S_3 + \lambda_4 S_4 + \beta_1\left(\frac{C}{y}\right) + \beta_2\left(\frac{C * \ln y}{y}\right) + \beta_3\left(\frac{C * W_1}{y}\right) + \beta_4\left(\frac{C * W_2}{y}\right) + (0 - \beta_3 - \beta_4)\left(\frac{C * W_2}{y}\right) + \nu_i \quad (8)$$

where S1 to S4 are dummy variables respectively for Q1 to Q4 size groups of banks.

3. Database and Measurement of Variables

There exist two main approaches in literature with regard to modeling the production structure of banking firms: production approach and intermediation approach. The production approach views the financial firms as typical production units which use real inputs (manpower and real assets) to produce financial services. Thus, on cost side, this approach includes only non-interest costs while deposits along with loans and other earning assets are classified as outputs.

[3]This is done so because we have our sample ranges over a very long period of 17 years and any attempt to classify sizes in absolute sense, e.g. by absolute size of assets, as is done in most studies, would result in most of banks being classified in lowest size class in earlier years and higher size classes in later years. However, the classification used by us would ideally require a sample size of which is multiple of four in each year. However, since our sample size keeps varying from year to year, as a rule have added a bank to the lowest size class and then to next class and so on in case the number of banks are not exact multiple of four. For example, if we have say 62 banks in a year, we will keep 16 banks in lowest and next to the lowest class and 15 banks in the two highest size classes. If the number of banks is 63, then the highest class will get 15 while all lower classes will get 16 banks.

Intermediation approach, on the other hand, regards the financial firms as engaged in a multi stage production process involving intermediate outputs (deposits). To produce loans and other earning assets, financial firms use loanable funds (financial inputs), which these firms borrow from depositors, as well as non-financial inputs such as labour and capital.

Most of the studies analysing banking competition have used intermediation approach (see Klein 1971; Sealey and Lindley 1977). Intermediation approach also seems more reasonable in our case as interest expenses are a major component of total cost constituting between one half to two third of total expenses. Thus our model includes three inputs, viz. labour, fixed capital, and total funding, i.e. deposits and borrowings. Total cost includes both interest and non-interest costs. Price of labour is obtained by dividing total expenses on labour by total number of employees. Price of capital is obtained by dividing capital expenses (difference between total operating expenses and establishment expenses) by total fixed assets. Price of funds is calculated as ratio of total funding to total interest expenses.

Output of a bank is measured as total amount of loans and investments in interest bearing securities. Price of output is calculated by dividing total output by total interest revenue. An advantage of calculating output price from balance sheet data (as compared to actually offered loan rate by banks which are not available in our data set) is that ex-ante loan rates offered by banks include some risk premium, while the ex-post interest rate obtained from actual income obtained by a bank after accounting for bad loans will not be biased by such risk premium.

The data for the present study spanning over 17 years (1991-92[4] to 2007-08) have been culled out from the various issues of the reports of banks viz.: (i) Financial Analysis of Banks;

[4] Wherever a fiscal year is referred to as single year in this study, it reflects the fiscal year ending in the given calendar year. That is, 1992 would represent fiscal year 1991-92 and so on.

(ii) Performance Highlights of Public Sector Banks; (iii) Performance Highlights of Private Sector Banks; (iv) Performance Highlights of Banks, all published by the Indian Banks' Association; and (v) Statistical Tables Related to Banks in India, published by the Reserve Bank of India.

We include banks of all ownerships on which data on all required variables were available for at least five years. However, with regard to foreign banks, we excluded the banks which operated with five or less branches. This is done because such banks primarily operate to service the clients of their parent banks and may choose their input/output mix on considerations totally different from all other banks (Das *et al.*, 2005). Our final data set is, therefore, an unbalanced panel with 1068 bank year observations. All the financial variables have been converted into constant prices using the GDP deflator

4. Empirical Results and Discussion

We use Full Information Maximum Likelihood (FIML) to estimate the system consisting of equations (4) and (6) and given in (7). FIML is chosen to address the potential concerns of endogeneity of the cost variable. This is because the total cost appears as an exogenous variable in equation 2, while it appears as an endogenous variable in equation 3. Estimated parameters are given in Table 1.

Table 1: Results of FIML Estimation of System described by Equations (8.6)

Variable	Coefficient	P-Value	Variable	Coefficient	P-Value
β_0	0.988	0.000	$\gamma 11$	0.006	0.000
β_1	0.906	0.000	$\gamma 12$	-0.040	0.001
β_2	0.006	0.005	$\gamma 13$	-0.109	0.456
β_3	0.005	0.000	$\gamma 22$	-0.004	0.000

β_4	-0.027	0.006	$\gamma 23$	-0.017	0.077
$(0-\beta_3-\beta_4)$	-0.038		$(0-\gamma 11-\gamma 12-\gamma 13-\gamma 22\ \gamma 23)$	0.147	
$\gamma 1$	-0.195	0.017	α	0.030	0.000
$\gamma 2$	0.284	0.000	λ	0.012	0.000
$(1-\gamma_1-\gamma_2)$	0.911		L.I.#	0.102	---

Computed value

Source: Authors Calculations

We note that the fit is generally good and most of the parameters have a P-Value of less than one percent. All first order parameters of cost function except price of labour have expected signs. In order to calculate the Lerner Index (L-I) we divided the value of λ by average of ex-post price of output. Calculated value of L-I worked out to be 0.10. Thus, on an average, banks exercise 10 percent mark-up over marginal cost.

In order to see the impact of size on competition, we re-estimate the model after replacing the conduct parameter λ by four size dummies in equation (6). Estimated values of λ and computed values of L-I for bank groups of different sizes are reported in table 8.3[5].

Table 2: Conduct of Banks Belonging to Different Size Groups

Size (Variable)	Coefficient	p-value	LI
Q_1 ($\lambda 1$)	0.008	0.000	0.066
Q_2 (λ_2)	0.013	0.000	0.113
Q_3 (λ_3)	0.014	0.000	0.123
Q_4 (λ_4)	0.010	0.000	0.094

[5] Since our focus is only on the conduct parameter and computed value of learner index, we have omitted the full results of this and subsequent estimations for the sake of brevity. The same are available from the authors on request.

Table 2 shows that the Q1 (smallest size) group charges the lowest mark-up of 6.6 percent followed by the Q4 (largest size) group which charges about 9.4 percent mark-up. The two medium sized bank groups, Q2 and Q3 charge the highest mark-ups of 11.3 percent and 12.3 percent respectively. These results are very important in sense that these show that there is an inverted U relation between size and conduct of banks, signifying that initially the mark-up increases with size, but the relation reverses for the largest size of banks. In context of the issue of future consolidation in Indian banking industry, it suggests that there may not be any reason to expect the large sized banks, which will result from the process of consolidation, to charge higher mark-up, or in other words, abuse the potential market power derived from larger size.

Next, in order to see whether the conduct of banks had changed over the reform period, we attempt to compute the separate value of λ for two periods: 1992-1998, the period that represents implementation of first generation of banking sector reforms; and 1999-2008, the period which represents the implementation of second generation banking reforms and beyond that.

Table 3: Conduct of Banks Belonging to Different Size Groups

Size (Variable)	1992-98			1999-2008		
	Coefficient	p-value	LI	Coefficient	p-value	LI
Q_1 ($\lambda 1$)	0.014	0.002	0.158	0.015	0.000	0.153
Q_2 (λ_2)	0.014	0.002	0.147	0.017	0.000	0.166
Q_3 (λ_3)	0.008	0.002	0.085	0.020	0.000	0.186
Q_4 (λ_4)	0.005	0.003	0.051	0.011	0.000	0.099

Results of separate estimations for the two time periods are given in table 3. We can see that in both the sub-periods, largest banks are the ones charging smallest mark-ups. However, the inverted U relation between size and mark-up that was witnessed in full period estimation is only

visible in the second sub-period. In the first sub-period, there seems to be a and linear inverse relation between size and mark-up.

Smallest banks charged highest mark-ups in the first sub-period while these charge second lowest in the second sub-period. This probably reflects the increasing pressure that small banks might have been facing as liberalization proceeded, forcing them to cut margins to maintain their clientele. Large banks charge the lowest mark-up in both the sub-periods, once again indicating that there is little danger of abuse of market power by large banks.

It is tempting here to compare the mark-ups not only in space but in time as well. However, such a comparisons can be usually biased due to changing regulatory structure as well as quality of banks output. For example, it is possible that the there is some increase in mark-up over time. However, if such an increase is accompanied by falling non-performing assets, then it would be difficult to state that banks had become less competitive. To make a sensible comparison over time using a model like one used in present study, output as well as prices would have to be somehow adjusted according to the quality of output, as measured in terms of, for example, non-performing assets. Changing regulatory structure over time would also have to be accommodated into such an analysis. These issues are left for future research.

5. Conclusion

Indian banking industry is presently at a crucial juncture. With increasing globalization in sight, there have been calls for greater consolidation in the industry from both the government as well as regulator. However, some quarters have expressed apprehensions regarding the fact that consolidation will result in much bigger banks which may in turn abuse market power achieved through higher size and charge higher prices. In the present study we used a 'Conjectural Variations' which gauges the competitive or otherwise behavior of a firm by computing the mark up over cost charged by it.

The study finds that mark-up charged by the larger banks in case of India is always lower than that compared with medium sized banks. The available evidence suggests that while banks charge largest banks generally charge lower mark-up compared with the banks of medium size.

While this does not per se builds a case for consolidation in Indian banking industry, it does answer an important question that researchers have asked often asked, that is, whether there would be greater abuse of market power by larger banks resulting from consolidation. The answer to this question, as inferred from the evidence in present study is obviously that larger banks might be more interested in gaining volumes by offering lower prices and maintain their market status in terms of size rather than charging higher price to gain greater profitability.

This does not however mean multiplicity of participants in the market may not be important for competition. What we can conclude is that, a potential reduction in number of banks in Indian market through consolidation, may not result in greater abuse of market power by banks in wake of increase in size gained through the process of consolidation

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