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THE EVOLUTION OF COMPETITIVE CONDITIONS IN THE US BANKING SECTOR

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Abstract

In this paper competitive conditions in the US banking sector are studied on the basis of a comprehensive State-level dataset for 1966-2000. Our findings are twofold. First, we empirically document that throughout the period studied the US banking sector's behaviour is consistent with a monopolistically competitive market structure. Second, the evolution of the market reveals that competitive conditions in the 90's have considerably weakened. (JEL classification: C33, **D43,** G21).

Keywords: Banking, Market Structure, Rosse-Paznar H-statistic.

1. Introduction

The structural consolidation within the US banking industry observed over the past two decades reflecting Deregulation, the wave of Mergers and Acquisitions (M&As) and bank failures have resulted in dramatic changes in the US banking sector's structure (Berger, 1999; Hanweck and Shull, 1999; Rhoades, 2000). In addition, concentration both for MSAs and non MSA's counties has significantly increased (Rhoades, 2000).

What is of particular importance both for policy makers as well as market participants is whether these changes have induced any changes in the competitive environment and conduct in the banking industry. At a different level, an equally important empirical question is to characterize the dynamics of competitive conditions. There is an apparent gap in the existing empirical literature, which typically attempts to assess competitive conditions by using 'snapshots' of the banking sector (cross-section) on a given date without offering any evidence to their dynamic path. Notable exceptions are the studies by

Amel and Liang (1990) and Rhoades (2000) that focus on the determinants of changes in concentration ratios[2].

The paper's contribution to the literature is twofold. First, we assess competitive conditions in the US banking sector by employing a comprehensive State-level dataset covering the latter part of the previous century. Second, we contribute to the literature by studying the evolution of competitive conditions, which allows a dynamic view of market conduct.

Our results can be summarised as follows. We empirically document that the US banking sector's behaviour from 1966 to 2000 is consistent with a monopolistically competitive market structure. Furthermore, our analysis shows that competitive conditions have followed a complex path, albeit showing a decline in competitive pressures. What becomes clear from our empirical results is that competitive conditions in the 90's have considerably weakened.

The remainder of the paper is organised a follows. Section 2 provides a brief discussion of the empirics of measuring competitive conditions. Section 3 discusses the econometric methodology followed, the dataset employed and the empirical results obtained by the analysis. Finally, section 4 concludes.

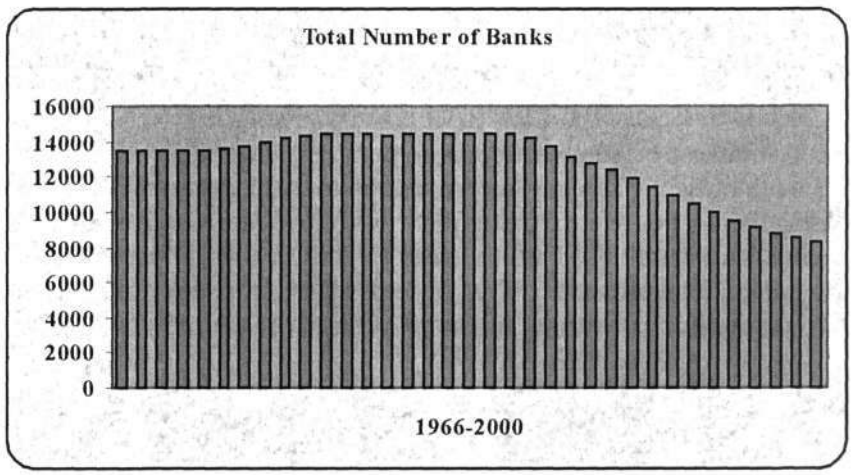
2. Measuring changes in Competitive Conditions in the US Banking Industry

The number of banks operating across the USA provides a very vivid picture of the underlying trends in the industry's structure. The number of banks operating in 2000 has shrunk by almost 39 percent when compared to 1966. The consolidation of the banking industry however is a trend observed during the past two decades. In fact, since 1966 the number of banks operating followed an upward trend, reaching its maximum in 1984[3]. Figure 1 depicts the path of the total number of banks operating across the USA.

The consolidation basically reflects (i) the huge wave of mergers that took place during the past two decades and especially in the 90's, and (ii) the large number of failures that occurred in the 80's as a result of various banking crises. Both issues have generated a vigorous debate in the form of numerous academic studies as well as policy design and implementation. By no means being exhaustive, three recent studies are representative of this literature: (i) Berger et al (1999) who offer an extensive discussion on the economic-theoretic causes and consequences of consolidation, (ii) Rhoades (2000) who focuses on the effect of mergers on banking structure and finally (iii) Hanweck and Shull (1999)

FIGURE 1.

The evolution of the number of branks in the USA.



who provide a more extensive discussion of policy issues. The Federal Deposit Insurance Corporation (FDIC) also provides an excellent account of the chronology and the surrounding conditions related to the 80's banking crisis (FDIC, 1997).

During the past two decades apart from the apparent dramatic changes in the market structure, Deregulation had also a significant impact both on conduct and structure. Restrictions on banks' ability to expand geographically were relaxed in the 1980's and early 1990's with a sequence of removals of restrictions on interstate and intrastate banking. Probably the most notable removal of restrictions is the Riegle-Neal Interstate Banking and Branching Efficiency act of 1994, which essentially permits interstate branching in almost all states[4].

Advances in economic theory over the past two decades have shown that the degree of competition in a particular market is not necessarily related to either the number of firms operating or any measure of market share (such as standard concentration ratios or the Herfindahl-Hirschman index). The number of competitors or the degree of concentration can be misleading indicators since what is important is the conduct of market participants. Consider the ex-

treme case of a perfectly contestable market *a la* Baumol (1982), where only one firm is operating. Pricing will be based on marginal cost even in the absence of competitors, a result induced by the potential hit and run entry. In other words, market characteristics such as the degree of concentration and/or the number of firms operating are not sufficient indicators of competitive conditions, albeit very useful. Panzar and Rosse (1987) have developed a method, based on reduced form revenue functions that can be used to measure the degree of market power. Essentially, **the degree of competition is assessed by the so-called *H-statistic,* which is computed as the elasticity of gross revenue to cost, in a reduced form revenue function[5], which captures the extent to which changes in cost (factor prices) are reflected in revenues.**

In some more detail, when firms operate at their long-run equilibrium, under perfect competition a given change in cost induces an equi-proportional change in revenues (with a perfectly elastic demand output does not change while output price rises to the same extent that cost has changed). In contrast, when firms operate in monopolistically competitive environment revenues will increase less than equi-proportionally to a change in cost since the demand each bank faces is rather inelastic (i.e. products of each firm are imperfect substitutes). Finally, when firms operate as monopolists there may be no response or even a negative response in revenues due to changes in cost. Hence, the index[6] we seek to estimate (the *H-statistic),* will be non-positive in the case of monopoly or conjectural variation short-run monopoly *(H<=0),* positive but smaller than unity in the case of monopolistic competition *(0<H<1),* and equal to unity under perfect competition or natural monopoly in a perfectly contestable market, or sales maximising firm subject to a breakeven constraint *(H=l).*

There are two things worth mentioning. First, as Panzar and Rose (1987) point out, it might be the case that this approach may not hold for various oligopoly equilibria. For example, they show that in the case of 'conjectural variation oligopoly' the elasticity of the reduced form output function with respect to cost is negative, while the effect of cost on the reduced form revenues will, in general, be indeterminate. They also stress that in essence such an approach, as the one followed here, constitutes a joint test of the underlying theory and competitive behaviour since some of the underlying assumptions include profit maximisation, equilibrium in the industry and 'well behaved' revenue and cost functions. Secondly, the extension of the Panzar and Rosse (1987) methodology to banking requires assuming that banks are treated as single product firms[7]. Following, De Band and Davis (1998), we assume that banks are considered mainly as financial intermediaries. This is consistent with the so-called

'intermediation approach' to banking, where the degree and the nature of competition in the loan and in the deposit market are independent[8].

3. Data, Econometric Methodology, and Empirical Results

3.1 Data Issues

The data is sampled at an annual frequency from 1966 to 2000 for each of the following States: *Alabama, Arizona, Arkansas, California, Colorado, District of Columbia, Connecticut, Delaware, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin,* and *Wyoming.* The following variables were constructed:

- 1n *($UREV_{s,t}$):* the natural logarithm of **Unit Interest Income** defined as the ratio of **Total Interest Revenue** to **Total Loans and Leases.** This serves as a measure of per unit revenue.

- 1n *(UCLs,t):* the natural logarithm of **Employee Salaries and Benefits** to **Total Number of Employees.** This is a measure of unit labour cost.

- 1n *($UCK_{s,t}$):* the natural logarithm of **Occupancy Expenses** to **Bank Premises and Equipment.** This is a measure of unit (physical) capital cost.

- 1n *($UCF_{s,t}$):* the natural logarithm of **Interest Expenses** to **Interest Bearing Deposits.** This is a measure of unit cost of funds.

- *($RISK1_{s,t}$):* the ratio of **Charge-Offs** to **Total Loans and Leases.** This ratio is included to account for differences across States with respect to the risk of default differences faced by banks when making a loan.

- *($RISK2_{s,t}$):* the ratio of **Provision for Loan** and **Lease Losses to Total Loans and Leases.** This ratio is included to account for differences across States with respect to the risk of default differences faced by banks when making a loan.

- *($EQT_{s,t}$)* the ratio of **Total Equity Capital** to **Total Assets.** This ratio is included to account for differences in terms of the finance mix of banks across States.

- ln $(AST_{s,t})$: the natural logarithm of **Total** Assets. We include total assets to control for differences in the size of banking sectors across States.

The data on **Total Interest Income, Total Interest Expense, Provision for Loan and Lease Losses, Total Loans and Leases, Total Equity Capital** and **Total** Assets were collected from the Balance Sheet and Income Account kindly provided by the Federal Deposit Insurance Corporation **(FDIC).**

3.2 Econometric Methodology

In our empirical application in order to assess the evolution in competitive conditions in US banking we estimate the H-statistic for various time periods from 1966 to 2000 using State-level data. In particular, we pool information across States and time, effectively estimating a panel (cross-section time series). The specification we employ is based on a three-factor production function for commercial banks, which includes labour, physical capital and funds. The empirical model we use is as follows:

$$\ln (UREV_{s,t}) = a, + h_1 \ln (UCL_{s,t}) + h_2 \ln (UCK_{s,t}) + h_3 \ln (UCF_{s,t}) + \beta_1 (RISK1_{s,t}) + \beta_2 (RISK2_{s,t}) + \gamma (EQT_{s,t}) + \delta \ln (AST_{s,t}) + u_{s,t}$$

where h_1, h_2, h_3, β_1, β_2, γ, δ, are constant parameters to be estimaed, a_s is a set of time-invariant but state-specific intercept terms (Fixed-Effects) while $u_{s,t}$ is a zero-mean, constant variance and non-autocorrelated disturbance term. The parameter of interest in our analysis is $H = h_1 + h_2 + h3$ whose estimate will be used in order to assess the degree of competition in the banking sector. The variables $(RISKl_{s,t})$, $(RISK2_{s,t})$, $(EQT_{s,t})$, $(AST_{s,t})$, are included to control for any unobserved heterogeneity, not captured by the Fixed-Effects, of banking markets across States.

3.3 Empirical Results

The parameters of model (1) are estimated allowing for Fixed-Effects by employing Generalised Least Squares using cross-section weights based on the estimated cross-section residual variances (Baltagi, 1995). In order to assess the evolution of competitive conditions in US banking we estimate the Rosse-Paznar H-statistic for various time periods from 1966 to 2000. In particular, we use three alternative segmentation strategies: (i) focus on decades (i.e the seventies vs. the eighties vs. the nineties), (ii) use non-overlapping five-year intervals and (iii) finally split the sample in half. The results are reported in Table 1[9].

TABLE 1

Estimation Results (Fixed-Effects)

	H-Statistic [Wald test: H=1]
Panel A: Whole Sample	
1966-2000 observations: 1784	0.77 [72.97*]
Panel B: Decades	
1971-1980 observations: 510	**0.90** [15.88]**
1981-1990 observations: 510	0.52 [135.55]**
1991-2000 observations: 510	0.29 [606.70]**
1966-1970 observations: 255	0.27 [1915.01]**
Panel C: 5-year intervals	
1971-1975 observations: 255	0.73 [208.79]**
1976-1980 observations: 255	**0.88** [30.57]**
1981-1985 observations: 255	0.39 [98.78]**
1986-1990 observations: 255	0.67 [330.45]**
1991-1995 observations: 255	0.63 [60.10]**
1996-2000 observations: 255	0.29 [402.01]**
Panel D: mid-sample-split	
1966-1982 observations: 866	**0.94** [10.49]**
1983-2000 observations: 918	0.18 [793.95]**

Based on the set of hypotheses tested we can rule out the case of monopoly since the null of a zero H-statistic is overwhelmingly rejected for the whole sample as well as for any sub-period. Similarly, we can rule out the hypothesis that the banking industry has behaved either perfectly competitive or as being a perfectly contestable market. Hence, our estimation results imply that the banking sector can be characterised as monopolistically competitive industry throughout our sample. This finding is consistent with findings reported in the

literature typically based on bank-level data rather than State-level. For instance, studies that have applied similar methodology to study the market structure of various banking systems (typically North American, Western European, and the Japanese) conclude that the banking sectors under scrutiny behave as monopolistically competitive (Nathan and Neave, 1989; Perrakis, 1991; Shaffer, 1993; Lloyd-Williams and Molyneux, 1994; Molyneux et al., 1994; Molyneux et al. 1996; Bikker and Groeveld, 1998; De Bandt and Davis, 1999). De Bandt and Davis (1999) focusing on the US banking sector during the 90's report a value for H-statistic of 0.48, which is consistent with our estimation results.

Answering the question of what market structure seems to fit the behaviour of the US banking sector during the latter part of the previous century although important *per se,* it is not our primary goal. We would like to focus on the dynamics of competitive conditions, i.e. how has it evolved if it indeed evolved. We estimate H-statistic for various (non-overlapping) intervals spanning the whole period from 1966 to 2000 in order to trace its time path. The results are reported in Panels B, C, and D of Table 3.

We interpret the point estimate of H as an indicator of competition in the market, with values closer to unity indicating stronger competitive pressure and values closer to zero indicating higher market power. However, one should be cautious in interpreting the point estimates of H mainly because it is an ordinal rather than a cardinal measure. As discussed in section 2, the main use of *H* is to map its values on a theoretical market structure. However, H being essentially elasticity its value can provide significant information regarding the competitive pressure imposed on banks. Bearing in mind this caveat we proceed by assessing *H's* evolution. Focusing on decades, H-statistic has followed a downward trend, which suggests that competition forces have been weakening continuously since 1971. Figure 2 below shows the evolution of H from 1971 (for the sake of interval symmetry) to 2000 broken down to decades[10].

However, in order to gain some insights for the path of H we break down the sample in 5-year intervals starting from 1966 until 2000. Figure 3 depicts the evolution of H.

Focusing on finer time intervals reveals a richer structure of competitive dynamics, where non-linearity is evident; resembling a bimodal distribution (M-shaped curve) with peaks at 1976-1980 and 1986-1990. Hence, although there is an overall downward trend in the H-statistic it is not a linear one, im-

FIGURE 2.

Estimation of H (decades).

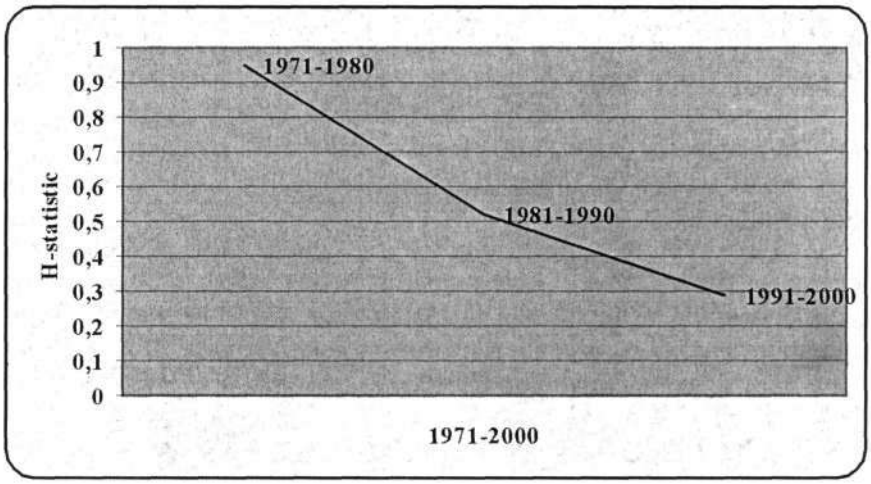
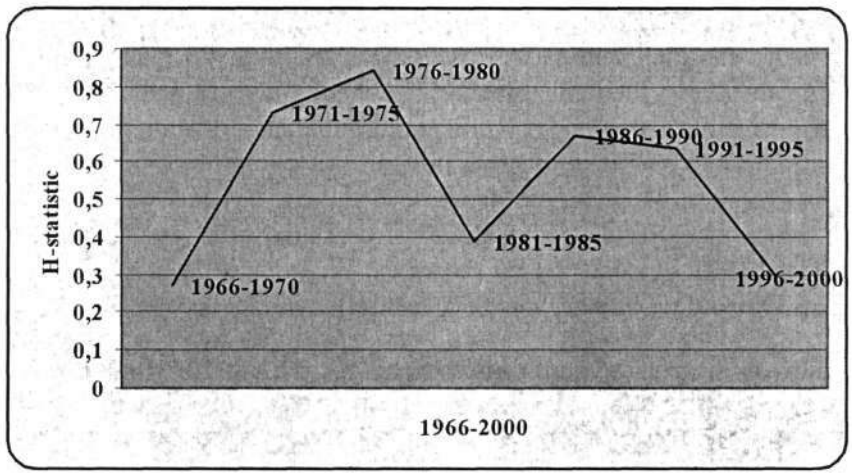


FIGURE 3.

Estimation of H (5-year intervals)



plying that significant time variations were in place. What is significant, from the point of view of policy analysis, is that competitive conditions have consi-

derably declined since in mid-80s. We defer a more extensive discussion of this period until the next subsection since it deserves a more detailed treatment.

3.4 Competitive Conditions (H), Regulation and Market Profile

3.4.1 Regulation

Having rejected the extreme cases of monopoly and perfectly contestable market, one needs to interpret the finding of a .monopolistically competitive market. One way forward is to revisit the conditions required for a market to be perfectly contestable and explore which of those are most unlikely to be satisfied. According to Baumol (1982, pp. 3) "A perfectly contestable market is one into which entry is absolutely free and exit is absolutely costless...the entrant suffers no disadvantage in terms of production technique or perceived product quality relative to the incumbent". The theory's entry assumptions may partially be relevant for the US banking industry especially when one considers the actual and potential effects of Deregulation. Revocability of sunk costs is very difficult to assess. Exit can mean either that a bank leaves the industry altogether or decides to terminate its operations in particular lines of business. As Nathan and Neave (1989, pp. 579) point out "It may well prove less costly to withdraw from a line of business than from an industry. Moreover, in withdrawing from the market or markets served by a line of business, sunk costs may be recovered more quickly than if a firm ceases doing business entirely". Unfortunately, there have been no rigorous or reliable assessments of capital malleability or the time needed to recover costs in the banking sector which does not provide us with the necessary tools to evaluate the contribution of this factor to the absence of contestability. As far as barriers to entry are concerned, again it is not very clear how they can be quantified, and moreover how differences in charting procedures across states can meaningfully be compared. According to the FDIC though, the beginning of the 80's marked a striking shift in charting policy towards a more competitive marketplace which would promote a more sound banking system. The Office of the Controller of the Currency (OCC) would therefore foster competition through the chartering of national banks, a strategy that led to an immediate and substantial increase in new bank charters, an increase that lasted into the mid-1980's. Evidence to this is that during the 1970's the OCC had approved an average of 58 percent of new applications each year, while in the 1980's this rose to 89 percent. On the other hand, "National chartering decreased in 1985 as economic decline and bank failures began to plague the Southwest, and rolling regional banking problems continued for the remainder of the period." (FDIC, pp. 107, chapter 2, 1997). Since 1985 entry requirements

have, to some extent at least, become more stringent. For instance, in 1985 the OCC began to require of most groups applying to form a new bank that they designate their CEO before charter approval, while in the following year, the agency required statements on formal lending policies and funds-management strategies. Another testament of the movement towards a more restrictive entry is the fact that in 1980 the FDIC adopted a policy stating that initial capitalisation should be sufficient to provide a ratio of unimpaired capital to total estimated assets of 10 percent after three years; applicants with less than $750 thousand in initial capital were discouraged. This minimum initial net capital requirement was later raised to $1 million and then, in 1992, to $2 million. Starting in 1992, initial capital was to be sufficient to provide a ration of Tier 1 capital to total estimated assets of at least 8 percent after three years. These requirements would have effectively superseded any more-lenient state regulations on capital. (FDIC, 1997, chapter 2).

3.4.2 Market Profile

A natural question to ask is which are the underlying causes or at least the accommodating conditions that are likely to determine the competitive environment. A popular view is the Structure-Conduct-Performance paradigm advocating that the level of competitive pressure is an increasing function of the number of firms in a market and a decreasing function of the average market share (Berger and Hannan, 1989; Schmalensee, 1989; Shaffer, 1993). Unfortunately, comparable data on market concentration are not available, while data on the number of banks operating in the market are readily available. More importantly data on the number of mergers, a basic determinant of the number of banks operating, are also available. To shed more light on the issue at hand, in Table 3 we report the sample correlations between the estimated H and (i) the (average) number of banks for the relevant time period, and (ii) the average number of mergers for the relevant time period.

TABLE 2.

Sample Correlations

	H	**Mergers**	**Number of Banks**
H	1,00		
Mergers	-0,20 (0.66)	**1.00**	
Number of Banks	0.40 (0.00)**	**-0.77** **(0.04)***	**1.00**

FIGURE 4.

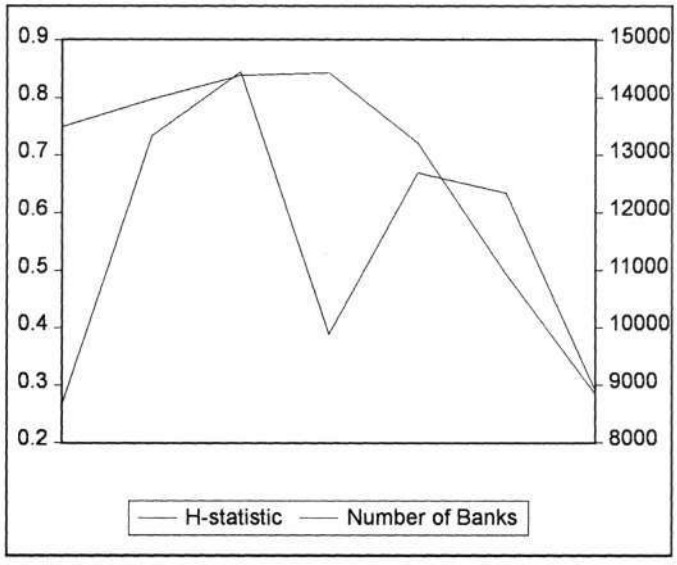
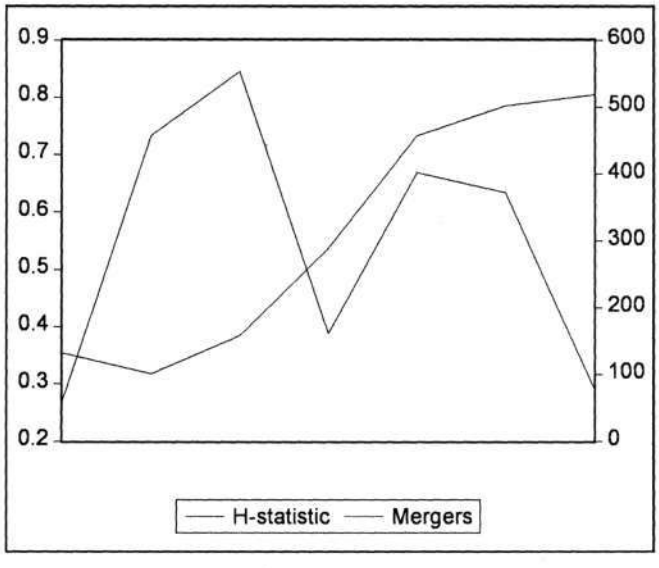


FIGURE 5.



The sample correlations carry the expected sign, indicating that H is negatively correlated with number of mergers and positively correlated with the number of banks operating in the market. However, the correlation with mergers is insignificant on all conventional levels, while in contrast, the correlation with the number of banks is highly significant. This finding implies that although according to economic theory the number of market participants (banks in this context) does not necessarily determine the level of competition in the case of the US banking sector it seems to be a significant factor.

4. Conclusion

This paper is an attempt to map competitive conditions in the US banking sector onto a stylised economic model by the means of the Rosse-Paznar H-statistic. Using data on a State-level covering the period 1966 to 2000 our analysis implies that the US banking sector's behaviour has been consistent with monopolistic competition. In addition, focusing on various time intervals spanning the 1996-2000 period we were able to draw inferences regarding the dynamic path of competitive conditions. **Our** empirical results indicate that competitive conditions in the US banking sector have been consistent with a monopolistically competitive paradigm. In particular, competitive pressures have considerably diminished during the 90s.

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Endnotes

1.I am grateful to Pierre Regibeau and Frank Bohn for their insightful comments. Any remaining errors and ambiguities are my own responsibility.

2. As it will be discussed in section 3 employing the concentration ratio as an indicator of competitive conditions can be misleading.

3. In fact, if one uses 1984 as a benchmark the number of banks decreased by almost 43 percent.

4. Berger et al (1995) provide a detailed analysis of changes in regulation.

5. The description of the test here is given in accordance with the empirical analysis that follows. In fact, Panzar and Rosse (1987), and other authors that have used this result, derive the implications of the *H-statistic* with respect to factor price elasticities of the reduced form revenue function. Here we employ an aggregate measure of cost and we do not further decompose cost to its components. See section 4 for details.

6. For an extensive discussion see Panzar and Rosse (1987).

7. Panzar and Rosse (1987) stress that their contribution has the drawback that it is valid only for single product firms, while the conjecture that the results should be similar in the multi-input, multi-output case: "While the issue turns out to be somewhat more complex when

dealing with multi-input, multi-output firms, we are clearly on the right track ..." (Panzar and Rosse (1987), pp. 443).

8. There are mainly two approaches to bank output measurement. The first, the *production approach,* considers banks as firms that use labour and capital to produce different categories of loans and deposits, where the number of related transactions measures output, and costs are measured as all operating costs to produce these transactions. The *intermediation approach* considers banks as intermediators of financial services and the value of loans and investments are used as output measures. Since both capital and labour are used as inputs in this process, operating costs plus interest costs constitutes the measure of cost of interest. See Davis and Salo (1998), and De Band and Davis (1999) *inter alia* for some details and the references therein.

9. For space conservation reasons we only report the estimates of H. However, the full set of results is available upon request.

10. The values in the figure correspond to the estimates of H based on the Fixed-Effects estimation.