

# Bank Merger Motivations: A Review of the Evidence and an Examination of Key Target Bank Characteristics

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Understanding the nature of the gains and losses resulting from bank mergers is becoming increasingly important in the United States. As Peter S. Rose (1989) reports, the average annual number of bank mergers in the 1980s is already triple that of the 1960s and double the average of the 1970s. These transactions must provide some benefit to the managers of the acquiring banks, or these managers would not make merger offers. Likewise, shareholders and managers of target banks must also benefit, or the offers would not be accepted. Whether the shareholders of acquiring banks and the public also gain from these mergers is less clear. Theoretically, bank managers are the agents of the bank's shareholders and, thus, should undertake only those mergers that benefit owners of the company's equities. However, regulatory limitations on bank takeovers may weaken the market for bank control and permit the man-

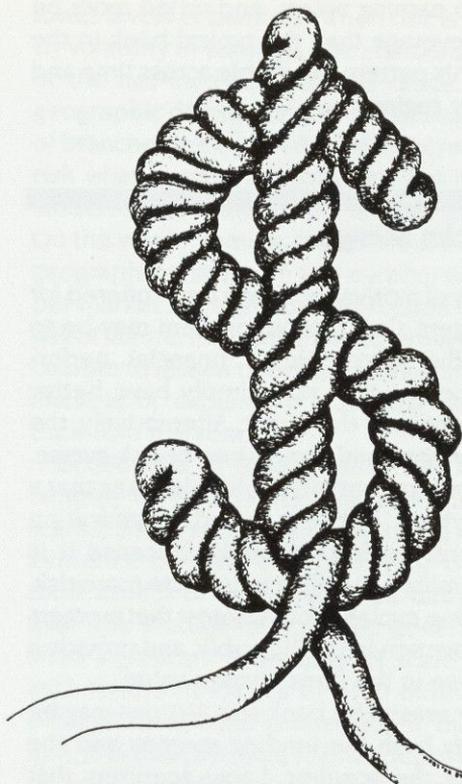
agers of some acquiring institutions to retain control of their banks even if their merger strategies are contrary to shareholders' interests. While the public can clearly benefit from mergers that enhance bank operating efficiency, the public interest could possibly be harmed, for example, by mergers that reduce competition among financial services providers.

One way to gain insight into the nature of the potential gains and losses associated with bank mergers is to analyze the managerial motives behind acquisitions. Knowing why mergers take place should help in analyzing their actual effect by focusing attention on those areas where bank managers believe the most important changes will occur. To determine what empirical support exists for the most commonly cited explanations for bank mergers, this article reviews the bank structure and performance literature that is most directly related to bank mergers. Existing research tends to support the hypothesis that acquirers are motivated by a desire to diversify their funding sources and earnings, and that the potential to gain from economies of scale often exists. However, the literature also

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*The authors' analysis of the financial profiles of 559 bank mergers during the period 1981-86 finds that the most valued characteristics in target banks include above-average profitability, faster deposit and asset growth, a higher ratio of loans to earning assets, and judicious use of financial leverage. These results are consistent with a survey of prior studies in suggesting that a variety of motives exist for bank mergers.*



suggests that, in many cases, acquirers follow strategies that do not maximize shareholders' wealth.

Of the many questions addressed in the bank merger literature in recent years, no issue has been more intriguing to bank analysts than ascertaining which financial characteristics in potential merger partners are most highly valued by acquiring banks. This article also presents original research that examines the financial characteristics of the target banks in 559 U.S. bank mergers during the period 1981 through 1986. Using the multivariate statistical technique of cluster analysis—which investigates the structure of a data set in cases where there is a lack of a complete understanding of the various forces shaping the data—the examination sought to determine if a strategic profile exists for target banks. This pattern was defined in terms of financial characteristics highly valued by acquiring banks and systematically associated with attractive purchase prices. When determined, the profile was examined for stability across geographic regions and across time.

The research reported in this article also examines the financial characteristics of the acquiring banks to see if a strategic acquirer profile could be identified and, if so, whether this profile is also stable across geographic regions and time. Unfortunately, the results of the analysis of acquirer banks did not reveal any strong systematic pattern. Thus, the following discussion concentrates on the results obtained in the analysis of the target banks. Although it is reasonable to expect that bank strategic profiles will be independent of geographic location, regional differences in banking markets and regulation could render certain target bank characteristics more highly valued in one geographic region than another, at least in the short run.

The cluster analysis strongly suggests that a definite strategic profile of highly valued financial characteristics of merger targets existed during the designated period. As will be shown, target banks with the largest mean purchase-price-to-book-equity ratios were more profitable, had faster premerger growth in core deposits and total assets, showed a higher ratio

of loans to earning assets, and relied more on financial leverage than the typical bank in the sample. This pattern was stable across time and geographic regions.

## Why Banks Merge

A variety of motivations have been offered for bank mergers. One reason for them may be to improve the target bank's financial performance. The acquirer may simply have better management than the target. Alternatively, the latter's managers and owners may be risk-averse, turning down potentially profitable loans that a larger, perhaps publicly traded, organization might more comfortably make because it is more diversified or willing to tolerate more risk. Both of these explanations suggest that mergers may improve service to the public and provide a net increase in the firms' market value.

Another reason for bank acquisitions may be to diversify both the funding sources and the earnings of the acquirer. Large acquirers that rely on purchased funds may be especially interested in buying banks that have significant core deposit funding bases. Although the deregulation of deposit interest rates has reduced the cost advantages of relying on core deposits, they are still highly valued because of their greater stability relative to purchased funds. Similarly, diversification of earnings, both geographically and by customer type, can reduce the overall credit riskiness of a bank's asset portfolio.

Shareholders may gain from a bank's diversification of both its funding sources and its loan portfolio. Banks that increase their reliance on core deposits are less likely to experience a disruptive bank run, which could terminate the option value of a bank's stock. Whether shareholders benefit from the diversification of a bank's loan portfolio depends on how diversified the individual shareholders are.<sup>1</sup> Those who maintain well-diversified portfolios or who own proportionate shares of individual banks that are combining may not be significantly affected by mergers. However, investors who own stock only in the acquirer and whose portfolios are not otherwise well diversified may benefit from such a risk-reducing merger.

Whether the public gains from the diversification associated with mergers is debatable. Regulators have historically taken the view that the banking system would be more stable if firms relied more on core deposits and less on purchased funds. However, an argument can be made that the tendency of purchased funds to be withdrawn when a bank encounters financial problems serves as an important source of market discipline. Thus, although banks that rely on core deposits may be more stable after the onset of financial problems, these firms can also follow riskier strategies than banks which depend on purchased funds. Additionally, industry concentration attendant upon mergers may pose other dangers. Although the benefits of asset diversification in reducing an individual bank's credit riskiness are undisputed, a banking system with a few large organizations may be less stable than one with more, smaller organizations, according to Sherrill Shaffer (1989). Losses that occur at one bank would not cause another independent bank to fail but could cause their joint failure if the two were merged.<sup>2</sup>

A third reason for bank mergers is that some acquirers may perceive gains solely from becoming a larger organization and being able to attain economies of scale. Another reason for expansion may be to become, as the current parlance has it, "too big to fail" or "too big to be acquired." For banks that are "too big to fail," the Federal Deposit Insurance Corporation (FDIC) is virtually certain to guarantee all deposits in the event of financial problems because of the risk presented to the banking system. Banks can also reduce the probability of receiving a hostile takeover offer by increasing their market capitalization above that of potential acquirers. Another important factor in bank size is that larger banks may pay higher salaries or provide more managerial perquisites.

Increased economies of scale can benefit both the general public and bank shareholders. The latter can benefit from a bank's becoming "too big to fail" insofar as depositors demand a lower risk premium; however, this gain comes at the public's expense through greater risk-bearing by the FDIC.

Both the public and bank shareholders can suffer from mergers that are motivated by a desire to become "too large to be acquired" because such transactions may reduce the over-

all efficiency of the banking system. The public and shareholders may also lose in mergers motivated by managers' desire for higher salaries and more perks. Unfortunately, distinguishing empirically among these motives for increased size is difficult, partly because the analysis of the targets' size cannot necessarily be used to support one explanation over another. An acquirer can obtain the same results with one big merger or several small mergers.

A fourth reason for taking over another bank is the acquirer's desire to increase its market power and reduce competition. If a less competitive environment translates into higher profits or reduced risk for the acquirers, their shareholders can benefit.<sup>3</sup> However, these gains come at the expense of the public, which must pay higher prices for bank services.

Thus, mergers may occur to improve the financial performance of the target, to diversify the acquirer, to provide the benefits associated with larger size, or to increase the acquirer's market power. These various explanations have different implications for both social welfare and the acquirer's shareholders.

## Existing Evidence about Bank Mergers

**The Effect of Size on Bank Risk.** The notion suggesting that larger, more diversified banks are less likely to fail appears to be supported by evidence dating as far back as the 1920s and 1930s. Of the many banks that failed in this period, small banks failed at a disproportionately high rate. More recent evidence on the relationship between size and risk is provided in a paper by Nellie Liang and Stephen A. Rhoades (1988). They studied several measures of bank risk relative to the firm's total assets, geographic diversification, and average number of branches per market, as well as a series of other control variables.<sup>4</sup> When risk is measured by a bank's capital-to-assets ratio, the researchers found a positive and statistically significant relationship between risk and bank size—that is, the larger banks typically have lower capital-to-asset ratios. In contrast, increases in geographic dispersion and in the number of branches per market are associated with statistically significant,

lower levels of bank risk when risk is measured by volatility in earnings (the standard deviation of the net-income-to-assets ratio). However, geographic dispersion and the average number of branches are associated with increased bank risk when measured using the net-income-to-assets ratio and the capital-to-total-assets ratio. On the whole, though, the effect of increases in geographic dispersion and number of branches per market is a significant reduction in a bank's risk of failure, implying that acquiring banks may be able to lessen their risk by entering into new markets or expanding branching networks in their own markets.

**Economies of Scale.** Jeffrey A. Clark (1988) recently surveyed a number of economies-of-scale studies, virtually all of which, he notes, find evidence of scale economies for banks with total assets of less than \$100 million. However, the studies he surveyed generally fail to show significant economies of scale for banks with assets in excess of \$100 million. These economies-of-scale studies define the relevant unit of production as a loan or deposit account. In order to implement this definition of production, the studies use the Federal Reserve's Functional Cost Analysis (FCA) data set, which provides the most comprehensive sample of banks for which the number of loan and deposit accounts are available. However, bank involvement in the FCA program is voluntary, and many banks do not participate. In particular, the FCA sample has too few banks with assets in excess of \$1 billion to estimate their cost function reliably. Thus, studies based on FCA data provide little information about the cost structure of larger banks.

An alternative method of examining bank production efficiency is through the intermediation approach, under which the relevant unit of output is defined in terms of dollars. By obviating the need to obtain data on the number of accounts, and given the comprehensive financial reporting that regulators require, researchers can select any domestic banks for inclusion in the sample. One of the authors of this article, William C. Hunter, and Stephen G. Timme (1988, 1989) analyzed economies of scale at very large banks using the intermediation approach. Their 1989 paper found significant economies of scale for banks with total assets in the \$800 million to \$5 billion range, with constant or slightly in-

creasing costs for larger banks. Although no research to date examines the scale economy question exclusively for banks in the \$100 million to \$800 million range, the evidence points to either constant costs or slight diseconomies of scale for these institutions.

Studies by Shaffer and Edmond David (1986) as well as Shaffer (1988) have examined economies of scale in large U.S. commercial banks. The 1988 study finds that, although large banks have statistically small scale economies, they can nevertheless be quite important economically.

Although empirical studies of scale economies in banking are extremely sensitive to researchers' statistical methodologies and data definitions, the bulk of the evidence suggests that, in most cases, the desire to improve production efficiencies through economies of scale appears to be a valid motivation for merging, especially for banks with total assets below \$5 billion. However, on the basis of this evidence, it would not necessarily be irrational for larger banks, say in the \$5 billion range for total assets, to make a series of acquisitions of smaller banks. Costs have been shown to be relatively constant for asset sizes up to about \$25 billion. In addition, since most scale economies studies are unable to measure precisely the impact on bank production of such factors as increased consumer convenience and enhanced diversification, mergers between extremely large banking organizations may be justified on the basis of these variables.

**Market Structure.** Aside from the effect of bank size on riskiness and efficiency, another consideration in understanding merger motivations is the effect on banks' markets, particularly whether banks in more concentrated markets—those with relatively fewer institutions—were more profitable. The question of whether concentrated banking markets are less competitive than unconcentrated ones has received considerable attention.<sup>5</sup> However, many of the early studies of this "structure-performance hypothesis" are severely criticized by two researchers in the field, R. Alton Gilbert (1984) and Michael Smirlock (1985). One of their principal criticisms is that the studies assumed, without providing adequate support, that higher concentration caused greater profitability. Harold Demsetz (1973, 1974) argues that more efficient banks

would be more profitable and would be able to gain market share at the expense of less efficient banks. This efficient-market-structure hypothesis claims that a positive relationship between concentration and profits merely implies that a large efficiency gap exists between different banks in the same market.

Several studies explore the efficient-market-structure hypothesis. Smirlock, Gary Whalen (1987), and Douglas D. Evanoff and Diana Fortier (1988) used bank market share as a proxy for bank efficiency. All three studies found that market share has a strong positive effect on profitability. However, both Smirlock and Whalen concluded that concentration ratios are unrelated to profitability after controlling for market share, whereas Evanoff and Fortier uncover only

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limited evidence that concentration has an effect on profitability.

William G. Shepard (1986) criticizes the efficiency proxy mentioned above and argues that market share could instead be a measure of market power. Smirlock, Thomas Gilligan, and William Marshall (1986) respond that the relationship between market share and market power is ambiguous in theory and, thus, Shepard's criticism is not necessarily valid. Allen N. Berger and Timothy H. Hannan (1989) suggest that analysis of pricing data may shed more light on the relationship between market share and market power than would an analysis of profitability data. Concentration, they argue, should have an unambiguously positive effect on prices charged (or a negative effect on deposit rates) if the structure-performance hypothesis is correct, and should have an insignificant or negative effect on prices (a positive effect on deposit

rates) if the efficient-market-structure hypothesis is correct.<sup>6</sup> Berger and Hannan found a negative relationship between concentration and the rate paid on bank deposits between September 1983 and December 1985, which supports the argument that higher concentration causes a reduction in competition that in turn boosts bank profitability.

Berger and Hannan's results are supported by two other studies. Research by Alan J. Daskin and John D. Wolken (1989) produced a significant positive relationship between bank concentration and the rates charged for commercial and industrial loans. Randall J. Pozdena (1986) attacks the problem from a different angle, looking at the connection between market concentration and the entry of new banks and

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branches. If the structure-performance hypothesis is correct, high profits in concentrated markets may attract competition. However, if the efficient-market-structure hypothesis is correct, the relationship between concentration and market entry should be insignificant or negative since new competitors would have to compete with large, very efficient banks. Pozdena found a positive and significant relationship between market concentration and the entry of new banks and branches, thus supporting the structure-performance hypothesis.

Although the evidence appears to indicate a relationship between structure and performance, several recent studies highlight the nature of market factors other than concentration. Evanoff and Fortier determined that a significant positive relationship exists between concentration and profitability only in unit banking states. Jim Burke and Rhoades (1987)

concluded that small banks in rural markets were significantly more profitable than comparably sized banks in urban markets (metropolitan statistical areas) between 1980 and 1984. Tony Cynak and Rhoades (1989) found that banks in markets with three or fewer organizations are substantially more profitable than banks in markets with four or more organizations.

#### **Characteristics of Targets and Acquirers.**

Analysis of the premerger characteristics of target and acquiring banks may provide information on several of the popular explanations for bank mergers. Five studies are of special interest.<sup>7</sup> Hannan and Rhoades (1987) analyzed the characteristics associated with being a target bank in Texas between 1970 and 1982.<sup>8</sup> Rose (1989) examines U.S. bank mergers from 1970 through 1985. His group includes 224 acquirers and 230 targets that could be successfully paired with comparably sized banks in the same county or standard metropolitan statistical area; holding company acquisitions appear to be excluded from the sample. Although the analysis of the performance of targets and acquirers is not the focus of their study, Benton E. Gup, David C. Cheng, Larry D. Wall (one of the authors of this article), and Kartono Liano (1989) provide descriptive data on 559 mergers that occurred between 1981 and July 1986.<sup>9</sup> One important limitation of this analysis of descriptive data is that statistical tests of the differences in means are not provided for the acquirers and targets. Randolph P. Beatty, Anthony M. Santomero, and Smirlock (1987) analyzed 149 matched target and acquiring banks covering acquisitions from 1984 and the first three quarters of 1985. They provided statistical tests of significant differences in key financial ratios for targets and acquirers using 1982 financial data. Rhoades (1985a) examined the size and location of all acquisitions in the United States between 1960 and 1982.

Analysis of the financial performance of the target and acquiring banks prior to acquisition provides mixed evidence on the hypothesis that mergers are undertaken to improve the efficiency of poorly managed institutions. Rose (1989) found that target banks were less profitable and less efficient in terms of dollars of assets per employee than were their acquirers. Beatty, Santomero, and Smirlock concluded

that acquirers have a higher return on equity, but the researchers suggest that this better performance may be due to generally higher risk profiles. Hannan and Rhoades, in their study of Texas banks, found that profitability was not an important determinant of whether a bank would be acquired. Additionally, Gup, Cheng, Wall, and Liano, using a larger and more recent sample, discovered that targets are not necessarily less profitable than acquirers if profitability is measured by return on assets.

Evidence of the relationship between the probability of being an acquisition target and the acquirer's potential to improve the target's performance by expanding its loan portfolio is not conclusive. Hannan and Rhoades found that the loan-to-asset ratio had an insignificant effect on the probability of being acquired. However, Rose (1989) showed that target banks had significantly lower loan-to-asset ratios than acquiring banks. Gup, Cheng, Wall, and Liano determined that targets have a retail-loan-to-total-loan ratio that is higher than that of acquiring banks.

According to Beatty, Santomero, and Smirlock, acquirers have lower percentages of U.S. Treasury securities, a lower proportion of investment securities, higher percentages of net loans, and higher debt-to-equity ratios. Gup, Cheng, Wall, and Liano found that acquirers experienced somewhat greater core deposit growth rates, but these researchers do not directly examine the level of core deposits. None of the five studies addressed specifically the issue of earnings diversification.

Rhoades (1985a) found that the overwhelming majority of banks acquired between 1960 and 1982 had assets of \$50 million or less. The number of targets with assets under \$50 million represent 84 percent of the nearly 4,400 banks sampled. The average size of bank mergers may have increased over time as bank asset sizes increased with inflation. However, 275 of the 422 targets in 1982 had assets of less than \$50 million and only 3 had assets of \$1 billion or more. These findings are consistent with the hypothesis that mergers are sought to achieve economies of scale in that they may lead to greater efficiencies in the target. The results also suggest that attempts to become "too big to fail" were not a significant factor in most mergers prior to 1983.

According to Hannan and Rhoades, concentration had a significantly negative effect on intramarket acquisitions. However, this result should not necessarily be taken to indicate that acquirers place little value on opportunities to increase concentration. The researchers' study suggests that antitrust limitations on bank mergers would discourage takeovers in highly concentrated markets.

**Determinants of the Prices Paid in Bank Mergers.** Several studies provide insight into the characteristics that acquirers value most in merger partners by examining the determinants of the ratio of the purchase price to book value of the target's equity. Rhoades (1987) analyzed the determinants of the purchase price in 1,835 mergers between 1973 and 1985. Donald R. Fraser and James W. Kolari (1987) examined

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pricing of 217 mergers in 1985. Beatty, Santomero, and Smirlock studied pricing in 264 bank mergers between the beginning of 1984 and the third quarter of 1985. Robert J. Rogowski and Donald G. Simonson (1989) looked at pricing in a sample of 168 mergers in selected states during the 1980s. Cheng, Gup, and Wall (1989) examine pricing for 135 mergers in selected southeastern states. The authors of this article also have a study in progress that examines 61 mergers between December 1981 and July 1986 where market-value data are available for both target and acquirer.<sup>10</sup>

The studies of purchase price provide little evidence to support the notion that acquirers engage in mergers with the express intention of improving the target's financial performance. One way of examining this issue is to determine the relationship between the price paid and the

target's profitability. Available evidence indicates that the financial performance of the target is not consistently related to its purchase price. For example, Rogowski and Simonson, as well as Rhoades (1987), failed to find a consistently significant and positive relationship, while such a linkage was indicated by Fraser and Kolari; Beatty, Santomero, and Smirlock; and Cheng, Gup, and Wall. If one interprets this group of findings as indicating no relationship between premerger profits and the purchase price, one could speculate that acquirers are looking to the target's postmerger profitability, which is unrelated to its premerger profits. This interpretation suggests that acquirers are planning on significantly changing the profitability of the target. However, even if the empirical evidence is accepted as supporting a positive rela-

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tionship between purchase price and profits, this evidence does not necessarily preclude the possibility that acquirers expect to improve the target's management. Premerger profitability may be positively correlated with postmerger profitability even if the acquirer expects to improve the target's management.

Another method of analyzing the acquirer's potential to improve the efficiency of the target would be to look at how efficient the acquirer's operations are. Acquiring banks with high profitability and high market-to-book-value ratios may be considered to have relatively more efficient management. Cheng, Gup, and Wall found that the market-to-book ratios of acquirers have a significantly positive effect on the purchase price but that the acquirer's profitability has a negative effect. The implications of these findings are not clear.

The studies also yield conflicting results on the ability of acquirers to adopt more aggressive loan policies. The research of Rogowski and Simonson indicated a significantly positive relationship between the loan-to-earning-asset ratio and the purchase-price ratio, whereas Beatty, Santomero, and Smirlock found a negative relationship.

Preliminary results of a study by the authors of this article support the hypothesis that potential diversification of the acquirer's earning assets has a significantly positive effect on the purchase price. The research found that the target's variance of return on assets and the covariance between the target and the acquirer's return on assets have a significantly negative effect on purchase price. The study also concluded that the acquirer's variance of return on assets has a significantly positive effect on purchase price.

Cheng, Gup, and Wall provide some support for the hypothesis that acquirers are seeking more core deposits. Their research revealed a positive relationship between the core deposit growth rate of the target and the purchase price.<sup>11</sup> Two studies support the hypothesis that size advantages may influence merger decisions. Hypothesizing that the acquirer's ability to add new services to a target is a positive function of the ratio of the acquirer's total assets to the target's total assets, Rogowski and Simonson found a significantly positive relationship, which is supported by Cheng, Gup, and Wall.<sup>12</sup>

Conflicting results are obtained for the effect of concentration on merger pricing. Studies by Rhoades (1987) and Rogowski and Simonson indicated that concentration had an insignificant effect on purchase price. On the other hand, Beatty, Santomero, and Smirlock found a significantly positive relationship.

**Effect of Mergers on Bank Shareholders.** In addition to studies of the characteristics of merging firms and research regarding the prices paid in mergers, numerous tests examine the change in the acquirer's stock-market valuation after the merger announcement. If acquiring banks are maximizing shareholder values and shareholders are acting in a rational manner, the acquirer's takeover announcement should yield stock returns significantly in excess of expected returns (positive abnormal returns) on the day of the announcement. If acquirers are maximizing

management's interest at the expense of shareholders, abnormal returns should be significantly negative. These studies could also be interpreted as offering evidence as to whether the mergers provide gains to the combined organizations. However, the presence or absence of other gains can be masked by the target's purchase price. For example, negative abnormal stock returns for the acquiring organization do not necessarily imply that the merger will decrease or merely maintain efficiency. The gains resulting from improved efficiency could be more than offset by the excessive purchase price paid by the acquirer.

Several studies have examined the stock market's reaction to the acquisition of nonfailing banks. A.S. Desai and R.D. Stover (1985) examined 18 bank and nonbank mergers between 1976 and 1982 and determined that acquirers earn significantly positive abnormal returns. Walter P. Neely (1987), on the other hand, looked at 26 mergers occurring between 1979 and 1985 and found that acquirers earned significantly negative abnormal returns.

Jack W. Thrifts and Kevin P. Scanlon (1987), analyzing 17 interstate acquisitions, determined that acquirers of large institutions—that is, those whose assets amounted to more than 20 percent of the acquirers'—experienced insignificant abnormal returns but that acquirers of small targets (those whose assets were less than 20 percent of the acquirers') realized significantly negative abnormal returns. Thrifts and Scanlon's conclusions are interesting when combined with the finding that prices paid for targets are a positive function of the ratio of acquirer-to-target total assets. The implication of these results is that acquirers may be overpaying for their relatively small acquisitions.

David A. Dubofsky and Fraser (1989) examined 101 mergers from 1973 through 1983 and reported significantly positive abnormal returns prior to 1981 but significantly negative abnormal returns thereafter. Wall and Gup (1989), studying 23 mergers between June 1981 and December 1983, found significantly negative abnormal returns during the announcement week.

Hannan and Wolken (1989) have extended prior studies to consider the target's abnormal returns, the acquirer's abnormal returns, and the combined value of both of these amounts for a selected set of mergers in 1982 through

1987. The study finds statistically significant positive abnormal returns for targets and significantly negative abnormal returns for acquirers, but their combined abnormal returns are insignificant. The study concludes that no available evidence shows that bank mergers produce synergies or other types of gains. However, the conclusion of no synergistic gains depends on the implicit assumption that the target bank's price prior to the merger announcement is solely a function of the bank's stand-alone value. If the price of the target exceeded its stand-alone value due to expectations that the target would be purchased at a premium, then measured abnormal returns may underestimate the gains produced by the merger.

**Summary of Existing Studies.** The various studies surveyed in this article yield some insights into the possible motives for bank mergers. The research produced results consistent with the following:

- acquiring banks may be able to realize economies of scale, at least to the extent of improving the target's efficiency;
- banks may be able to boost their profitability by increasing market concentration; and
- acquiring bank managers do not always follow a shareholder-wealth-maximizing strategy in their acquisitions policy.

Also, the types of target banks likely to attract the highest purchase prices are those whose core deposits are growing rapidly and whose portfolios offer greater potential for reducing the acquirer's risk. A clear positive relationship is also apparent between the purchase price and the ratio of the target's assets to those of the acquirer. The larger this ratio, the higher the price paid. However, stock market reactions suggest that banks are overpaying for small merger partners. The acquisition of core deposits may be a motivation for merger activity, though this hypothesis was not directly tested.

Some research led to mixed results on the matter of bank acquisitions and the purchase prices paid in those transactions. Whether acquiring banks enhance the target's profitability is unclear, as is the evidence that acquirers seek to expand the target's lending activity. In addition, research does not show conclusively that an acquirer's ability to add services to a target is a positive function of the ratio

of the target's assets to the acquirer's. Examinations of purchase prices yield mixed results as to whether one motivation to engage in merger activity is the acquirer's desire to increase market concentration.

Research has also indicated that several popular hypotheses lack empirical support. One is that targets are poorly managed and that the acquirer will improve the situation. Another is that the probability of a bank's being acquired is related to its profitability relative to its acquirer: target banks' profitability is not unambiguously less than that of acquirers.

Overall, the literature yields mixed or negative evidence on several merger hypotheses, owing in part to the methodologies employed in these studies. While most research treats bank mergers as homogenous events, different mergers may be motivated by a variety of different goals. The following section of this article recognizes that not all takeovers and mergers are necessarily motivated by the same factors and that actual bank merger and acquisition decisions are the result of a complex multidimensional process that analysts are only beginning to comprehend.

## An Examination of Key Target Bank Characteristics

**Methodology.** This section evaluates the characteristics that acquiring banks seem to value most highly in merger partners. As should be clear from the review of the bank mergers literature, the economic forces that lead banks to become involved in merger activities are part of a complex process. While researchers know a great deal about the factors and processes that influence a bank's decision to become involved in a merger, this knowledge is in no way complete. Thus, a statistical analysis of the merger data set using cluster analysis, an atheoretical methodology, may provide valuable insights into the acquisition process and the financial characteristics acquirers appear to value most in takeover decisions.

A complete description of the cluster analysis technique is beyond the scope of this article; the interested reader should refer to the detailed exposition of clustering techniques in

John A. Hartigan (1975). In simple terms, cluster analysis belongs to a class of statistical procedures that search a data set and attempt to find simpler representations of the underlying characteristics of the data. Cluster analysis looks for interactions among variables by forming clusters or groups of variables on the basis of their statistical similarity. Regarding the analysis performed in this article, the cluster technique can be thought of as a statistical procedure designed to categorize or assign banks into groups based on the criterion that the members of the group are most alike in terms of their underlying characteristics, where they are taken as a set instead of individually.<sup>13</sup>

The analysis presented here is similar to that contained in Gup, Cheng, Wall, and Liano. Both studies utilize the same basic data set and both examine regional differences in bank characteristics. However, unlike Gup, Cheng, Wall, and Liano, this study does not evaluate the marginal contribution of acquirer and target bank characteristics to the purchase-price-to-book-value-of-equity ratio of the target in a merger, holding other factors constant. Instead, this analysis attempts to delineate the set of characteristics which—when taken as a whole, allowing all factors to vary—are associated with higher purchase-price-to-book-value-of-equity ratios of target banks in mergers. That is, the research presented here attempts to identify the set of financial characteristics that emerge strategically from bank merger and acquisition decisions. Thus, in principle, the clustering procedure should shed light on the optimal mix of the key financial characteristics valued highly by acquiring banks and that tend to be systematically associated with attractive acquisition prices. In applying cluster analysis directly to bank characteristics, the data are allowed to define any strategic profiles that might exist over five possible groupings.

**Sample and Data Sources.** The sample consists of 559 U.S. bank mergers that took place from 1981 through 1986. Information on these mergers was obtained from various issues of *MergerWatch* published by Cates Consulting Analysts, Incorporated. *MergerWatch* compiles selected financial data on all bank mergers in the United States where the acquiring bank has total assets of \$100 million or more and the target bank has total assets of \$25 million or

more. Based on publicly available bank merger data, the *MergerWatch* reports captured approximately 92 percent of all acquiring banks and 30 percent of all target banks during the 1981-86 period.

The *MergerWatch* data base provides a host of financial and accounting variables on the banks involved in each merger. Data on the terms of the merger, the costs to the acquirer, and the benefits to the target are included. In addition, detailed financial and accounting data for both the acquirer and target banks are presented. In addition to nonfinancial data, the statistics include return on assets; dividend payout ratios; and past five-year growth rates of assets, deposits, income, and equity. To be included in the sample the merging banks had to be in the *MergerWatch* data base from its inception through July 1986 and had to have a complete set of merger-related data.

For each target bank in the sample, the following variables were examined: the ratio of the purchase price paid in the merger to the book value of equity of the target; the ratios of book-equity capital to total assets, retail loans to total loans (retail-loan mix), loans to earning assets, and net income after taxes to book equity (ROE); the five-year growth rate in total assets; and the five-year growth rate in core deposits.

The mergers in the sample were classified into six geographic subregions: Central (Illinois, Indiana, Kentucky, Michigan, Ohio, and Wisconsin); Northeast (Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Puerto Rico, Rhode Island, and Vermont); Southeast (Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia); Midwest (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota); West (Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming); and Southwest (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas). To obtain a sufficient number of mergers for the last three regions listed above, this article aggregates the Midwest, Southwest, and West regions into a single West subregion.

**Empirical Findings.** Before describing the findings of this research, it should be noted that one shortcoming associated with cluster analy-

sis and related procedures is that it is generally not possible to present a robust overall summary statistical measure reflecting the goodness of fit of these models as is the case with other statistical procedures like regression analysis.<sup>14</sup> As a consequence, this study compares the percentage differences between the means of the variables examined for the target banks in the clusters with the largest purchase-price-to-book-value-of-equity ratios with those of the other clusters. In order to identify any significant regional differences, this comparison was also conducted on a regional basis for the clusters with the largest purchase-price-to-book-value ratios. Questions regarding the stability of cluster profiles were addressed by conducting an annual comparison of cluster profiles over the 1981-86 period.

Table I presents the means and standard deviations of the variables used in the empirical analysis for the entire sample (the national sample) and for the four geographic subregions. As can be seen in that table, the mean purchase-price-to-book-value-of-equity ratio was the highest for mergers in the Southeast subregion and lowest in the Central subregion. The average purchase-price-to-book ratio in southeastern acquisitions over the 1981-86 period was about 14 percent higher than that of the national sample and about 32 percent higher than that associated with mergers in the Central subregion. Banks in the West subregion enjoyed the fastest rates of growth in both total assets and core deposits over the five years prior to being acquired. The five-year growth rate in these banks' total assets exceeded the average for the national sample by 36 percent, and their growth rate in core deposits outpaced the national sample average by 22 percent. Target banks from the Southeast subregion exhibited the second-fastest rates of growth in total assets and core deposits over the sample period, while targets from the Central subregion posted the slowest rates of growth.

In terms of profitability, as measured by return on equity, target banks located in the West subregion posted the highest return, 16.3 percent, while the sample banks from the Central subregion had the lowest return on equity, 12.4 percent.

Table I also reveals that target banks from the Southeast subregion were the best capitalized,

**Table 1.**  
**Means of Sample Data, 1981-86**  
*(standard deviations in parentheses)*

Variable	National	Northeast	Southeast	Central	West
Purchase Price to Book Ratio	1.67 (0.55)	1.57 (0.58)	1.90 (0.51)	1.44 (0.42)	1.79 (0.58)
Equity to Assets	7.90 (1.91)	7.70 (2.13)	8.40 (1.85)	8.00 (1.84)	7.30 (1.51)
Core Deposit Growth	10.60 (6.33)	9.00 (5.15)	12.60 (6.53)	8.40 (4.79)	12.90 (7.85)
Retail Loan Mix	54.10 (16.14)	57.90 (15.14)	55.70 (15.56)	56.60 (14.07)	41.00 (15.59)
Loans to Earning Assets	59.60 (10.70)	62.10 (10.33)	57.30 (11.30)	57.00 (9.75)	64.10 (9.15)
Asset Growth	11.50 (6.73)	9.50 (4.65)	13.30 (6.59)	8.90 (4.55)	15.60 (9.39)
Return on Equity	14.10 (4.00)	13.20 (3.65)	15.10 (4.05)	12.40 (2.77)	16.30 (4.73)
Number of Observations	559	152	161	155	91

Source: Calculated at the Federal Reserve Bank of Atlanta from data compiled by *MergerWatch*, 1981-86.

with an average equity-to-assets ratio of 8.4 percent, while the banks from the West subregion were the most leveraged (equity-to-assets ratio of 7.3 percent). In terms of portfolio mix, target banks from the West subregion had the largest percentage of earning assets in the form of loans but also had the smallest proportion of these loans in the retail category. In contrast, target banks from the Central subregion had the smallest percentage of earning assets in the form of loans, of which close to 57 percent were in the retail category.

To determine whether a strategic target bank profile existed during the period under study, a cluster analysis was performed on the sample banks based on a maximum of five permissible clusters.<sup>15</sup> The analysis was conducted for each of the four geographical subregions. The mean values and standard deviations for each of the financial variables included in the analysis are given in Table 2.

An examination of Table 2 suggests that a definite and stable strategic profile existed for the cluster groups with the largest mean purchase-price-to-book ratios. In each of the subregions, the top-ranked cluster with respect to this ratio (cluster 4 in the Central subregion

and cluster 1 in each of the three other subregions) exhibited higher profitability as measured by return on equity, faster preacquisition growth—measured by average annual growth rates in core deposits and total assets over the five years immediately preceding acquisition—and more leverage (measured by the ratio of equity capital to assets) than the banks making up the other clusters.

A comparison of percentage differences in cluster means shows that the purchase-price-to-book ratio of the top-ranked cluster in each subregion was on average about 13 percent higher than that of the next-highest-ranked cluster in each subregion and about 33 percent higher than the lowest-ranked cluster.<sup>16</sup> In terms of profitability, the top-ranked cluster in each subregion posted mean return-on-equity ratios that were on average 14 percent higher than the mean of the next-highest-ranked cluster and 23 percent higher than the mean of the lowest-ranked cluster. The mean core deposit growth at the top-ranked cluster in each subregion was on average 107 percent higher than the mean associated with the next-highest-ranked cluster and 149 percent greater than the mean of the lowest-ranked cluster. In all sub-

**Table 2.**  
**Target Bank Cluster Means by Region, 1981-86**  
*(standard deviations in parentheses)*

Cluster	Number of Members	Purchase Price to Book	Equity to Assets	Core Deposit Growth	Retail Loan Mix	Loans to Earning Assets	Asset Growth	Return on Equity
<b>Panel A: Central</b>								
1	7	1.44 (0.39)	10.60 (3.06)	8.60 (3.30)	61.80 (9.92)	30.00 (9.16)	9.90 (3.20)	13.80 (3.49)
2	97	1.45 (0.44)	7.70 (1.64)	7.90 (3.33)	52.20 (7.10)	58.80 (7.34)	8.40 (3.26)	12.20 (2.63)
3	1	1.12 N.A.	9.40 N.A.	47.60 N.A.	71.60 N.A.	70.60 N.A.	43.10 N.A.	7.10 N.A.
4*	11	1.55 (0.60)	7.00 (1.38)	9.20 (2.79)	26.50 (8.61)	62.10 (7.80)	8.40 (3.34)	13.90 (2.99)
5	39	1.40 (0.35)	8.30 (1.67)	9.10 (4.09)	72.70 (6.84)	56.40 (7.81)	9.50 (4.41)	12.70 (2.81)
<b>Panel B: Northeast</b>								
1*	36	1.76 (0.63)	6.90 (1.36)	11.00 (4.92)	57.40 (5.99)	69.80 (7.19)	11.40 (4.70)	13.50 (4.59)
25	48	1.45 (0.59)	8.00 (1.62)	6.90 (2.25)	71.60 (6.46)	64.10 (6.79)	8.70 (3.00)	12.60 (3.14)
35	21	1.40 (0.51)	7.20 (1.80)	6.70 (4.85)	31.40 (8.17)	64.40 (6.64)	10.50 (6.33)	12.10 (2.45)
45	33	1.56 (0.43)	8.30 (3.18)	7.40 (3.67)	50.30 (5.49)	57.50 (6.01)	8.40 (4.18)	13.00 (2.85)
5	14	1.49 (0.51)	9.00 (3.05)	6.90 (3.07)	70.10 (8.44)	41.20 (7.13)	7.30 (2.52)	13.30 (2.58)

*continued on next page*

regions except the Central, the top-ranked cluster posted mean preacquisition total asset growth rates that exceeded those of the next-highest-ranked cluster and those of the lowest-ranked cluster. These differences averaged 82 percent and 90 percent, respectively. The top-ranked clusters in all subregions employed more financial leverage than did any of the lower-ranked clusters. The mean equity-to-assets ratios for these clusters were on average 11 percent and 9 percent lower than the means of the next-highest-ranked and lowest-ranked clusters.

With respect to the asset portfolio variables, the mean loan-to-assets ratio of the top-ranked clusters showed a pattern similar to those noted above. The mean loan-to-assets ratio of the top-ranked cluster in each region exceeded the

mean of the next-highest-ranked cluster by an average of 15 percent and that of the lowest-ranked cluster by an average of about 25 percent. On the other hand, the means of the retail-loan mix ratios did not exhibit any systematic pattern across clusters.

An interesting feature of the means of several of the financial variables, excluding those for clusters with insufficient membership, is that they vary directly with the mean purchase-price-to-book ratio across all clusters in a given region. Examples include the return-on-equity ratio and the core-deposit growth variable for the Southeast, West, and Northeast subregions; the asset-growth variable and the equity-to-assets ratio for the Southeast and West subregions; and the retail-loan mix variable for the Central subregion. Of these monotonic relationships

Table 2 continued

Cluster	Number of Members	Purchase Price to Book	Equity to Assets	Core Deposit Growth	Retail Loan Mix	Loans to Earning Assets	Asset Growth	Return on Equity
<b>Panel C: Southeast</b>								
1*	21	2.35 (0.57)	8.00 (1.34)	24.10 (7.53)	44.60 (10.35)	68.00 (7.87)	24.10 (6.58)	17.80 (4.00)
2	23	1.55 (0.39)	9.50 (2.42)	9.10 (3.37)	42.30 (10.00)	40.00 (9.27)	10.60 (3.67)	14.70 (3.25)
3	35	1.92 (0.51)	8.60 (1.46)	12.20 (4.97)	76.70 (7.65)	55.80 (9.76)	13.40 (5.94)	15.00 (2.98)
4	80	1.86 (0.50)	8.70 (1.58)	11.30 (4.65)	54.70 (8.44)	59.70 (7.45)	11.80 (4.97)	14.80 (4.15)
5	2	2.26 (0.04)	7.10 (1.70)	11.70 (6.51)	10.70 (14.37)	62.10 (3.81)	12.40 (8.00)	24.70 (13.55)
<b>Panel D: West</b>								
1*	4	2.16 (0.52)	6.90 (0.69)	45.10 (8.21)	44.70 (8.54)	69.00 (8.54)	44.40 (9.09)	19.90 (2.46)
2	10	1.90 (0.58)	7.70 (1.36)	12.30 (3.27)	69.80 (11.06)	61.70 (11.06)	14.20 (4.21)	16.70 (5.91)
3	2	1.47 (0.11)	11.20 (3.80)	41.50 (7.96)	24.30 (11.46)	70.70 (4.12)	41.50 (6.77)	13.50 (6.49)
4	46	1.81 (0.51)	7.70 (1.46)	12.00 (4.36)	45.50 (6.42)	65.40 (8.01)	13.80 (6.44)	16.60 (5.45)
5	29	1.78 (0.67)	7.90 (1.27)	9.70 (4.38)	24.70 (7.41)	62.60 (10.44)	13.30 (5.32)	15.20 (3.86)

\*Denotes cluster with largest purchase-price-to-book ratio.

Note: All numbers in percentages except purchase-price-to-book ratio.

Source: See Table 1.

(those that vary in a consistent direction with the independent variables), the strongest clearly involve target bank profitability and core-deposit growth. These relationships augment and strengthen the conclusions concerning the importance of target-bank profitability and core-deposit growth in determining the purchase-price-to-book ratio in a merger. These results also support the findings reported in Cheng, Gup, and Wall of a positive and significant relationship between core-deposit growth and the purchase-price-to-book ratio using regression analysis. On the other hand, the conclusion regarding the relationship between the profitability of the target bank and the purchase-price-to-book ratio differs from those of Rogowski and Simonson as well as Rhoades (1987), and agrees with the findings of Fraser and

Kolari; Beatty, Santomero, and Smirlock; and Cheng, Gup, and Wall.

Although the other variables do not vary monotonically with the purchase-price-to-book ratio, they do vary in a fairly systematic manner as earlier comparisons of mean percentage differences of financial characteristics among the top- and lower-ranked clusters indicate. With respect to the behavior of the asset growth rate, the loans-to-earning-assets ratio, and the retail loan mix variable, the evidence suggests that asset growth is a very important factor in merger pricing, especially when it takes place in an environment where loans rather than securities are the dominant earning asset of the bank. This conclusion is supported by Rogowski and Simonson, who found a positive and significant relationship between the loan-to-earning-asset

**Table 3.**  
**Annual Cluster Means, 1981-86**

Cluster	Number of Members	Purchase Price to Book	Equity to Assets	Core Deposit Growth	Retail Loan Mix	Loans to Earning Assets	Asset Growth	Return on Equity
<b>Panel A: 1981</b>								
1	15	1.85	7.1	11.1	43.2	62.8	13.6	15.3
2*	4	2.60	7.3	11.8	17.4	54.0	15.0	16.0
3	12	1.45	8.1	9.9	74.7	69.1	11.8	13.7
4	11	1.63	8.7	9.8	64.0	46.6	10.0	15.5
5*	2	2.60	6.6	39.5	49.5	72.0	44.4	18.7
<b>Panel B: 1982</b>								
1	17	1.40	7.8	6.6	41.7	59.8	8.4	15.2
2	11	1.59	8.8	8.5	70.3	48.1	10.0	15.3
3	32	1.59	7.6	8.1	61.7	67.8	9.8	13.1
4	11	1.34	8.4	10.6	81.8	63.0	11.7	14.9
5*	10	1.72	6.8	10.7	26.7	68.7	14.0	16.8
<b>Panel C: 1983</b>								
1*	16	1.99	8.2	20.0	54.4	62.6	22.8	16.5
2	30	1.40	7.6	8.2	37.9	65.4	11.3	14.3
3	16	1.55	9.0	7.3	37.9	48.2	9.2	14.4
4	11	1.52	8.2	7.1	69.6	46.0	9.5	14.3
5	41	1.53	7.7	9.6	67.1	63.9	10.8	13.6
<b>Panel D: 1984</b>								
1	18	1.35	8.4	8.5	52.7	39.1	8.9	13.4
2	23	1.54	8.2	9.5	74.0	59.6	10.0	12.2
3*	10	2.21	8.2	25.7	52.3	66.5	27.9	18.3
4	26	1.69	7.3	10.9	34.7	62.0	13.2	15.6
5	55	1.50	7.9	8.4	53.7	62.1	8.8	13.3
<b>Panel E: 1985</b>								
1*	17	1.86	7.3	12.0	28.4	66.1	11.2	15.1
2	77	1.75	7.4	10.8	53.5	61.7	10.3	13.5
3	31	1.63	9.4	9.4	66.4	45.5	10.3	13.1
4	1	1.12	9.4	47.6	71.6	70.6	43.0	7.1
5	3	1.80	9.8	38.9	26.4	70.9	39.0	13.4
<b>Panel F: 1986</b>								
1	11	1.97	8.3	11.9	72.3	60.5	12.1	14.8
2*	6	2.24	8.1	15.9	24.3	63.0	12.2	15.6
3	9	1.97	8.4	9.2	67.4	39.0	9.2	14.1
4	32	2.01	7.8	11.4	50.8	62.7	10.6	12.2
5	1	1.79	10.4	16.3	40.8	10.4	15.3	7.8

\*Denotes cluster with largest purchase-price-to-book ratio.

Source: See Table 1.

ratio and the purchase-price-to-book-equity ratio. Since the retail loan mix variable does not exhibit any systematic behavior in the cluster analysis, one cannot conclude that there is a predictable relationship between the composi-

tion of the loan portfolio and the purchase-price-to-book-equity ratio. Clearly, this relationship will vary depending on the mix of the loan portfolio of the acquiring bank. As the behavior of the portfolio mix variable indicates,

the strategic profile of the top-ranked target bank clusters appears to be independent of the particular customer base served by these banks. The loan portfolio of the top-ranked cluster in the Central subregion is consistent with the profile of a wholesale bank, that of the Northeast subregion is consistent with a retail bank profile, and those of the Southeast and West regions reflect a loan portfolio that is more balanced than those of the other two subregions.

The stability of the financial profile of banks in the top-ranked clusters across geographic subregions lends credibility to the notion that the financial characteristics of potential merger partners are key determinants of acquisition prices. Geographic location is not unimportant in the pricing process, as the best-performing clusters in the analysis are associated with the West and Southeast subregions. However, without quality management in each of the dimensions identified by this analysis, any location advantages—due perhaps to the structure of local banking markets and regulation—may not be realized by the target bank shareholders.

The stability of the strategic target bank profile over time can be assessed using the data in Table 3, which presents the results from annual cluster analyses and shows that the same basic strategic profile emerges each year. Over the six-year period the top-ranked cluster, with respect to the purchase-price-to-book-equity ratio, systematically exhibited higher profitability and faster premerger growth in core deposits and total assets and tended to con-

centrate its earning assets in loans as opposed to securities while judiciously using more financial leverage than banks in the other clusters.

## Summary

A review of the literature is consistent with the hypothesis that banks which acquire other banks are motivated most by the desire to diversify their earnings and growth potential and, in many cases, to achieve economies of scale in the production of financial services. With respect to the other commonly cited motivations, including the desires to improve the efficiency of the target bank and to increase market power, strong support is not found.

A cluster analysis of the financial characteristics of a sample of 559 target banks indicates that the strategic profile of the most valued merger partner characteristics consists of the following items: higher-than-average profitability (as measured by the return on equity), faster growth in core deposits and total assets, and a higher ratio of loans to earning assets, all augmented by the judicious use of financial leverage. This profile was found to be stable across geographic subregions, time, and bank customer bases. Based on the literature review and empirical findings, if the shareholders of target banks are to obtain the greatest benefit from any proposed merger, having quality management in each of the dimensions of the strategic profile is apparently a prerequisite.

## Notes

<sup>1</sup>Loan participations can also help, but the gain is limited by moral hazard problems.

<sup>2</sup>Consider two banks, both with \$10 billion in assets and \$500 million in capital. Assume one of the banks suffers a \$1,100 million loss and the other earns a \$60 million profit. If the banks are separately owned, the bank suffering the loss will fail and the other bank will continue in operation. If the two banks are merged together and no synergies are present, both firms will fail.

<sup>3</sup>Shareholders may not gain if management use the increases in potential profits to increase their perks.

<sup>4</sup>Geographic dispersion is measured by the sum of squares of the percentage of an organization's deposits from each market it serves.

<sup>5</sup>See, for example, the survey by Rhoades (1982).

<sup>6</sup>Berger and Hannan discuss the potential for a negative relationship to exist between price and concentration under the efficient-market-structure hypothesis but con-

clude that a negative relationship would be inconsistent with the argument that the efficient-market-structure hypothesis explains the positive relationship between profitability and concentration.

<sup>7</sup>In addition to the study cited below, Rhoades (1986) examines bank mergers. Rhoades's analysis is not reviewed in this article because his sample period ends in 1978. Phillis and Pavel (1986) examine interstate bank mergers. Their principal finding is that participants in the interstate takeover market tend to have more offices than spectators (banks not active in the market) and that acquirers tend to be larger than targets.

<sup>8</sup>Their sample consisted of 1,046 banks, and they used multinomial logit.

<sup>9</sup>Cheng, Gup, and Wall (1989) and Rogowski and Simonson (1989) also provide descriptive data on bank mergers, but their data sets are smaller and largely overlap that analyzed in Gup et al. (1989).

- <sup>10</sup>Gup et al. (1989) find significant regional differences in the pricing of bank mergers. Their study is not reviewed here because they note that collinearity problems may interfere with the interpretation of the coefficients on variables examined in their study.
- <sup>11</sup>Cheng, Gup, and Wall also provide controls for net income growth, total asset growth, earning asset growth, and equity growth. They use principal components regression to control the collinearity problems that may arise from using all of these variables in the same regression.
- <sup>12</sup>Cheng, Gup, and Wall find a significantly negative coefficient on the ratio of target-to-acquirer total assets.
- <sup>13</sup>The exact clustering algorithm used in this article is the Fastclus procedure available in the SAS software package developed by the SAS Institute. Fastclus is a non-hierarchical clustering algorithm. The procedure allows the analyst to define a maximum number of clusters to which the banks are to be assigned, and the assignment of banks to clusters is done independently of the results of any previous assignments resulting from a different specification of the maximum number of clusters. The procedure produces clusters that are discrete in the sense that each bank is assigned to one and only one group. The data in this article were examined using a maximum cluster size of five groups to avoid problems associated with having too many groups with only one or two members.

The output of cluster analysis is very sensitive to the exact numerical algorithm used by the procedure for assigning observations to groups. Thus, it is not surprising

that the output of two different clustering procedures using different algorithms but applied to the same data set will produce different groupings. Many algorithms will also produce different final outputs depending on the number of iterations performed on the data and on the values used to initialize the clustering algorithm. Note that this variation is the case for the procedure used in the cluster analysis. However, these differences appear to be minor in most cases. See Hartigan (1975) for a more complete discussion.

- <sup>14</sup>In addition, there are no robust statistical tests of differences in the group means produced by clustering algorithms. Altman et al. (1981) describe tests that are similar in spirit to classical t-tests of mean differences. However, this procedure requires that there be equality of the variances for each pair of means tested.
- <sup>15</sup>There is generally no universally agreed-upon procedure for deciding on the maximum number of clusters into which the sample observations should be divided. Our choice of five clusters was made on the basis of minimizing the number of clusters composed of outliers, that is, clusters with only one or two members. Outlier problems were encountered when the limit on the maximum number of clusters exceeded five.
- <sup>16</sup>In the calculations of percentage differences in cluster means which follow, cluster 1 was excluded from the Central subregion, cluster 5 from the Southeast subregion, and cluster 3 from the West region, when appropriate, due to the lack of a sufficient number of cluster members.

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