

Running head: Concentration in Indian Private Domestic Banking Industry

Title: Market Structure and Entry: A Study of the Determinants of Market Concentration in Private Domestic Banking Industry in India.

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ABSTRACT

The relationship between concentration and market structure has not been fully explored in the literature. The existing understanding of the impact of entry on concentration and competition through market structure is rather mechanical and needs to be re-examined. The deregulation of domestic private banking industry in India, since early nineties, provides the opportunity for such a study. The present study takes up an organic approach that is based on an analysis of the identity of firms, the dynamics of rank and their market shares. Although concentration is the central issue in market structure, it can not be taken uncritically as an index of competition. There has not been any empirical analysis of the pattern and determinants of market concentration. This paper is the first of its kind to identify a distinct pattern of change in the concentration ratio and explain it in terms of a cubic form equation. Concentration is explained in terms of its determinants- number of firms, average asset size and their distribution, which are found to be highly significant. The results show that the industry dynamics is more important than policy factors in explaining concentration. The study arrives at definite evidence that relates number of firms to concentration. However, the purported negative impact is not easy to interpret. The study also points out to a possible pattern that concentration follows upon deregulation. This, it is argued, may constitute a possible evidence of existence of economic size.

Key words: concentration, deregulation, market structure, organic approach.

JEL classification: L1, L5, L8 and G2.

INTRODUCTION

The single most important component of the liberal policy package, ushered in Indian banking industry, was to allow entry of private domestic banks in 1993. The underlying philosophy was that entry would reduce concentration and automatically instil the necessary competition. The objective of the present study is to analyse the evolution of the market structure of Indian private domestic banking industry (henceforth to be referred as the industry) consequent to entry of new banks. The study raises and attempts to answer the following questions.

- What is the relationship between concentration, number of firms and competition?
- What has been the trend in concentration in the industry?
- What are the determinants of concentration in the industry?

Plan of the study

Section I of the study is devoted to a brief review of present scenario in private domestic banking industry in India. Section II focuses on review of the literature. Section III is devoted to a discussion of conceptual framework. This is followed by a discussion of data sources and methodology in the next section. Section V reports and analyses the results of the study. Summary and conclusions of the study are discussed in section VI.

Section I: Present scenerio in private domestic banking in India:

The scenerio in the industry on the eve of deregulaion (till April, 1992) was characterized by administered interest rate and service charges, as well as, a tight credit allocation mechanism, coupled with restricted entry into private domestic banking sector. The situation of a private domestic sector bank, during this period, can be compared to an atomistic producer, whose status is that of a price taker, with the difference that the interest rate on liabilities and assets were not fixed by profit motive but by RBI (Reserve Bank of India) regulation through the system of administration spreads. A “uniform price” was artificially prevalent during the

regime. It may be appropriate to call the then market structure of the private domestic banking industry “pseudo competitive”, in which profits were enjoyed by the banks due to the existence of administered spreads that could not be competed away by new entrants. Apart from regulation of interest rate, RBI also regulated the credit allocation by banks through different mechanisms. Presence of interest controls, as well as, rigorous credit allocation mechanisms, eliminated price competition and the tendency toward optimal resource allocation. Credit allocation mechanisms included capital authorisation scheme, credit-monitoring arrangement, consortium financing and lead bank system.

A committee of experts headed by M. Narasimham, submitted its report on Indian financial system in 1991. The salient features of the recommendations made by the committee include dismantling of administrative interest rates, service charges, and asset allocation mechanisms. They also include introduction of asset classification, income recognition and capital adequacy norms, as well as, entry of new banks. As these measures were gradually introduced, the post-deregulatory phase in Indian domestic private banking industry unfolded itself through the following four phases.

Phase I-April 1992 to 1995:

Phase I is characterised by beginning of steps related to deregulation of interest rates and lifting of restrictions on entry of new private domestic banks as well as continued restriction on credit allocation.

Phase II-1995 to 1997:

This phase is characterised by three features: Entry in private domestic banking sector in 1995, further steps towards deregulation of interest rates and continued regulation of credit allocation.

Phase III- 1997 to 1999:

Characteristic features of this phase include discarding of credit allocation schemes as well as entry of more private domestic banks leading to product differentiation.

Phase IV- September 1999 onwards:

Trends observed in the period were freeing of service charges, vigorous use of brandnames by new private domestic banks followed by old banks and mergers.

On January 22 1993, RBI issued guidelines that permitted entry of new private domestic banks. It took some time for the industry forces to galvanise and it is only in 1995, eight new such banks started functioning. This is a watershed year in the history of private banking in India. It provides the researcher an opportunity to study the impact of entry on concentration in an attempt to characterise the market structure. During 1999, number of private domestic banks had increased to ten, as opposed to twenty-four of old private domestic banks. The share of new private domestic banks in assets owned by all private sector banks had increased from 20%, in 1995, to 65%, in 2002. The following table depicts change in the importance of private domestic banks, in the entire banking industry, in terms of three aspects-assets, advances and deposits¹. It reveals while the share of public sector banks have declined and that of foreign banks remained roughly unchanged, the private domestic banks had registered a threefold rise in their share over 1992-2002.

Insert table I here.

Section II: Review of literature:

The literature surveyed for the present study is divided into following groups. First group of studies are of general nature pertaining to private domestic banking industry in India and do not address the question raised in the study². The second category includes theoretical work on the relationship between entry, number of firms and competition. They include, Shubik (1990),

¹ Concepts of assets, advances and deposits are given below.

Assets: Assets comprise of cash in hand, balances with RBI balances with other banks, money with call and short notice, balances with banks with outside India, investments, advances, fixed assets and other assets.

Deposits: Deposits of bank include all kinds of deposits placed with the bank such as demand deposits, saving deposits and term deposits.

Advances: This included bills purchased and discounted, cash credits, overdrafts and loans as well term loans.

² The studies include Malgi T.S. (1992) and Ajit, D and R. D. Bangar (1998). While the first study highlighted the problems faced by the private domestic banking industry in India, the other merely compared public sector banks with the private sector ones in respect of certain parameters.

as well as, Fama and Laffer (1962). The third group consists of empirical studies in the Structure-Conduct-Performance(S-C-P) tradition. Considerable effort has been directed towards analyzing the effect of entry on the behavior and performance of the firms in the seventies and eighties (Caves and Porter, 1978, Gort, 1963, Mann, 1966 and McGuckin, 1972). Only the following studies come somewhat close to the questions examined by the present study. They include Bresnahan and Reiss (1991), who proposed an empirical framework for measuring the effects of entry in concentrated markets. The study suggests that competitive conduct changes quickly as the number of incumbents increases. The other study is attempted by Bikker and Groeneveld (2000) which provided support for the conventional view that concentration impairs competitiveness.

The latter studies apply S-C-P hypothesis particularly in the context of banking industry. Gilbert (1984) provides a detailed survey of such studies. Such studies attempt to test the hypothesis that degree of concentration influences the degree of competition. They estimate measures of bank performance as functions of concentration of deposits among banks in local market areas. The measures of performance used as indicators of the degree of competition among banks include bank profit rates, interest rates charged on loans and paid on deposits. However, results of the bank market structure do not consistently support or reject the hypothesis that market concentration influences bank performance.

Section III: Conceptual framework.

The purpose of studying the theoretical underpinnings is three-fold.

1. to clarify certain basic concepts, like a banking market, so as to lay out the contours of the study.
2. to study the relationship between entry, concentration and competition.
3. to examine relationship between the policy framework and the existing conceptual framework.

Banking market

The analysis of the market structure must be preceded by a conceptualization of what a banking market is. Gibson's (1984) survey of literature on bank market structure and competition highlighted the significance of defining a banking market. According to Haslem (1985), specification of banking products i.e. services and definition of geographic pattern of banking markets are the two basic problems in defining a banking market. He goes on to argue that existence of one single market for banking services, or different markets for various banking services, depends on whether, financial services provided by bank, are complementary to one another, or each banking service constitute a distinct product. The relevant clue to the problem is whether consumers consider nonidentical financial services substitutes for one another or complementary services consumed together. Haslem argued that the determination of geographic markets is a function of the specification of financial services. In the present context, the importance of the aspect of geographical spread of the market is diluted with emergence of telephone banking, internet banking and ATMs, which enable country wide access to banking services.

Haslem did not elaborate all aspects of a banking market. Apparently, three factors are relevant in understanding the concept of a banking market. They are a) nature of the products produced by a bank; b) size of bank; c) size of banking market. It may be argued that the volume of both its deposits and advances may capture size of a bank. Such a conceptualisation is derived from the basic functions of a bank and depicts the control of the bank over the market. Clearly both credit and deposits are basic aspects of a functioning of a bank, implying that mere deposits, or advances, cannot reflect size of a bank. Provision of advances justify deposit mobilization, on the one hand, and deposits once mobilised are of no use, if advances are not made from these deposits. If deposits expand but advances do not, profitable operation of the bank will be adversely effected. In a reverse situation, where advances go on increasing but deposits do not,

there would occur a situation where the bank will neither be able to sustain increased credit, nor maintain liquidity. In both the situation, the existence of a bank will be endangered. From the above argument, it is clear that deposits and advances are complements. As for the size of the bank, it would follow that it is the sum total of deposits and advances. By the same token, the size of the market is the sum of the respective sizes of the total number of banks operating in the market. Hereafter, in the rest of the paper, bank's market structure relates to total deposits and advances.

Entry, concentration and competition.

There are three well-known elements of market structure: concentration, economies of scale and product differentiation. The study analyses the concentration aspect of market structure along with the related issues of entry and number of banks. The other two aspects of market structure are beyond the scope of the study.

It is instructive to see whether the industry is characterised by any standard market structure. Ordinarily, attempts are made to characterise a market in terms of three basic features: number of firms, nature of product as well as freedom of entry and exit. A popular notion of competition relates presence of a large number of firms to competition. This popular notion needs to be critically examined.

The question of how many banks are needed for sufficient competition is raised by Shubik (1976). He provides the answer in terms of nature of strategic variables and the solution concept considered. If a banking industry is modelled along the lines of Bertrand model, the structure of the game may be described as follows.

1. Players: The industry consists of two firms.

2. Strategy: Each firm's strategy be defined as choosing their rate of interest at which loan will be supplied. Thus each firm i chooses $p_i \in A_i = [0, \alpha]$, A_i is set of different strategies open to firm i .

3. The payoff function: The payoff function of each firm is its profit function. Firm i 's cost of production is $c_i(q_i)$ and its profit function is defined by $\pi_i = p_i q_i(p_i, p_j) - c_i(q_i)$ where q_i is the quantity of credit sold, $c_i(q_i)$ is firm i 's cost of production and p_j is the price fixed by its competitor, j .

In the Bertrand model, only two banks are needed for an efficient noncooperative solution. Thus as per this model, large number is not a necessary condition for competition. Similar conclusion is derived from contestable market theory as well.

If a banking industry is modeled along Cournotian lines, then following will describe the structure of the game.

1. Players: A set of N players, whose names are listed in the set $I \equiv \{1, 2, \dots, N\}$.

2. Strategy : Each firm's strategy be defined as choosing their level of credit offered. Thus each firm chooses $q_i \in S_i = [0, \alpha]$, whereas S_i is the set of different strategies open to firm i .

3. The payoff function: As in the earlier model, the payoff function of each firm is its profit function. The firm i sells credit at the market clearing price $p_i(q)$, where $q = \sum q_i$. Firm i 's cost of production is $c_i(q_i)$ and firm's profit function is defined by $\pi_i = q_i p(q) - c_i(q_i)$

Cournot model posits a positive relationship between degree of competition and number of firms in an industry. Thus it appears that in this model, large number of firms is a sufficient condition for competition. Fama and Laffer (1962) demonstrated that a positive relationship between number of firms in the industry and the degree of competition, as appears in Cournot model, emerges only in a partial equilibrium framework, but disappears in a general equilibrium setting. It has been argued that the said model has caused some confusion, leading to a belief that competitive behaviour is possible only when there are infinitely many firms. (Shy, pp.103). It has been argued that competitive market structure may exist, even if there is one firm (Shy, pp.66). Clearly, it may be argued that large number is not a necessary condition for competition.

Browning & Browning (1994,) also pointed out that the relationship between the number of firms and degree of competition is not obvious. It depends on the degree of elasticity of demand.

Pyndick and Rubinfeld (1995) has argued that the possibility of explicit and implicit collusion among firms in setting prices leads to irrelevance of number of firms for competition. It is useful to clarify the role of collusion in rendering number of firms redundant in influencing competition, with the help of an example. Let there be a hypothetical situation characterized by existence of collusion among the top firms. In such a case, competition will emerge even with no entry, if collusion ceases to exist. Clearly, here entry is not a necessary condition for competition. On the other hand, if entry of firms leads to collusion among top, a feature, which was nonexistent earlier, then entry will fail to increase competition. Thus entry is not a sufficient condition as well for increasing competition.

Santos (1995, p.631) and Nickell, (1996, p.741) used number of firms as measure of competition in their industry. But it is not clear whether the degree of competition increases if number of firms increase. It appears that Narasimham Committee implicitly subscribes to the first view. This is because Narasimham Committee sought to increase competition in domestic private banking industry by allows new banks to operate.

An analysis of the real world precludes extreme market structures, namely, monopoly and perfect competition because they do not exist in practice. The intermediate bandwidth of market structures can be identified with numbers only to the extent that the numbers would define market structure in a limiting sense. Other than this, basing judgement about market structures on numbers alone is almost irrelevant. What is argued here that both entry as well as concentration are inadequate indicators of market structure and competition. It is necessary to go into theoretical underpinnings of these indicators of competition.

The theoretical inspiration behind the idea of entry reducing concentration and thereby increasing competition is apparently derived from the notion of perfect competition. In a

classical sense, with a single homogenous product, entry will lead to an increase in number of firms in a market which will put pressure on the existing firms in a market with fixed size. Clearly the same market will be divided between the old and the new firms which will lead to a reduction in concentration in the market and is likely to usher in competition, in the long run. In such a case, competition is reduced to mere price competition. Non-price competition like product differentiation is ruled out by virtue of requirement of homogenous product in perfect competition. In such an idealistic model of competition, entry of firms may be seen as a necessary and sufficient condition for reduction in concentration and ushering of competition subject to the implicit assumption of fixed market size.

In the case of monopolistic competition, new entrants may be able to manipulate market share at the cost of the top old firms, by virtue of product differentiation, even with a given market size. Here, the dominance of the old top firms would be reduced leading to a reduction in the concentration ratio. On the other hand, the existing top firms may be able to differentiate their products successfully, as compared to the new entrants. This would lead to an increase in the concentration ratio. Hence, there is nothing predictable about the impact of entry on concentration in the scenario of monopolistic competition.

It may be argued that competition may emerge, even in the absence of entry, if non-price competition is allowed for. If firms that produce identical products differentiate their products, competition between them would emerge, even in the short run, without entry of firms. Thus while entry will lead to competition in terms of price in long run, introduction of product differentiation, by firms, leads to non-price competition in short run itself. Thus, in a monopolistically competitive market structure, entry is not necessary condition for competition. The influence of collusion on the impact of entry on competition has already been underlined. To sum up, entry would reduce concentration under the following assumptions: fixed market

size over time, absence of product differentiation, as well as, collusion. All these assumptions can be questioned in case of the industry.

The theoretical inspiration behind the idea of relationship between concentration and competition is apparently derived from the notion of monopoly. Ordinarily, monopoly and concentration are treated synonymously. With falling concentration, it is argued that monopoly power decreases. Thus, it may be argued that entry will lead to a fall in concentration and thereby will lead to a rise in competition. This argument consists of the following steps, which are worth examining.

1. Entry will reduce concentration.
2. Reduction in Concentration will reduce monopoly power³.
3. Reduction in monopoly power is synonymous with rise in competition.(Nickell, p.724)

The first step in the above argument is flawed. Although Bedenhorn (1990, p.684) and Denizer (1997, p.29) argued that entry would reduce concentration, Davies et.al (1991, p.93) argued that entry might as well increase concentration ratio. The relationship between entry and concentration ratio may be understood with the help of the following analysis.

Two time periods, one and two, are constructed. In time period one, let the size of top n firms add upto t_0 and the summation of size of all firms i.e the market size be a (such that $t_0 < a$). Thus n-firm concentration ratio is $CR_1 = t_0/a$.

Time period two may be characterised in two different ways. The first characterization is as follows.

1. Size of the top n firms change from t_0 to t_0^1 (t_0^1 is either $>$ or $<$ t_0).

³ Monopoly power is the ability to alter prices away from competitive levels to earn economic profit for long periods, without attracting new competitors and without improving their product or reducing their production cost. (Mas-Colell, Whinston and Green, pp. 383)

2. The size of other firms also change as well so that the market size i.e the summation of size of all firms change to a_1 from a . (a_1 is $>$ or $<$ a and $t_0^1 < a^1$).

3. Now, n new firms enter now, with sizes of the each of the entrants fall short of smallest of the top n firms, i.e their total size, denoted by t_1 , is less than t_0^1 .

Thus new n -firm concentration ratio, $CR_2 = t_0^1 / (a_1 + t_1)$. It is only when, $t_1 > a(t_0^1 / t_0 - a_1/a)$, concentration ratio falls in period 2.

Proof: $CR_1 > CR_2$

$$\Rightarrow t_0/a > t_0^1 / (a_1 + t_1)$$

$$\Rightarrow t_0(a_1 + t_1) > a t_0^1$$

$$\Rightarrow t_0 t_1 > a t_0^1 - a_1 t_0$$

$$\Rightarrow t_1 > a(t_0^1 / t_0 - a_1/a).$$

In the second kind of characterization of period 2, first two conditions remain same, but the characterizations of entrants differ. Entrants are such that the size of each of the entrants exceed the largest of the top n firms, i.e their total size, denoted by t_1 , is more than t_0^1 . Now, the new n -firm concentration ratio, $CR_2 = t_1 / (a_1 + t_1)$, while the old n -firm concentration ratio, $CR_1 = t_0/a$. ($t_0^1 >$ or $<$ t_0 and t_1 is more than t_0^1). It is only when $t_1 < a_1 t_0 / (a - t_0)$, concentration ratio falls in period two.

Proof: $CR_2 < CR_1$

$$\Rightarrow t_1 / (a_1 + t_1) < t_0/a$$

$$\Rightarrow a t_1 < t_0 (a_1 + t_1)$$

$$\Rightarrow -t_0 t_1 + a t_1 < a_1 t_0$$

$$\Rightarrow t_1 < a_1 t_0 / (a - t_0).$$

Similarly, for the Herfindal's concentration ratio as well, it can be demonstrated that it will not necessarily fall consequent on entry. H may be expressed as $(1 + CV^2)/n$, whereas CV represents the coefficient of variation of size of banks and n represents the number of banks.

The behaviour of H consequent on rise on n will depend on the behaviour of coefficient of variation. Movement in coefficient of variation may impact H in different ways as compared to rise in n . Impact of a rise in n on H may be counterbalanced by a rise in CV . One can distinguish among the following situations.

1. n rises and CV falls: H falls.
2. n rises and CV remains same: H falls.
3. n rises and CV rises. If CV rises at the same or faster rate as n , H will rise.

After demolishing the first chain in the argument that links entry to concentration, let us critically analyse the second chain that links degree of concentration to monopoly power. Saving(1970) has worked out a systematic relationship between k firm concentration ratio and Lerner's and Rothchild's measure of monopoly power, under the following assumptions:

1. There is a price leadership model, where some firms behave as a cartel, maximizing joint profits and rest of the firms, along with other entrants, are price takers.
2. Firms produce a homogenous product.
3. Market is cleared at all times.
4. Market demand function and supply function of the remaining firms and possible entrants are continuously differentiable.

For such a model, it is spelt out that the sufficient conditions for the k -firm concentration ratio to be proportional to degree of monopoly over time are:

- (a) the k firms in each time period behave as a single firm;
- (b) the industry elasticity of demand is the same for time period compared; and
- (c) the elasticity of supply of the remaining firms and possible entrants is identical for the time period considered.

It is apparent from the forgoing analysis that the relationship among number of firms, concentration and competition in a conventional framework is at best a naïve portrayal of reality. The number of firms and concentration ratio, as basic indicators of competition are tenuous.

The new policy framework primarily treats entry as the instrument for ushering in competition. It does free interest rate, but this also is a measure for price competition. Narasimham Committee does not speak of non-price competition nor does it introduce specific measures to that effect, as would be apparent from the following section.

Section IV: Data sources and methodology:

The study uses bank level data on assets, deposits and advances published in different volumes of “Statistical Tables Relating to Banks” for the period from 1993-2002, in an attempt to understand the nature of the market structure of domestic private banks, in terms of concentration. This is followed by an attempt to examine the implications of entry on concentration in the industry.

Lorenz curve is a standard tool for depicting concentration. Comparison of concentration in an industry over time is not possible if the curves intersect each other. This apprehension has led to use of other measures in the study. The commonly used measure of concentration is share of industry size accounted for by k largest firms. It is defined as follows.

$$CR_k = \sum_{i=1}^k S_i$$

CR_k = k firm concentration ratio.

S_i = percentage market share of the ith firm. .

Usually, four or five concentration ratios are used. It is popular because it is easy to understand and has limited data requirements. However, there are a few problems with this measure. First, traditional concentration ratio is not inspired theoretically. Secondly, it emphasizes inequalities between the top k firms and rest of the industry at the cost of

everything else. Two markets with the identical shares held by k largest firms, would have identical concentration ratios. Yet, the market with more firms is likely to be more competitive. Thirdly, it ignores identity of firms. This may lead to problems. For example, an unchanged four firm concentration ratio may be taken to mean that there is no change in concentration even when four different firms may replace the four largest firms. Fourthly, the choice of particular value of k is arbitrarily and has little direct economic significance. It reports only one point on the cumulative concentration curve. Comparison of concentration in an industry at two points of time depends on the arbitrarily chosen value of k⁴. This had led us to rely more on a generalised measure of concentration. A generalised measure transforms the information on the number and size distribution of firms presented by concentration curve into a single value. This is known as Herfindal's ratio, which is calculated by summing the squares of the market shares of all firms in the market.

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

H= Hirfindal's ratio.

Si= the percentage market share of the ith firm.

The following factors will be considered, in an attempt to understand the status of competition in the market.

1. changes in concentration ratio over time.
2. Impact of entry of banks on identities and ranks of leading firms.
3. Collusion among banks.

The empirical exercises, to be conducted in the next section, include the following.

1. Frequency distribution of sizes of banks during 1994 and 1995 is constructed.
2. Concentration ratios over the period 1993-2002 are calculated.

⁴ Wherever, five firm concentration ratios have been used, they have been supplemented by one, two, three and four firm concentration ratios.

3. Correlation matrix of four firm, five firm and Hirfindal's concentration ratio is computed.
4. The value of H, at the following two points of time is almost same: 1992-93 and 1993-94; 1995-96 and 1996-97; 1997-98 and 1998-99. The problem with H is that it does not correspond to a unique size distribution of firms. Many different size distributions and, hence, markets with differing levels of competitiveness, could give the same value of H. Hence, a test is carried out to rule out such inconsistency⁵.
5. Identification of market leaders, before and after entry of banks, is done on the basis of market share. Five banks, with highest market shares, are classified as market leaders. Identification of market leaders, during the pre and post entry periods, will facilitate an understanding of the impact of entry on market leaders. If they remain the same, in the post entry period, it may be understood that the market is stable and there is likely to be collusion among them. On the other hand, if entry makes a difference to the market leaders, the market is unstable and is likely to be characterised by competition and not collusion.
6. Existence of structural break due to the entry of new banks and merger of banks is tested in terms of change in concentration ratio in one period vis-à-vis the earlier period.
7. Pattern and Determinants of concentration ratio are indentified.

Section V: Results of the study:

Deregulation in the industry has been discussed in terms of four periods. However, for the purpose of empirical analysis, only three phases have been distinguished: 1993-94(denoted as first phase), 1995-1999(to be called second phase) and 2000-02(designated as the third phase).

⁵ An F test based on Jarque-Bera test of normality is used to test how close is the size distributions of banks in two years to normal distribution and hence how similar or different they are with respect to each other. To test whether a distribution is significantly different from normal distribution, one calculates a Chi square statistic with two degrees of freedom, which is defined as follows.

$$1/6[(\text{coeff. Of skewness})^2 + (\text{coeff. Of kurtosis}-3)^2]$$

One can construct an F statistic by dividing two chi square statistics relating to size distribution in two years adjusted for their degrees of freedom. The value of F statistic with (2,2) degrees of freedom is 99 and 19 at 1 % and 5% level of confidence respectively. The F test rejects the hypothesis of different size distributions underlying the same value of H over the said period.

The phases are so distinguished because new banks entered the industry in 1995 and merger started occurring from 2000 onwards.

Insert table II here.

A comparison of sizes of new banks with old ones, as depicted in table II, reveals that most of the new banks have entered in the lower segment of the market. With a given market size, this can happen only at the cost of reduction in the size of the existing firms, resulting in a lower concentration ratio in the post entry period. Nevertheless, the market size has increased. As is discussed, nothing apriori may be said about the impact of entry on concentration, with varying market size.

Insert table III here.

An analysis of concentration ratios reported in table III has to be preceded by clarification of certain points. First, it is important to know whether the concentration ratios used in the study move together. For this purpose, a correlation matrix of four firm, five firm and Hirfindal's concentration ratio is computed. Such a matrix is reported in table IV, which reveals a very high correlation coefficient between any pair out of the three concentration ratios. The other point relates to use of H. As mentioned earlier, if two different size distribution lead to the same H, use of H leads to problems. Before proceeding further, it is advisable to test whether different distributions of size are associated with an unchanging H during 1996-1999. An F statistic is used to test whether size distributions of banks in two years are different with respect to each other. The test rejects the hypothesis of different size distributions of private banks underlying similar H during 1995-96, 1996-97, 1997-98 and 1998-99.

Insert table IV here.

Table V identifies top five banks in terms of market share. Table III is supplemented with it, in an attempt to meaningfully interpret concentration ratios reported in therein.

Insert table V here.

Table III and V reveal the following. The first phase is characterised by unchanging concentration ratio and swapping of the positions of the old private domestic banks. While the top five banks have remained the same in this phase, the ranks of top three banks have changed amongst themselves. They include, Jammu and Kashmir Bank, Federal Bank and Vyasa Bank. Except for this change, the profile of the top firms remains almost static, in the first phase. Interestingly, a complete static scenario would have emerged, had we considered only three firm concentration ratio till 1999. Control of these banks over the industry may be attributed to oligopolistic behaviour possibly collusive behaviour.

Jammu and Kashmir Bank, Federal Bank and Vyasa Bank maintained their top positions in first and second phase. However, new banks started replacing the other banks, in the top five categories, from middle of the second phase. Ultimately, two banks among the top, mentioned earlier, were replaced by new banks, by the beginning of the third phase. The following summarises the scenario in the period under consideration.

1. 1993-96: Old banks as top five banks.
2. 1997-99: Only first three positions retained by the old banks.
3. 2000-02: Two new banks thrust themselves into the top three group.

A statistically significant fall in the concentration ratio is observed, in the post entry period, in the industry. Nevertheless, the rise in concentration ratio in the post merger period, compared to the earlier period, was not found to be statistically significant. Thus it is entry and not merger which has exerted a statistically significant impact on the concentration in the industry in India. This result is independent of the measure of concentration used and therefore robust. The leading banks in the first phase continued to enjoy a similar status for a certain period (till 1999) in the second phase as well, despite the entry of new banks. The impact of entry of new banks becomes apparent only in 1995-96, when a new bank forced itself in the top five group. This

shows while most of the banks have entered in lower echelon of market, a few emerged strong enough over a period to affect the core of the market position held by leading firms.

Insert tables VI.1to VI.6 here.

There have been some loosely framed hypothesis that seek to explain the behaviour of concentration ratio in relation to certain conventional market related variables. However, to date, there has not been any attempt to empirically identify the determinants of concentration ratio. The explanations refer to, though not set in any empirical framework, have been advanced, as though they were single independent variables that determine concentration. In fact, concentration ratio is a complex measure, that needs to be explained with the help of a set of variables. The attempt to do so with single variables results in anomalous conclusion.

One of the conventional arguments relates concentration ratio to economic power. A measure of concentration of economic power is the asset base. Market concentration, amongst other variables, is sought to be explained by average asset size. Another conventional argument relates concentration ratio to number of firms. Thus, two hypotheses that summarise these conventional arguments are:

1. An increase in average asset will increase concentration ratio.
2. A rise in the number of banks will reduce concentration ratio.

It may be noted that these two variables will have the said impact on concentration only if market size remains fixed. Hence, the purported signs associated with these variables may not be expected in an empirical framework, where market size does not remain fixed.

While number of firms and size have been advanced as arguments for explaining concentration ratio, the role of dispersion has been entirely overlooked. While size of the firms change, their distribution may also change. With increasing dispersion, concentration increases. Standard deviation is a general measure of dispersion, while skewness is a better measure, as it would indicate, at which end of the size spectrum,

firms get concentrated. With highest frequency of firms in a low size class, mode is lower than median, distribution is negatively skewed and concentration is low. On the other hand, with highest frequency of firms in a large size class, mode is higher than median, distribution is positively skewed and concentration is high. Thus, as skewness increases, concentration rises. Therefore, apart from number of firms and average asset size, asymmetry in distribution of assets is also used to explain concentration ratio.

In sum, number of firms, average asset of a firm and skewness emerge as explanatory variables of concentration ratio. Concentration ratio is a resultant of a complex interaction among these three variables. The attempt to explain concentration, in terms of a set of explanatory variables, is complicated by four factors.

1. The values of the explanatory variables.
2. The sign of the coefficients.
3. The magnitude of the coefficients.
4. The form in which each variable influences concentration: linear, quadratic and cubic.

All the above forces act in unison to bring about changes in the resultant pattern on concentration ratio in different phases. The simple purported impact of conventional variables pre-supposes a single linear form of explanation, in which the impact of each variable is straightforward. But, with varying sign associated with variables in quadratic and cubic form, a situation may emerge when a variable in a linear form, even with a larger coefficient or large values, will have a smaller impact on concentration, as compared to a variable in quadratic or cubic form, even with a smaller coefficient. It is through this mechanism that the avowed effects and apparent relationships get obscured. In a linear form of equation, only the first three of the above factors are relevant. In such a case, while explanatory variables change, their relative balance remains unchanged

and the impact on the dependent variable occurs only in one direction. In a non-linear form of equation, the relative balance of the forces, represented by the explanatory variables, change. This leads to a change in direction of dependent variable over time.

After hypothesising about the determinants of concentration ratio, it is necessary to find out the precise form in which the determinants influence concentration ratio. Three forms of concentration ratio were used as dependent variable: four-firm, five-firm and Hirfindal's concentration ratio. Firstly, a linear form of relationship was considered and a combination of industry and policy variables was used to test for structural break. Industry variables included average asset and number of banks, while policy variable was represented by an exogenous time variable. It generated three equations. Subsequently, the same combination of variables was used and the form was changed from linear to cubic. Variables were alternately run in quadratic and cubic form to determine the precise form in which they influence concentration ratio. It generated six equations. In the third stage, a set of models, based on industry variables alone were used. Industry variables include asset size, size distribution of asset and number of banks. The later two variables were alternately used in quadratic and cubic form. Here again, standard deviation and skewness were alternately used as measure of dispersion of asset size. Such combinations generated twelve equations. In all, twenty one equations were run.

The first set of linear models and the second set of six models did not perform well across all forms of dependent variable. The later two sets of models performed uniformly well with all forms of dependent variable. Between them, models with skewness performed better than models with standard deviation. Once again, within the models using skewness, those using a cubic form of number of firms and a quadratic form of skewness performed even better. The selected model uses Hirfindal's ratio as the dependent variable, because it is a generalised measure of concentration, free from any

subjective bias. In such a model, all the variables are found to be statistically significant, with t ratio associated with coefficients of each variables exceeding three. The equation is characterised by an overall high explanatory power in terms of a high coefficient of determination(around .94) along with a significant F ratio(53.25).

Form of the equation fitted is

$$H=\beta_0+\beta_1(SIZE)+\beta_2(SKEW)^2 +\beta_3(NUMBER)^3 +U_t$$

Insert Table VIII here

It is interesting to note that while changes in H are not very large in magnitude⁶, the determinants do explain significantly the changes in concentration ratio. Here again, coefficients of the variables themselves are extremely small in magnitude (each in six decimal points or more) and yet are highly statistically significant. Among all the variables used, skewness has emerged as the most important variable in explaining pattern of concentration. Incidentally, the t value associated with its coefficient is also maximum(8.45). This is very significant because skewness, as a determinant of concentration, has not apparently drawn any attention in the literature. It may also be seen that, larger the values assumed by a variable, the smaller is its coefficient. Numerically, average asset size (to be designated as the first variable) has assumed largest values followed by number of firms raised to the power three, (to be called second variable) which, in turn, is preceded by skewness raised to the power two(to be referred as the third variable). It may be seen that the coefficient of the second variable as a proportion of the coefficient of the first variable is 37.56, while coefficient of the third variable as a proportion of the coefficient of the first variable is as high as 123720.576. The magnitude of t values associated the variables also follows the same pattern. They vary inversely with the magnitude of the values assumed by the variables used in the model.

⁶ Changes in H ranges merely from .04 to .1.

Ratios of predicted value to actual value of the concentration ratio have been obtained to construct an efficiency index of the model reported in the study. This is intended to indicate the predictive power of the model at each data point. The ratio calculated at different points show that it fluctuates around one. This implies that the predicted values of concentration ratio do not lie on one side of the actual values. Graphs of the actual and estimated concentration ratio were drawn to show that the estimated concentration ratios lie very close to the values of actual concentration ratio.

Insert table VIII and graph I here

It is seen from the table, that average asset in linear form and number of firms in cubic form exert a significantly negative impact on the concentration ratio. When number of banks rose, top banks grew slower than the total market size. This led to a lower concentration ratio. When the market size has increased faster than number of banks, with an increase in average size in assets, share of top banks in the market got squeezed. Thus, as average asset size of banks rose, concentration fell. The third variable, capturing distribution of asset size, in terms of skewness in quadratic form, exerts a significantly positive impact on the concentration ratio. This is in line with the hypothesis.

Isolated interpretation of the forces, which act on unison on concentration ratio, is fraught with problems. It is not possible to assign an independent interpretation to each of the coefficients of the variables and relate it to the actual pattern of concentration. A cubic equation is used to explain concentration ratio, which follows a cyclic pattern. In such a scenerio, one can not explain the impact of change in one explanatory variable on concentration, without referring to changes in other variables. In different phases, explanatory variables move in different directions, create varying market dynamics and a differential impact is manifested on concentration ratio. The negative sign of the

coefficient associated with number of firms does not have an unambiguous meaning in case of the complex cubic equation used in the study.⁷

Now, an attempt is made to explain the pattern of concentration ratio in three phases. An index of Herfindal's concentration ratio with 1993 as the base year is constructed in an attempt to analyse the changes in concentration ratio over the period 1993-2002.

Insert table IX here.

Phase I: Average asset and skewness were rising, while number of banks remained unchanged during this phase. The positive impact on concentration emanating from skewness, in quadratic form, with a larger coefficient, more than counterbalanced the negative impact of average asset, with a smaller coefficient. This led to a rising concentration ratio in phase I.

Phase II: During this phase, average asset was increasing and the number of firms was rising for most part of the period. Skewness was falling in this phase. The negative impact of increase in average asset as well as number of firms reinforced the positive impact of falling skewness. As a result, concentration ratio fell during this phase.

Phase III: Average asset and skewness were increasing, but the number of firms were falling during this phase. The positive impact of rising skewness reinforced the negative impact of fall in number of firms to counterbalance the negative impact of rise in average asset. This led to a rise concentration ratio during this phase.

Empirically, the policy variable did not perform significantly and consistently across all forms of dependent variable and hence it did not play a robust role in explaining concentration. The later empiricism, based on industry dynamics and a cubic form, has been able to provide a better explanation of the pattern and determinants

⁷ In an ordinary cubic equation, all the three independent variables are the same and differ only in power. In our equation, there are three independent variables, which assume different powers, but act in unison.

of concentration. The industry variables were consistently behaving better than the policy variable. In this paper, the impact of policy variable on concentration ratio, in the pre-deregulatory period, could not be worked out because its data set does not include data for the pre-deregulatory period.

While concentration ratio was explained with the industry variables alone, this is not to be interpreted to mean that policy has not played any role. While its direct impact on concentration may be ambiguous, its indirect impact, in terms of permitting entry and liberating the industry forces, can not be denied. In order to verify this, another exercise was conducted, wherein the statistical significance of mean level of determinants of concentration was tested with the help of a t statistic. Variables like average size of a bank as well as number of banks showed a significant upward trend. The size asymmetry did not rise uniformly. However, it showed a dynamic pattern of rise and fall. On the whole, this may be interpreted as an indirect impact of the new policy dynamics. The policy intervention has led to creation of an environment in which the industry dynamics has taken over.

Deregulation of banking industry began in April 1992, with deregulation of interest rate on liabilities and assets, followed by relaxation of entry of private domestic banks in January 1993. However, entry in the industry occurred only during 1995. During the first phase, the top old banks derived the benefit of a deregulated regime and could maintain their position in an expanded market, without having to face competition from new banks. This led to an unchanged concentration ratio during the first phase. New banks entered in 1995 with state of art technology, unleashed competitive forces and forced a reversal of fortunes of top old banks, which manifested in terms of a continual fall in their market shares. This led to a fall in concentration during

the second phase. However, during the third phase, merger between banks reversed the course of concentration ratio and led to its rise.

It has been observed that H, after falling from its initial level in 1993, rose to a higher level from which it has begun to decline⁸. It is interesting to examine whether this is a reflection of existence of some economies of scale in the industry. It may be argued that entry of banks, consequent on deregulation, has resulted in over fragmentation of the market. As a result, a natural sifting has taken place in the industry, through regrouping of forces, by means of which economic size is arrived at. This is likely to be peculiar to the private banking industry as compared to public sector banking industry because of relatively free operation of market forces.

Section VII: Summary and conclusions.

This paper attempts to study certain aspects of the market structure of private domestic banking industry in India. The relatively deregulated environment, in the nineties, provides the opportunity for such a study. It examines the relationship between entry, concentration and market structure. There is a general notion that entry reduces concentration. Such a notion does not analyse the process through which entry reduces concentration and may be termed as a mechanistic view of competition. It also treats market size as fixed and hence may also be regarded as a static view. In lieu of such a view, an alternative organic view has been proposed in this study. The organic view of competition, developed in the study, goes beyond number of firms and simple measures of concentration ratio and looks into identities of individual firms, dynamics of the rank and the shares of the array of firms.

Market structure has been defined, in terms of certain variables, on the assumption that certain change in those variables would necessarily bring about a movement towards a competitive structure. It is argued that if entry reduces

concentration, through increasing the number of firms, competition exists. The purpose of S-C-P, having this three tier analytical framework, is to see the effect of each of these on competition. The variables are not the effect. There is a certain expected effect of these variables, which is basically creation of a more competitive structure. It is seen that these three variables are not able to uniquely determine the existence of competition. The banks have been able to retain the ranks, despite entry of new banks, increase in number of banks and significant fall in concentration. This appears to be an effect of a conduct variable called collusion, which is influencing market structure. In view of existence of collusion, entry ipso facto does not imply increased competition. From this analysis, it seems that there is a need to appeal to dynamic framework of S-C-P, which allows for feedback. Hence the present study of the Industry shows that static S-C-P framework does not suffice.

Nevertheless, there is a need to analyze market structure, in terms of concentration ratio. The determinants of concentration ratio have been only loosely stated without any empirical framework. Hence an attempt is made to explain market structure, in terms of concentration ratio, through certain market related determinants by using a rigorous empirical framework. The most important contribution of the study lies in developing a model in cubic form that explains concentration ratio in terms of average asset size of a bank, number of banks and skewness of the asset distribution. This analysis rejects a simplistic interpretation of impact of number of firms on concentration ratio and finds that relationship is dynamic, nonlinear and circuitous. Further, it argues that the said relationship is complicated by presence of impact of other variables, which includes average asset size and skewness in asset distribution. The results also show that the industry dynamics are more important than policy factors in explaining concentration.

⁸ *H fell from .08 in 1993 to .04 in 2000 to rise again to .1 in 2002.*

The empirics in the paper demonstrated that a cubic function, with given determinants, would best explain the phenomenon of market concentration consequent to entry. It is also capable of generating varying patterns of concentration, according to the combination of three varying levels of the determinants. In each case, amplitude, gradient, point of inflexion and range may differ. It should be stressed that an analysis of pattern of concentration in the industry consequent on entry of new banks is not merely relevant to India. It is of general importance for a number of countries which have deregulated entry into their banking industry. The cubic model, developed in the paper can serve the purpose of a generalised model, which explains concentration over time and in different contexts.

Banks could not rationalize their size before deregulation, due to restrictions imposed on them in the regulatory phase. Once restrictions were removed, it took two years for the forces to be regrouped before the entry was made into the industry. The new private domestic banks sought to serve the middle class segment in the metros, which provided the niche for them. The said customer segment wanted to get rid of the indifferent service provided by the public sector banks, but at the same time, did not have the capacity to shift to foreign banks, because of the enormous cost associated with it. By offering cheaper services, with quality comparable to foreign banks, new private sector banks provided the middle class in metros the much needed respite. Nevertheless, while such a niche area existed, it was not adequate for all the new private sector banks for exploiting their scale economies. The market was unduly fragmented among a larger number of banks, not warranted by the size of the market. Under such a situation, banks could not continue with their present size and form. Consequently, merger occurred thereafter precisely because modern banking is not possible without a commensurate size. Internet banking, ATM facilities, delivery of

large sized loan(consequent on abandonment of consortium banking made optional in 1997) and the development of a high risk bearing capability in a competitive scenario are some of the features of modern banking, for which a large size is a must⁹. When number of banks was not found to be viable, in view of the market size, merger took place automatically and inevitably when forces of competition, deregulation and liberalization were allowed to operate.

⁹ The ordinary rules of atomistic competition, where it is possible for a small sized firm to profitably survive do not apply in this context.

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Banks could not rationalize their size before deregulation, due to restrictions imposed on them in the regulatory phase. Once restrictions were removed, it took two years for the forces to be regrouped before the entry was made into the industry. It is very interesting to note that the new private domestic banks sought to serve the middle class segment in the metros, which provided the niche area for them. The said segment wanted to get rid of the indifferent service provided by the public sector banks, but at the same time did not have the capacity to shift to foreign banks because of the enormous cost associated with it. By offering service, comparable to foreign banks, new private sector banks provided the middle class in metros the much needed opportunity. Nevertheless, while such a niche area existed, it was not adequate for all the new private sector banks which entered the arena. Consequently, merger occurred thereafter precisely because modern banking is not possible without a commensurate size. Internet banking, ATM facilities, delivery of large sized loan (consequent on abandonment of consortium banking made optional in 1997) and the development of a high risk bearing capability in a competitive scenario are some of the features of modern banking, for which a large size is a must. Clearly before merger, the market was unduly fragmented among a larger number of banks, not warranted by the size of the market. Under such a situation, banks could not continue with their present size and form. When number of banks was not found to be viable, in view of the market size, merger took place automatically and inevitably when forces of competition, deregulation and liberalization were allowed to operate.

Interpretation of beta coefficients is intrinsic to the algebraic form the equation. Change in y in cubic form is the net resultant of the values of the variables, direction and magnitude of their coefficients and the form assumed by different variables.

The problems with a simple multiple regression framework get compounded in our cubic form

1. In a simple linear framework, $y=a+bx+cu+dw$. Change in y in this form is the net resultant of the values of the variables, direction and magnitude of their coefficients. **The relative balance of forces remain the same and Y moves in a particular direction.**

2. In a simple cubic equation, $y=a+bx-cx^2+dx^3$.

*But with varying sign associated with variables in quadratic and cubic form, a situation may emerge when a variable in a linear form, even with a larger coefficient or large values, will have a smaller impact on concentration over time, as compared to a variable in quadratic or cubic form, even with a smaller coefficient. Thus **the relative balance of forces do not remain the same and Y goes up, goes down to go up again.***

In a simple cubic form, one can observe a sequential impact of the variables. First x, then x^2 and later x^3 will have the dominant influence. The coefficients of the variables will go down as we move from x to x^2 and then to x^3 . When x begins to rise but remains small, the coeff of x is $b>0$, impact of x^2 and x^3 will also be smaller and the dominant effect will of b and y will rise. When x has risen to some extent, then coeff of x^2 is $c<0$ even with smaller coefficient of x^2 , the negative impact of x^2 overcompensated the impact of x variable with its positive coefficient, b. thus y will fall. When x becomes very high, then the effect of x^3 outweighs the negative impact of x^2 with a even smaller coefficient and creates the most dominant impact on y. This will lead to rise in rise again. Thus one can observe a sequence in which each variable assumes dominance to outweigh other variables to forces a direction of change for y.

Thus, in case a simple cubic equation, apart from the above factors, the linear, quadratic and cubic form assumed by variables. needs to be considered in order to examine the impact on y. There is a sequential impact of variables, each becoming dominant for a particular range of values of x. **The direction of y keeps changing.**

3. In our cubic form, $y=a+bx_1-x_2^2+dx_3^3$ This problem gets compounded with an our cubic form because

- Such sequential pattern is missing in our cubic form.** In the simple form, the effect of x is dominant in the first phase, that of x^2 in the second phase and that of x^3 is in the third phase. In our cubic form, all the variables start operating right from the beginning and which variable has the dominant impact is not known. apriori. Unlike the earlier case, where each variable moves in the same direction, here the variables are unrelated to each other One can not construct the phase of changes in y from changes occurring in the explanatory variables without making some assumptions about the dominant effects.
- given the impact of, x_2^2 and x_3^3 , it is difficult to work out the impact of base level variables like x_2 and x_3 .
- The ordinary cubic equation may be shown as a two dimensional plane, but four dimensions are needed to show our cubic form.

- d) The ordinary cubic equation generates only two patterns, but our cubic equation generates numerous patterns
- e) **In all the above cases**, All the variables act in unison. They can not interpreted in isolation. It is not possible to assign an independent interpretation to each of the coeffs and relate it to the actual pattern of the dependent variable.

The relationship between concentration and market structure has not been fully explored in the literature. The impact of entry on concentration and competition through market structure needs to be re-examined. The deregulation of domestic private banking industry in India, since early nineties, provides the opportunity for such a study. The existing understanding of this relationship is rather mechanical. The present study takes up an organic approach that is based on an analysis of the identity of firms, the dynamics of rank and their market shares. Although concentration is the central issue in market structure, it can not be taken uncritically as an index of competition. There has not been any empirical analysis of the pattern and determinants of market concentration. This paper for the first time identifies a distinct pattern of change in the concentration ratio and explains it in terms of a cubic form of equation. Concentration is explained in terms of its determinants- number of firms, average asset size and their distribution, that are found to be highly significant. The study arrives at some evidence in favour of certain conventional determinants of concentration. Alongside, it points out to a possible pattern that concentration follows upon deregulation. This, it is argued may constitute a possible evidence of existence of economic size.

The policy intervention has led to creation of an environment in which the industry dynamics has taken over which which will lead to competition i.e., change in conduct which will influence performance resulting in enhancement of efficiency.

It has been observed that H, after falling from its level in 1993, again rose to a level dropping from .08 to .04, Hirfindal's concentration ratio has risen to .1, which is slightly higher than the level from which it has began to decline.

It is important to note that the above analysis of results would have been appropriate, had we used a linear form of a equation, where the dependent variable moves in one particular direction as a result of changes in the explanatory variables. However, a cubic equation is used to explain concentration ratio, which after remains constant, goes down to go up again. In such a scenerio, one can not explain impact of change in one explanatory variable on concentration without referring to changes in other variables. In different phases, explanatory variables move in different directions, create varying market dynamics and a differential impact is manifested on concentration ratio.

We have not applied the structural break at 1992

It clearly shows that concentration would vary according to the combination of three varying levels of determinants.
(countries/sectors).

Section IV: Phases of deregulation:

The pre-deregulatory phase continued till April, 1992. It is a phase characterized by administered interest rate and service charges as well as tight credit allocation mechanism coupled with restricted entry into private domestic banking sector. The situation of a private domestic sector bank during this period appears to be akin to an atomistic producer whose status is that of a price taker. But the interest rate on liabilities and assets were not fixed by profit motive but by RBI regulation through the system of administration spreads. A “uniform price” was artificially prevalent during the regime. It may be appropriate to call the then market structure of the private domestic banking industry “pseudo competitive” in which the profits enjoyed by the banks due to existence of administered spreads can not be competed away by new entrants. Apart from regulation of interest rate, RBI also regulated the credit allocation by banks through different mechanisms. Presence of interest controls, as well as, rigorous credit allocation mechanisms, eliminated price competition and the tendency toward optimal resource allocation. Credit allocation mechanisms included capital authorisation scheme, credit-monitoring arrangement, and consortium financing and lead bank system.

Different measures relating to deregulation broadly include dismantling of administrative interest rates and service charges, asset allocation mechanisms as well as entry of new banks. Among the large number of deregulatory measures, what is vitally important for our analysis is the aspect of entry and merger which followed entry subsequently. Hence different deregulatory measures are very briefly discussed in terms of the following four phases.

Phase I: from April 1992 to 1995; Phase I is characterised by beginning of steps related to deregulation of interest rates and lifting of restrictions on entry of new private domestic banks as well as continued restriction on credit allocation.

Phase II: 1995 to 1997: This phase is characterised by three features: entry in private domestic banking sector in 1995, more steps towards deregulation of interest rates and continued regulation of credit allocation.

Phase III: from April 1997 to September 1999: Characteristic features of this phase include discarding of credit allocation schemes as well as entry of more private domestic banks leading to product differentiation.

Phase IV: After September 1999 and onwards: Freeing of service charges, vigorous use of brandnames by new private domestic banks followed by old banks and mergers constitute features of this phase.

As far as form is concerned, the analysis was in terms of testing for structural breaks corresponding to certain policy periods. Concentration could not be explained so well with such a form of equation. Certain dummies which represented policy impact were also not found to be significant determinants. Hence the pattern and determinants were not well explained with the help of an empirics based on a policy framework. The later empiricism based on industry dynamics and a cubic form has been able to explain pattern and determinants better. However, this is not to say that policy has not played a role. While its direct impact on Concentration may be ambiguous, its indirect impact in terms of permitting entry and liberating the industry forces can not be denied. For verifying this, another exercise was conducted wherein the statistical significance of mean level of determinants of concentration was tested with the help of a t test. Size as well as number showed a significant upward trend. The size asymmetry did not rise uniformly however it showed a dynamic pattern of rise and fall. On the whole, it can be stated

that the indirect impact of the new policy environment has been significant and is responsible for liberating the forces of industrial dynamics.

Thus direct impact of policy intervention on concentration is ambiguous. The impact of deregulation is that the industry dynamics take over. During the pre92 regime which was not a liberalised regime, one can talk of policy interventions. During the pre1992 phase, policy may have played a significant and consistent role in explaining concentration. There is a case for changing the focus from policy intervention to industry dynamics and competition. If merger can not be prevented in the new policy environment, then whenever, industry consisted of firms moving to uneconomic size, there would be regrouping of forces leading to merger and hence increasing concentration. **New paradigm of competition policy is vindicated by our empirical findings.**

If policy variable is not influencing concentration, then the question of controlling monopoly power with policy intervention becomes somewhat questionable on account of our results.

The graph of four-firm concentration ratio has been constructed. A preliminary observation of the graph of concentration ratio reveals the following pattern: a rising phase followed by a falling one which is again succeeded by a rising phase.

Insert graph I here.

A look at the graph leads one to fit a cubic function to explain four-firm concentration ratio. The model was run with alternative forms of explanatory variables and with different concentration ratios as the dependent variables. Among different specifications, four-firm concentration ratio is best explained by average asset in linear form, number of firms in quadratic form and exogenous variable in cubic form. Thus the form of the equation fitted is $y=a+bx+cx_1^2+dt^3$, where y =four-firm concentration ratio, x =average asset, x_1 =number of firms, t =time variable.

Insert table VIII here.

It is not a question of exogenous or endogenous variables. It is question of policy and industry variables or policy variables and industry variables.

In the first set of models, we had a linear relationship involving a mixture of industry and policy variables. We rejected this set because the cubic relationships which was involving only the industry variables was doing better than the one with both industry and policy variables. The explanatory power of the first set of models was lower and all the variables were not uniformly significant across all forms of dependent variable.

Thus we took the next two models and then tried to identify which variables has a linear, quadratic and cubic form. In all we have tested eighteen plus three models. Three are three forms of the dependent variables. The first set of was model runs for all variables in linear form. Then n and standard deviations were tries alternately in squared and cubic form. This again generated three models. In the next step another set of models were run using skewness instead of standard deviations. The first set of models which were in linear form was rejected because Therefore, in the final analysis, we tested three variables all in cubic form.

The impact of number of banks and asset distribution occurs on concentration ratio in a magnified form.

The pattern and determinants were not well explained with the help of an empirics based on a policy framework.

Two time periods, one and two, are constructed. In time period one, let the size of top n firms add upto t_0 and the summation of size of all firms i.e the market size be a (such that $t_0 < a$). Thus n-firm concentration ratio is $CR_1 = t_0/a$.

Time period two may be characterised in two different ways.

1. Size of the top n firms change from t_0 to t_0^1 (t_0^1 is either $>$ or $<$ t_0).
2. The size of other firms also change as well so that the market size i.e the summation of size of all firms change to a_1 from a . (a_1 is $>$ or $<$ a and $t_0^1 < a^1$).
3. n new firms enter now, with sizes of the each of the entrants fall short of smallest of the top n firms, i.e their total size, denoted by t_1 is less than t_0^1 .

Thus new n-firm concentration ratio, $CR_2 = t_0^1 / (a_1 + t_1)$. It is only when, $t_1 > a(t_0^1 / t_0 - a_1/a)$, concentration ratio falls in period 2.

Proof: $CR_1 > CR_2$

$$\Rightarrow t_0/a > t_0^1 / (a_1 + t_1)$$

$$\Rightarrow t_0(a_1 + t_1) > a t_0^1$$

$$\Rightarrow t_0 t_1 > a t_0^1 - a_1 t_0$$

$$\Rightarrow t_1 > a (t_0^1 / t_0 - a_1/a).$$

In the second kind of characterization of period 2, first two conditions remain same, but the characterizations of entrants differ. Entrants are such that the size of each of the entrants exceed the largest of the top n firms, i.e their total size, denoted by t_1 is more than t_0^1 . Now, the new n-firm concentration ratio, $CR_2 = t_1 / (a_1 + t_1)$, while the old n-firm concentration ratio, $CR_1 = t_0/a$. ($t_0^1 >$ or $<$ t_0 and t_1 is more than t_0^1). It is only when $t_1 < a_1 t_0 / (a - t_0)$, concentration ratio falls in period two.

Proof: $CR_2 < CR_1$

$$\Rightarrow t_1 / (a_1 + t_1) < t_0/a$$

$$\Rightarrow a t_1 < t_0 (a_1 + t_1)$$

$$\Rightarrow -t_0 t_1 + a t_1 < a_1 t_0$$

$$\Rightarrow t_1 < a_1 t_0 / (a - t_0).$$

Dear Krishnendu,

Received your E-mail. I shall remain highly obliged for the kind of attention I am getting from you, despite your busy schedule. In this crude world, it is spectacular to remain in touch with good people.

With warm regards.

Monopoly power is the ability to alter prices away from competitive levels to earn economic profit for long periods, without attracting new competitors and without improving their product or reducing their production cost. (Edgmand, Moomaw and Olson, pp. 102; Mas-Collel, Whinston and Green, pp. 383)