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1. INTRODUCTION

SHORTLY AFTER THE *Philadelphia National Bank* case of 1963, which brought banking under the jurisdiction of antitrust laws, numerous researchers began to investigate the structure-conduct-performance (S-C-P) relationship in banking. At best, the results have been inconclusive. Rhoades (1977), in a survey of the literature, expresses "disbelief . . . and . . . frustration" in the overall inability to link concentration and performance "since so many studies of the industrial sector have found a relatively large effect of concentration on performance."

In this paper I offer and test an alternative explanation for these results. Specifically, it is posited that there is no relationship between concentration and profitability, but rather between bank market share and bank profitability. Following Demsetz (1973), Peltzman (1977), and Brozen (1982), it is hypothesized that market concentration is not a random event but rather the result of firms with superior efficiency obtaining a large market share. In this case, market share and profits will be correlated but there will be no casual relation between market concentration and profits. To test this hypothesis, the interrelationship between profits, market share, and concentration is investigated for over 2,700 unit state banks. The results of the analysis suggest that the link is between market share and profitability and that, once this is controlled for, there is no discernible positive relationship between concentration and profitability.

This paper is divided into four sections. In section 2 I present a brief review of the literature and, in light of past studies, describe the competing S-C-P hypotheses

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and the implications for bank regulatory policy. Section 3 contains a description of the methodology to be used in the empirical analysis. The data are described and results presented in section 4. Section 5 contains a summary of the paper and the conclusions.

2. S-C-P IN BANKING: EMPIRICAL EVIDENCE AND COMPETING HYPOTHESES

That bank researchers have been unable to find a consistently positive and significant relationship between concentration and profits is frequently viewed as troublesome. Rhoades, for example, in his survey of 39 studies from 1961–77, determined that 30 of these studies had been "successful" in finding support for the basic validity of the S-C-P hypothesis, but included among successful studies, as a representative example, one by Rose and Fraser (1976), where 27 estimated equations produced only 6 successful equations. Gilbert (1984, Table 4) summarizes the respose of bank performance measures to a change in market concentration and finds that in only 27 of the 56 studies reviewed does concentration significantly affect performance in the predicted direction. Osborne and Wendel (1982), in a detailed critique of the literature, argue that it contains so many inconsistencies as to provide no evidence of a positive association between concentration and performance in banking. [1]

Much of this frustration seems to be based on a priori acceptance of the fundamental axiom of the traditional S-C-P paradigm. This axiom, which I refer to as the traditional hypothesis, is that high seller concentration lowers the cost of collusion and fosters tacit and/or explicit collusion on the part of firms. As a result of this collusion, all firms in the market earn monopoly rents. Since virtually all studies utilizing manufacturing data have reported a positive correlation between concentration and profitability, it is only natural to expect such a relationship to prevail in the banking industry.[2]

The traditional hypothesis has been challenged by Demsetz (1973, 1974) and others.[3] These economists argue that concentration is not a random event but rather the result of the superior efficiency of the leading firms. Firms possessing a comparative advantage in production become large and obtain a high market share and, as a consequence, the market becomes more concentrated. Such firms earn Ricardian rents. This view, which I refer to as the efficient structure hypothesis, implies that market share proxies for relative firm efficiency and is therefore positively correlated with profitability.[4] Concentration, far from leading to collusion, actually

[1]For additional reviews of the literature or parts of the literature, see Benston (1973), Osborne (1977), Heggestad (1979), and Gilbert (1984).

[2]For a survey of the manufacturing S-C-P literature, see Weiss (1974).

[3]For example, Brozen (1982), Peltzman (1977), and McGee (1974). For an excellent discussion of this position, see Brozen (1982).

[4]Such cost differences may be due to differences in technological or managerial skills, reputation, or simply that employee teams just happen to "click" (Demsetz 1973, p. 2). Accordingly, two firms of the same size may have different cost structures. Additionally, Gilligan, Smirlock, and Marshall (1984) have provided evidence that banking is characterized by economies of scope, that is, cost savings are realized from joint production. Differences in the ability to achieve these cost savings may also be a determinant of relative efficiency.

emerges from the competitive process. Demsetz has argued that the observed relationship between concentration and profits is spurious and simply proxies for the interrelationship between superior efficiency, high market share, and concentration. Several papers that have directly tested these competing hypotheses using manufacturing data (Demsetz 1973; Carter 1978; Peltzman 1977; Smirlock, Gilligan, and Marshall 1984) have provided evidence in favor of the efficient structure hypothesis.

The efficient structure hypothesis provides a potential explanation of the failure to find evidence of a consistently positive concentration- profitability relationship in banking, the latter of which Heggestad (1979) considers a summary index of performance. According to the efficient structure hypothesis, some firms will earn supernormal profits because of superior efficiency. This efficiency is reflected in high market share. Since markets containing such firms will tend to exhibit high concentration, it is possible a spurious relationship between concentration and profitability will be observed when market share is not properly considered. When observed, however, one might expect this relationship to be quantitatively weak, which is exactly what is reported in the banking literature.[5]

Differential efficiency is not the only possible cause of a market share profitability relationship. Higher profits can result not only from lower costs but also from higher prices. Mueller (1983) and Ravenscraft (1983) argue that market share may capture market power stemming from product differentiation: that is, banks with a large market share may have higher quality products, enabling them to charge higher prices and earn higher profits. I refer to this as the product differentiation hypothesis.

Discriminating between the efficient structure and product differentiation hypotheses using profit data is problematic, but some insight into discriminating between these two, and in fact among all three, hypotheses can be gained by using price to measure performance. Specifically, in an equation that uses price to measure performance and includes both market share and concentration as regressors, the traditional hypothesis predicts a zero coefficient on market share and a positive coefficient on concentration, the efficient structure hypothesis a zero coefficient on both market structure variables, and the product differentiation hypothesis a positive coefficient on market share and a zero coefficient on concentration.[6] As Heggestad (1979), Osborne and Wendel (1982), and Gilbert (1984) all note, however, mea-

[5]Extant banking literature has suggested that the quantitative weakness of the concentration-profitability relationship is due to concentration permitting managers to behave in a manner inconsistent with profit maximization. This behavior may take the form of additional on-the-job consumption by managers (expense-preference behavior) (Edwards 1977; Hannan and Mavinga 1980) or risk reduction to permit the "quiet life" (Heggestad 1977; Rhoades and Rutz 1982). Smirlock and Marshall (1983) have argued that owners will permit increased managerial perquisite consumption as concentration increases only if concentration and monitoring costs are positively related, which Jensen and Meckling (1976) have shown not to be the case. Smirlock and Marshall argue the Edwards-Hannan-Mavinga results are due to misspecification of the estimated equation used to test the hypothesis. Once properly specified, the evidence indicates no relationship between concentration and expense-preference behavior. Similarly, concentration alone is unlikely to permit managerial risk reduction inconsistent with owner wealth maximization. If, however, supernormal profits attract adverse regulatory attention, then some risk reduction may be in the owners' interests. The source of these supernormal profits, however, is not clear.

[6]The efficient structure hypothesis implies that leading firms can price at the level of secondary firms and still earn supernormal profits, but that there need not be a relationship between price and either market structure variable. Also note that higher prices due to market power and higher prices due to product differentiation have distinct welfare implications, and, in the latter case, higher prices may be associated with increased welfare.

surement of prices using bank call report data, as used in this and most bank S-C-P studies, is problematic and provides generally poor proxies of actual prices.[7] Prices may be more accurately measured by survey. Three of the 39 studies reviewed by Rhoades and one study since use survey data to calculate prices and include both market share and concentration as regressors. Stolz (1976) employs nine price measures of which only two yield a statistically significant effect of concentration on price. A similar finding applies to the market share variable. Two other studies by Heggestad and Mingo (1976, 1977) use data from the same Federal Reserve survey. Gilbert (1984) notes that in the authors' earlier study only one of the five price measures employed yields a coefficient on concentration that is statistically significant at the 5 percent level, though the authors, using a different criterion, claim that four of the prices are significantly related to concentration.[8] In no case is the market share variable significant. In their later study, Heggestad and Mingo focus on two of their price measures in investigating the possibility of a nonlinear relationship between price and concentration. They find support for a price-concentration relationship, though Osborne and Wendel (1981) criticize one of their price measures, demand deposit service charges, as having little correlation with actual price. Specifically, Osborne and Wendel report that, for their sample, variations in a demand deposit price proxy constructed similar to that of Heggested and Mingo explains only 17 percent of the variations in actual price. Osborne and Wendel (1981), using actual prices charged on checking accounts instead of proxies, find no relationship between price and either market structure variable.

The evidence from these studies suggests no relationship between price and market share, indicating that the product differentiation hypothesis is unlikely to be driving a profit/market share relationship, while providing support for the efficient structure hypothesis as underlying such a relationship. The evidence from these studies regarding a price-concentration relationship is, at best, mixed. This inconclusiveness mirrors the entire price-concentration literature.[9] As noted, part of this puzzle is due to the use of poor price proxies. Gilbert (1984, p. 632) asserts that "if banks in areas with higher market concentration charge higher [prices] . . . , these effects will be reflected in the pattern of bank profit rates, even though it may not be possible to measure accurately the effects of market concentration on [prices]. . . ." Based on the above, I use profit rates to measure firm performance and consider the analysis as testing the appropriateness of the efficient structure and traditional hypotheses.

[7]For example, a frequently used price proxy obtained from call report data is service charges per dollar of demand deposits. Osborne (1977), for a sample of 154 Texas banks, found a correlation of −0.04 between this proxy and actual price.

[8]Heggestad and Mingo (1976) consider the coefficient on concentration significant if it is significant at the 10 percent level, one-tailed test. This is a much less strict standard than that used by Gilbert. Even at the 10 percent, two-tailed test (or, equivalently, a 5 percent, one-tailed significance level), only one of the five prices is significantly affected by concentration.

[9]Gilbert's summary (Table 4) concludes that only 5 of 11 studies have reported a statistically significant relationship between average rates on loans and market concentration, 5 of 13 between average interest rate paid on time and savings deposits and market concentration, and 4 of 7 between revenue from demand deposit sevices charges as a percentage of demand deposits and market concentration. He does, however, conclude that 4 of 5 studies find a relationship between the interest rate charged on business loans and market concentration, though all of these studies took place prior to 1971.

It is important to determine which of these behavioral hypotheses describes the banking industry because the assumed positive relationship between concentration and profitability affects regulatory decisions regarding mergers and de novo entry (Guerin-Calvert 1983). Increasing market concentration is viewed as a social cost and a corresponding onus is put on the petitioning banks to demonstrate public benefits that outweigh these costs. This cost is positive (zero) according to the traditional (efficient structure) hypothesis. Heggestad (1979) has asserted that "high profits in a market signal a need for more resources; they indicate a need for more competition and more entry into those markets." Although this may be true under the traditional hypothesis, it is also clear that such a policy could lead to resource waste under the efficient structure hypothesis. Further, Rhoades and Rutz (1982) have suggested that "bankers may be particularly sensitive about showing high profits as a result of their regulatory status." To the extent that regulators force efficient banks to undertake actions inconsistent with profit maximization, economic waste is incurred.

3. METHODOLOGY

The methodology utilized in this paper is based on Weiss's (1974, p. 225–26) assertion that the correct test of the competing hypotheses is one that "takes both market share and concentration into account at the same time." A direct way to do this is to estimate a cross-sectional profit equation that includes both market share and concentration as independent variables and to examine the significance of their coefficients.[10] Despite the simplicity of this approach, none of the studies surveyed by Rhoades or Gilbert adopts this methodology.[11] Accordingly, I estimate the equation

$$\pi = a_0 + a_1 MS + a_2 CR + a_3 MSCR + \sum_{i=4}^{n} a_i Z_i , \qquad (1)$$

where π is some measure of the profit rate, MS denotes the market share of the firm, CR is a measure of market concentration, $MSCR$ is an interaction term defined as MS multiplied by CR, and Z is a vector of additional control variables that prior studies have found to affect bank profitability.

[10]Several authors have done this using manufacturing data (e.g., Ravenscraft 1983; Smirlock, Gilligan, and Marshall 1984). These studies have generally found that once market share is included as an explanatory variable, the coefficient on concentration is insignificant.

[11]Glassman and Rhoades (1980) utilize both market share and concentration as structure variables to explain bank profitability but do not use them in the same regression equation. Although both market structure variables are positive and significant, their results cannot distinguish between the competing hypotheses. Curry (1981), in his examination of the preacquisition characteristics of banks acquired by multibank holding companies, does include both market share and concentration in a profitability equation. He finds that neither market share variable is significant. This result, which is substantially different from the findings reported in this paper and by Glassman and Rhoades, is difficult to explain. Curry's sample is designed to examine independent versus recently acquired bank characteristics so that his sample selection, which is more specific than that used here, may be driving his results. None of the eight control variables used by Curry is significant at the 5 percent level, and the R^2 of his equation is 0.01. This is substantially poorer than similar studies, leading to the suspicion that Curry's findings are due to sample selection.

The usefulness of (1) in discriminating between the two hypotheses is straightforward. Ignoring the interaction term temporarily, a coefficent combination of $a_1 > 0$, $a_2 = 0$ implies that firms with high market share are more efficient than their rivals and earn rents because of this efficiency while also indicating that increased market concentration does not result in banks earning any monopoly rents. Conversely, a coefficient combination of $a_1 = 0$, $a_2 > 0$ implies that market share does not affect firm rents and that rents reflected in higher profitability are monopoly rents that result from market concentration. Thus, $a_1 > 0$, $a_2 = 0$ supports the efficient structure hypothesis, whereas $a_1 = 0$, $a_2 > 0$ supports the traditional hypothesis.

This, of course, does not exhaust the possible combinations of a_1 and a_2. Of particular interest is the case where both a_1 and a_2 are greater than zero. Advocates of the traditional hypothesis would interpret such a result as demonstrating that all firms in concentrated markets earn monopoly rents from collusion and that these benefits, as suggested by theories of oligopolistic behavior, are distributed unevenly with the larger firms in the market capturing the lion's share of monopoly rents (note that these large firms are earning disproportionate rents due to monopoly and not efficiency). Proponents of the efficient structure hypothesis would view such a finding as evidence that leading firms are more efficient than their rivals and that market concentration fosters collusion that results in monopoly rents being earned. To appropriately interpret such a finding requires determining whether the effect of market share on profitability is primarily related to efficiency or collusion. In the latter case, the coefficient on concentration may be biased toward zero (Ravenscraft 1980), and perhaps even a finding of $a_1 > 0$, $a_2 = 0$ would not be accepted as unambiguous evidence in favor of the efficient structure hypothesis. An indirect test of the cause of the market share effect involves employing the interaction of market share and concentration, *MSCR*, as an additional regressor. If high concentration is associated with collusive behavior that is characterized by disproportionate rent sharing in favor of the larger firms, then a positive coefficent on *MSCR* should be observed. If collusion is not extant, then $a_3 \leq 0$.[12]

4. DATA AND RESULTS

The data in this study are composed of balance sheet information for the years 1973 and 1978 for over 2,700 unit state banks operating in the seven-state area under the jurisdiction of the Federal Reserve Bank of Kansas City. The data are obtained from the reports of condition that all FDIC-insured banks are required to file annually with their primary federal regulator.[13] By using data from unit bank states

[12]One conjecture consistent with a negative coefficient on *MSCR* is that the ability of firms to exploit any efficiency advantage depends on the absence of other large rivals. This rivalry version of the efficient structure hypothesis implies $a_1 > 0$, $a_2 = 0$, $a_3 < 0$.

[13]These seven states are Colorado, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, and Wyoming. In truth, New Mexico is a limited branching state in 1978, but branching is limited to within the county. The sample consists of all FDIC-insured banks in this area. Complete data for the 1978 static analysis is available for 2,704 banks.

we minimize some of the market measurement and potential competition difficulties associated with branch bank states. Indeed, the higher entry barriers associated with unit bank states suggest that if collusion is not present for this sample, it is unlikely to characterize the banking industry as a whole.

Many S-C-P studies employing manufacturing firm data have used the rate of return on equity (π_E) as the profit rate measure. Weiss (1974) has argued correctly that π_E is more appropriate than alternative measures since this corresponds most closely to what owners seek to maximize. Banking studies, however, have chosen to emphasize two other profit rate measures, the rate of return on total capital (π_C) and (particularly) the rate of return on total assets (π_A). As Heggestad (1979) notes, it is actually π_A that has provided the strongest evidence on a concentration-profitability relationship in banking. Although π_E is the most appropriate definition, for comparability with previous studies, the analysis is performed utilizing all three profit rate measures.[14]

Following virtually all other studies, the market is approximated by the SMSA or non-SMSA county in which a bank is located.[15] A bank's market share is defined as its total deposits divided by total bank deposits in the market. To measure market concentration the three-bank deposit concentration ratio is used. In the regression analysis six additional control variables are used. Total market deposits, *MKTDEP*, is included to account for the possibility that entry is easier in larger than in smaller markets and that bank customers in these markets may tend to be more sophisticated and less tradition bound than customers in smaller markets (Rhoades and Rutz 1982). Rhoades and Rutz also assert, however, that this may result in banks having a riskier portfolio, which, accordingly, may yield a higher return. Thus the coefficient on this variable may be either positive or negative. The percentage growth in market deposits from 1973 to 1978, *MKTGROW*, is employed because rapid market growth should expand profit opportunities for existing banks. The ratio of demand deposits to total deposits, *DDTODEP*, is included in the analysis because explicit interest payments on demand deposits were prohibited and thus provided a cheaper source of funds than other deposits. The coefficients on both these variables should be positive. Total bank assets, *ASSETS*, is included as an independent variable to account for cost and capital ratio differences related to bank size and to control for the possibility that large banks are likely to have greater product and loan diversification. This increased diversification implies less risk and hence a lower required rate of return. The coefficient on this variable may be positive or negative. The variable *INDEP* is designed to capture the effect of holding company affiliation; it is equal to one if the bank is not a member of a bank holding company and zero otherwise. Since holding company affiliation has been posited to allow banks to achieve efficiencies along a number of margins, I expect the coefficient on this variable to be negative. The variable *MULTI* describes state law with respect to

[14] π_E is defined as net income after taxes divided by the book value of equity; π_C is defined as net income after taxes divided by the book value of capital (= equity plus debt capital); π_A is defined as net income after taxes divided by total assets.

[15] There are 467 banking markets in the sample and the average bank size in 1978 is approximately $25 million in deposits.

multibank holding companies and takes a value of one if the bank is located in a state that allows multibank holding companies and zero otherwise. The effect of permitting multibank holding companies on the level of bank profits is theoretically indeterminate. The presence of multibank holding companies might increase profit rates by discouraging entrants (Curry and Rose 1981). Alternatively, the result could be an increase in the extent of potential competition and a decrease in entry barriers resulting in a decrease in bank profits.[16]

The complete regression equation to be estimated is

$$\pi = a_0 + a_1 MS + a_2 CR + a_3 MSCR + a_4 MKTDEP + a_5 MKTGROW + a_6 ASSET + a_7 DDTODEP + a_8 INDEP + a_9 MULTI . \quad (2)$$

Virtually all bank structure/profitability studies have estimated an equation that resembles (2) with the restriction $a_1 = a_3 = 0$ imposed. This restricted version of (2) provides a basis for comparison with previous studies and, if $a_2 > 0$, implies that the ensuing findings are not due to differences between the data of this and earlier studies. The estimates of this constrained equation are presented in the first three rows of Table 1. The signs on the control variables are consistent with expectations (these variables are discussed in more detail when (1) is estimated without parameter restrictions). The coefficient on concentration is positive and significant and the magnitude of its effect on profitability is similar to that reported by Rhoades and Rutz (1982). Based on this evidence, which is broadly consistent with that reported in previous studies, one might be led to conclude that the traditional hypothesis is valid.

Equation (2) is also estimated with market share as the only structural variable, that is, with the restriction $a_2 = a_3 = 0$ imposed. These results are reported in the middle three rows of Table 1. For all profit rate definitions, the control variables are consistent with expectations and the coefficient on market share is positive and significant. The explanatory power of these equations exceeds those where *CR* is the market structure variable, a finding that is consistent with the results reported by Glassman and Rhoades (1980). Proponents of the traditional hypothesis would be inclined to view market share as a market power variable that enables banks with high market power to reap the majority of the benefits associated with collusion. Advocates of the efficient structure hypothesis would argue that these results reflect the superior efficiency of leading banks in the market.

These results are similar to those reported in the literature. They do not, however, shed any light on the competing hypotheses. As an initial test, (2) is estimated restricting only the coefficient on the interaction variable to be zero. These results are reported in the last three rows of Table 1. For all profit rate definitions, the coefficient on market share is positive and significant at the 1 percent level and the

[16]These variables were chosen because of their use, or use of a similar variable, in previous bank S-C-P studies. As a check on the robustness of the results, various combinations of the control variables were employed. In no case were the results qualitatively different from those reported in the text, which is interpreted as evidence of the strength of the empirical findings.

TABLE 1

STATIC ANALYSIS REGRESSION RESULTS (t-statistics in parentheses)

Dependent Variable	Intercept	*MS*	*CR*	*MKTDEP*	*MKTGROW*	*DDTODEP*	*ASSETS*	*INDEP*	*MULTI*	SEE	R^2
π_A	0.0051†		0.0020†	−0.0004	0.0020†	0.0102†	−0.0018*	−0.0008†	−0.0006†	0.0942	0.05
	(6.62)		(2.65)	(0.60)	(3.69)	(9.05)	(1.74)	(3.37)	(2.65)		
π_C	0.0713†		0.0195‡	0.0005	0.0424†	0.0504†	0.0033	−0.0192†	−0.0067‡	14.58	0.03
	(7.40)		(2.00)	(0.69)	(6.15)	(3.59)	(0.25)	(6.51)	(2.16)		
π_E	0.0757†		0.0178*	0.0008	0.0451†	0.0453†	−0.0030	−0.0207†	−0.0064‡	15.15	0.03
	(7.71)		(1.79)	(1.06)	(6.41)	(3.16)	(0.22)	(6.86)	(2.04)		
π_A	0.0057†	0.0041†		−0.0001	0.0021†	0.0105†	−0.0026†	−0.0007†	0.0006†	0.0930	0.06
	(16.25)	(6.56)		(0.11)	(3.83)	(9.42)	(2.53)	(2.95)	(3.09)		
π_C	0.0746†	0.0501†		0.0012*	0.0427†	0.0545†	−0.0133	−0.0181†	−0.0082†	14.39	0.05
	(10.75)	(6.34)		(1.91)	(6.26)	(3.90)	(1.01)	(6.15)	(2.70)		
π_E	0.0778†	0.0500†		0.0004‡	0.0452†	0.0495†	−0.0070	−0.0195†	−0.0080†	14.96	0.05
	(11.00)	(6.21)		(2.47)	(6.50)	(3.46)	(0.52)	(6.51)	(2.60)		
π_A	0.0062†	0.0045†	−0.0009	−0.0004	0.0021†	0.0106†	−0.0027†	−0.0006†	−0.0007†	0.0130	0.06
	(7.92)	(6.08)	(0.98)	(0.65)	(3.91)	(9.46)	(2.60)	(2.88)	(2.89)		
π_C	0.0859†	0.0582†	−0.0185	0.0005	0.0438†	0.0556†	−0.0149	−0.0177†	−0.0074‡	14.38	0.05
	(8.72)	(6.23)	(1.62)	(0.65)	(6.39)	(3.98)	(1.13)	(6.03)	(2.41)		
π_E	0.0905†	0.0591†	−0.020*	0.0008	0.0462†	0.0505†	−0.0088	−0.0191†	−0.0071‡	14.94	0.05
	(9.02)	(6.20)	(1.78)	(1.02)	(6.65)	(3.54)	(0.65)	(6.37)	(2.28)		

NOTES: N = 2,704 for all regressions. *ASSETS* and *MKTDEP* measured in millions of dollars and coefficients on these variables multiplied by 1,000.
†Coefficient significant at the 1 percent level (two-tailed test).
‡Coefficient significant at the 5 percent level (two-tailed test).
*Coefficient significant at the 10 percent level (two-tailed test)

coefficient on concentration is negative. This finding provides strong support for the proposition that the relationship is between profitability and market share and not between profits and concentration. This also implies that the profit-concentration relationship observed in previous bank studies is proxying for the relationship between profits and the omitted market share variable.

To further test the alternative hypotheses, (2) is estimated without any parameter restrictions. These results are presented in the first three rows of Table 2. The control variables *MKTGROW*, *DDTODEP*, and *INDEP* all have the expected sign and in virtually all instances are significant at the 5 percent level. The variable *ASSET* is generally negative but also insignificant, whereas the variable *MKTDEP* is positive and significant in equations employing a capital-based measure of profitability. The significant negative coefficient on *MULTI* lends support to the position that allowing multibank holding companies has pro-competitive effects.

The effect of the market structure variables are similar and equally striking across profit rate measures. In all cases $a_1 > 0$ and is significant at the 1 percent level; a_2, on the other hand, is never significantly different from zero. These results indicate that once market share is properly considered, market concentration has no effect on bank profitability though the converse is not true. The variable *MSCR* provides a test of whether this finding is due to a potential relationship between market share and monopoly rent sharing. The negative and significant value of a_3 is inconsistent with such an interpretation. The magnitude of the market share and concentration effect can be assessed by evaluating the derivative of profitability with respect to each market structure variable. Evaluated at the mean values of these variables, I find $\partial\pi_E/\partial MS \approx 0.001$ and $\partial\pi_E/\partial CR \approx -0.0003$. These effects, which are both significant at the 10 percent level, imply that an increase in market share (concentration) of 10 percentage points increases (decreases) profitability by approximately 8.5 (2.5) percent relative to the mean value of π_E.[17,18] The significant positive effect of *CR* on profitability reported in Table 1 appears to be due to its proxying for the omitted *MS* variable rather than any indication of collusion. As noted above, these results support the efficient structure hypothesis and are inconsistent with the tradi-

[17]These derivatives are evaluated at mean values assuming a change in market structure of 1 percentage point, or 0.01. The mean values of *MS*, *CR*, and π_E are 0.17, 0.71, and 0.1191, respectively. The effect and significance of changes in *MS* and *CR* on the alternative profit rate measures are similar to those reported in the text. Specifically, $\partial\pi_A/\partial MS \approx 0.00007$ and $\partial\pi_A/\partial CR \approx -0.00002$. This implies that an increase in *MS*(*CR*) of 10 percentage pints increases (decreases) π_A by 6.7 (1.6) percent relative to the mean value of $\pi_A (= 0.0104)$. Similarly, $\partial\pi_C/\partial MS \approx 0.001$ and $\partial\pi_C/\partial CR \approx -0.0003$. This implies that an increase in *MS*(*CR*) of 10 percentage points increases (decreases) π_C by 8.7 (2.6) percent relative to the mean value of $\pi_C (= 0.1160)$.

[18]The negative, rather than a zero, effect of concentration on profitability is, to some degree, surprising. It should be noted that this negative relationship appears primarily, if not entirely, due to the negative coefficient on *MSCR*, which is included to discriminate between the competing hypotheses. One conjecture consistent with this observation is the rivalry version of the efficient structure hypothesis discussed in note 12. In this case, the negative coefficient on *MSCR* reflects a decrease in the ability of leading firms to exploit efficiency advantages due to the presence of other large rivals. Accordingly, the negative concentration-profitability relationship can be viewed as reflecting the increase in rivalry induced by an increase in concentration — an effect obviously not present if it is the most efficient firm gaining market share. The effect of concentration, beyond that indicated by the rivalry hypothesis, may best be captured by the coefficient on *CR*, which in no case is significantly different from zero.

TABLE 2

STATIC ANALYSIS REGRESSION RESULTS (t-statistics in parentheses)

Dependent Variable	Intercept	*MS*	*CR*	*MSCR*	*MKTDEP*	*MKTGROW*	*DDTODEP*	*ASSETS*	*INDEP*	*MULTI*	*SEE*	R^2
π_A	0.0049†	0.0158†	0.0003	−0.0119‡	0.0005	0.0021†	0.0104†	−0.0035†	−0.0006†	−0.0007†	0.0928	0.06
	(5.08)	(3.11)	(0.33)	(2.24)	(0.67)	(3.94)	(9.66)	(3.18)	(2.76)	(2.98)		
π_C	0.0666†	0.2268†	0.0004	−0.1782†	0.0019‡	0.0440†	0.0598†	−0.0267*	−0.0173†	0.0077‡	14.34	0.05
	(5.47)	(3.58)	(0.03)	(2.69)	(2.01)	(6.43)	(4.26)	(1.93)	(5.89)	(2.51)		
π_E	0.0706†	0.2325†	−0.0012	−0.1833†	0.0023‡	0.0413†	0.0549†	−0.0209	−0.0187†	−0.0075‡	14.90	0.05
	(5.69)	(3.60)	(0.09)	(2.71)	(2.34)	(6.26)	(3.83)	(1.48)	(6.23)	(2.38)		
π_A	0.0053†	0.0083†	0.0019	−0.0042*	0.0003	0.0021†	0.0107†	−0.0033†	−0.0006†	−0.0007†	0.0928	0.06
	(8.59)	(3.98)	(0.50)	(1.93)	(0.55)	(3.392)	(9.58)	(2.94)	(2.78)	(2.94)		
π_C	0.0682†	0.1122†	0.0028	−0.0633‡	0.0017‡	0.0435†	0.0578†	−0.0016	−0.0175†	−0.0078†	14.35	0.05
	(8.91)	(4.32)	(0.58)	(2.33)	(2.34)	(6.36)	(4.12)	(1.55)	(5.94)	(2.54)		
π_E	0.0716†	0.1123†	0.0021	−0.0629‡	0.0020†	0.0461†	0.0526†	−0.0009	−0.0189†	−0.0075†	14.91	0.05
	(9.18)	(4.24)	(0.42)	(2.27)	(2.61)	(6.62)	(3.68)	(1.06)	(6.29)	(2.40)		

NOTES N = 2,704 for all regressions For regressions in last three rows, *CR* refers to *CR**, the threshold level of concentration described in the text, and *MSCR* refers to *MSCR* ASSETS* and *MKTDEP* measured in millions of dollars and coefficients on these variables multiplied by 1,000.

†Coefficient significant at the 1 percent level (two-tailed test).

‡Coefficient significant at the 5 percent level (two-tailed test).

*Coefficient significant at the 10 percent level (two-tailed test).

tional hypothesis. There is no evidence that market concentration enables banks to earn monopoly rents due to collusion.[19]

Several authors (e.g., Weiss 1974; Edwards 1977) have maintained that the concentration-profitability relationship may be discrete rather than continuous; that is, that there is some critical or threshold level of concentration at which banks are able to collude and earn monopoly rents. In this case, measuring concentration as a continuous variable will bias this coefficient toward zero.

To test this proposition, (2) is reestimated substituting the variable CR^* for CR, where CR^* is equal to one when market concentration is greater than or equal to some threshold level and zero otherwise. The variable $MSCR^*$ is defined as MS times CR^*. Since the critical level of concentration cannot be known a priori, we follow several previous studies and utilize Quandt's "switching-of-regimes" technique to determine it.[20] This procedure indicates a critical level of concentration at 0.75 (75 percent). Consequently, CR^* is equal to one when CR is greater than or equal to 0.75 and is zero otherwise.

The results of estimating (2) with CR^* are reported in the last three rows of Table 2. These results do not support the contention that there is some critical level of concentration that permits collusion and earning of monopoly rents. In no case is CR^* significant. The effect of market share, however, is positive and significant at the 1 percent level and is similar in magnitude to that reported in Tables 1 and 2. The variable $MSCR^*$ is negative and significant for all profit rate measures and is considered additional evidence against the traditional hypothesis. These results provide further evidence that the efficient structure hypothesis is a more accurate description of banking markets than the traditional hypothesis.

5. SUMMARY AND CONCLUSIONS

The results of this paper provide evidence that once market share is accounted for properly, concentration adds nothing to explaining bank profit rates. Market share, on the other hand, is positively and significantly related to profitability even after

[19]Rhoades cautions that employing both MS and CR in the same regression may introduce degrading collinearity that results in unreliable significance tests. Although casual inspection of our results suggests this is not a problem, to more properly assess the possibility of harmful collinearity the procedure recommended by Belsley, Kuh, and Welsch (BKW 1980) was utilized. This methodology involves calculation and examination of the condition indexes (CI) and variance-decomposition proportions (VDP) of the data. BKW (p. 156) suggest $CI > 30$ as the level at which further investigation may be warranted. Only one CI (= 44.60) exceeds this level, suggesting that collinearity is not a problem. Moreover, the high variance decompositions (greater than 0.5) corresponding to this CI are not associated with MS and CR, indicating that any possible collinearity problem is not associated with these variables. The simple correlations between MS and CR, MS and $MSCR$, and CR and $MSCR$, which, as BKW state, are not appropriate signals of collinearity, are 0.41, 0.64, and 0.46, respectively.

Further, even when the model is reduced to only MS, CR, and $MSCR$ as independent variables, for all profit rate definitions the coefficient on market share is significant, the coefficient on concentration is insignificant, and the coefficient on the interaction term is negative. These results provide further support for the efficient structure hypothesis. The analysis was also performed using the Herfindahl index rather than the three-bank concentration ratio as the measure of market concentration. These results mirror those reported in the text providing additional evidence in favor of the efficient structure hypothesis.

[20]See Goldfeld and Quandt (1973) for a description of this technique. This methodology has been used in banking studies to determine a threshold level of concentration by, for example, Edwards (1977) and Smirlock and Marshall (1983).

controlling for concentration. This finding does not support the notion that concentration in banking markets results in monopoly profits being earned and suggests that any effect of concentration reported in previous studies is spurious and probably due to a correlation between profitability and the omitted market share variable. I view these findings as supporting the efficient structure hypothesis over the traditional hypothesis as a description of banking markets. Consistent with this is the assertion that market concentration is not a signal of collusive behavior but rather the superior efficiency of the leading firms. Regulatory actions that penalize this efficiency and/or encourage efficient banks to be less efficient may also be decreasing economic welfare.

As with any empirical analysis, several caveats are in order. First, this study is limited to unit state banks, and generalization to branching state banks may not be appropriate. Second, there is some evidence that chain banking may be important in unit banking states. Data limitations, however, make such an analysis impossible in this paper. To the extent that chain banking is important, the coefficient on concentration may be biased downward. Third, my findings do not necessarily imply that some bank prices are not subject to collusion. For example, it may be that certain loan rates are higher in concentrated markets but do not affect profits enough to yield a significant profitability-concentration relationship. Any such pricing relationship should be of concern to regulators. For at least this reason, regardless of the profitability-concentration relationship, the results reported here cannot be viewed as a blanket endorsement of bank mergers. Fourth, the evidence against the product differentiation hypothesis is based on only a few studies. Before definitive statements regarding the source of the profitability/market share relationship can be made, more research needs to be done.

Future research should provide additional evidence on the issues addressed in this paper, particularly the interaction between profits, market share, and concentration in banking, and should extend the analysis to explore potential sources of differential bank efficiencies. At a minimum, the results of this paper indicate that the role of market structure on bank profitability and the efficient structure hypothesis deserve further investigation.

LITERATURE CITED

Belsley, David A., Edward Kuh, and Robert Welsch. *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity*. New York: Wiley, 1980.

Benston, George J. "The Optimal Banking Structure: Theory and Evidence." *Journal of Bank Research* 3 (Winter 1973), 220–37.

Brozen, Yale. *Concentration, Mergers, and Public Policy*. New York: Macmillan, 1982.

Carter, John. "Collusion, Efficiency, and Antitrust." *Journal of Law and Economics* 21 (October 1978), 435–44.

Curry, Timothy J. "The Pre-acquisition Characteristics of Banks Acquired by Multibank Holding Companies." *Journal of Bank Research* 12 (Summer 1981), 82–89.

Curry, Timothy J., and John Rose. "Multibank Holding Companies: Recent Evidence on Competition and Performance in Banking Markets." Staff Study No. 114, Board of Governors of the Federal Reserve System, 1981.

Demsetz, Harold. "Industry Structure, Market Rivalry, and Public Policy." *Journal of Law and Economics* 16 (April 1973), 1–9.

_____. "Two Systems of Belief about Monopoly." In *Industrial Concentration: The New Learning,* edited by H. Goldschmid, H. M. Mann, and J. F. Weston, pp. 164–84. Boston: Little, Brown, and Company, 1974.

Edwards, Franklin. "Managerial Objectives in Regulated Industries: Expense-Preference Behavior in Banking." *Journal of Political Economy* 85 (February 1977), 147–62.

Gilbert, R. Alton. "Bank Market Structure and Competition: A Survey." *Journal of Money, Credit, and Banking,* 4 (November 1984, Part 2), 617–45.

Gilligan, Thomas, Michael Smirlock, and William Marshall. "Scale and Scope Economies in the Multiproduct Banking Firm." *Journal of Monetary Economics,* 13 (May 1984), 393–405.

Glassman, Cynthia A., and Stephen A. Rhoades. "Owner vs. Manager Control Effects on Bank Performance." *Review of Economics and Statistics* 62 (May 1980), 263–70.

Goldfeld, Stephen M., and Richard E. Quandt. "The Estimation of Structural Shifts by Switching Regressions." *Annals of Economic and Social Measurement* 2 (October 1973), 475–85.

Guerin-Calvert, Margaret. "The 1982 Department of Justice Merger Guidelines: Applications to Banking Mergers." *Issues in Bank Regulation* 10 (Winter 1983), 18–25.

Hannan, Timothy H., and Ferdinand Mavinga. "Expense Preference and Managerial Control: The Case of the Banking Firm." *Bell Journal of Economics* 11 (Autumn 1980), 671–82.

Heggestad, Arnold A. "Market Structure, Risk, and Profitability in Commercial Banking." *Journal of Finance* 32 (September 1977), 1207–16.

_____. "Market Structure, Competition, and Performance in Financial Industries: A Survey of Banking Studies." In *Issues in Financial Regulation,* edited by Franklin R. Edwards, pp. 449–90. New York: McGraw-Hill, 1979.

Heggestad, Arnold A., and John J. Mingo. "Prices, Nonprices, and Concentration in Commercial Banking." *Journal of Money, Credit, and Banking* 8 (February 1976), 107–17.

_____. "The Competitive Condition of U.S. Banking Markets and the Impact of Structural Reform." *Journal of Finance* 32 (June 1977), 649–61.

Jensen, Michael, and William H. Meckling. "Theory of the Firm, Managerial Behavior, Agency Costs, and Ownership Structure." *Journal of Financial Economics* 3 (October 1976), 305–60.

McGee, John. "Efficiency and Economies of Size." In *Industrial Concentration: The New Learning,* edited by H. Goldschmid, H. M. Mann, and J. F. Weston, pp. 55–97. Boston: Little, Brown, and Company, 1974.

Mueller, Dennis. "The Determinants of Persistent Profits." Federal Trade Commission Economic Report, pp. 1–33, 1983.

Osborne, Dale K. "Bank Structure and Performance: Survey of Empirical Findings on the Cost of Checking Accounts." *Federal Reserve Bank of Dallas Review* (May 1977), 7–15.

Osborne, Dale K., and Jeanne Wendel. "Concentration and Checking Account Prices: A Note." *Journal of Finance* 36 (March 1981), 181–86.

_____. "A Critical Review of Empirical Research in Banking Competition, 1964–1979." Unpublished manuscript, Oklahoma State University, 1982.

Peltzman, Sam. "The Gains and Losses from Industrial Concentration." *Journal of Law and Economics* 20 (October 1977), 229–63.

Ravenscraft, David. "Price-Raising and Cost-Reducing Effects in Profit-Concentration Studies." Ph.D. dissertation, Northwestern University, 1980.

_____. "Structure-Profit Relationships at the Line of Business and Industry Level." *Review of Economics and Statistics* 55 (February 1983), 22–32.

Rhoades, Stephen A. "Structure-Performance Studies in Banking: A Summary and Evaluation." Staff Economic Studies No. 92, Federal Reserve Board, 1977.

Rhoades, Stephen A., and Roger D. Rutz. "Market Power and Firm Risk: A Test of the 'Quiet Life' Hypothesis." *Journal of Monetary Economics* 9 (January 1982), 73–85.

Rose, Peter S. and Donald R. Fraser. "The Relationships between Stability and Change in Market Structure: An Analysis of Bank Prices." *Journal of Industrial Economics* 24 (June 1976), 251–66.

Smirlock, Michael, Thomas Gilligan, and William Marshall. "Tobin's q and the Structure-Performance Relationship." *American Economic Review* (December 1984), in press.

Smirlock, Michael, and William Marshall. "Monopoly Power and Expense-Preference Behavior: Theory and Evidence to the Contrary." *Bell Journal of Economics* 14 (Spring 1983), 166–78.

Stolz, Richard. "Local Banking Markets, Structure, and Conduct in Rural Areas." *Proceedings of a Conference on Bank Structure and Competition,* pp. 134–48. Chicago: Federal Reserve Bank of Chicago, 1976.

Weiss, Leonard W. "The Concentration-Profits Relationship and Antitrust." In *Industrial Concentration: The New Learning,* edited by H. Goldschmid, H. M. Mann, and J. F. Weston, pp. 184–233. Boston: Little, Brown, and Company, 1974.