

Competition in Indian commercial banking sector in the liberalized regime: An empirical evaluation

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Abstract

The purpose of this study is to analyze the degree of competition in Indian commercial banking sector for the period 1996-97 to 2004-05. In this study, we have estimated a model containing first order condition for profit maximization, coupled with cost function and inverse demand function. Our findings supports that the competitive environment of Indian banking sector has improved during the regime of on going liberalization and competition has become more severe in the latter two years.

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Competition in Indian commercial banking sector in the liberalized regime: An empirical evaluation

1. Introduction

The purpose of this study is to estimate the degree of competition in Indian banking sector for the period 1997-98 to 2004-05 where the market prohibits free entry by imposition of legal and/or economic barriers. The estimates of average degree of competition for each year of our investigation will trace the competitiveness of the banking sector that has been passing through the ongoing process of liberalization. Most of the commercial banks were under the control of public sector and the system was over regulated and over administered. Keeping pace with the global changes in banking liberalization, India has resorted to liberalization and deregulated banking sector to cope with the ongoing reforms of real sectors. Therefore, one can expect that competitiveness of Indian banking sector has improved.

Few studies have investigated the degree of competition of Indian commercial banks¹. Bresnahan (1982) and Lau (1982) method of testing competitive behavior is accomplished by using a simultaneous equation model to estimate a system of equations involving the supply and demand functions as well as a price equation to derive long run average degree of competition using time- series data. In contrast, the short-run measure of the degree of competition can be estimated using panel data (Ucida and Tsutsui (2005)). Ours is a modest effort to estimate short-run measures of the market power of Indian commercial banks.

We organize our paper as follows. Section 2 describes the brief outline of the banking sector reform. In section 3, we focus on the relevant literature on the measurement of competition. Section 4 describes the model used in our study. Section 5 deals with data source and estimation methods. Section 6 analyses the empirical findings of our study and section 7 concludes.

¹ To our knowledge, Prasad and Ghosh (2005) is the only study.

2. A brief outline of the banking sector reform

In the post-independence period, India observed the emergence of large number of institutions for providing finance to different sectors of the economy. During the five year plans, the Reserve Bank of India (RBI; Central Bank in India) and the government nurtured and encouraged commercial banks through various financial incentives and other supportive programs to provide with cheap finance to encourage industries to implement the import substitution growth model adopted by planning commission of India. There was significance presence of foreign banks as well as domestic banks. The schedule commercial banks comprise of foreign banks operating in India, public and private sector India banks and regional rural banks (RRBs). There were two nationalizations of banks in India, one in 1969 and the other in 1980. The activities of private sector and foreign banks were restricted through branch licensing and entry regulation norms. The share of advances to priority sector increased considerably following nationalization of major banks. RBI has heavily regulated market entry or exit, capital adequacy, reserve and liquidity requirements, asset portfolio allocation, number of branches, deposit insurance, interest rates on deposits and loans.

The over regulated and over administered polices eroded the capital base of most of the public sector banks and recapitalization of 19 nationalized banks was made by government through budgetary provision

Nevertheless, acute problem arises in productivity, efficiency and profitability front of the commercial banks. The policy of directed investment in the form of high SLR and CRR, directed credit programs, extra administrative interference in credit decision making, high operating costs, regulated interest rates, non-transparent accounting system coupled with nonexistence of operational flexibility, internal autonomy and absence of competition contaminated the health of the commercial banks and threatened their future survival.

The committee on Financial System (GOI 1991), with the objective to fabricate efficient, prudent and internationality competitive system, suggested more market-friendly blue print for first generation reforms of financial sector.

Liberal policies facilitate to increase market competition among banks to augment efficiency and productivity by the management to choose independent decisions about input-output and their prices by individual banks. The Committee on Financial Systems (GOI, 1998) suggested the road map for second-generation reform to keep pace with liberalization of financial sector in other parts of the world.

The other remarkable developments to enhance competition in banking sector reforms are:

- 1) It abolished administered interest rate regime by allowing banks to determine lending and deposit rates.
- 2) Competition has infused by allowing the operation of new private sector banks and more liberal entry of foreign banks.
- 3) Measures to broaden the ownership base of PSBs have also taken.
- 4) The system has also observed greater levels of transparency and standards of disclosure.
- 5) It introduced ratification of the legal structure to strengthen banks position in the areas of loan and default loan.

It was mandatory on the part of CBs to get license from RBI to open new branches until 1992. RBI has withdrawn the practice of branch licensing and given greater freedom to banks to rationalize their existing branch network to relocate branches and establishing extension counters provided they attain the revised capital adequacy norms and prudential accounting system. Although the reform was initiated in 1991, the transformation into a fully price competitive setup was not effective until 1994. The entry restriction in banking market by new private sector banks was diluted to accelerate the competition.

Foreign banks operating in India have achieved the freedom to open new branches, provided they also fulfill the norms set for the entrance of new banks. Foreign banks have

also permitted to collaborate with new private sector banks. Foreign equity in private banks is permissible. It allowed joint venture between local banks and foreign banks in the business of non-bank financial services.

The basic tenet of these policies is withdrawal of government intervention in the financial system by way of ceiling in interest rates or direction of credit allocation and increased freedom of entry in the sector.

The efficiency and progress of financial sector depends on portfolio management of assets, information acquisition and stock of skilled human resource. Public sector banks (PSBs) now enjoys greater autonomy to recruit skilled and specialize human resources from the open market with market ruled remunerations to cope with the new technological and business challenges of the new and emerging banking activities.

Operational flexibility and functional autonomy of PSBs will definitely improve due to partial privatization. Government diluted the holding stake of equity to 51%. It has further proposed to reduce holding to minimum 33% on case-by-case basis. The entry of new private banks and foreign banks will promote competitiveness by introducing new products and better technology.

The banks guided by the principle of free market are likely to change product mix, client mix and geographical areas of activities by executing appropriate human resource management given the technological constraint. The banks may opt for more risky asset to earn higher expected return on assets. Banks are likely to shift higher funding cost and interest rate risk to borrowers. The synergic effect of deregulation and adoption of prudential norms is likely to lead to higher level of efficiency, better resource allocation, innovation of products and process by diffusing competition among participants.

3. Relevant literature on competition

There are an enormous academic writings on the aspect of competition in the banking sector of different countries. To our knowledge, only one study is available which measures market power of Indian commercial banks. Prasad and Ghosh (2005) estimated the Panzar and Rosse(1987) H-statistic of Indian banks in the period 1997-2004 for 64

banks and in turn found monopolistic competition equilibrium. They derived the result from a sample size that does not cover the entire market. Estimated conduct parameter is likely to be biased when sample does not cover the entire market. Ours is a modest effort to estimate the degree of competition of Indian commercial banks using a different methodology that covers almost the entire market.

Empirical evidence supports that in concentrated markets banks charge higher rates on small business loans and pay lower rates on retail deposits (Berger and Hannan, 1989, 1997; Hannan 1991). Researchers found that in more concentrated markets deposit rates are sticky or slow to respond to changes in open market interest rates, and the sticky character is greater with respect to increases than decreases, consistent with market power (Hannan and Berger, 1991; Neumark and Sharpe, 1992; Jackson, 1997). Studies related to local market structure have tested the price-taking versus price-setting behavior of banks; support both schemes (Hancock, 1986; Shaffer, 1989; English and Hayes, 1991; Hannan and Liang, 1993).

Shaffer (1993), Shaffer and DiSalvo (1994), Zardkoohi and Fraser (1998) and Ucida and Tsutsui (2005) applied the Bresnahan (1982) and Lau (1982) methodology to the banking industries of USA, Canada, and Japan.

4. Model

We assume that bank i collects deposit d_i from market and lends q_i amount and purchases b_i amount of securities at time t . Here we assume intermediation approach and treat deposit as input in the production of single homogeneous output loans together with other factors (Sealy and Lindley 1997; Klein 1971). Banks are price taker in input and money markets.

The profit function of bank i at time t is

$$\Pi_{i,t} = P_t(Q_t)q_{i,t} + r^b_{i,t}b_{i,t} - r^d_{i,t}d_{i,t} - C_{i,t}(q_{i,t}, d_{i,t}) \quad (1)$$

where $P_t(Q_t)$ is the inverse demand function for loans, $Q_t = \sum_{i=1}^n q_{i,t}$, is the aggregate demand for output, where n is the number of banks, $r^b_{i,t}$, $r^d_{i,t}$ and $C_{i,t}(q_{i,t}, d_{i,t})$, stands for yield on bonds, rate of interest on deposits and operating cost respectively.

Banks interact strategically to set output level to maximize profit level i.e. the i th bank's problem is to maximize $\Pi_{i,t}$ profit function subject to $b_{i,t} + q_{i,t} = d_{i,t}$ (2)

The first order conditions for profit maximization are as follows;

$$\frac{\partial \Pi_{i,t}}{\partial q_{i,t}} = P_t(Q_t) + q_{i,t} \frac{\partial P_t}{\partial Q_t} \frac{\partial Q_t}{\partial q_{i,t}} - r_{i,t}^b - \frac{\partial C_{i,t}}{\partial q_{i,t}} = 0 \quad (3)$$

$$\frac{\partial \Pi_{i,t}}{\partial d_{i,t}} = r_{i,t}^b - r_{i,t}^d - \frac{\partial C_{i,t}}{\partial d_{i,t}} = 0 \quad (4)$$

We can write equation (3) as

$$P_t \left(1 - \frac{\lambda_{i,t}}{\eta_t}\right) = r_{i,t}^b + \frac{\partial C_{i,t}}{\partial q_{i,t}} \quad (3a)$$

$$\text{where } \lambda_{i,t} = \left(\frac{\partial Q_t}{\partial q_{i,t}} \frac{q_{i,t}}{Q_t}\right) \text{ and } \eta_t = -\frac{\partial Q_t}{\partial P_t} \frac{P_t}{Q_t}$$

$\lambda_{i,t}$ is the index of the competitiveness of oligopoly conduct. We define conjectural variation as the reaction the firm conjectures about the output of its competitors if the firm is to change its own output. $\lambda_{i,t} = 0$ implies perfect competition, whereas $\lambda_{i,t} = 1$ implies monopoly equilibrium. The conduct of the firm moves farther from perfect competition as $\lambda_{i,t}$ moves farther from zero, (Bresnahan, 1989). $q_{i,t} / Q_t < \lambda_{i,t} < 1$ represents the collection of game equilibrium whose on one-shot game is Cournot equilibrium, and for identical firms Cournot equilibrium is $1/n$ and price elasticity of demand for loans is η_t .

Multiplying equation (3a) by $q_{i,t}$ we get

$$R_{i,t} \left(1 - \frac{\lambda_{i,t}}{\eta_t}\right) = r_{i,t}^b q_{i,t} + q_{i,t} \frac{\partial C_{i,t}}{\partial q_{i,t}} \quad (5)$$

where $R_{i,t} = P_t q_{i,t}$ is the interest income from loans and λ_t is the average degree of competition for year t .

Equation (5) can be rearranged as

$$RBA_{i,t} = \frac{\lambda_t}{\eta_t} R_{i,t} + q_{i,t} \frac{\partial C_{i,t}}{\partial q_{i,t}} \quad (6)$$

where $RBA_{i,t} = R_{i,t} - r_{i,t}^b q_{i,t}$

We assume cost function as:

$$\log C_{i,t} = C_0 + C_1 \log q_{i,t} + \frac{1}{2} C_2 (\log q_{i,t})^2 + C_3 \log d_{i,t} + \frac{1}{2} C_4 (\log d_{i,t})^2 + C_5 \log w_{i,t} + \frac{1}{2} C_6 (\log w_{i,t})^2 + C_7 \log q_{i,t} \log w_{i,t} + C_8 \log q_{i,t} \log d_{i,t} + C_9 \log d_{i,t} \log w_{i,t} + e_{i,t}^c \quad (7)$$

where $w_{i,t}$ is the wage rate of bank i at period j.

Substituting derivatives of cost function in equation (6) we obtain

$$RBA_{i,t} = \frac{\lambda_t}{\eta_t} R_{i,t} + C_{i,t} (C_1 + C_2 \log q_{i,t} + C_7 \log w_{i,t} + C_8 \log d_{i,t}) + e_{i,t}^a \quad (8)$$

We assume demand function for loans as:

$$\log P_{i,t} = b_0 - \frac{1}{\eta_t} \log Q_t + b_2 \log Y_t + b_3 \log NPA_{i,t} + b_4 \log BR_{i,t} + e_{i,t}^d \quad (9)$$

where Y_t is GDP for the year t, $NPA_{i,t}$ is the net-nonperforming asset at period t, it embraces the credit risk of the banks in our analysis, and $BR_{i,t}$ is number of branches of bank i at period t.

Simultaneous estimation of (7), (8), and (9) provides estimate of the degree of competition together with the estimates of other coefficients.

Bresnahan (1982) and Lau (1982) method of testing competitive behavior is accomplished by using a simultaneous equation model to estimate a system of equations involving the supply and demand functions as well as a price equation to derive long run average degree of competition using time-series data. However, the estimation of above simultaneous equation system helps us decipher the average degree of competition for each year by using the panel data.

5. Data source

In India, commercial banks act mainly as financial intermediaries. Indian commercial banks collect deposits, give loans, and invest primarily in government securities and other securities as well. We have used the data of reports on trends and progress of commercial banks, RBI publications and statistical tables relating to banks of India, RBI publication

for the period 1996-97 to 2004-05. Estimated conduct parameter using Bresnahan-Lau technique is biased when sample does not cover the complete market (Shaffer, 2001). In our study, we have taken the whole banking sector of the country.

Our sample incorporates data for each bank including public sector, private, and foreign banks after excluding few observation that are either not available or outliers. The sample size of banks varies between 85 and 97. We plotted Herfindahl index (HI) as a measure of market concentration for loan (advances) in Figure1. It shows continuous fall of HI in almost all the years tempting one to conclude that concentration decreases every year.

Table 1 is approximately here

List and description of data considered for the variables:

$C_{i,t}$ = Operating cost of bank i at time t

$d_{i,t}$ = Deposit of bank i at time t

$r^b_{i,t}$ = Price received from bonds for bank i at time t

$q_{i,t}$ = Amount of advances (loans) of bank i at time t

$w_{i,t}$ = Expenses on employees/ total number of employees of bank i at time t

$R_{i,t}$ = Revenue from advances (loans) of bank i at time t

$P_{i,t}$ = Interest rate on advances (loans) of bank i at time t

Q_t = Total amount of advances (loans) by all banks at time t

Y_t = Gross domestic product at time t

$NPA_{i,t}$ = Non- performing asset of bank i at time t

$BR_{i,t}$ = Number of branches of bank i at time t

Simultaneous estimation of (7), (8), and (9) provides estimate of the degree of competition together with the estimates of other coefficients. The above is an over determined system of equations with unknown parameters where residuals are not independently and identically distributed. 3SLS and SURE estimate the parameters of the system, accounting for heteroskedasticity, and contemporaneous correlation in the errors across equations. 3SLS is a system method that estimates all the coefficients of the

model, then forms weights and re-estimates the model using the estimated weighting matrix. The iteration of SURE technique will produce estimates that converge to ML parameter estimates. In order to estimate λ_t , the average degree of competition for year t , we employ dummy variables for each year in equation (8). We use dummy variables for each two years from 1998 to 2005 in equation (9) to estimate η_t to avoid the problem of multicollinearity and to get a reasonable number of the estimates of η_t . We estimated the above-mentioned model by Three -stage Least Squares and Iterative Seemingly Unrelated Regression equation and present it in Table 2.

Figure1 is approximately here

6. Estimation result

We report the estimated values of the variables by 3SLS and Iterative Seemingly Unrelated Regression Equations in Table 2. Both the estimates are almost identical. In the cost equation, the estimated coefficients are spastically significant, while coefficients of $\log d$, $\log d \times \log q$ and $\log d \times \log w$ are negative and significant at 1 percent level. This is perhaps because of public sector banks with large number of branches considered deposit mobilization as the performance indicator of bank officials. Deposit size was only the measuring rod to judge the performance of the employees as well as the balance sheet of every bank.

In the demand equation the coefficients of NPA and number of branches have the expected sign (positive and negative, respectively), and are both statistically significant at 1% level. The estimated value of elasticity η for the 1997 is statistically significant.

Table 2 is approximately here

Figure: 2 depicts estimates of λ_t using both the methods of Three Stage Least Square and Iterative Seemingly Unrelated Regression Equation. The estimated value of λ_t by 3SLS is always slightly greater than that of the estimated value by Iterative SURE method. We can easily conjecture that λ_t had a downward trend in general in the year 2005 compared to the year 1997. The degree of competition decreased in alternate years from the

measure of the previous year for the period 1997 and 2004. It never reaches the high 1997 level. There is no uniform change in the magnitude of the fluctuation of the degree of competition. However, the estimated parameter of the market power showed regular and consistent decrease from the year 2003.

Figure2 is approximately here

We have tested the estimated value of λ_t against the following hypotheses:

- 1) Indian commercial banking market is perfectly competitive.
- 2) Monopoly (collusive) conduct of the Indian banks to maximize joint profit of the industry is the character of the market.
- 3) Cournot oligopoly equilibrium prevails in the Indian banking sector, where $1/n$ is the proxy for Cournot oligopoly.

Table:3, shows that the above null hypotheses were rejected at 1 % level of significance against the respective alternative hypotheses that those are not. It indicates that Indian banking sector is more competitive than monopoly but less competitive than Cournot oligopoly equilibrium. In summary, we can conclude that the competitive environment of Indian banking sector has improved during the regime of on going liberalization and competition has become more severe in the latter two years.

Table3 is approximately here

7. Conclusion

In this paper, we have estimated the degree of competition in Indian banking sector for the period 1997-98 to 2004-05 where free entry into the market is prohibited by imposition of legal and/or economic barriers. This study also traces the average degree of competition for each year of our investigation. The estimates of average degree of competition for each year of our investigation will trace the competitiveness of the banking sector that has been passing through the ongoing process of liberalization. In this study, we have estimated a model containing first order condition for profit maximization, coupled with cost function and inverse demand function. Our findings supports that the competitive environment of Indian banking sector has improved during

the regime of on going liberalization and competition has become more severe in the latter two years compared to that of earlier periods.

Table 1 Descriptive statistics for the variables used

Variable	Average	Maximum	Minimum	Median	St.Dev
R	60281.89	1304351	4.00	20247	128381.5
C	35039.2	1007418	113.00	9594	84870.56
d	1187990	36704753	32.00	304557	2904424
q	641744.4	20237446	230.00	176212	1535760
rb	0.09839	0.338309	-0.24176	0.101083	0.029802
W	4.015005	30.76471	0.570336	2.667473	3.699579
P	0.117132	1.21103	0.000467	0.110899	0.056992
NPA	6.500036	61.37	0.00	4.98	7.229881
BR	569.0373	9161	1.00	84	1185.047

R, C, d, q, and w is amount in Lakh, rb, P, NPA are ratios and BR is measured in numbers.

Table3.2 System estimation results

Parameter	3SLS Estimate		Iterative SURE Estimate	
	Estimate	Probability	Estimate	Probability
λ 1997	0.4100	0.0000	0.3829	0.0000
λ 1998	0.2743	0.0000	0.2501	0.0000
λ 1999	0.3383	0.0002	0.3109	0.0002
λ 2000	0.2815	0.0000	0.2584	0.0000
λ 2001	0.3366	0.0002	0.3159	0.0007
λ 2002	0.2124	0.0000	0.1950	0.0000
λ 2003	0.2469	0.0000	0.2329	0.0000
λ 2004	0.2297	0.0000	0.2176	0.0000
λ 2005	0.1553	0.0000	0.1498	0.0000
C0	1.1981	0.0000	1.2309	0.0000
C1	0.2388	0.0147	0.3574	0.0000
C2	0.3202	0.0000	0.1989	0.0034
C3	-0.2478	0.0291	-0.3694	0.0002
C4	0.7436	0.0000	0.6524	0.0000
C5	0.3207	0.1555	0.2962	0.1095
C6	0.3714	0.0180	0.4379	0.0007
C7	0.5800	0.0000	0.5189	0.0000
C8	-0.4463	0.0000	-0.3398	0.0000
C9	-0.6057	0.0000	-0.5498	0.0000
b0	1.9227	0.2555	2.0078	0.2339
b2	0.5861	0.3354	0.5515	0.3635
b3	0.0529	0.0001	0.0551	0.0001
b4	-0.0135	0.0020	-0.0142	0.0011

η 1997	1.1695	0.0141	1.1926	0.0158
η 1998-99	1.1696	0.9816	1.1931	0.9186
η 2000-01	1.1736	0.6193	1.1976	0.5564
η 2002-03	1.1822	0.2478	1.2069	0.2085
η 2004-05	1.1752	0.6963	1.2000	0.6179
Adjusted-R Square				
for(7)	0.9435		0.9454	
for(8)	0.5379		0.5312	
for(9)	0.2905		0.2971	

Table: 3.3 Test of Market Structure

Parameter	Perfect Competition	Monopoly	Cournot Equilibrium
λ 1997	Rejected	Rejected	Rejected
λ 1998	Rejected	Rejected	Rejected
λ 1999	Rejected	Rejected	Rejected
λ 2000	Rejected	Rejected	Rejected
λ 2001	Rejected	Rejected	Rejected
λ 2002	Rejected	Rejected	Rejected
λ 2003	Rejected	Rejected	Rejected
λ 2004	Rejected	Rejected	Rejected
λ 2005	Rejected	Rejected	Rejected

Rejected at 1% level of significance

Figure1: HI

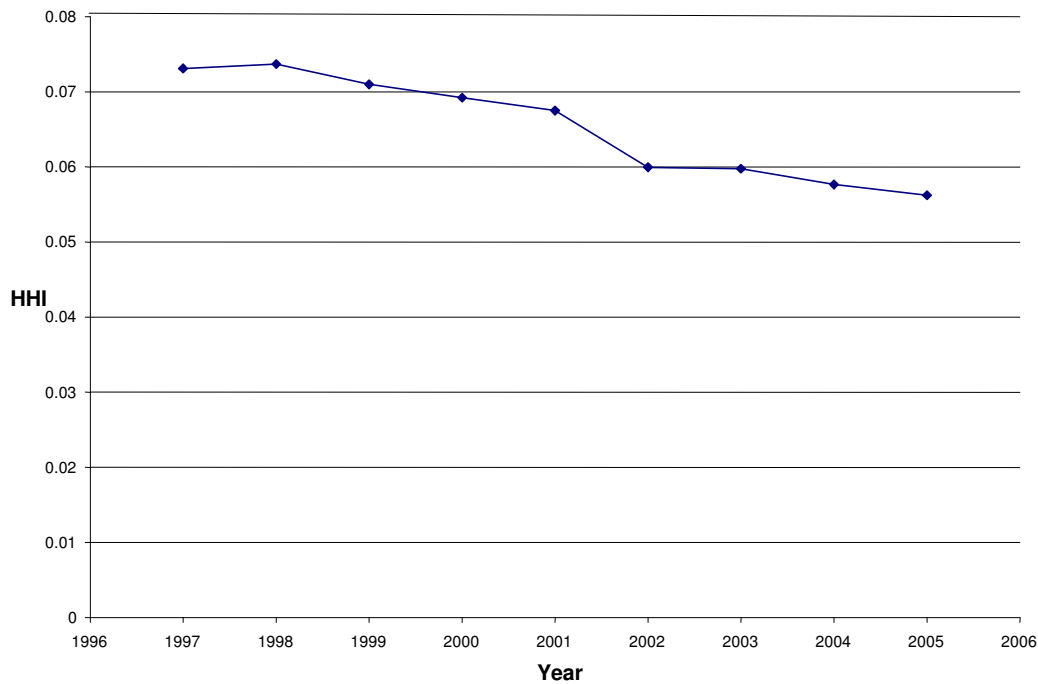
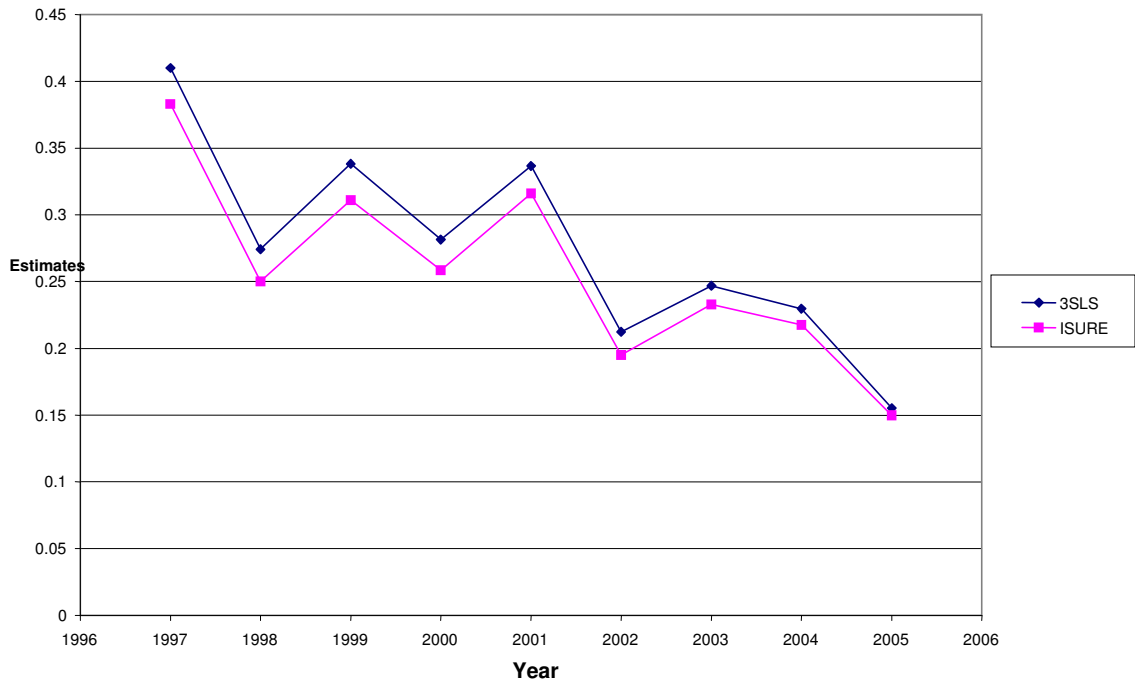


Figure .2 Market Power



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