Has Antitrust Policy in Banking Become Obsolete?

Katerina Simons and Joanna Stavins

Economists, Federal Reserve Bank of Boston. *The authors are grateful to Katharine Bradbury, Richard Kopcke, and Eric Rosengren for helpful comments. Krystl Black, Kevin Daly, and Marie Willard provided valuable research assistance.*

The U.S. banking industry has been rapidly consolidating for more than a decade. As a result, the number of commercial banks has declined by almost 30 percent, from 13,123 in 1988 to 9,215 in 1997.[1] The reduction is second only to the one that occurred during the Great Depression, when the number of banks declined by half. In addition, recent changes in banking law have relaxed constraints on allowable bank activities and geographic expansion, and technology improvements have brought about new secondary markets and payment systems. While banks entered new markets, other financial institutions entered the markets traditionally served by banks. Such far-reaching changes in the financial system make this an appropriate time to reassess antitrust policy in banking.

The aim of this article is threefold. The first is to describe a key element of antitrust enforcement—merger analysis by the federal banking supervisory agencies—as it is practiced today. The second is to review the analytical foundations and empirical evidence on which merger analysis is currently based. And the third is to provide new empirical evidence on the effect of mergers on the interest rates banks pay on consumer deposits, in order to test the hypothesis that bank mergers raise market power. This evidence suggests that it might be time to reevaluate the current merger approval policies. The first section of the article describes the antitrust criteria used by the federal regulatory agencies in approving or denying bank mergers. This is followed by a discussion of how markets are defined for antitrust purposes and empirical evidence that the relevant banking markets remain local. The third section briefly reviews the existing literature on the effects of market concentration on prices in banking. Section IV describes the methodology and data used in a new empirical analysis of the effect of bank mergers on deposit interest rates. The next section presents the results of the analysis, while Section VI discusses their implications.

I. Antitrust Policy Today

The basis of antitrust enforcement in banking is the Clayton Antitrust Act of 1914. Section 7 of the Act prohibits the acquisition of any firm when "in any line of commerce in any section of the country the effect of such acquisition may be to substantially lessen competition" (Section 7, 15 U.S.C. 18). On the federal level, jurisdiction for antitrust enforcement in banking is shared by the three federal bank supervisory agencies, namely the Federal Reserve, the Comptroller of the Currency, and the Federal Deposit Insurance Corporation, and by the Department of Justice. In addition, applicable state laws are enforced by state attorneys general and state bank regulators.

The Department of Justice (DOJ) and the federal banking agencies rely on the DOJ Merger Guidelines for specific standards to evaluate the impact of a merger on competition. The DOJ Merger Guidelines are expressed in terms of market shares of deposits that banks hold in each market affected by the potential merger. The Guidelines establish concentration thresholds in terms of the Herfindahl-Hirschman Index (HHI) rather than the proportion of deposits held by the largest banks. The HHI is defined as the sum of the squares of individual market shares of all the firms operating in a particular market. The box gives an example of calculating the effect of a merger on the HHI.

Far-reaching changes in the financial system make this an appropriate time to reasssess antitrust policy in banking.

According to the Guidelines, a bank merger would harm competition if it increased the HHI by 200 points or more *and* resulted in a highly concentrated market. A highly concentrated market is defined as one for which the total HHI equals 1800 or more. The 200-point threshold is more lenient than the 50-point threshold applied to nonbanking firms, reflecting the presumed impact of competition from thrifts and nondepository financial institutions. The Merger Guidelines also state that a merger will be considered to be anticompetitive if the merged institution controlled more than 35 percent of all deposits in a market.

In analyzing the effect of a merger on competition, federal agencies and the DOJ take into account competition from thrift institutions, which are now allowed to offer many banking services. However, since thrift competition with banks is still limited, especially in the area of commercial lending, deposits of thrift institutions are commonly counted at 50 percent in computing market concentration. (In particular instances, thrift deposits may be counted at more or less than 50 percent, depending on how active thrifts are in commercial lending in individual markets.)

The federal agencies do not automatically deny a merger if it results in market concentration above the threshold. Instead, each potential merger is further analyzed to consider the presence of possible mitigating factors such as especially active competition from thrifts and credit unions, ease of entry into the market, attractiveness of the market for entry, improvements in efficiency that the merger would achieve, a large number of firms remaining in the market, and other circumstances that would

An Example of HHI Calculation

Let us suppose that a market consists of 10 competing firms and that each firm has a 10 percent market share. The HHI is the sum of the squared market shares of each firm:

$$HHI_1 = \sum_i s_i^2 = \sum_1^{10} 10^2 = 1{,}000.$$

Let us suppose further that two of the 10 firms merge. The market would now consist of eight firms with 10 percent market share each and one firm with a 20 percent market share. The resulting HHI could be calculated as

$$HHI_2 = 8 \times 10^2 + 20^2 = 1{,}200.$$

The merger would increase the HHI by 200 points, from 1,000 to 1,200. A market with the HHI of 1,200 is still considered to be unconcentrated. Thus, for the purposes of the DOJ Merger Guidelines, such a merger would not be considered to have an adverse effect on competition.

[1] Source: Federal Deposit Insurance Corporation. The number includes all FDIC-insured commercial banks. The latest number is for the third quarter of 1997.

make coordinated interaction and exercise of market power more difficult.

If the increase in concentration is too large to be justified by the mitigating factors, the agencies or the DOJ may require divestitures of competing branches and offices as a condition of approval. Such divestitures would usually bring the concentration under or very close to the threshold and allow the merger to be approved. In addition to the DOJ Merger Guidelines, the agencies publish orders on specific mergers and acquisitions and provide guidance from their staffs to banks to indicate which mergers are likely to raise anticompetitive issues. As a result, while very few mergers are actually denied on competitive grounds, the process is effective in discouraging many applications that would be judged anticompetitive.

New empirical evidence on the effect of bank mergers on the interest rates banks pay on consumer deposits suggests that it might be time to reevaluate the current merger approval policies.

If the merger review policies work well, participating in a merger does not give banks greater market power. One way to answer the question of whether the process has been effective enough is to estimate the effect of mergers on bank pricing. After discussing the relevant banking markets and reviewing the existing empirical evidence, this article presents an empirical analysis of the effect of bank mergers on one price measure, interest rates on deposits.

II. Defining Banking Markets

Defining a meaningful geographic market is often the most difficult aspect of antitrust analysis. Frequently, merger applicants seek to define their market as broadly as possible to minimize their own effect upon it, while regulators tend to define it more narrowly. Banking agencies consider a local, economically integrated area to be a banking market. In practice, this usually means a city, a metropolitan statistical area (MSA), or a rural county. Merger applicants have often argued, however, that local market delineations have become obsolete as a result of changing demographic, economic, and financial conditions. In particular, the spread of interstate banking and branching has led banks to restructure some of their business lines. For example, banks have established small business lending and consumer finance units that are not tied to local branches but serve larger areas. Merger applicants sometimes cite the existence of such units as a sign that the geographic scope of banking markets has increased. However, this argument confuses a service area of a bank with a market, which is an economically integrated area where customers can switch among the service providers without incurring large transaction costs. There is no reason that banks cannot charge different prices in different markets within their service areas. Indeed, even if the headquarters set baseline prices for services, local managers are usually given discretion to adjust prices in keeping with local conditions.

An additional source of competition to banks comes from a number of nonbank financial service companies such as mutual fund and brokerage firms that now offer cash management services. Such services typically include money market accounts with check-writing, mutual funds, and credit cards. Some of the financial service companies market their services nationally.

One way to answer the question of whether the merger review process has been effective enough is to estimate the effect of mergers on bank pricing.

The evolving technology of delivering banking products and services is frequently cited as another reason to expand market delineations. Many banks can now serve consumers and small businesses independently of branches through ATMs, telephone call centers, personal computers, and calling officers who work from their homes. Indeed, the number of ATMs grew from around 800 in 1972, to 18,500 in 1980, and 109,000 in 1994 (Rhoades 1996a, p. 353).

However, neither nonbank competitors, nor banks that offer their services nationally through mail,

telephone, or computers, have yet achieved significant consumer acceptance in the sense of substituting fully for having an account at a local bank. Much of the empirical evidence shows that banking markets are still overwhelmingly local. The 1992 Survey of Consumer Finances shows that 94.1 percent of households that used any financial institution identified a local institution as their primary provider of financial services. Sixty-eight percent of the primary institutions were commercial banks, 24 percent were savings and loans and credit unions. Moreover, these primary providers were located very close to the consumer's home or workplace. Half of the respondents kept their deposit accounts at an institution or branch within two to three miles of their home or workplace, and three-quarters of respondents had their accounts within 12 miles of their home or work. The majority of households in the survey also obtained credit within three to eight miles of their home or work.

Neither nonbank competitors, nor banks that offer their services nationally through mail, telephone, or computers, have yet achieved significant consumer acceptance in the sense of substituting fully for having an account at a local bank.

Survey data also indicate that local banks are the primary suppliers of financial services to small businesses. According to the 1992 Survey of Small Business Finances, 96 percent of small businesses (defined as those with fewer than 500 employees) used a local institution as their primary financial services provider, with 84 percent using commercial banks and 9 percent using thrifts. Like consumers, small businesses preferred doing business with institutions located near their place of business. Specifically, the Survey of Small Business Finances asked about respondents' use of 13 categories of financial services.[2] Fifty percent of respondents obtained eight of the 13 services listed within four miles of their place of business and all of the services except leasing within seven miles of their place of business.

The above evidence suggests that interstate banking and electronic technology have not changed the strongly local orientation of consumers and small businesses. Thus, local markets remain the appropriate focus of analysis of competitive effects of bank mergers.

III. Market Structure and Market Power—Empirical Evidence

The ability of firms to exercise market power by setting prices is of major concern to economists and policy makers. An extensive literature beginning with Bain (1951) has examined the relationship between market structure, as measured by market concentration and a firm's market share, and the exercise of market power. One way to address this question is to examine the relationship between market structure and firm profits. According to the structure-conduct-performance paradigm, higher market concentration or larger market share allows firms to exploit their market power by earning higher profits. The second approach looks directly at the relationship between market structure and the prices firms charge—higher concentration should lead to higher prices.

A bank's deposit pricing can be affected not only by its own merger, but also by a merger between rival banks operating in the same market.

The relationship between concentration and profit in banking has been extensively studied. In a review of the literature, Gilbert (1984) found that empirical evidence largely supported the existence of a positive relationship. However, interpreting higher profits in more concentrated markets as evidence of market power is problematic because there is a plausible alternative explanation, namely higher efficiency. Some banks are likely to be more efficient than others

[2] The financial services were checking accounts, savings accounts, leasing, lines of credit, four categories of loans, transaction services, cash management, and trust, brokerage, and credit-related services.

and, as a result, will earn higher profits. If such banks also gain higher market share and thereby make their markets more concentrated, it would appear that concentration leads to higher profits, while in fact both are caused by higher efficiency (Bresnahan 1989). A number of studies of concentration and profits in banking, such as Smirlock (1985) and Berger (1995), control for some aspects of efficiency. They find that the relationship between concentration and profits disappears when efficiency is taken into account. However, Evanoff and Fortier (1988) found that even after correcting for efficiency differences, concentration is correlated with higher profits in markets with high barriers to entry.

Studies of a relationship between market concentration and prices largely avoid the problem of efficiency effects because greater efficiency would be associated with lower costs (and therefore more favorable prices to consumers), while greater market power would move prices in the opposite direction. The results of such studies done in the 1960s and 1970s were inconclusive, however, probably because of the poor quality of the price data available at that time (Gilbert 1984). More recent studies have lent support to the concentration–market power hypothesis. Hannan (1991) found concentration to be positively related to loan rates, and Berger and Hannan (1989) and Calem and Carlino (1991) found it to be negatively related to deposit rates. In addition, Hannan and Berger (1991) and Neumark and Sharpe (1992) found evidence that market concentration is related to asymmetric rigidity in deposit pricing: that is, when interest rates change, banks in more concentrated markets adjust deposit rates more slowly in favor of the consumer and faster in favor of the bank.

One way to measure the relationship between *changes* in market structure and market power is by measuring the direct effect of bank mergers on deposit pricing—if mergers raise efficiency, they will lower costs and lead to higher rates on consumer deposits, but if they raise participating banks' market power, they will result in lower deposit rates. This article tests the hypothesis that bank mergers raise market power. We also measure the effect of mergers between other banks located in the same banking markets ("rivals") on banks' pricing of deposits. If a merger between rival banks located in the same market results in lower rates on deposits, that would be evidence that bank mergers have anticompetitive effects that involve more than the merged banks themselves. If, however, a rival's merger results in higher deposit interest rates being offered by other banks, then competition from other banks is a mitigating factor that should be considered when merger approval decisions are made.

Very few empirical studies have examined the relationship between bank mergers and deposit pricing. In one recent study, Hannan and Prager (1996) examined the direct effects of "problem" mergers (defined as mergers that have been approved despite exceeding the DOJ Merger Guidelines) on the changes in deposit interest rates over two 2-year periods: 1989–91 and 1992–94. Hannan and Prager found that banks participating in problem mergers, as well as their rivals in the same markets, lowered their deposit interest rates more than banks not located in markets where such mergers took place. This effect was found to be significant over the 1992–94 period but not over the 1989–91 period, for which fewer problem merger observations were available.

The full effect of a bank merger on pricing can take some time to manifest itself. Furthermore, it can take some time for rivals to react to its pricing strategy, and that reaction can change over time.

This study differs from that of Hannan and Prager in two respects. First, it examines all the mergers that took place during the sample period and involved either sampled banks or their rivals, not just the mergers that exceeded the DOJ Merger Guidelines. Second, the sample period includes 11 years of data. The longer sample period makes it possible to test for a variety of time lags; lag structure may be important, because the effect of mergers on prices can take time to manifest itself.

IV. Methodology and Data

The analysis measures direct effects of bank mergers on bank pricing, controlling for market concentration and bank size. It tests whether banks' own mergers increase their market power, allowing them to pay lower interest rates on deposits. In addition, it

examines the effect of rival banks' mergers on bank pricing.

The banks in this study include a relatively high proportion of large banks that have branch networks in more than one market. However, the banks report only one interest rate for each type of deposit. While the banks certainly have the capability to set different prices in different markets according to the degree of competition, it is unclear to what extent they actually do so. Consequently, because of the lack of market-specific interest rates, this study assumes that the banks in the survey pay the same interest rates in all their markets. However, it is important to recognize that the impact a merger might have on the bank's reported interest rate would depend on the importance to the bank of the location of the merger. Specifically, when a bank with a branch network covering several markets merges with another bank, competition can be affected in more than one market, depending on how much the banks' branch networks overlap. This study defines the acquiring bank's main market as the Metropolitan Statistical Area (MSA) or county where the majority of the bank's deposits are located. Other MSAs or counties in which the acquiring bank has branches are considered to be its secondary markets. This study distinguishes between mergers that affect the bank's main and secondary markets. The "secondary" mergers are expected to have a smaller effect, if any, on competition than the "main" market mergers.

Banks initially increase interest rates following a rivals' merger, perhaps because they see a merger of their competitors as an important marketing opportunity.

A bank's deposit pricing can be affected not only by its own merger, but also by a merger between rival banks operating in the same market. A merger between rival banks can be expected to reduce competition and allow the bank an opportunity to pay lower deposit rates.

Three dummy variables are used to define the various types of mergers: a dummy variable equal to 1 if a bank participated in a merger in its main market (MERGER), a dummy variable equal to 1 if a bank participated in a merger in one of its secondary markets (SECMER), and a dummy variable equal to 1 if a rival bank participated in a merger in the bank's main market (RIVMER). For example, if A, B, and C are three banks all operating in the same market and that is A's main market, MERGER measures the effect of a merger between A and B on the survivor A's interest rate; RIVMER measures the effect of the merger on C's interest rate (if this is C's main market). If A merges with D in A's secondary market, SECMER measures the effect of the A-D merger on A's interest rate. Small, medium, and large bank mergers are also separated to test whether the effect of mergers on deposit pricing varies with the size of merging institutions.

Small banks are more likely to try to attract new customers (or prevent existing ones from leaving) after their rivals merge.

The full effect of a bank merger on pricing can take some time to manifest itself. While the Federal Reserve's National Information Center Database, the data source for bank mergers, reports a date on which the merger is officially consummated, the actual consolidation of two merged banks' operations is a multi-stage process that can take a year or more. Furthermore, after the merged bank has set its pricing strategy, it can take some time for rivals to react to it and that reaction can change over time. For these reasons, deposit pricing is observed over three years following each merger. In other words, for each survey of deposit interest rates, we include mergers that took place any time within three years prior to the survey by including three separate dummies—for mergers that took place within the past year, between one and two years ago, and between two and three years ago. We also calculate the cumulative effect of each merger during the past three years by adding the three estimated coefficients and testing

for their statistical significance. The basic model is as follows:

$$\ln (r_{it}) = \beta_0 + \beta_1 \text{MERGER1}_{it} + \beta_2 \text{MERGER2}_{it} + \beta_3 \text{MERGER3}_{it} + \beta_4 \text{RIVMER1}_{it} + \beta_5 \text{RIVMER2}_{it} + \beta_6 \text{RIVMER3}_{it} + \beta_7 \text{SECMER1}_{it} + \beta_8 \text{SECMER2}_{it} + \beta_9 \text{SECMER3}_{it} + \beta_{10} \ln (\text{HHI}_{it}) + \beta_{11} \ln (\text{ASSETS}_{it}) + \beta_{12} \ln (\text{TBILL}_t) + \beta_{13} \ln (\text{AVGDEP}_t) + \beta_{14} \text{LIMIT}_{it} + \beta_{CR} \text{CR} + \beta_{YR} \text{YR} + \beta_{CRYR} \text{CR*YR} + \varepsilon_{it}$$

where the dependent variable $\ln (r_{it})$ is the log of the interest rate bank *i* pays on money market deposit or CD accounts in month *t*. While these interest rates are reported monthly, banks' asset and deposit data are only available quarterly (each March, June, September, and December). Thus, only interest rates for those four months are used in the regressions.

The independent variables are as follows: MERGER1 is a dummy indicating whether the bank participated in a merger in its main market during the year ending in *t*; MERGER2 is a dummy indicating whether the bank participated in a merger in its main market between one and two years prior to *t*; MERGER3 is a dummy indicating whether the bank participated in a merger in its main market between two and three years prior to *t*; similarly, RIVMER1–RIVMER3 is a set of dummy variables equal to 1 if a rival bank in the surveyed bank's main market participated in a merger; SECMER1–SECMER3 is a set of dummy variables equal to 1 if the bank participated in a merger in one of its secondary markets; HHI is the Herfindahl-Hirschman Index of market concentration in the bank's main market.[3] Following the Federal Reserve practice, the measure includes 100 percent of deposits held by banks and 50 percent of deposits held by nonbank thrift institutions.[4] HHI is expected to have a negative sign—the higher the market concentration, the larger the market power and the lower the rate on deposits paid by the bank. ASSETS are bank *i*'s assets. The expected effect of assets is ambiguous—if economies of scale exist, then the larger the assets, the lower the bank's costs and the higher the rate on deposits, but the larger the assets, the higher the bank's market power. TBILL is the interest rate on a 6-month U.S. Treasury bill. AVGDEP is the national average interest rate paid on deposits (either MMDAs or CDs) that month. The average rate is included because the spreads between the Treasury bill rate and bank deposit rates changed during the sample period. LIMIT is a dummy indicating whether the state limits entry by out-of-state banks. It is expected to have a negative sign, as entry restrictions limit competition.

The last three sets of variables, CR, YR, and CR*YR, represent dummy variables for the nine Census regions, for each year in the sample period, and their interactions, respectively. The variables control for the effects of geography and timing on the deposit interest rates that are unrelated to competitive effects. In particular, the sample period studied includes the period of rapid growth of bank loan portfolios, followed by the real estate crises and the resulting retrenchments and consolidations, that occurred in the oil- and gas-producing states in the mid 1980s and in New England in the early 1990s. Rapid loan growth and associated demand for funding can cause banks to bid up deposit rates, while retrenchment and consolidation following loan losses after a real estate crisis have an opposite effect. Furthermore, while mergers involving failed banks are excluded from our sample of mergers, some consolidations that took place during that period without the FDIC's assistance were also due to economic distress. Including the regional and time dummies and their interactions allows us to isolate the competitive effect of bank mergers on deposit rates from the effects of economic conditions.

The ability of firms to exercise market power by setting prices is of major concern to economists and policy makers.

The Sample

The data on deposit prices come from the Federal Reserve's Monthly Survey of Selected Deposits. The

[3] HHI is calculated as follows:

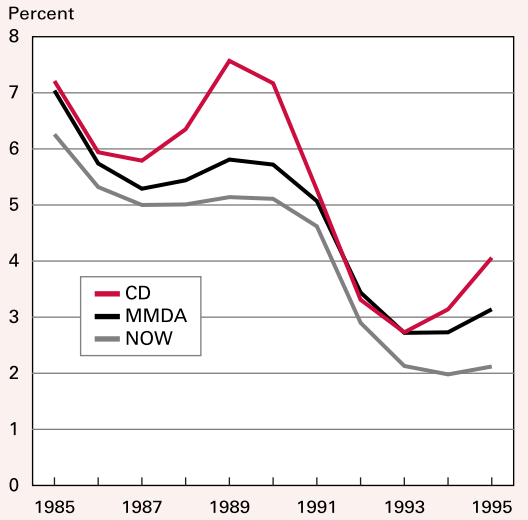
$$HHI = \sum_j s_j^2 = \sum_j \left(\frac{DEPOSITS_j}{DEPOSITS} \right)^2.$$

[4] Altering the weights assigned to thrifts' deposits did not affect the results.

survey respondents provide information on their most common deposit interest rates and amounts outstanding for NOW accounts, money market deposit accounts (MMDAs), and certificates of deposit (CDs) with maturities between 7 and 90 days. Approximately 500 banks are surveyed each month, most of them repeatedly. The survey samples predominantly large institutions. The sample consists of all survey respondents for the period of March 1985 to June 1995 and includes a total of 25,579 observations on 836 banks, an average of 535 banks sampled each period. However, since the data on HHI were not available for 1985 or 1995, the observations included in the regressions extended from 1986 to 1994. Bank assets and deposits are from the quarterly Call Reports, while information on deposits in individual bank branches necessary to calculate the HHI comes from the Federal Deposit Insurance Corporation (FDIC) annual Summary of Deposits. Because the branch-level Summary of Deposits data are collected once a year, each market's HHI is the same throughout each year. The data on limitations in interstate branching are from Amel (1993) and its periodic updates through April 1996.

Figure 1

Average Interest Rates on Deposits in NOW Accounts, MMDAs, and CDs at Sample Banks



Source: Authors' calculations using Federal Reserve's Monthly Survey of Selected Deposits.

V. Results

Descriptive Analysis

Table 1 reports the number of mergers in the sample, stratified both by bank size (small, medium, and large) and by the type of merger (mergers of surveyed banks in their main market, mergers of rival banks in the surveyed banks' main market, and mergers of surveyed banks in one of their secondary markets). Throughout the sample period, a surveyed bank participated in a merger in its main market 139 times, a surveyed bank participated in a merger in its secondary market 181 times, and rival banks in a surveyed bank's main market merged 179 times. Out of the 139 mergers, only 4 were problem mergers according to the DOJ Merger Guidelines classification. Similarly, only 4 of the 179 rival mergers were classified as problem mergers.

Table 1

Descriptive Statistics: Mergers by Bank Size[a] and Type of Merger, Entire Sample

	Own Mergers in Main Market	Mergers of Rivals in Main Market	Own Mergers in Secondary Markets	Total
Small Bank	6	67	8	81
Medium Bank	40	39	42	121
Large Bank	93	73	131	297
Total	139	179	181	499

[a]We define small, medium, and large banks as the bottom, middle, and top thirds of the sample according to bank assets: Small banks had assets below $188 million, medium banks had assets between $188 million and $1.6 billion, and large banks had assets above $1.6 billion.

Table 2 reports annual average levels and changes in deposit interest rates and in market concentration. The first and second columns report average annual levels of market concentration (as measured by HHI) and of interest rates on money market deposit accounts, respectively. The next two columns show annual changes in the two measures, averaged across individual markets. The average HHI in the sample increased every year except for one, and the average interest rates most often declined (see also Figure 1). The right-most column then correlates the year-to-year changes in each market to examine whether increases in market concentration (due to mergers or otherwise) were associated with declines in the interest rates offered on consumer deposits. Despite the overall trend, year-to-year changes in market concen-

Table 2
Correlation Between Changes in Market Concentration[a] and Changes in Interest Rates[b]

Year	Average HHI	Average Interest Rate on MMDAs (percent)	Average Change in HHI from Previous Year (points)	Average Change in Interest Rate from Previous Year (percent)	Correlation Coefficients between the Changes in HHI and the Changes in Interest Rates
1987	1419	5.32	7.74	−.17	.012
1988	1422	5.48	1.89	.16	.042
1989	1426	5.81	.82	.33	.019
1990	1502	5.71	56.44	−.11	.050
1991	1548	4.95	29.58	−.76	.004
1992	1599	3.29	44.49	−1.66	−.070
1993	1569	2.66	−51.86	−.63	.100
1994	1634	2.79	45.14	.12	−.006
Average	1495	4.83	16.65	−.41	.004

[a]Herfindahl-Hirschman Index (HHI).
[b]Interest rates on money market deposit accounts.

tration were not correlated with changes in deposit interest rates within individual markets.

A more detailed breakdown of changes in concentration in individual markets showed that interest rates on deposits decreased more in markets where concentration increased substantially from one year to the next. All the market-years in the sample were divided into four groups according to changes in market concentration (change in HHI) from the previous year: (1) a decrease of 200 or more, (2) a decrease of less than 200, (3) an increase of less than 200, and (4) an increase of 200 or more. Table 3 reports average year-to-year changes in deposit interest rates for each group. While interest rates on deposits dropped in all groups, banks located in markets where HHI increased by 200 or more lowered their rates on deposits by more than any other group. The difference persisted regardless of whether a merger took place in the market during that year or not. These patterns indicate that a significant increase in concentration in a given market was typically associated with worse terms on consumer deposits in that market, although of course it shows nothing about causality.

Table 3 points to an important distinction, namely that between static and dynamic effects of concentration on deposit interest rates. While other studies have provided evidence that higher *levels* of market concentration are associated with worse terms on consumer deposits, high prices charged by banks (that is, low interest rates offered on bank deposits) may be also

Table 3
Average Annual Changes in Interest Rates on MMDAs for Markets Grouped by Changes in HHI

Market	Δ HHI ≤ -200[a]	$-200 < \Delta$ HHI < 0	$0 \leq \Delta$ HHI < 200	Δ HHI ≥ 200
All MSAs	−.46 (736)	−.33 (4,567)	−.27 (5,372)	−.50 (1,229)
MSAs where mergers occurred	−.29 (42)	−.35 (270)	−.31 (196)	−.51 (62)
MSAs where no mergers occurred	−.47 (694)	−.32 (4,297)	−.27 (5,176)	−.49 (1,167)

[a]Sample sizes given in parentheses.

associated with *increases* in market concentration. In our sample, banks offered lower interest rates on deposits in markets where the HHI rose noticeably than they offered in other markets.

However, market concentration could change as a result of mergers or for other reasons, such as a bank opening or closing its operations in a given market. Table 4 indicates that mergers appear to contribute to the market concentration results. The average annual change in interest rates on MMDAs for the entire sample was −0.43. By comparison, the average was −0.50 for banks that participated in a merger in their main market during the past year, −0.47 for banks located in markets where rival banks participated in a merger during the past year, and −0.41 for banks located in markets where no mergers took place during the past year (Table 4). To quantify the separate effects of bank mergers, market concentration, and bank size on bank pricing, the next section undertakes an econometric analysis of the interest rates banks pay.

Table 4
Annual Average Change in Interest Rates on MMDAs[a]

Entire sample	−.43	(19,147)
Bank participated in merger during past year	−.50	(388)
Rival banks participated in merger in bank's market during past year	−.47	(484)
No merger occurred in bank's market	−.41	(18,275)

[a]Number of observations noted in parentheses.

Econometric Analysis

Table 5 presents regression results for the two equations explaining interest rates paid on deposits. Column 1 shows results of a regression where the dependent variable is the log of the interest rate on CDs, while column 3 shows results for the log of the interest rate on MMDAs. Columns 2 and 4 report the tests for the cumulative three-year significance of each of the three types of merger variables for CD and MMDA rates, respectively, showing the sum of their coefficients and the t-statistics for the sums.

Own Mergers in the Bank's Main Market

As column 1 in Table 5 shows, a bank's own merger in its main market reduces its deposit interest rates on CDs during the first and second years of the merger. The effect during the first year is a 0.9 percent decrease in interest rates on CDs. That implies that if the rate on CDs was 5 percent before the merger, for instance, it would be 4.96 percent after the merger; similarly, for a 10 percent rate, the rate would drop to 9.91 percent. During the second year, the effect of the merger on CD rates drops to 0.6 percent. Somewhat surprisingly, in the third year the merger actually increases the rate on CDs by 1.7 percent, more than making up for the previous decreases. Thus, the combined three-year effect is slightly positive but of negligible magnitude and not significantly different from zero. For the money market funds, the effect of the merger on interest rates is negative only in the first year, reducing the rate by 0.7 percent. The effect is reversed in the second and third years, and the combined effect is, again, positive but small and not significantly different from zero.

Own Merger in Secondary Markets

For CDs, a bank's participation in a merger in one of its secondary markets increases the rate by a small amount not significantly different from zero in the first year, reduces the rate in the second year, then again increases it the third year, with the combined three-year effect very small and not significantly different from zero. For MMDAs, however, the effect is negative and significant in both the first and second years after the merger, but is reversed in the third year. The combined three-year effect of a secondary market merger is a reduction of 1.2 percent and is significant at the 10 percent level.

It seems particularly interesting that banks initially increase interest rates following the rivals' merger.

Rivals' Merger in Bank's Main Market

Perhaps the most interesting results of this study concern the effects of a merger of rivals in the bank's main market on that bank's deposit pricing. In the

Table 5

Regression Results: Effects of Mergers on Interest Rates Paid on Deposits

Dependent variable: ln (interest rates paid on deposits)

	Interest Paid on CDs		Interest Paid on MMDAs	
	(1)	(2) Cumulative Merger Effects over 3 Years	(3)	(4) Cumulative Merger Effects over 3 Years
Independent Variable				
Intercept	−4.769** (−42.22)		−4.604** (−58.39)	
Main market merger last year	−.009* (−1.65)		−.007 (−1.27)	
Main market merger 1–2 years ago	−.006 (−1.34)	.0015 (.19)	.004 (0.85)	.0009 (.11)
Main market merger 2–3 years ago	.017** (3.82)		.004 (0.94)	
Secondary market merger last year	.003 (.52)		−.016** (−3.23)	
Secondary market merger 1–2 years ago	−.013** (−2.89)	−.0002 (−.04)	−.013** (−2.94)	−.0122* (−1.91)
Secondary market merger 2–3 years ago	.010** (2.40)		.017** (3.90)	
Rival bank merger last year	.015** (2.69)		.002 (.33)	
Rival bank merger 1–2 years ago	−.020** (−3.57)	−.0253** (−4.21)	−.014** (−2.54)	−.0352** (−6.05)
Rival bank merger 2–3 years ago	−.020** (−3.94)		−.023** (−4.64)	
ln (HHI)	−.003** (−1.84)		−.012** (−7.42)	
ln (assets)	−.008** (−18.64)		−.007** (−15.29)	
ln (T-bill)	−.091** (−3.91)		−.074** (−5.12)	
ln (avg. deposit rate)	1.009** (38.04)		.984** (42.61)	
Branch limit	.007** (3.14)		−.011** (−4.94)	
R^2	.927		.895	
F	2,362		1,660	
N	17,642		18,483	

t-statistics in parentheses.

Census region, year, and interaction dummy variables were included in the regression.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level or better.

year following a rivals' merger, banks increase their deposit rates on CDs by 1.5 percent (the effect on MMDA interest rates is not significantly different from zero). However, the effect is negative and significant both for MMDAs and CDs in the subsequent two years, and the cumulative three-year effect is negative,

large in magnitude, and significant at the 1 percent level. The combined three-year effect of a rivals' merger is the lowering of deposit interest rates on CDs by 2.5 percent, and on MMDAs by 3.5 percent. This means that with an initial rate of 5 percent, the CD and MMDA rates would be lowered to 4.88 and 4.83 percent, respectively. This is a much larger decline than that following the bank's own merger, suggesting that in the long run rivals can better take advantage of market power that results from a merger of another bank in their market than from their own merger.

It seems particularly interesting that banks initially increase interest rates following the rivals' merger. One explanation of this result is that banks see a merger of their competitors as an important marketing opportunity. They try to induce the possibly dissatisfied customers of the merging institutions to switch banks by advertising their own continuity, high level of service, and (at least for now) attractive interest rates. This strategy would be particularly effective if the merged bank's service does, in fact, deteriorate. The deterioration of service can also explain why the merged banks themselves do not lower their rates more—the deterioration of service itself can be seen as a substitute for lower rates. This may be the reason why in the next two years, rivals can take advantage of the reduction in competition resulting from a merger and lower their interest rates, more than offsetting the initial benefit of the increase in rates to consumers.

Control Variables

The equations also include the natural logarithm of HHI, ln (HHI). Thus, coefficients on the merger dummy variables measure the effect of merger-induced *changes* in market concentration, holding the *level* of market concentration constant (measured by HHI). The coefficients on the level of market concentration are also statistically significant and have the expected signs. The effect is small, however. A bank located in a market where HHI is 1 percent higher offers 0.3 percent lower interest rates on CDs and 1.2 percent lower interest rates on MMDAs. Based on the 1994 average HHI levels, the average HHI for MSAs was 1,806 and for non-MSA counties 4,153 (Rhoades 1996b, p. 25). According to our estimates, the difference leads to banks located in non-MSA counties offering rates 0.24 percent lower than those offered by MSA banks for CDs, and 0.96 percent lower for MMDAs. That is, if an average rate offered by MSA banks was 5 percent, the average offered by non-MSA banks would be 4.99 percent on CDs and 4.95 on MMDAs.

Bank size was also found to affect interest rates on deposits. Larger banks offer lower rates on deposits for both CDs and MMDAs, holding the effect of mergers and market concentration constant. The average small bank in the sample has assets that are 143 times lower than those for the average large bank in the sample.[5] Our estimates suggest that interest rates offered by large banks would be 4.1 percent lower than those offered by small banks for CDs, and 3.3 percent lower for MMDAs. For a 5 percent rate offered by an average small bank, an average large bank would offer 4.96 percent on CDs and 4.97 percent on MMDAs. The difference could be caused by large banks' market power, but it could also arise if large banks offer higher service quality because of a wider scope of services and a larger number of branches. The coefficient on AVGDEP was approximately equal to 1 in all the specifications, indicating an approximately one-to-one relationship between the national average and local deposit interest rates. The effect on interest rates of state limits on branch entry is ambiguous—the coefficient on the LIMIT variable was positive in the CD interest rates regressions, but negative in the MMDA regressions. The ambiguity may result from the fact that the regressions control for Census region and year effects, and the variable is constant for a given state and year.

Size of Merging Banks

In the analysis discussed above, each merger is treated equally, regardless of the participating banks' size. It is possible, however, that large banks' mergers affect their market power and pricing differently from small banks' mergers. To test that hypothesis, the regressions were repeated allowing a different coefficient estimate on the merger variables according to the size of the bank. While coefficients on own-merger indicators varied somewhat depending on bank size, none of the coefficients were significantly different from zero and the differences between them were relatively small. (See Table 6 for the results of one specification.) Interestingly, large banks constituted the only group for which deposit interest rates de-

[5] We define small, medium, and large banks as the bottom, middle, and top thirds of the sample according to bank assets. The cutoff for small banks was below $188 million in assets, and the cutoff for large banks was above $1.6 billion. The mean value of assets for small banks was below $70 million, while the mean value of assets for large banks was above $10 billion.

clined significantly after their rivals' mergers—by 3.7 percent on CDs and by 4.8 percent on MMDAs. In contrast, the effect of rivals' mergers on small banks' CD interest rates was positive. The result indicates that small banks are more likely to try to attract new customers (or prevent existing ones from leaving) after their rivals merge. Large banks do not need to compete on the basis of price to the same extent that small banks do, because they offer greater convenience and a greater variety of services to their customers. In particular, large banks typically have more extensive branch networks and a larger number of ATMs. These features are likely to lead to a lower sensitivity to deposit rates among large bank customers.

VI. Summary and Conclusions

The empirical results presented in this article suggest that banks exercise market power in pricing money market deposits and CDs in their local markets. First, banks pay lower deposit interest rates in markets that are more concentrated. Second, deposit interest rates are lower following a bank's participation in a merger for any level of market concentration, although the cumulative three-year effects were positive and not statistically significant. Third, banks temporarily increase interest rates following a merger of their rivals in the same market, but the result is more than reversed the following year.

Rivals of a merged bank are more successful in exercising market power than the merged banks themselves.

A somewhat unexpected finding of this study is that rivals of a merged bank are more successful in exercising market power by lowering deposit rates than the merged banks themselves. However, this finding is consistent with the hypothesis that service quality deteriorates following a merger. To the extent that price and quality of service are substitutes, a deterioration of service quality may prevent the merged institution from lowering its own interest rates but allow its rivals in the same market, whose own quality has remained unchanged, to take full advantage of the reduction in competition.

Table 6
Regression Results: Effect of Mergers by Bank Size
Dependent variable: ln (interest rates paid on deposits)

Independent Variable	Interest Paid on CDs	Interest Paid on MMDAs
Intercept	−4.799**	−4.603**
	(−42.50)	(−58.54)
Small bank merger last year	−.020	−.021
	(−.82)	(−.85)
Medium bank merger last year	−.008	−.019*
	(−.83)	(−1.95)
Large bank merger last year	−.010	.000
	(−1.41)	(.04)
Small rival bank merger last year	.016**	−.011
	(2.21)	(−1.59)
Medium rival bank merger last year	.002	.010
	(.21)	(1.10)
Large rival bank merger last year	−.037**	−.048**
	(−3.70)	(−4.63)
Secondary market merger last year	.002	−.016**
	(.39)	(−3.35)
Secondary market merger 1–2 years ago	−.012**	−.009**
	(−2.75)	(−1.96)
Secondary market merger 2–3 years ago	.009**	.008**
	(2.49)	(2.32)
ln (HHI)	−.003*	−.011**
	(−1.64)	(−7.14)
ln (assets)	−.008**	−.006**
	(−17.56)	(−14.41)
ln (T-bill)	−.095**	−.072**
	(−4.10)	(−4.96)
ln (avg. deposit rate)	1.015**	.984**
	(38.31)	(42.65)
Limit	.008**	−.011**
	(3.43)	(−4.72)
R^2	.927	.894
F	2,356	1,657
N	17,642	18,483

t-statistics in parentheses.
Census region, year, and interaction dummy variables were included in the regression.
*Statistically significant at the 10 percent level.
**Statistically significant at the 5 percent level or better.

The finding that mergers have an adverse effect on consumer deposit pricing raises a question about whether antitrust enforcement has been sufficiently vigorous. Since consolidation is a continuing trend in the banking industry, this problem will remain important in the future. The effect of bank mergers on pricing deserves further analysis. In particular, the potential impact of mergers on rival banks' pricing should be taken into account. The pricing survey on which this and other studies have relied is rather limited in scope. Better pricing data would allow researchers to estimate cross-elasticities of demand for banking products and thus to define banking markets more precisely. Antitrust policy in banking is important for the nation's financial health. It deserves to be put on firmer empirical ground.

References

Amel, Dean. 1993. "State Laws Affecting Geographic Expansion of Commercial Banks." Mimeo, Board of Governors of the Federal Reserve System.

Bain, Joe S. 1951. "Relationship of Profit Rate to Industry Concentration: American Manufacturing, 1936–40." *Quarterly Journal of Economics*, vol. 65, pp. 293–324.

Berger, Allen N. 1995. "The Profit-Structure Relationship in Banking—Tests of Market-Power and Efficient-Structure Hypotheses." *Journal of Money, Credit and Banking*, vol. 27 (May), pp. 404–31.

Berger, Allen N. and Timothy H. Hannan. 1989. "The Price-Concentration Relationship in Banking." *The Review of Economics and Statistics*, vol. 71 (May), pp. 291–99.

Bresnahan, Timothy F. 1989. "Empirical Studies of Industries with Market Power." *Handbook of Industrial Organization*, vol. II, pp. 1011–57.

Calem, Paul S. and Gerald A. Carlino. 1991. "The Concentration/Conduct Relationship in Bank Deposit Markets." *The Review of Economics and Statistics*, vol. 73 (May), pp. 268–76.

Calem, Paul S. and Leonard I. Nakamura. 1995. "Branch Banking and the Geography of Bank Pricing." Finance and Economics Discussion Series Working Paper, Federal Reserve Board, Washington, DC.

Evanoff, Douglas D. and Diana L. Fortier. 1988. "Reevaluation of the Structure-Conduct-Performance Paradigm in Banking." *Journal of Financial Services Research*, vol. 1 (June), pp. 277–94.

Gilbert, R. Alton. 1984. "Bank Market Structure and Competition." *Journal of Money, Credit and Banking*, vol. 23 (November), pp. 617–45.

Hannan, Timothy H. 1991. "Bank Commercial Loan Markets and the Role of Market Structure: Evidence from Surveys of Commercial Lending." *Journal of Banking and Finance*, vol. 15 (February), pp. 133–49.

Hannan, Timothy H. and Allen N. Berger. 1991. "The Rigidity of Prices: Evidence from the Banking Industry." *The American Economic Review*, vol. 81 (September), pp. 938–45.

Hannan, Timothy H. and Robin Prager. 1996. "Do Substantial Horizontal Mergers Generate Significant Price Effects? Evidence from the Banking Industry." Mimeo, Board of Governors of the Federal Reserve System.

Neumark, David and Steven A. Sharpe. 1992. "Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits." *Quarterly Journal of Economics*, vol. 107, no. 2, pp. 657–80.

Rhoades, Stephen A. 1996a. "Competition and Bank Mergers: Directions for Analysis from Available Evidence." *The Antitrust Bulletin* (Summer), pp. 339–64.

———. 1996b. "Bank Mergers and Industrywide Structure, 1980–94." Staff Study No. 169, Board of Governors of the Federal Reserve System (January).

Smirlock, Michael. 1985. "Evidence on the (Non) Relationship between Concentration and Profitability in Banking." *Journal of Money, Credit and Banking*, vol. 17, no. 1 (February), pp. 69–83.