

Actual Competition, Potential Competition, and Bank Profitability in Rural Markets

by Gay Whalen

Gay Whalen is an economic advisor at the Federal Reserve Bank of Cleveland. The author wishes to acknowledge the helpful comments of Kelly Eakin.

Introduction

The nature of the relationship between the structure of the market in which banks operate—the number and size distribution of actual competitors in a market—and their performance has been examined in a considerable number of empirical studies over the past 20 years.¹ Industrial organization economists have investigated the structure; performance relationship for a wide variety of intra- and interindustries samples of firms.

The typical maintained hypothesis has been that explicit or tacit collusion is more likely in markets with a limited number of large competitors and should result in a statistically significant positive relationship between market concentration and the profitability of firms operating in the market. Definitive support for this hypothesis implies that an activist antitrust policy aimed at limiting merger-related increases in concentration is an appropriate public policy goal.

A positive concentration/profits relationship has been found in some, but far from all, of the empirical studies investigating bank market structure and performance. The mixed results of this body of empirical work have been interpreted in widely different ways.

Some researchers, predisposed to accept the reasonableness of the concentration/collusion hypothesis, have concluded that the weight of the evidence supports this position and have advanced a number of reasons to discount the lack of consistent empirical support for the expected relationship between concentration and bank profitability.² One is that the equations estimated in many of these studies have been misspecified, possibly biasing the estimated coefficient on the concentration variable. In particular, several researchers have suggested that market concentration might impact bank management's risk-return preferences or opportunities.³ Specifically, bank management operating in concentrated markets might trade off potential monopoly profits for lower risk. If this is the case, significant concentration-related differences in profitability might not be evident in studies that fail to explicitly control for risk.

Other researchers have argued that the single-equation estimation techniques typically used in previous empirical work, even those where risk measures have been included as additional

■ 1 For reviews of this work, see Rhoades (1982), Gilbert (1984), and Osborne and Wendel (1983).

2 This is the conclusion of Rhoades (1982).

3 See Heggstad (1977), Rhoades and Rutz (1982), Clark (1986b), and Liang (1987).

explanaton variables. may have biased the results.⁴ In their view, profitability and risk are determined simultaneously, so we should rely only on the results of studies where the relationships between these variables and concentration are investigated using simultaneous equation estimation techniques.

Yet another group of researchers argue that the concentration/collusion hypothesis is unreasonable because it embodies a questionable implicit assumption: that technological conditions, regulation, other barriers to entry, or the threat of predation allow colluding firms in concentrated markets to disregard potential competitors.

Concentration-related monopoly power and profits can exist and persist only when there is no threat of entry by potential competitors.⁵ Markets in which this type of behavior can occur have been given the label "noncontestable." In theoretical work, researchers have shown that when entry and exit are not precluded, or a market is contestable, then outcomes can approximate those of perfect competition even if the number of actual competitors is quite small or if concentration is high.⁶ Consequently, firm profitability should not be expected to vary with concentration.

The possibility that potential competitors may significantly affect the prices charged and profits earned by incumbent firms has been recognized for some time.⁷ Until quite recently, however, banks and other financial intermediaries faced numerous regulator), and legislative constraints on geographic location, on permissible products and services they could offer, as well as on the prices they could charge. Thus, few of the geographic and product markets in which banks operated approximated the contestable ideal.

This situation has changed dramatically in the past 10 years. A large number of states have reduced intrastate and, more recently, interstate

barriers to geographic expansion by commercial banks and by savings and loan institutions. In addition, the repeal of usury laws and removal of Regulation Q ceilings on deposit rates have left financial intermediaries basically free to compete on a price basis.

Empirical investigations of scale and scope economies in banking suggest that small-scale entry is not precluded by cost conditions.⁸ A negligible amount of the costs of branching appears to be sunk. These circumstances suggest that banking markets—at least in states that have liberalized branching to some extent, facilitating entry by out-of-market firms—have become contestable. Alternatively, potential competition may have become an effective disciplinarian force, which could explain the absence of a strong positive concentration/profitability relationship in some of the more recent empirical studies.⁹

Researchers who do not subscribe to the concentration/collusion hypothesis have offered an alternative explanation for the significant positive relationship between concentration and profitability reported in some previous studies. They argue that such a finding need not necessarily signal collusion or indicate causation running from concentration to profitability. In their view, labeled the "efficient structure hypothesis" (ESH), superior efficiency, management, or luck could result in increased firm profitability and market share and, ultimately, in higher concentration.¹⁰ If the ESH is correct, then the positive relationship between concentration and profitability detected in empirical work where a market share variable is not included is spurious and simply reflects the correlation between market share and concentration.

At present, then, there continues to be a great deal of uncertainty and disagreement about the relationship between market concentration, potential competition, and bank performance. Very few of the numerous previous studies have incorporated risk, controlled for market share, and investigated possible simultaneity.

More important, virtually no empirical work on the impact of potential competition in banking, or in any other industry for that matter, has

8 4 This is the conclusion of Clark (1986b) and Liang (1987)

■ 5 See Brozen (1982) and Baumol, Panzar, and Willig (1982)

■ 6 Actually researchers have differentiated markets according to the degree to which they are contestable. At one extreme are noncontestable markets. At the other extreme are perfectly contestable markets. In essence perfectly contestable markets are ones in which entry and exit are costless. This, in turn, implies no barriers of any kind to entry and exit. In particular, zero sunk costs are required to enter the market. Markets in which entry and exit can occur but are not costless have been labeled imperfectly contestable. In such markets potential competition is expected to influence the performance of incumbent firms. For a more detailed discussion of these issues, see Schwanz (1986), pp. 37-48, and Morrison and Winston (1987), pp. 53-60

8 7 This possibility was noted in Barn (1949) more than 30 years ago.

8 8 See Berger, Hanweck, and Humphrey (1986)

8 9 For example, Evanoff and Fortier (1988) find evidence of a positive concentration/profitability relationship for a subsample of banks drawn from unit banking states but not for the subsample drawn from states where branching is permitted

8 10 See Smirlock (1985).

been done to date.¹¹ A number of circumstances make banking an ideal subject for such research. The partial, gradual elimination of geographic barriers to market entry, cost conditions, and the local nature of banking markets mean that entry can occur if market conditions warrant and that the number of potential bank entrants for each local market can be determined.

This paper attempts to provide more definitive evidence on the relationship between competition and bank profitability. The relationship between bank profitability and both actual and potential competition is examined in a framework that explicitly includes market share and risk variables. Further, the impact of possible simultaneity is also explored.

The sample consists of 159 banks drawn from non-MSA (metropolitan statistical area) counties in Ohio. The focus is on non-MSA counties for several reasons. First, the number of actual bank competitors in a typical non-MSA county is generally small, and concentration is high relative to MSAs in the state. Second, economic and demographic characteristics of rural counties generally make them less attractive for entry than urban counties. Finally, actual and potential competition from out-of-market and nonbank suppliers of financial services is likely to be limited.

Thus, if the concentration/collusion hypothesis is correct and if potential competition is a relatively unimportant determinant of firm performance, supporting empirical evidence is likely to be obtained from this data set. Conversely, absence of support for the concentration-collusion hypothesis and the finding that potential competition impacts bank performance in rural markets is strong evidence that local banking markets, both rural and urban, are contestable.

The time interval examined is from 1979 to 1981. This particular period was chosen because the bank branching law in Ohio was liberalized in January 1979. Before then, de novo branching was limited to a bank's home office county. Under the new law, banks could branch de novo into all counties contiguous to the county in

which their head office was located. Thus, the partial removal of geographic restrictions on branching created an identifiable number of potential bank entrants for each county in the state.

The choice of a three-year time period appears somewhat arbitrary. However, a period of this length should be short enough to ensure that ongoing expansion activity by banks does not materially affect the measure of potential competition used in the study. It should also be long enough to allow any performance impacts attributable to potential competition to be detected statistically.

In the following sections, we discuss the model to be estimated, describe the sample and estimation techniques, and present the results. A summary and conclusions follow.

I. Model Specification

Unfortunately, there continues to be no strong consensus about the "best" microeconomic model of the banking firm. As a result, researchers disagree about how the profitability equation to be estimated—whether a single reduced-form equation or a structural equation in a simultaneous system—should be specified. No attempt is made here to resolve the theoretical debate. Our approach is simply to estimate versions used in previous studies, with market share, risk, and potential competition variables explicitly included.

Thus, the profitability equations estimated had the following general form:

$$(1) \quad PROF_i = f(AC_i, PC_i, MS_i, RISK_i, \underline{Z}_i)$$

where

PROF_i: a measure of the profitability of bank *i*

AC_i: a proxy for actual competition in the market in which bank *i* operates

PC_i: a proxy for potential competition faced by bank *i*

MS_i: the market share of bank *i*

RISK_i: a measure of the overall risk of bank *i*

\underline{Z}_i : a vector of additional control variables

The profitability measure employed as the dependent variable in this study is rate of return on equity (net income after taxes, excluding securities gains and losses, divided by book equity,

8 11 The only explicit empirical test to date is Hannan (1979). In many structure/performance studies, the sign and statistical significance of coefficients on branching law dummies in estimated profitability equations are used to draw inferences about the intensity of potential competition. In others, the statistical significance (or lack of significance) of the estimated coefficient on the concentration term is used to obtain insight on this issue. In fact, very few explicit empirical tests of contestability/potential competition have been done for any industry, including the airline industry which Baumol et al. cited as an example of one with contestable markets. The study by Morrison and Winston (1987) may be the only one published to date.

both measured at year-end) averaged over the three years from 1979 to 1981. This profitability measure best reflects the efforts of managers interested in shareholder wealth maximization.

The determinants of profitability of primary interest in this study are actual and potential competition. The former is proxied in two alternative ways: by incumbent-firm market concentration and by the number of actual competitors. The latter is proxied only by the number of potential competitors.¹²

The precise form of the relationship between the proxies for actual competition, potential competition, and profitability are unclear and could take a number of different forms.

The consensus view is that actual competition will be more intense and incumbent profitability will be lower, the greater the number of actual competitors or the lower the market concentration. The relationship between these proxies, the likelihood of collusion, and the intensity of competition and ultimately profitability might not be linear, however.¹³ For example, the 'marginal impact' of additional actual competitors might not be constant, but could decline as the number of competitors increased. As a result, we also investigate nonlinear relationships between the proxies for actual competition and profitability.

As long as entry into rural banking markets is not precluded, the prices and profits of incumbents should also vary systematically with the number of potential entrants. However, there is some uncertainty about the precise form of the relationship between incumbent profitability and the number of potential competitors because the relationship between the number of potential competitors and the intensity of potential competition is unclear.¹⁴ The standard view appears to be that the larger the number of potential entrants, the greater the perceived threat of entry and the lower the incumbent prices and profits.

Some writers, however, have suggested that when more than one potential entrant exists, each potential entrant will recognize that entry by others could occur and could impact its

expected profit.¹⁵ Researchers have demonstrated that mutual awareness among potential entrants could cause the relationship between the number of potential entrants and the overall likelihood of entry to be non-monotonic, perhaps even negative. This type of relationship implies that the negative marginal impact of additional potential competitors on incumbent profitability could decline as the number of potential entrants increases. Because of this possibility, a quadratic potential competition specification is also explored.

Several researchers have also suggested that the impact of potential competition could vary with the intensity of actual market competition, and possibly with the two measures of market structure employed here to proxy this force.¹⁶ In particular, a given number of potential competitors could impose a larger impact on incumbent profitability if actual competition in the market were less intense. To investigate this possibility, actual competition/potential competition interaction variables are included in several versions of the performance equations estimated.

Our study uses two summary measures of incumbent market structure: the three-firm deposit concentration ratio and the number of actual competitors. Two variants of each of these measures are employed. One is calculated using data for commercial banks only. The other is calculated using data for both banks and savings and loans, in recognition of the typically considerable thrift share of deposits in counties throughout Ohio and their expanding ability to compete with commercial banks.

The number of holding company organizations legally permitted to branch *de novo* into each market is the measure of potential competition employed in this analysis. Available data revealed that holding company affiliates were responsible for most of the *de novo* branching activity in Ohio from 1979 to 1981. We exclude smaller banks that are unlikely to branch *de novo* in order to produce a more precise measure of potential competition.¹⁷

8 12 Since it is not clear that the size distribution of potential competitors influences their performance impact, and since construction of a measure of potential competitor concentration would be extremely tedious, only the number of potential competitors is employed

■ 13 The possibility of a nonlinear relationship between measures of market structure and performance is noted in Heggstad (1979), pp. 468-69.

8 14 For a discussion of the expected relationship between concentration, potential competition, and incumbent profitability, see Call and Keeler (1986), p. 224; Schwartz (1986), pp. 47-48; and Morrison and Winston (1987).

8 15 See Kalish, Hartzog, and Cassidy (1978). Empirical evidence supporting this view appears in Hannan (1981) and Morrison and Winston (1987)

■ 16 Possible interactions between measures of actual and potential competition are discussed in Hannan (1979), pp. 442-43, and in Morrison and Winston (1987), p. 63.

■ 17 Examination of data on branching in Ohio over the 1979 to 1981 period revealed that holding company affiliates established 61 percent of the total number of *de novo* branches over this interval. Further, they established 64 percent of those opened in contiguous counties. See Whalen (1981).

Following the approach taken with the concentration variable, market share for each bank is defined in two different ways: by its share of commercial bank deposits in the market and by its share of bank and savings and loan deposits in the market. An insignificant coefficient on the incumbent market structure variable, in conjunction with a positive, significant coefficient on the related market share term, is evidence supporting the efficient structure hypothesis.

The risk measure used in this study is the same one used by a number of previous researchers: the standard deviation of return on equity over the period examined (1979 to 1981). There is some disagreement about the nature of the relationship between this variable and profitability. Heggstad (1979) and Clark (1986b) have argued that the relationship should be positive; Liang (1987) has suggested that it should be negative.¹⁸ There is empirical evidence in support of both positions. Because of the uncertainty and because the precise nature of the relationship between these two variables is not the primary focus of this paper, the anticipated sign of the coefficient on the risk measure is left ambiguous.

The other explanatory variables in the estimated profitability equations are elements of the vector, Z . These are presumably exogenous variables that reflect differences in the characteristics of an individual bank, or economic conditions in its market or its regulatory environment that could influence its profitability.

Three bank characteristic variables are employed: a bank size measure, a dummy variable measure of the number of branches operated, and a dummy variable indicating whether the bank was a subsidiary of a bank holding company. Economic conditions in each bank's local market are represented by two variables: average per capita personal income and per capita personal income growth. Finally, we use a Federal Reserve System membership dummy to control for regulation-related cost differentials.

To determine if the estimated relationship between actual competition, potential competition, and profitability is materially influenced by the neglect of possible simultaneity, the profitability equation is also viewed as a structural equation in a multi-equation simultaneous system. Specifically, a two-equation system similar to that used in Liang (1987) is employed. In this

system, bank risk is the other endogenous variable. The main difference between her specification and the one employed here is the addition of the potential competition term.

Liang's structural equation for risk contains five predetermined variables that do not appear in the profitability equation discussed above. These variables are designed to proxy market uncertainty. They are the standard deviation of market per capita personal income, unexplained market deposit supply, unexplained variation in bank i 's loan demand, unexplained variation in bank i 's deposit supply, and the covariance of bank i 's unexplained loan demand and deposit supply. The precise definition of each of these variables and the reduced-form equations for this model are detailed in the appendix.

II. Sample and Methodology

Our sample consists of the 159 single-market banks headquartered in non-MSA Ohio counties at the end of 1981. Single-market banks are those with all offices located within their home office county. This criterion allows their performance to be related to the characteristics of their particular local markets. The presumption is that non-MSA counties approximate local rural banking markets.

The profitability equations are estimated using two different statistical techniques. Ordinary least squares regression (OLS) is used to estimate versions in which risk is viewed as exogenous. Two-stage least squares (2SLS) is the technique used to estimate the profitability equation when it is viewed as part of a simultaneous system.

III. Results

Regression results are presented in tables 1 and 2. Only the equations containing measures of actual market structure and market share calculated using commercial bank data are included in the tables. The results were essentially the same when savings and loans were considered in the calculation of these variables and therefore are not reported.

Table 1 contains versions of the profitability equation estimated using OLS; table 2 contains abbreviated results obtained by estimating versions of the equations in table 1 viewed as part of a two-equation simultaneous model. The estimation technique is 2SLS. Only the coefficients and t -statistics for the actual competition, potential competition, market share, and risk variables are reported. In general, the overall explanatory

¹⁸ In Liang's model, greater profit variability implies greater expected costs and associated penalties to the bank, resulting in a negative relationship between profit variability and expected profit margins.

TABLE 1

OLS Versions of Profitability Equations
Dependent Variable: ARDE

Variables	(1) Coefficient	(2) Coefficient	(3) Coefficient	(4) Coefficient
<i>CBO</i>	-0.003253 (-0.17)	-0.012121 (-0.62)		
<i>NCBO</i>			0.018071 (0.12)	-0.520431 (-1.80)
<i>MSBO</i>	0.036970 (1.58)	0.043162 (1.85)	0.036723 (1.48)	0.035676 (1.45)
<i>PCPIGR</i>	0.096151 (1.26)	0.100644 (1.33)	0.094267 (1.20)	0.090787 (1.17)
<i>PCPI</i>	0.000213 (0.80)	0.000204 (0.77)	0.000210 (0.78)	0.000175 (0.66)
<i>OD</i>	-0.495045 (-0.76)	-0.634474 (-0.98)	-0.496847 (-0.76)	-0.467602 (-0.72)
<i>FRM</i>	-0.003253 (-0.17)	-0.149174 (-0.28)	-0.031221 (-0.06)	-0.095712 (-0.18)
<i>MBHC</i>	2.183394 (3.14)	2.113173 (3.06)	2.186579 (3.10)	2.271347 (3.26)
<i>SIZE</i>	-0.741219 (-1.49)	-0.791260 (-1.61)	-0.734965 (-1.46)	-0.834644 (-1.68)
<i>SDROE</i>	-0.757202 (-8.07)	-0.737778 (-7.91)	-0.757808 (-8.06)	-0.750641 (-8.08)
<i>HCPE</i>	-0.158573 (-1.29)	-1.219721 (-7.34)	-0.15688' (-1.38)	-0.80624' (-2.46)
<i>HCPE SQ</i>		0.114109 (2.10)		
<i>HCNCBO</i>				0.112784 (2.16)
<i>INT</i>	14.110421 (4.31)	16.894396 (4.83)	13.787394 (4.97)	17.385094 (5.42)
<i>F</i>	7.46	7.34	7.41	7.33
<i>RSQ</i>	0.34	0.35	0.34	0.36

NOTE: T-statistics are in parentheses.
 SOURCE: Author.

power of the estimated equations is good, given the size and cross-sectional nature of the sample.

The coefficients on the actual and potential competition and market share variables are of primary interest. The signs and statistical significance of the other variables in the estimated equations are of secondary importance here and will not be discussed.

The coefficient on the concentration variable is never even marginally significant in any version of the equation estimated." The results were invariant to specification and estimation techniques. Including savings and loans in the calculation of this variable and excluding the market share term did not alter this finding.

When the number of actual competitors is used as the actual competition proxy, the results obtained do vary with the specification employed. The coefficient on the number of actual competitors term is insignificant when a linear specification is employed and when an actual competition: potential competition interaction term is not included in the estimated equation. However, when an interaction term is included, the coefficient on the number of actual competitors variable becomes negative and significant. This result holds when savings and loans are included in this measure and when a simultaneous-equations estimation technique is employed. The coefficients are not significant when a quadratic version is examined.

The estimated coefficient on the number of potential competitors variable is negative, but only marginally significant (that is, 10 percent level, one-tail test) when a linear specification is employed and when an actual competition/potential competition interaction term is not included. However, when this variable is used in an estimated equation in conjunction with the number of actual competitors and an interaction term, the coefficient is negative and significant.

In these equations, the actual competition/potential competition interaction term, constructed by multiplying the number of actual and potential competitors, exhibits a positive significant coefficient. This finding supports the view that the negative marginal impact of additional actual competitors declines as the number of potential competitors increases. Similarly, the larger the number of actual competitors in a market, the smaller the negative marginal impact of additional potential competitors.

When a quadratic potential competition specification is employed, the estimated coefficients on the number of potential competitors term and the square of this variable are both significant. The pattern of signs (negative and positive, respectively) could reflect mutual awareness among potential entrants. This result suggests that the marginal impact of additional potential competitors is initially negative.

However, the size of the negative impact declines as the number of potential competitors increases and finally turns positive. The magnitudes of the coefficients imply that incumbent firm profitability is constrained in markets with five or fewer potential entrants. This finding supports the notion of a nonlinear relationship between the number of potential entrants and the overall probability of entry.

Changing the definition of the market structure and market share variables to include savings and loans did not alter either the size or the statistical significance of the coefficients on the potential competition variables in any of the specifications examined. Further, a comparison of each equation in table 1 with its counterpart in table 3 also demonstrates that the sign and statistical significance of the coefficients on the variables of interest in the estimated equations are not sensitive to the estimation technique used.²⁰ This was true for the other exogenous control variables as well.

T A B L E 2

Summary Results
 Four Specifications of Profitability Equations
 Dependent Variable: *ROA*

Variables	(1) Coefficient	(2) Coefficient	(3) Coefficient	(4) Coefficient
<i>CBO</i>	-0.001519 (-0.08)	-0.01080 (-0.53)		
<i>NCBO</i>			0.00936 (0.05)	-0.520134 (-1.79)
<i>MSBO</i>	0.036002 (1.52)	0.042391 (1.79)	0.035831 (1.43)	0.035165 (1.43)
<i>SDROE</i>	-0.857773 (-3.95)	-0.810309 (-2.78)	-0.870202 (-3.00)	-0.80304 (-2.80)
<i>HCPE</i>	-0.159169 (-1.28)	-1.186875 (-2)	-0.158830 (-1.30)	-0.801043 (-2.46)
<i>HCPESQ</i>		0.110422 (1.93)		
<i>HCNCBO</i>				0.111721 (2.13)
F	1.80	2.33	1.81	1.11
<i>RSQ</i>	0.11	0.15	0.11	0.14

NOTE: T-statistics are in parentheses.

SOURCE: Author.

In general, the coefficient on the market share variable is positive and at least marginally significant (at the 10 percent level, one-tail test) in every variant of the profitability equation estimated. As with the concentration measure, somewhat stronger results are obtained when savings and loan deposits are considered in the construction of this variable.

IV. Summary and Conclusions

The results support the notion that non-MSA banking markets are contestable. That is, we found bank performance to be systematically related to proxies designed to measure the intensity of actual and potential competition. The threat of entry by potential competitors does appear to limit incumbent firm profitability, although the threat of entry and the number of potential competitors may not be monotonically related. Incorporating risk into the analysis and considering possible simultaneity between risk and profitability did not materially alter the results.

Both proxies for actual competition were not found to be consistently related to bank performance, however. The concentration measure was not found to be significantly related to the profitability of banks operating in rural markets in Ohio in any specification investigated. Only the number of competitors proxy was found to be significantly related to bank profitability in the expected way.

The finding that potential competition has a significant impact on incumbent performance is somewhat surprising for several reasons. First, potential competition is generally expected to be a weak force in rural banking markets. Second, researchers have argued that potential entrants may not significantly impact incumbent prices and profits in periods immediately after a change in regulations that affects entry conditions. The interval analyzed was just such a period. In addition, the potential entrant variable used in this study does not include potential nonbank competitors, particularly savings and loans. Thus, the variable is obviously not a perfect proxy for the threat of entry in the markets examined.

Further research on the impact of potential competition in banking markets appears warranted to determine if the observed relationships

■ 20 In addition to further examine the sensitivity of the results to changes in specification, versions of the profitability equation similar to the one appearing in the four-equation model developed in Clark (1986b) were also estimated. The only change in Clark's specification was the addition of the potential competition measures used in this study. Again, this change in specification did not materially alter the results reported above.

are evident for other samples of banks and in other time periods. However, the results of this study suggest that it is unclear whether the consolidation taking place in banking in recent years has substantially lessened competition, given the simultaneous reductions in barriers to market entry that have occurred.

For bank regulatory agencies, the results also imply that the competitive impacts of bank

mergers cannot be reliably determined solely from a mechanical analysis of changes in actual market structure. Entry conditions and the existence of potential competition should also be considered and used to temper conclusions drawn from an analysis of merger-related changes in concentration or in the number of actual competitors.

APPENDIX

AROE: Bank i 's annual after-tax return on equity, averaged over the 1979-1981 period.

CBO: Three-firm market concentration ratio, banks only, June 1980.

NCBO: Number of banks operating in the market of bank i , June 1980.

HCPE: Number of holding company organizations legally permitted to branch de novo into the market.

HCPE²: The square of *HCPE*.

HC---: Interaction term. *HCPE* times various alternative measures of market structure.

MSBO: Bank i 's deposit market share, banks only, June 1980.

SDROE: Bank i 's standard deviation of annual after-tax return on equity over the 1979-1981 period.

SIZE: Log of total assets of bank i .

OD: Dummy variable equal to one if bank i has at least one branch, otherwise equal to zero.

FRM: Dummy variable equal to one if bank i was a member of the Federal Reserve System, otherwise equal to zero.

MBHC: Dummy variable equal to one if bank i is a holding company subsidiary, otherwise equal to zero.

PCPI: Per capita personal income in the market averaged over the 1979-1981 interval.

PCPIGR: Per capita personal income growth in the market over the 1979-1981 interval.

SDPCPI: The standard deviation of market per capita personal income over the 1979-1981 interval.

MDU: Market deposit uncertainty variable equal to proportion of unexplained variation in market deposits derived from the regression of market deposits on market income over the 1979-1981 interval.

WSK: Loan uncertainty variable for bank i equal to proportion of unexplained variation in total loans derived from the regression of total loans on market income over the 1979-1981 interval.

DRISK: Deposit uncertainty variable for bank i equal to proportion of unexplained variation in total transactions deposits derived from the regression of total transactions deposits on market income over the 1979-1981 interval.

COVLD: Covariance of unexplained loans and deposits for bank i over the 1979-1981 period.

\hat{SDROE} : Predicted value for *SDROE* derived from the following first-stage regression with the relevant actual and potential competition variable(s) added:

$\hat{SDROE} = f(MSBO, SIZE, OD, FRM, MBHC, PCPI, PCPIGR, SDPCPI, MDU, LRISK, DRISK, COVLD)$.

References

- Bain, Joe S. "A Note On Pricing in Monopoly and Oligopoly." *American Economic Review*. 39(March 1949): 448-64.
- Baumol, William J., John C. Panzar, and Robert D. Willig. *Contestable Markets and the Theory of Industry Structure*. New York: Harcourt, Brace and Jovanovich, 1983.
- Berger, Allen N., and Timothy Hannan. "The Price-Concentration Relationship in Banking." In *Merging Commercial and Investment Banking: Proceedings from a Conference on Bank Structure and Competition*. Federal Reserve Bank of Chicago (May 1987): 538-9.
- Berger, Allen N., Gerald A. Hanweck, and David B. Humphrey. "Competitive Viability in Banking: Scale, Scope, and Product Mix Economies." Board of Governors of the Federal Reserve System. *Research Papers in Banking and Financial Economics*, February 1986.
- Boyle, Stanley E., Richard K. Ford, and Charles G. Martin. "The Application of Industrial Organization Theory to Commercial Banking: A Review and Analysis." University of Arkansas-Little Rock, Department of Economics and Finance. *Working Paper*, 1987.
- Brozen, Yale. *Concentration, Mergers, and Public Policy*. New York: Macmillan Publishing Company, Inc., 1983.
- Burke, J., and S. Rhoades. "Profits and 'Contestability' in Highly Concentrated Banking Markets." *Review of Industrial Organization*. (Fall 1987).
- Call, C., and T. Keeler. "Airline Deregulation, Fares, and Market Behavior: Some Empirical Evidence." In A. Daugherty, ed., *Analytical Studies in Transport Economics*. Cambridge, Mass.: Cambridge University Press, 1986.
- Clark, Jeffrey A. "Single-Equation, Multiple-Regression Methodology: Is It an Appropriate Methodology for the Estimation of the Structure-Performance Relationship in Banking?" *Journal of Monetary Economics*. 18, no. 3(November 1986a): 295-312.
- _____. "Market Structure, Risk, and Profitability: The Quiet Life Hypothesis Revisited." *Quarterly Review of Economics and Business*. 26, no. 1(Spring 1986b): 45-56.
- Evanoff, Douglas D., and Diana L. Fortier. "Re-evaluation of the Structure-Conduct-Performance Paradigm in Banking." *Journal of Financial Services Research*. 1, no. 3(June 1988): 277-94.
- Gilbert, R. "Bank Market Structure and Competition." *Journal of Money, Credit, and Banking*. 16, no. 4(November 1984).
- Graddy, Duane B., and Reuben Kyle III. "The Simultaneity of Bank Decision-Making, Market Structure, and Bank Performance." *Journal of Finance*. 34, no. 1(March 1979): 1-18.
- Graham, David R., Daniel P. Kaplan, and David S. Sibley. "Efficiency and Competition in the Airline Industry." *Bell Journal of Economics*. 14, no. 1(Spring 1983): 118-38.
- Hannan, Timothy H. "Mutual Awareness Among Potential Entrants: An Empirical Examination." *Southern Economic Journal*. 47, no. 3(January 1981): 805-8.
- _____. "Limit Pricing and the Banking Industry." *Journal of Money, Credit, and Banking*. 11, no. 4(November 1979): 438-46.
- Heggstad, Arnold A. "Market Structure, Competition, and Performance in Financial Industries: A Survey of Banking Studies." In Franklin R. Edwards, ed., *Issues in Financial Regulation*. New York: McGraw Hill Book Company, 1979.
- _____. "Market Structure, Risk, and Profitability in Commercial Banking." *Journal of Finance*. 32, no. 4(September 1977): 1207-16.
- Kalish, Lionel, Jerry Hartzog, and Henry Cassidy. "The Threat of Entry With Mutually Aware Potential Entrants: Comment." *Journal of Political Economy*. 86, no. 1(February 1978): 147-50.
- Liang, Nellie. "Bank Profitability and Risk." Unpublished paper, Board of Governors of the Federal Reserve System, November 1987.
- Morrison, Steven A., and Clifford Winston. "Empirical Implications and Tests of the Contestability Hypothesis." *Journal of Law and Economics*. 30(April 1987): 53-66.
- Osborne, Dale K., and Jeanne Wendel. "Research on Structure, Conduct, and Performance in Banking, 1964-1979." Oklahoma State University, College of Business Administration. *Working Paper* 83-8, July 1983.

Rhoades, Stephen A. "Structure-Performance Studies in Banking: An Updated Summary and Evaluation." Board of Governors of the Federal Reserve System, Staff Study No. 119, August 1982.

_____, and Roger D. **Rutz.** "Market Power and Firm Risk: A Test of the 'Quiet Life' Hypothesis." *Journal of Monetary Economics*. 9(January 1982): 73-86.

Schwartz, Marius. "The Nature and Scope of Contestability Theory." *Oxford Economic Papers*. 38, Supplement (November 1986): 37-57.

Smirlock, Michael. "Evidence on the (Non)Relationship Between Concentration and Profitability in Banking." *Journal of Money, Credit, and Banking*. 17, no. 1(February 1985).

Whalen, Gar: "Concentration and Profitability in Non-MSA Banking Markets." Federal Reserve Bank of Cleveland. *Economic Review* (Quarter 1, 1987): 2-14.

_____. "Bank Expansion in Ohio." Federal Reserve Bank of Cleveland. *Economic Commentary*, April 6, 1981.