

## **The Impact of Network Size on Bank Branch Performance**

Beverly Hirtle\*  
Federal Reserve Bank of New York

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### ABSTRACT

Despite significant technological innovation in retail banking services delivery, the number of U.S. bank branches has grown steadily over time. Further, more and more of these branches are held by banks with large branch networks. This paper assesses the implications of these developments by examining measures of branch performance and asking how these measure vary across institutions with different branch network sizes. Our findings suggest that banks with mid-sized branch networks may be at a competitive disadvantage in branching activities. We find no systematic relationship between branch network size and overall institutional profitability, perhaps because banking organizations optimize the size of their branch network operations as part of an overall strategy involving both branch-based and non-branch-based activities.

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\*Federal Reserve Bank of New York, 33 Liberty Street, New York, NY 10045; phone: (212) 720-7544; fax: (212) 720-8363; email: [Beverly.hirtle@ny.frb.org](mailto:Beverly.hirtle@ny.frb.org).

## **The Impact of Branch Network Size on Branch Performance\***

### **I. Introduction**

Recent innovations in the delivery of retail financial services have raised questions about the role of bricks-and-mortar branches in the banking industry. The advent of Internet banking, the proliferation of automatic teller machines (ATMs), and the increasing reliance on centralized call centers, combined with post-merger pushes for efficiency, all seemed to challenge the traditional branch method of delivering banking services. Yet the number of full-service branches in the United States has increased steadily since the early 1990s. Further, consistent with the general trend toward consolidation in the banking industry, these branches have become increasingly concentrated within the large branch networks of a limited number of institutions.

The implications of these branching trends have been relatively unexplored, though they could have significant consequences for bank performance. It has been argued, for instance, that bricks-and-mortar branches are a comparatively expensive means of delivering retail financial services, particularly deposit-based services (Orlow, Radecki, and Wenninger, 1996). The creation of extensive branch networks could thus impose a significant cost structure on banking organizations. This need not result in reduced profitability, however, if there are economies of scale in the operation of branch networks or if the revenue-generating performance of branches is otherwise enhanced when they are part of large branch networks.

This paper addresses the implications of recent developments in branch banking by examining a series of simple branch performance measures for a large sample of U.S. banking organizations over the years 1995 to 2003. We identify a series of institution-level proxy variables that are plausibly correlated with branch performance and ask how these measure vary, on average, across institutions with different branch network sizes. The variables examined are bank-average deposits and small business loans per branch. Finally, we also examine the impact of branch network size on overall profitability for the institutions in our sample.

Our findings suggest that banks with mid-sized branch networks may be at a competitive disadvantage in branching activities relative to banks with larger branch networks. Banking organizations with 101 to 500 branches had lower deposits per branch and roughly equal volumes of small business loans per branch compared to larger branch networks and lower deposits and small business loans per branch relative to smaller branch networks. Whatever the difference in these branch-related performance measures, we find no systematic relationship between branch network size and overall institutional profitability. This suggests that banking organizations may be optimizing the size of their branch network operations as part of an overall strategy involving both branch-based and non-branch-based activities.

The remainder of this paper is organized as follows. The next section presents an overview of recent trends in U.S. bank branching, as well as a review of previous research on bank branch performance. Section III describes the data used in this paper and presents descriptive statistics. Section IV contains the main empirical analysis, consisting of cross-sectional regressions of the proxy branch performance measures on variables intended to capture institution-specific factors and branch market characteristics, as well as branch network characteristics. Section V contains summary and conclusions.

## **II. Recent Trends in U.S. Bank Branching**

Bricks-and-mortar branches were once the only way banks and thrifts could attract and retain retail customers. But both technological innovation and regulatory changes in the 1990s challenged this standard delivery model. On the technological front, banks developed alternative distribution channels such as ATMs and call centers to handle both product and service origination and on-going customer service needs. The Internet boom encouraged banks to offer customers electronic access to their accounts and to conduct transactions remotely, and Internet banks, with no physical offices, appeared to offer an alternative, low-cost model for providing banking services. The passage of Riegle-Neal Act allowed banks to branch and merge across state lines, and the number of U.S. banks and thrifts decreased from nearly 13,000 in 1994 to just under 9,000 as of the end of 2004 (FDIC, 2004).

However, even in the face of these pressures, the number of branches of FDIC-insured banks and thrifts has actually risen fairly steadily since the early 1990s (Figure 1). Between 1993 and 2004, the

number of U.S. bank and thrift branches increased by 12 percent, to more than 90,000, with total offices exceeding their peak number for the mid-1980s (FDIC, 2004).

The overall growth of the number of branches has been accompanied by a change in the distribution across banking organizations. As illustrated in Figure 2, branches have become increasingly consolidated into the largest branch networks during the past decade. In 1994, bank and thrift organizations with more than 100 branches held 53 percent of the country's deposits and 46 percent of branches. By the middle of 2003, those figures had risen to 61 percent of deposits and 51 percent of branches. However, the most marked change has occurred at organizations with the very largest branch networks, those with more than 1,000 branches. These organizations held just under 20,000 branches in June 2003, a sharp increase from the 9,200 branches held in such networks in 1994. These very large branch networks now hold nearly 25 percent of all U.S. bank branches, as compared to less than 12 percent in 1994 (Hirtle and Metli, 2004).

The trend towards consolidation of branches in very large branch networks has implications for both bank customers and the banks themselves. Consumers and small businesses are the customer segments that have traditionally relied most heavily on branches to access bank services. Prior research suggests that these customers face something of a trade-off in light of the growth of very large branch networks. On the one hand, larger banking organizations and organizations that operate in multiple markets tend to charge higher fees and offer lower deposit rates than smaller, single-market institutions (Hannan, 2002, 2004; Hannan and Prager, 2004a, 2004b; Park and Pennacchi, 2004), suggesting that branch-dependent customers could face additional costs as branches are increasingly consolidated into the large branch networks of multi-market banking organizations.

On the other hand, large branch networks offer the convenience of many possible points of contact with the institution and, potentially, the ability to avoid ATM surcharges and other usage fees by staying within the bank's own network. Prior research suggests that depositors value geographic reach (having branches in many states and municipalities) and local branch density (having many branches of

an institution in a given area) when selecting a depository institution (Dick, 2003). These factors imply that the scope and scale of large branch network are qualities that many customers value.

The growth in the number of bank branches and the consolidation of branches within very large branch networks also have implications for cost structure, business focus, and profitability of individual banks. Full service branches impose significant costs that banks must cover through the revenues generated by these networks, primarily the implicit and explicit income associated with deposit accounts (Orlow, Radecki and Wenninger, 1996)<sup>1</sup>. Continued expansion of branch networks seems consistent with a belief by these organizations that branches will continue to be an effective channel for generating retail banking revenues, despite these costs and the development of alternative distribution channels such as call centers, ATMs, and online banking.<sup>2</sup>

Several papers have examined the impact of the growth of large, multi-market banks on bank performance and profitability. For instance, Berger et al. (2007) find that the profits of small, single-market banks are lower when the market share of large, multi-market banks is greater and that this impact has increased over the period during which the large branch networks were being formed. Hirtle and Stiroh (forthcoming) examine how the extent of retail banking intensity, including the number of branches, affect risk and return, finding that greater emphasis on retail banking leads to both lower risk and lower return.

Other research examines the impact of branch banking by assessing the cost efficiency of individual bank branches held within a branch network. In general, these studies have found increasing returns to scale for individual bank branches (see, for instance, Athanassopoulos, 1998, Berger et al., 1997, and Zardkoohi and Kolari, 1994, and the references therein). These findings are consistent with the idea that banks “over branch” in the sense that the individual branches are smaller than would be justified purely on the grounds of cost efficiency. Some papers (Berger et al., 1987, Berger et al., 1997) have argued that this apparent inefficiency may relate to the desire by banking organizations to provide convenience to customers, suggesting that while large branch networks may be inefficient from the perspective of minimizing costs, they may be effective at generating revenue.

Fewer studies have looked at the impact of overall branch network size on efficiency or profitability, largely due to the lack of detailed branch data across a large number of institutions. Zardkoohi and Kolari (1994) examine branch networks in Finland and find that branch-level efficiency increases with the number of branches in a network, but that this effect levels off at a relatively small network size (5 branches). Hensel (2003) finds that larger European banks are less likely to realize additional cost efficiencies from expanding their branch networks than smaller institutions. Carbó Valverde et al. (2004) find that the number of bank branches and the relationship between the number of bank branches and the number of ATMs help explain a significant portion of cost inefficiency across Spanish banks. Seale (2004) finds that among U.S. commercial banks, branching is associated with higher profitability, lower expenses, and higher fee income, but his analysis primarily examines distinctions among institutions with fewer than 30 branches, rather than among institutions with the large branch networks that are the focus on this paper.

With the exception of Seale (2004) and Carbó Valverde et al. (2004), most of the previous studies of branch efficiency have focused on data from the 1980s to mid-1990s and thus do not reflect the recent technological and regulatory changes that have affected branch banking. The analysis in this paper is complementary to these prior studies in that we examine a large number of U.S. banking organizations using recent data on branch network structure and institutional performance. These data allow us to make assessments of the relative performance of branch networks across the network size spectrum and to ask how other network characteristics – such as geographic scope and local branch density – affect performance. We can also distinguish between branch network size and overall institution size using these data. The trade-off is that the data provide information primarily at the institution level, so our analysis is limited to assessing average branch performance. However, examining the performance of the branch network as a whole is not an unreasonable approach for thinking about the impact of recent branch banking developments on banking industry structure.

### **III. Data and Empirical Approach**

The data used in this paper are derived from bank and thrift regulatory reports, which provide coverage of a wide set of institutions over a relatively long period of time. Specifically, the FDIC Summary of Deposit data contain information about the location, ownership, and deposit amounts booked at all offices of FDIC-insured bank and thrift institutions as of June 30 of each year. We use the FDIC data to create a series of annual data sets for the years 1995 to 2003. We aggregate these branch-level data to the highest U.S. bank holding company (BHC) level to form the branch network for each institution. Branch network size is defined as the number of full service, permanent branches held by the organization, including both stand-alone and in-store (“supermarket”) branches. We also use data on branch location to construct variables intended to capture the geographic scope and density of each branch network.

We then link the branch network data to income and balance sheet data for the banks and thrifts in the organization. In particular, we identify all commercial banks and thrifts held in each organization and aggregate data from the Call Reports (for commercial banks) and the Thrift Financial Report (for thrifts) to construct aggregate performance measures and control variables. Because we are primarily interested in the performance of banks operating significant branch networks – as opposed to unit banks or small community banks – we eliminate all organizations with ten or fewer branches.<sup>3</sup> Within each organization, we also drop special-purpose processing or credit-card banks whose activities are not retail in nature.<sup>4</sup> For those institutions that have publicly traded equity – about 40 percent of the sample – we also link stock return data from the Center for Research in Security Prices (CRSP).

Table 1 provides a breakdown of the sample across years by branch network size. The number of organizations in the sample rises steadily over the years, from 524 in 1995 to 682 in 2003. Essentially all of this increase is accounted for by the growth in the number of organization in the smallest size cohort – those with 11 to 50 branches. These organizations represent 82 percent of the sample in 2003, as compared to 75 percent in 1995. This increase is paralleled almost exactly by a decrease in the share of organizations in the 101-to-500 branch cohort, which falls from 14 percent to 8 percent of the sample (and from 72 to 57 institutions).

There are relatively few institutions in the two largest branch network size cohorts, though these institutions hold an increasing share of the number of branches over time. Between 17 and 20 institutions hold more than 500 branches, with the number holding more than 1,000 branches growing from 6 to 9 over the sample period. The largest branch network in 2003 is composed of more than 4,000 branches, as compared to less than 2,000 in 1995.

Ideally, for each institution, we would like to be able to capture both the revenue generated by these branch networks as well as the costs associated with operating them. Unfortunately, regulatory reports provide information only at the institution level, which does not permit us to isolate branch network operations cleanly. Instead, we develop a series of proxy measures that we argue are likely to be correlated with branch network performance.

In particular, one of the key functions of a branch network is to collect deposits; all else equal, the higher the level of deposits held at a branch, the more profitable the branch, as the fixed costs of branch operation can be spread across a wider deposit base (see Orlow, Radecki and Wenninger, 1996). Research also indicates that, controlling for other characteristics of the transaction, higher levels of deposits are associated with higher premiums in branch sales (Edelstein and Morgan, 2006) and that differences in deposits per branch help explain variation in cost efficiency across banks (Carbó Valverde et al., 2004), consistent with the idea that deposits are a meaningful measure of branch performance.

There are several potential ways of calculating deposits per branch using the regulatory report data. The most straightforward is to use total domestic deposits, the aggregate of transaction (checking), savings, and large and small time deposits. This basic measure may present a biased picture of the performance of the branch network in collecting deposits across the branch network size spectrum, however. Since larger institutions have wholesale or brokered deposits that are not collected through the branch network, total deposit variable may over-state branch network performance for larger institutions.

To control for this effect, we use the Summary of Deposits data to identify and remove “head office” branches that appear to have large volumes of non-retail deposits.<sup>5</sup> While we use this non-head office deposit variable as our primary measure of deposits per branch, results using total domestic



deposits, core deposits (defined as total domestic deposits minus all time deposits greater than \$100 thousand) and non-brokered deposits are quite similar, so the choice of deposit measure does not affect the nature of the results.

Aside from collecting deposits, branch networks also generate new lending, especially consumer and small business lending. While at many banking organizations, credit decisions have been centralized in regional or national credit offices, branches continue to serve as an initial point of contact for new consumer and small business customers. Unfortunately, we cannot measure the flow of new retail lending generated through these contacts from the available regulatory report data. Instead, as a proxy measure, we calculate the volume of small business lending per branch. We focus on small business loans rather than consumer credit because for many large institutions, consumer credit such as credit cards and mortgages are national businesses run outside of the branch network. While small business lending may suffer somewhat from the same bias, we believe that it is likely to be more closely tied to the branch network.

The variable we use in the regressions is total small business loans per branch, using the regulatory report definition of “small business loans” as loans to commercial and industrial borrowers (including those secured by nonresidential real estate) with original amounts of \$1 million or less. The results are quite similar if we limit the variable to “small” small business loans with original principal amounts of \$250,000 or less.

Our empirical approach is to do simple annual regressions of these performance proxies on a series of variables intended to capture the characteristics of the bank and the geographic markets in which it operates branches, as well as characteristics of the branch network itself. We estimate annual equations to capture any changes in the relationship between branch network size and performance over the sample period.<sup>6</sup>

The variables intended to capture characteristics of the institution include asset size, the total risk-based capital ratio, and the loan-to-asset ratio. To create variables that more closely track the branch-related activity of the holding company, we calculate these institution-level financial variables as

aggregates of the commercial bank and thrift subsidiary values, rather than from consolidated holding company data. As a rough control for the impact of recent merger activity, we also include the ratio of all banking or thrift assets acquired through mergers in the two years prior to our observation point to end-of-period banking and thrift assets.<sup>7</sup> Finally, we include the number of bank and thrift subsidiaries in the holding company as a proxy measure for institutional complexity.

We control for several variables intended to capture the characteristics of the markets in which the bank operates branches and of the branch network itself. In particular, to capture differences in economic activity across markets, we include average state-level personal income growth in the two years prior to our observation point, weighted by the share of the firm's branches in each state. To capture differences in market competition, we include the average deposit-based Herfindahl-Hirschmann Index (HHI) in the MSAs in which the institution operates, weighted by the share of the organization's branches in each MSA.<sup>8</sup> To reflect the geographic scope and local density of the branch network, we include the number of states and number of MSAs and non-MSA counties in which each organization holds branches and the weighted average branches-per-capita at the MSA level, where the share of the network's branches in each MSA is used as the weight. Finally, we include a control for the share of branches in supermarkets and other retail outlets ("in-store branches") since these branches may operate on a different scale than stand-alone offices. Summary statistics for the regression data set are presented in Table 2.

Our key measures are a series of dummy variables for branch network size groups. In particular, we separate the observations into branch network cohorts with 11 to 50 branches, 51 to 100 branches, 101 to 500 branches, 501 to 1000 branches, and more than 1000 branches (see Table 1). We break branch network size into discrete groups, rather than using a continuous variable, to allow for a non-linear relationship between branch network size and performance. The particular cut-offs selected are arbitrary in the sense that they are guided by pragmatism (creating cohorts with a meaningful number of observations) rather than by theory. This means that the results discussed below should be taken as indicative of differences across size cohorts rather than as defining sharp differences at or near the cut-off points. We also estimated alternative specifications using a quadratic specification – log number of

branches and log number of branches squared – and obtained qualitatively similar results to those discussed below, so the choice of branch network variable does not appear to be driving the results.

#### **IV. Empirical Results**

##### *Branch Network Performance*

As a first step in assessing the impact of branch network size on our proxy performance variables, we do a simple comparison of means and medians across the branch network size groups on the pooled 1995 to 2003 data. These results are presented in Table 3. Deposits per branch increase as the size of branch network grows, from an average of about \$35 million per branch for networks with 11 to 50 branches to an average of \$50 million for the largest branch networks. A different pattern emerges for the small business loan variables, with average and median tending to decline with the size of the branch network, though this decrease is not monotonic. Average total small business loans per branch range from about \$7 million for the smaller branch networks to \$5 million for networks with more than 1000 branches.

The results in Table 3, while indicative, do not take other potentially important influences on branch performance into account. Tables 4 and 5 present the results of cross-sectional regressions that control for the institution- and market-specific factors described in the previous section. All regressions are estimated using robust standard errors.

Table 4 presents the results for average deposits per branch. Turning first to the control variables, of those included to control for institution-specific factors only asset size consistently appears to influence the average volume of deposits per branch, which increases significantly across the asset size groups. Deposits per branch are negatively correlated with the amount of assets recently acquired through mergers, though this variable is not statistically significant in all years. Of the variables intended to capture market characteristics, state personal income growth enters with a significant coefficient, though the sign varies from year to year. Higher market concentration appears to be associated with lower deposits per branch, though this result is significant only about half the time.

In terms of branch network characteristics, the variables capturing the geographic scope of the branch network – number of states and number of MSAs in which each institution holds branches – both enter the regressions significantly, but with opposite signs. Operating in more states is associated with higher per-branch deposit volumes, while the opposite is true at the MSA level. Higher network density in local markets is associated with lower deposits-per-branch, a finding consistent with the “over-branching” hypothesis (Berger et al., 1987; Berger et al., 1997). Finally, higher shares of supermarket (in-store) branches are associated with lower deposit volumes, most likely reflecting the smaller scale of in-store branches as compared to stand-alone branches.

The key variables of interest in our estimation specification are the dummy variables reflecting branch network size. These variables are jointly significant in each year of the sample (see the last row of the table), with a generally similar U-shaped pattern. In particular, the estimates suggest that institutions with between 101 and 500 branches (the omitted branch network size category in the regression) tend to have lower deposits per branch, all else equal, than institutions at both the lower and upper end of the branch network size spectrum. The network size coefficients are individually statistically significant for the smaller size categories and are significant for the very largest branch network size group in about half the years.<sup>9</sup> The estimates imply that, all else equal, average deposits per branch are \$17 to \$25 million higher at banks with 11 to 50 branches and about \$5 to \$20 million higher at banks with 1,000 or more branches than at banks with mid-sized branch networks.<sup>10</sup>

The next set of results involves the small business loan proxy variables (Table 5). The impact of many of the institution-specific and market-specific control variables are similar to those in the regressions with the deposit-based performance proxies. The main differences are that the variables describing branch network geographic scope are not significant in the small business loan equations, while the coefficient on the institution’s overall loans-to-assets ratio is positive and significant.

Once again, the key variables of interest are the branch network size dummies. In each year, the hypothesis that average small business loans per branch are the same across branch network size groups can be strongly rejected (see the last row of the table). The coefficients suggest that, all else equal,

average small business loans per branch tend to be higher for institutions with 100 or fewer branches than for institutions at the larger end of the branch network size range. While the coefficients are almost always negative for the two largest branch network size groups, they are generally not statistically significant.

It is possible that the lower levels of small business loans per branch at the banks with larger branch networks may reflect differences in strategy and focus, rather than differences in performance *per se*. Previous research has documented that large banks have lower shares of small business loans per dollars of assets than smaller banks and that large banks tend to focus on “transactional” small business lending while smaller banks do more relationship-based (and thus more likely branch-based) lending (Berger, 2004). The regressions include asset size and the banks’ overall loans-to-assets ratios, however, which should help control for systematic differences in strategy. Nonetheless, the possibility of differences in strategy regarding the nature and intensity of small business lending activity are another reason that small business loans a more noisy proxy of branch performance than deposits.

Taken together, the results discussed above suggest that banking organizations with mid-sized branch networks – those with 101 to 500 branches – may face competitive pressure in their branch banking activities. These mid-sized networks tend to have lower deposits and about equal small business loans per branch than institutions at the upper end of the branch network size range, and both lower deposits and small business loans per branch than small networks.<sup>11</sup>

Of course, these results paint only a partial picture of branch network performance, since they involve measures of branch output and not measures of branch cost. Ideally, we would like to examine cost measures that capture the full cost of operating branch networks, including interest expense, real estate, technology, and salary and other personnel costs. While interest expense information is available for the banks in our sample, the regulatory reports do not break out other cost information for branch network operations.<sup>12</sup>

Nonetheless, our performance results are consistent with some of observed behavior of retail banking organizations in recent years. Organizations with smaller and mid-sized branch networks have

grown faster and devoted much more of their overall branch activity (acquisition of new branches through purchase or de novo opening and divestiture through sales and closings) to expansion than institutions with larger branch networks (Hirtle and Metli, 2004). Within our data set, the share of institutions with mid-sized networks has declined over the sample period (Table 1). These trends are consistent with the idea these institutions were adopting a branch network growth strategy, perhaps in light of the kinds of performance issues illustrated in our regression results. More generally, the overall trend towards consolidation of U.S. bank and thrift branches within the very largest branch networks and away from mid-sized networks (see Figure 2) is consistent with these findings.

### *Institutional Profitability*

Examining branch network operations in isolation from the rest of the banking organization may ignore important cross-effects that could impact branch network performance. There could, for instance, be technological scope economies in the design, implementation, and operation of branch network information processing systems with systems in other parts of the banking organization, or revenue generated for other business lines through cross-selling (e.g., insurance sales or mutual fund sales or asset management accounts). On the other side of the ledger, very large and diverse organizations could suffer managerial inefficiencies that could detract from the operating performance of the branch network.

To explore these possibilities, we examine the impact of branch network size on firm-wide measures of performance. The first measure is accounting-based return on equity (ROE), calculated as the ratio of annualized third-quarter net income to book equity. The second measure is the risk-adjusted market return on the bank holding company's publicly traded equity, calculated as the average of weekly returns during the third quarter divided by the standard deviation of weekly returns (the "Sharpe Ratio").<sup>13</sup> Since it is based on regulatory report data, ROE is available for nearly all observations in the sample, but the market-based measures are available only for the sub-set of firms with publicly traded stock.<sup>14</sup> Descriptive statistics of the ROE and risk-adjusted market return variables are reported in Table 2.

The regressions include some additional control variables to capture the effects of non-branch based activities. These include information on the risk appetite and operating characteristics of the bank –

the ratio of nonperforming loans to total loans and the ratio of non-interest income to operating income (non-interest income plus net interest income); information on asset composition – the ratio of trading assets to total assets, the ratio of securities to total assets, and the share of the loan portfolio composed of retail loans, commercial and industrial loans, non-residential real estate loans, loans to depository institutions, and other loans; and information on the bank's input costs – average salary per employee and premises expense per branch office. Balance sheet variables are as of June 30 of each year, while the non-interest income ratio and salary and premises expense are for the 12 months ending June 30.

The results for the profitability regressions are reported in Tables 6 and 7. The results reveal no consistent relationship between branch network size and profitability. In most cases, the branch network size variables are not statistically significant for the accounting-based measure of profitability (ROE) and while the coefficients are statistically significant for about half the years in the market-based profitability regressions, there is no clear pattern in the sign and magnitude of the coefficient estimates over time. The lack of clear pattern holds for the accounting-based measures of profitability as well. Thus, there appears to be little systematic relationship between branch network size and overall firm profitability.<sup>15</sup>

This (lack of) result may mean that branch network size has no systematic influence on firm profitability. Alternatively, it may be that the regression specification lacks sufficient controls for the banks' non-branch-based activities to isolate the impact of differences in branch network size. If banks optimize the size and extent of branch-based activities to complement their non-branch-based businesses (e.g., lending to mid-sized and large corporations or capital markets activities), then it may be difficult to identify the impact of branch network size on overall firm performance. Although the augmented regression specification contains additional controls, the weak relationship between branch network size and overall firm performance may signal broader strategic objectives at the firm level.

## **V. Summary and Conclusions**

Despite technological and regulatory innovations that might have been expected to reduce banking institutions' reliance on bricks-and-mortar branches to deliver financial services, the number of full-service bank and thrift branches has increased steadily since the early 1990s. In addition, an

increasing share of these branches is held in the very largest branch networks. Despite these significant structural changes, relatively little analysis has taken a direct look at the impact of increasing branch network size on bank performance.

This paper takes a simple empirical approach to addressing these developments. We identify a series of performance proxies and assess the impact of branch network size, after controlling for other institution-specific and market-specific factors. Our results suggest that banks with mid-sized branch networks may face profit pressure in their branch network operations since their per-branch performance appears to lag that of both smaller and larger institutions. There appears to be little relationship, however, between branch network size and overall firm profitability, perhaps because banks are optimizing the size of their branch network operations as part of an overall strategy involving both branch-based and non-branch-based activities.

Aside from these specific findings, the paper makes a complementary contribution to prior research by distinguishing between asset size and branch network size in the empirical specification. Much of recent consolidation in the U.S. banking industry has reflected a desire by banks to extend their retail branch networks. Thus, in assessing the implications of these developments, it is helpful to distinguish between asset size, which reflects the full range of activities pursued by an organization, and branch network size, which is more closely tied to retail activities. Our results suggest that there is a meaningful distinction between these two measures of institutional size, and that it may be important to control for both when assessing the impact of recent consolidation and institutional focus on retail banking activities.



## Endnotes

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<sup>1</sup> Implicit income is derived from deposits that are priced below the market rates for alternative sources of funding, such as Fed funds or other forms of wholesale funding. Explicit revenues include fees and other revenues derived from transactions associated with deposit accounts. Radecki (1999) suggests that these two sources of revenue account for about 30 percent of operating revenues for large bank holding companies.

<sup>2</sup> Humphrey et al. (2005) find that rising shares of electronic payments and greater deployment of ATMs significantly reduced operating costs of European banks during the 1990s.

<sup>3</sup> Limiting the sample to BHCs with more than 10 branches excludes a large number of organization. For instance, in 2003, this screen drops 1,989 unit branch institutions and 3,812 institutions with 2 to 10 branches. The regression results are not significantly changed if we include these smaller branch networks in the sample.

<sup>4</sup> In particular, we drop credit card banks (defined as any bank with credit card loans plus securitized receivables exceeding 50 percent of assets or with credit card loans exceeding 80 percent of loans), banks or thrifts holding no loans on the balance sheet, and banks and thrifts where small time plus savings deposits equal less than 5 percent of transaction deposits.

<sup>5</sup> We cannot identify which deposits at any particular branch are retail in nature and which might be wholesale or related to national businesses not tied to the branch network. However, many large banking organizations have one or more branches with significantly larger volumes of deposits than the rest of the branch network. These branches seem most likely to be the ones where non-retail deposits are booked.

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To identify these in a systematic way, we examined all bank holding companies with more than 100 branches and sorted the branches for each bank and thrift in the organization by deposit volume. Then, going subsidiary by subsidiary within the holding company, we looked at branches with \$1 billion or more in deposits. Starting with the smallest of these, we flagged a branch if it held 15 percent or more of the subsidiary's overall deposits or if its deposits were more than twice the amount of the next smallest branch in the subsidiary. We then dropped the flagged branch and any branches larger than the flagged branch. In addition, we dropped any branch holding more than \$5 billion in deposits. Most institutions had only one branch dropped; the maximum number dropped was six. We tried several variants of this approach, including a branch-by-branch review of large branches; the regression results are not sensitive to the particular method we use to identify "head office" branches.

<sup>6</sup> The results are quite similar if we combine the annual data sets and estimate the equations using a panel data approach with residuals clustered at the BHC level.

<sup>7</sup> Previous studies have found evidence of a run-off in deposits and a decline in small business lending following mergers (DiSalvo, 2002 and Berger et al., 1998), especially those involving larger banks. There is evidence that the decline in small business lending is offset over time by changing behavior of the merging institutions (Berger et al., 1998), by increased lending by community banks (Avery and Samolyk, 2004), and by new entry into the affected market (Berger et al., 2004).

<sup>8</sup> The HHI is calculated as the sum of the square of the market share of each participant in a geographic market. In our case, the relevant market share is based on deposits held by each organization, and the geographic market is defined either as an MSA or non-MSA county. The HHI runs between 0 for a market with an infinite number of competitors to 1.0 for a market with a single competitor.

<sup>9</sup> The imprecision of the large network results may reflect that there are relatively few observations in this size cohort, somewhere between 6 and 9, depending on the year (see Table 1).

<sup>10</sup> One question is whether differences in the extent of de novo branching activity across branch network size groups might be affecting the results. For instance, if mid-sized networks were more heavily

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engaged in expansion via de novo branching, then this might explain the U-shaped results, since new branches tend to have lower deposit levels as they grow into maturity. To test for this possibility, we augmented the 2003 regression data with information about branch age and re-estimated the deposits-per-branch equation (1) with an additional control variable capturing the share of branches less than two years old and (2) excluding branches less than 2 years old from the dependent variable. These changes did not alter the basic results, suggesting that differences in de novo activity are unlikely to explain the basic findings.

<sup>11</sup> The results are consistent with DeYoung et al. (2004), who argue that while technological and regulatory change has exposed community banks to greater competition, there continues to be scope for well-managed community banks to compete effectively against larger institutions.

<sup>12</sup> Analysis of net deposit interest expense – interest paid on deposits minus deposit fees received – suggests that deposit costs are higher for banks with mid-sized branch networks than at banks with large branch networks, further supporting the idea that mid-sized branch networks are at a competitive disadvantage relative to larger branch networks. This differential has declined since 2000, however, suggesting some improvement in the performance over time. Net deposits costs are higher at banks with smaller networks than at banks with mid-sized networks, suggesting a mixed picture of the relative performance of smaller versus mid-sized networks. Smaller networks generate higher output, but at higher expense. These comparisons do not take non-interest costs into account, of course. The net deposit cost results are available from the author on request.

<sup>13</sup> We also did estimates with unadjusted market returns; the results are similar to those for the risk-adjusted returns.

<sup>14</sup> As noted above, since ROE is calculated using net income from the quarter following the date of the branch data, we lose some observations due to mergers. In addition, we drop observations where the calculated ROE either exceeded 50 percent or was less than -50 percent. Altogether, about 30 observations are dropped from the sample.

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<sup>15</sup> This finding is unchanged if the regressions are run using just the asset size control variables and the branch network size variables.

## References

- Athanassopoulos, A.D., 1998. Nonparametric Frontier Models for Assessing the Market and Cost Efficiency of Large-scale Bank Branch Networks. *Journal of Money, Credit, and Banking* 30, 172-92.
- Avery, R.B., Samolyk K. A., 2004. Bank Consolidation and Small Business Lending: The Role of Community Banks. *Journal of Financial Services Research* 25, 291-325.
- Berger, A. N., 2004. Potential Competitive Effects of Basel II on Banks in SME Credit Markets in the United States. Mimeo. Board of Governors of the Federal Reserve System. February 2004.
- Berger, A.N., Bonime, S.D., Goldberg, L.G., White, L.J., 2004. The Dynamics of Market Entry: The Effects of Mergers and Acquisitions on Entry in the Banking Industry. *Journal of Business* 77, 797-834.
- Berger, A.N., Dick, A.A., Goldberg, L.G. White, L.J., 2007. The Effects of Competition from Large, Multimarket Firms on the Performance of Small, Single-Market Firms: Evidence from the Banking Industry. *Journal of Money, Credit and Banking*. Forthcoming.
- Berger, A.N., Hanweck, G.A., Humphrey, D.B., 1987. Competitive Viability in Banking: Scale, Scope, and Product Mix Economies. *Journal of Monetary Economics* 20, 501-520.
- Berger, A.N., Leusner, J.H., Mingo, J.J., 1997. The Efficiency of Bank Branches. *Journal of Monetary Economics* 40, 141-162.
- Berger, A.N., Saunders, A., Scalise, J.M., Udell, G.F., 1998. The Effects of Bank Mergers and Acquisitions on Small Business Lending. *Journal of Financial Economics* 50, 187-229.
- Carbó Valverde, S., Humphrey, D.B., López del Paso, R., 2004. Opening the Black Box: Finding the Source of Cost Inefficiency. Florida State University. Manuscript. July 2004.
- DeYoung, R., Hunter, W.C., Udell, G.F., 2004. The Past, Present, and Probable Future for Community Banks. *Journal of Financial Services Research* 25, 85-133.
- Dick, A.A., 2003. Demand Estimation and Consumer Welfare in the Banking Industry. Board of Governors of the Federal Reserve System Finance and Economics Discussion Series 2003 – 14.
- DiSalvo, J., 2002. Deposit Runoff from Bank Mergers. Federal Reserve Bank of Philadelphia. Manuscript. December 2002.
- Edelstein, P., Morgan, D.P., 2006. Local or State? Evidence on the Size of Banking Markets Using Prices at the Branch Level. Federal Reserve Bank of New York Economic Policy Review 12, 15-25.
- Federal Deposit Insurance Corporation, 2004. Historical Statistics on Banking. <http://www2.fdic.gov/hsob/index.asp>.
- Hannan, T.H., 2002. Retail Fees of Depository Institutions, 1997- 2001. *Federal Reserve Bulletin*. Sept. 2002, 405-413.

- Hannan, T.H., 2004. Bank Retail Fees and Multimarket Banking. Manuscript. Board of Governors of the Federal Reserve System.
- Hannan, T.H., Prager, R.A., 2004a. The Competitive Implications of Multimarket Bank Branching. *Journal of Banking and Finance* 28, 1889-1914.
- Hannan, T.H., Prager, R.A., 2004b. Multimarket Bank Pricing: An Empirical Investigation of Deposit Interest Rates. Board of Governors of the Federal Reserve System Finance and Economics Discussion Series 2004-38.
- Hensel, N.D., 2003. Strategic Management of Cost Efficiencies in Networks: Cross-country Evidence on European Branch Banking. *European Financial Management* 9, 333-60.
- Hirtle, B., Stiroh, K., 2006. "The Return to Retail and the Performance of U.S. Banks." *Journal of Banking and Finance*. (forthcoming).
- Hirtle, B., Metli, C., 2004. The Evolution of U.S. Bank Branch Networks: Growth, Consolidation, and Strategy. *Federal Reserve Bank of New York Current Issues in Economics and Finance* 10, No. 8.
- Humphrey, D., Willeson, M., Bergendahl, G., Lindblom, T., 2005. Benefits from a Changing Payment Technology in European Banking. *Journal of Banking and Finance* 30, 1631-52.
- Orlow, D.K., Radecki, L.J., Wenninger, J., 1996. Ongoing Restructuring of Retail Banking. Federal Reserve Bank of New York Research Paper #9634.
- Park, K., Pennacchi, G., 2004. Harming Depositors and Helping Borrowers: The Disparate Impact of Bank Consolidation. Manuscript. University of Illinois.
- Radecki, L.J., 1999. Banks' Payments-Driven Revenues. *Federal Reserve Bank of New York Economic Policy Review* 5, 53-70.
- Seale, G., 2004. Branching Continues to Thrive as the U.S. Banking System Consolidates. *Federal Deposit Insurance Corporation FYI*. October 20, 2004.
- Zardhoohi, A., Kolari, J., 1994. Branch Office Economies of Scale and Scope: Evidence from Savings Banks in Finland. *Journal of Banking and Finance* 18, 421-32.

Figure 1: Offices of FDIC Insured Banks and Thrifts

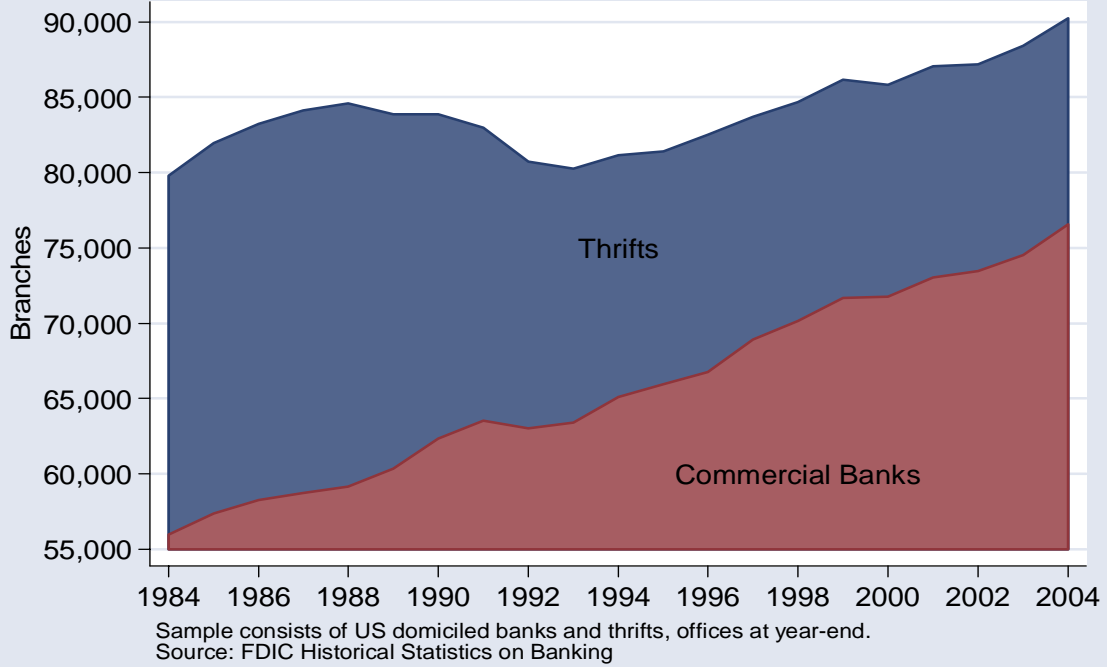
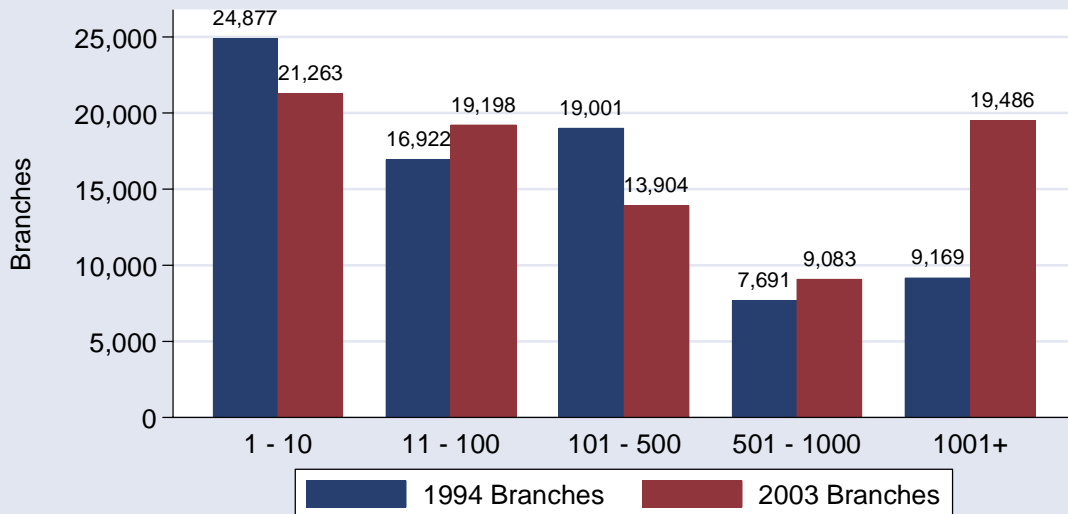


Figure 2: Distribution of Branches by Branch Network Size



Sample consists of all full-service deposit taking offices as of mid-year.  
Source: FDIC Summary of Deposits

**Table 1**  
**Distribution of Sample by Branch Network Size**  
**1995 to 2003**

Branch Network Size	2003	2002	2001	2000	1999	1998	1997	1996	1995
	Number of Bank Holding Companies								
11 – 50	557	534	511	496	478	453	429	432	394
51 – 100	48	50	56	52	52	48	50	41	40
101 – 500	57	56	52	57	63	63	64	62	72
501 – 1000	11	8	12	11	9	12	11	13	12
More than 1000	9	9	8	9	8	7	7	7	6
Total	682	657	639	625	610	583	561	555	524
	Average Number of Branches								
11 – 50	20	19	19	19	19	19	19	19	20
51 – 100	70	73	71	71	71	68	72	73	73
101 – 500	215	233	220	222	229	231	235	223	235
501 – 1000	703	718	718	683	715	715	688	700	645
More than 1000	2009	2029	2108	1842	1110	1842	1678	1685	1504
Total	77	78	79	80	80	82	83	83	85

Source: FDIC Summary of Deposits and author's calculations.



**Table 2: Summary Statistics for the Pooled 1995-2003 Regression Data Set**

	Mean	Median	Minimum	Maximum
<i>Performance Proxy Variables</i>				
Non-head office Deposits	37.5	32.9	2.6	346.3
Total Small Business Loans	7.1	6.3	0.0	43.4
<i>Profitability</i>				
ROE	14.48	14.46	-43.26	47.90
Risk-Adjusted Market Return	0.13	0.14	-2.18	1.82
<i>Institution Characteristics</i>				
Total Assets	7.976	0.828	0.064	685.0
Total Capital Ratio	0.137	0.126	0.076	0.832
Loans to Assets Ratio	0.643	0.655	0.105	0.955
Assets Acquired via Merger over Assets	0.087	0.000	0.000	2.955
Number of Entities	2.91	1	1	63
<i>Market Characteristics</i>				
Weighted Average State Personal Income Growth	0.103	0.105	0.015	0.211
Weighted Average HHI, MSA level	0.1784	0.1641	0.0466	0.5709
<i>Branch Network Characteristics</i>				
Number of States	1.88	1	1	33
Number of MSAs	12.80	5	1	439
Branches per capita, MSA level	0.053	0.041	0.001	.392
In-store Share	0.033	0.000	0.000	1.000

Sample is pooled data from 1995 to 2003. All data are as of June 30 unless otherwise noted. Non-head office deposits are aggregate deposits held in all bank and thrift branches, excluding deposits held in large head offices of organizations with 100 or more branches. Small business loans have original principal amount of less than \$1 million. ROE is annualized Q3 net income divided by equity. Risk-adjusted market return is the average weekly return on the BHC's public equity during Q3 divided by the standard deviation of the weekly return during the quarter. Total assets is in billions of dollars. Total capital, loans to assets, assets acquired via merger, and state personal income growth are ratios. Number of entities equals the number of bank and thrifts held by the bank holding company. HHI variable is expressed from 0 to 1. Branches per capita variables are branches per thousand people. In-store share is the share of retail ("supermarket") branches. All data come from the Reports of Condition and Income (Call Reports) for commercial bank subsidiaries and the Thrift Financial Reports for thrift subsidiaries of the holding company, with the exception of the data for non-head office deposits and market and branch network characteristics, which are derived from branch-level deposit data as reported on the FDIC's Summary of Deposits, and stock return data, which are from the Center for Research in Securities Prices.

**Table 3: Proxy Variables by Branch Network Size Group  
for the Pooled 1995 to 2003 Regression Sample**

	<b>Branch Network Size</b>				
	<b>11 to 50 branches</b>	<b>51 to 100 branches</b>	<b>101 to 500 branches</b>	<b>501 to 1000 branches</b>	<b>1001+ branches</b>
	<b>Mean (Median)</b>				
Non-head Office Deposits	35.8 (30.7)	41.9 (37.7)	43.1 (40.1)	51.8 (44.6)	50.2 (48.6)
Total Small Business Loans	7.2 (6.4)	6.8 (6.6)	6.3 (6.1)	6.5 (6.5)	5.4 (5.4)

Sample is pooled data from 1995 to 2003. All data are as of June 30 unless otherwise noted. Non-head office deposits are aggregate deposits held in all bank and thrift branches, excluding deposits held in large head offices of organizations with 100 or more branches. Small business loans have original principal amount of less than \$1 million. All data come from the Reports of Condition and Income (Call Reports) for commercial bank subsidiaries and the Thrift Financial Reports for thrift subsidiaries of the holding company, with the exception of the data for non-head office deposits and branch network size, which are derived from branch-level deposit data as reported on the FDIC's Summary of Deposits.

**Table 4: Non-head Office Deposits per Branch and Branch Network Size, 1995-2003**

	2003	2002	2001	2000	1999	1998	1997	1996	1995
<i>Institution Characteristics</i>									
Asset Size:									
\$500M to \$1B	10.477*** (0.968)	10.444*** (0.965)	10.209*** (0.949)	9.945*** (0.996)	10.606*** (1.021)	11.933*** (0.950)	10.901*** (1.045)	12.407*** (1.029)	11.681*** (1.178)
\$1B to \$10B	28.374*** (2.270)	27.991*** (2.401)	27.055*** (2.186)	27.648*** (2.255)	31.287*** (2.620)	28.913*** (2.207)	26.707*** (2.605)	29.709*** (3.225)	29.053*** (3.083)
More than \$10B	49.394*** (4.178)	50.942*** (4.866)	49.476*** (4.335)	46.726*** (3.803)	49.774*** (4.973)	48.505*** (4.922)	43.623*** (4.792)	47.333*** (5.580)	42.565*** (4.032)
Total Capital Ratio	13.768 (34.111)	17.048 (28.006)	9.690 (22.678)	-9.260 (21.605)	-17.648 (21.644)	-7.623 (21.336)	-13.346 (21.542)	5.144 (17.121)	-6.579 (14.542)
Loans to Assets Ratio	4.616 (11.828)	3.983 (11.442)	4.132 (10.515)	-2.916 (9.344)	-9.299 (9.895)	-10.597 (10.313)	-14.483 (10.575)	-13.789 (8.650)	-12.390* (7.398)
Assets from Mergers	-2.842 (4.813)	-4.394 (4.268)	-6.416* (3.533)	-7.772** (3.454)	-10.733*** (3.996)	-2.365 (5.421)	0.231 (5.520)	-3.190 (5.370)	-4.565** (2.065)
Log(Number of Entities)	1.880* (1.085)	0.917 (1.060)	0.821 (0.947)	-0.180 (1.038)	-0.215 (1.068)	0.257 (0.882)	-0.860 (0.916)	-0.582 (1.159)	1.383 (1.030)
<i>Market Characteristics</i>									
State Personal Income Growth	-177.07*** (41.138)	-141.01*** (40.503)	132.35*** (32.417)	130.03*** (33.024)	116.96*** (34.534)	36.998 (25.454)	62.512** (25.047)	80.622*** (24.240)	-9.822 (28.158)
Average MSA HHI	-8.103 (11.131)	-24.177** (11.826)	-16.807 (10.421)	-21.330* (10.912)	-14.725 (12.686)	-19.244 (12.062)	-15.802 (11.313)	-24.106* (12.445)	-35.836*** (12.483)
<i>Branch Network Characteristics</i>									
Number of States	1.091* (0.620)	1.961** (0.819)	1.269* (0.741)	1.744* (0.905)	1.383* (0.783)	2.462** (0.969)	3.220*** (1.209)	2.920*** (1.037)	2.128** (1.043)
Number of MSAs	-0.133** (0.053)	-0.179*** (0.064)	-0.135** (0.053)	-0.171** (0.071)	-0.139** (0.064)	-0.248*** (0.075)	-0.261*** (0.087)	-0.324*** (0.088)	-0.290*** (0.090)
Average Branches per Capita	-64.868*** (15.784)	-66.494*** (14.504)	-52.109*** (12.977)	-40.241*** (14.931)	-53.129*** (16.631)	-45.733*** (16.134)	-49.384*** (15.537)	-38.184** (15.045)	-35.184** (16.128)
In-store Share	-20.106*** (4.461)	-26.389*** (4.865)	-24.000*** (4.449)	-23.902*** (5.182)	-23.289*** (5.253)	-20.583*** (4.430)	-18.804*** (5.238)	-85.561 (58.307)	-20.844*** (6.321)
<i>Branch Network Size:</i>									
11 to 50	22.592*** (2.957)	24.297*** (3.563)	20.313*** (3.205)	17.815*** (3.344)	20.661*** (3.819)	19.536*** (3.756)	17.061*** (3.869)	16.724*** (4.415)	16.885*** (4.239)
51 to 100	10.468*** (3.079)	12.741*** (3.539)	8.404*** (3.004)	5.957** (2.831)	8.785** (3.876)	9.619** (4.084)	9.113** (4.009)	6.639 (4.236)	3.909 (2.667)
501 to 1000	7.253 (10.538)	5.178 (13.926)	1.926 (9.513)	0.371 (9.739)	-0.544 (9.618)	5.247 (6.852)	2.996 (5.434)	7.522 (4.706)	8.264* (4.804)
More than 1000	21.021** (10.006)	17.801* (9.805)	11.122 (8.297)	9.792 (9.091)	5.781 (8.788)	7.623 (7.945)	5.735 (6.759)	17.240** (8.700)	23.203** (9.257)
Number of Observations	682	657	639	625	610	583	561	555	524
R-squared	0.42	0.43	0.44	0.42	0.41	0.47	0.41	0.38	0.36
F-test	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Regressions are estimated with robust standard errors, which are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5%, and 10% levels. The F-test row reports the p-values of a test of the joint significance of the branch network size dummy variables. The omitted asset size group is organizations with under \$500 million in assets and the omitted branch network size group is organizations with 101 to 500 branches. Deposits per branch variables are in millions of dollars. Total capital, loans to assets, assets acquired via merger, in-store share, and state personal income growth are ratios. HHI variables are expressed from 0 to 1. Branches-per-capita variables are branches per thousand people. All data are as of June 30 for the year in question.

**Table 5: Total Small Business Loans per Branch and Branch Network Size, 1995-2003**

	2003	2002	2001	2000	1999	1998	1997	1996	1995
<i>Institution Characteristics</i>									
Asset Size:									
\$500M to \$1B	1.977*** (0.295)	2.085*** (0.290)	2.154*** (0.309)	1.858*** (0.300)	1.994*** (0.322)	2.080*** (0.326)	2.049*** (0.285)	1.935*** (0.315)	1.874*** (0.327)
\$1B to \$10B	3.588*** (0.466)	3.665*** (0.485)	3.871*** (0.482)	3.888*** (0.526)	4.620*** (0.556)	4.155*** (0.547)	3.447*** (0.531)	3.533*** (0.529)	3.606*** (0.460)
More than \$10B	5.386*** (0.851)	5.866*** (0.969)	5.210*** (0.734)	5.068*** (0.757)	5.160*** (0.758)	4.633*** (0.759)	4.279*** (0.805)	4.271*** (0.792)	4.143*** (0.774)
Total Capital Ratio	-9.150 (6.014)	-7.860 (5.901)	-5.830 (4.860)	-8.254* (4.806)	-8.439* (4.328)	-6.674 (4.195)	-2.365 (3.690)	-1.036 (3.493)	-2.879 (3.356)
Loans to Assets Ratio	6.924*** (1.748)	8.044*** (1.815)	6.863*** (1.727)	6.610*** (1.864)	6.176*** (1.850)	5.000*** (1.773)	5.573*** (1.756)	4.618** (1.893)	4.051** (1.635)
Assets from Mergers	0.169 (1.008)	0.619 (0.904)	0.577 (0.810)	0.813 (0.881)	0.804 (0.985)	0.615 (0.948)	1.374 (1.124)	0.211 (0.874)	0.080 (0.606)
Log(Number of Entities)	0.817*** (0.261)	0.943*** (0.322)	0.723*** (0.263)	0.605** (0.245)	0.509** (0.246)	0.490** (0.228)	0.206 (0.193)	0.161 (0.210)	0.414** (0.190)
<i>Market Characteristics</i>									
State Personal Income Growth	-15.910* (9.295)	-17.546* (10.414)	6.313 (6.596)	19.432*** (6.542)	32.327*** (7.429)	26.966*** (7.213)	19.248** (7.795)	22.865*** (6.072)	11.878* (6.247)
Average MSA HHI	4.195* (2.441)	4.302 (3.046)	3.221 (2.804)	4.655 (2.910)	5.897* (3.556)	4.166 (3.424)	1.688 (2.987)	-0.648 (3.040)	-2.902 (2.624)
<i>Branch Network Characteristics</i>									
Number of States	0.116 (0.151)	0.278 (0.197)	0.053 (0.125)	0.116 (0.169)	-0.022 (0.088)	-0.030 (0.133)	0.012 (0.149)	0.217 (0.162)	0.234 (0.174)
Number of MSAs	-0.010 (0.008)	-0.019* (0.011)	-0.004 (0.007)	-0.010 (0.010)	-0.011* (0.006)	-0.017* (0.010)	-0.015 (0.011)	-0.026** (0.013)	-0.027* (0.015)
Average Branches per Capita	-25.208*** (3.799)	-27.090*** (4.225)	-23.637*** (3.925)	-24.950*** (4.107)	-25.408*** (4.829)	-20.446*** (4.880)	-16.112*** (3.783)	-14.259*** (3.565)	-12.330*** (3.663)
In-store Share	-4.437*** (0.924)	-5.071*** (1.125)	-3.940*** (1.071)	-4.329*** (1.253)	-3.773*** (1.404)	-3.513*** (1.023)	-3.044*** (1.157)	-11.668 (13.739)	-3.290* (1.995)
<i>Branch Network Size:</i>									
11 to 50	4.477*** (0.628)	4.793*** (0.804)	4.132*** (0.698)	4.564*** (0.730)	4.311*** (0.675)	3.768*** (0.601)	3.014*** (0.651)	3.110*** (0.623)	3.438*** (0.597)
51 to 100	2.114*** (0.662)	2.008*** (0.742)	1.286** (0.557)	1.553** (0.610)	0.966* (0.577)	1.126* (0.574)	1.239** (0.604)	1.449** (0.586)	0.782 (0.638)
501 to 1000	-0.304 (1.015)	-0.844 (1.053)	-0.519 (0.714)	-0.254 (0.803)	0.120 (0.705)	1.535** (0.756)	-0.035 (0.720)	0.023 (0.659)	-0.550 (0.609)
More than 1000	-0.685 (1.019)	-0.821 (1.168)	-1.585* (0.862)	-0.748 (1.210)	0.287 (1.314)	0.211 (1.034)	-0.535 (1.234)	-0.513 (1.365)	-0.463 (1.558)
Number of Observations	682	657	639	625	610	583	561	555	524
R-squared	0.29	0.29	0.27	0.28	0.30	0.29	0.23	0.24	0.26
F-test	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Regressions are estimated with robust standard errors, which are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5%, and 10% levels. The F-test row reports the p-values of a test of the joint significance of the branch network size dummy variables. The omitted asset size group is organizations with under \$500 million in assets and the omitted branch network size group is organizations with 101 to 500 branches. Small business loans per branch variables are in millions of dollars. Total capital, loans to assets, assets acquired via merger, in-store share, and state personal income growth are ratios. HHI variables are expressed from 0 to 1. Branches-per-capita variables are branches per thousand people. All data are as of June 30 for the year in question.

**Table 6: Return on Equity and Branch Network Size, 1995-2003**

	2003	2002	2001	2000	1999	1998	1997	1996	1995
<b>PANEL A</b>									
<i>Institution Characteristics</i>									
Asset Size:									
\$500M to \$1B	-0.107 (0.673)	0.221 (0.687)	-0.233 (0.720)	-0.405 (0.651)	1.262* (0.677)	0.137 (0.763)	0.552 (0.485)	-0.689 (0.714)	0.655 (0.591)
\$1B to \$10B	1.257 (0.827)	0.909 (0.964)	0.045 (1.018)	0.315 (0.867)	1.559* (0.813)	1.196 (0.851)	0.652 (0.627)	-0.539 (0.913)	1.138 (0.990)
More than \$10B	0.889 (1.634)	3.609 (2.476)	1.579 (2.897)	-0.276 (3.374)	1.602 (1.557)	4.244* (2.258)	1.909 (1.423)	0.050 (1.970)	3.797** (1.537)
Total Capital Ratio	-3.643 (7.275)	-16.710*** (5.772)	-4.142 (5.646)	-10.764** (5.243)	-10.628 (6.937)	-5.768 (8.920)	-13.527** (5.801)	-21.713*** (7.698)	-8.400 (9.792)
Loans to Assets Ratio	13.244* (7.023)	14.907** (7.377)	24.209*** (7.952)	32.876*** (11.448)	25.631*** (7.834)	21.433** (9.121)	10.539* (5.796)	21.097** (9.150)	14.480* (7.569)
Securities to Assets Ratio	6.691 (6.699)	21.009*** (7.176)	23.566*** (8.351)	30.232*** (11.090)	29.676*** (7.803)	16.877** (8.352)	12.060** (5.883)	27.309** (11.332)	14.515** (7.037)
Trading Assets / Assets	14.600 (16.870)	-20.026 (19.035)	-13.319 (37.799)	74.934*** (28.552)	81.847** (36.097)	-46.804 (52.048)	-7.740 (16.108)	7.202 (25.041)	13.206 (12.410)
Retail Loans / Total Loans	0.270 (3.101)	2.957 (2.827)	4.183 (3.142)	-2.955 (3.965)	-1.277 (3.404)	-9.801** (4.173)	-2.174 (3.365)	7.831 (5.928)	1.917 (3.979)
C&I Loans/Total Loans	-7.318* (3.907)	-3.978 (3.664)	1.858 (3.802)	-4.259 (4.876)	-3.437 (4.083)	-16.229*** (5.768)	-3.402 (3.952)	8.792 (6.227)	-1.854 (4.957)
Non-residential Real Estate/ Total Loans	4.042 (3.005)	8.425*** (2.558)	8.797*** (3.337)	3.985 (4.112)	0.510 (3.741)	-4.669 (4.401)	3.376 (3.389)	9.887* (5.318)	5.228 (4.909)
Loans to Depositories/ Total Loans	2.395 (12.947)	36.595 (25.041)	11.247 (14.435)	-31.449 (35.776)	-41.896 (38.108)	-34.334 (41.807)	-15.877 (16.715)	3.646 (17.491)	5.617 (22.589)
Non-performing Loans / Total Loans	-209.48*** (50.878)	-201.40*** (36.433)	-180.34*** (39.637)	-92.17** (38.264)	-167.33*** (31.780)	-87.65 (55.907)	-36.32 (30.185)	9.04 (27.532)	-107.19*** (35.939)
Non-interest Income / Operating Income	9.134** (3.754)	4.060 (4.121)	10.724** (4.654)	5.341 (3.611)	-0.348 (4.854)	14.008*** (3.747)	11.271*** (3.563)	1.078 (5.446)	3.130 (4.072)
Log(Salary per Employee)	-0.522 (1.555)	1.907 (1.742)	2.914* (1.699)	-0.340 (1.877)	-0.393 (1.797)	1.561 (1.741)	1.253 (1.574)	4.970* (2.845)	3.335** (1.591)
Log(Premises Expense/ Branch)	0.790 (0.625)	0.135 (0.950)	-1.285* (0.743)	0.620 (0.911)	0.804 (0.773)	-1.015 (0.647)	-0.257 (0.561)	0.563 (0.816)	-0.675 (0.654)
Assets from Mergers	-4.991*** (1.780)	-0.544 (1.505)	-1.888 (1.768)	-2.771 (1.818)	-4.168*** (1.529)	-0.112 (1.907)	-2.033 (1.320)	-0.535 (1.603)	1.822 (1.597)
Log(Number of Entities)	-0.231 (0.362)	0.440 (0.370)	0.213 (0.460)	0.247 (0.424)	-0.357 (0.323)	-0.354 (0.394)	-0.192 (0.299)	1.399*** (0.470)	0.306 (0.371)
<i>Market Characteristics</i>									
State Personal Income Growth	-3.107 (14.259)	-6.041 (15.548)	19.352 (14.279)	51.310*** (9.317)	38.860*** (10.383)	34.812*** (11.075)	9.043 (9.841)	32.464* (18.223)	33.245*** (11.838)
Average MSA HHI	-3.485 (4.921)	-2.430 (5.325)	-1.216 (4.996)	-9.112** (4.569)	2.077 (4.833)	0.894 (5.295)	0.013 (3.966)	15.611*** (5.750)	2.969 (4.232)

**Table 6: Return on Equity, 1995-2003 (Continued)**

	2003	2002	2001	2000	1999	1998	1997	1996	1995
<b>PANEL B</b>									
<i>Branch Network Characteristics</i>									
Number of States	-0.371 (0.231)	-0.277 (0.235)	-0.184 (0.313)	0.332 (0.337)	0.318** (0.154)	0.197 (0.241)	-0.069 (0.343)	0.459 (0.376)	0.342 (0.497)
Number of MSAs	0.010 (0.015)	0.012 (0.018)	0.001 (0.024)	-0.045** (0.020)	-0.002 (0.020)	-0.043 (0.034)	0.032 (0.023)	-0.047 (0.032)	-0.026 (0.028)
Average Branches per Capita	9.518 (8.258)	5.625 (9.165)	1.199 (7.934)	20.016** (9.002)	3.170 (7.581)	-3.340 (9.835)	1.582 (6.981)	-9.302 (8.570)	-3.089 (7.911)
In-store Share	2.452 (2.971)	5.834* (3.163)	5.242 (3.423)	2.084 (2.962)	0.195 (4.144)	-3.470 (3.288)	-2.254 (3.791)	128.288* (74.947)	-12.328 (7.558)
<i>Branch Network Size:</i>									
11 to 50 Branches	-1.450 (1.134)	0.140 (2.016)	-0.981 (2.532)	-0.739 (2.254)	-1.565 (1.001)	0.118 (1.783)	0.218 (0.959)	1.338 (0.968)	1.385 (0.926)
51 to 100 Branches	-0.596 (1.178)	1.077 (1.914)	-0.506 (2.629)	0.995 (2.373)	-0.219 (1.130)	2.717 (1.858)	1.448 (1.036)	0.955 (0.854)	1.814** (0.900)
501 to 1000 Branches	3.136** (1.539)	2.397 (1.922)	1.828 (2.530)	-0.195 (4.902)	-2.409 (2.212)	2.142 (2.584)	0.945 (1.907)	4.333** (1.918)	-0.546 (1.114)
More than 1000 Branches	3.896 (2.520)	3.257 (3.007)	-1.017 (4.198)	6.328 (5.911)	3.216 (3.072)	4.621 (3.984)	-4.571* (2.380)	1.195 (3.531)	3.477 (3.485)
Number of Observations	650	632	603	581	551	512	503	511	480
R-squared	0.21	0.18	0.15	0.15	0.17	0.17	0.15	0.12	0.21
F-test	0.19	0.67	0.81	0.46	0.15	0.04	0.07	0.13	0.18

Notes: Regressions are estimated with robust standard errors, which are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5%, and 10% levels. The F-test row reports the p-values of a test of the joint significance of the branch network size dummy variables. The omitted asset size group is organizations with under \$500 million in assets and the omitted branch network size group is organizations with 101 to 500 branches. ROE is in percent (annualized). Total capital, loans to assets, non-performing loans to total loans, non-interest income to operating income, retail loans to total loans, trading assets to total assets, assets acquired via merger, in-store share, and state personal income growth are ratios. HHI variables are expressed from 0 to 1. Branches-per-capita variables are branches per thousand people. Return of equity is based on annualized data from the third quarter of the year in question.

**Table 7: Risk-Adjusted Market Return and Branch Network Size, 1995-2003**

	2003	2002	2001	2000	1999	1998	1997	1996	1995
<i>Institution Characteristics</i>									
Asset Size:									
\$500M to \$1B	-0.284*** (0.105)	0.106 (0.100)	-0.083 (0.097)	-0.130 (0.116)	0.179 (0.124)	0.022 (0.079)	-0.071 (0.096)	0.064 (0.080)	0.094 (0.097)
\$1B to \$10B	-0.226** (0.110)	-0.078 (0.095)	-0.186** (0.093)	0.021 (0.120)	0.198 (0.129)	0.049 (0.087)	-0.051 (0.100)	0.171** (0.087)	0.170* (0.100)
More than \$10B	0.013 (0.143)	-0.179 (0.143)	-0.385** (0.151)	0.442** (0.198)	0.290 (0.190)	0.029 (0.168)	0.053 (0.166)	0.236 (0.143)	0.204 (0.150)
Total Capital Ratio	-2.445** (0.983)	0.709 (0.957)	0.480 (1.192)	-0.430 (1.466)	-0.000 (1.344)	-0.672 (0.918)	-2.253** (1.001)	-0.775 (1.030)	0.600 (1.076)
Loans to Assets Ratio	0.145 (0.618)	-0.820 (0.645)	1.056 (0.798)	0.825 (1.152)	-0.475 (1.092)	0.118 (0.765)	-1.148 (0.816)	-0.620 (0.792)	0.265 (0.736)
Securities to Assets Ratio	0.541 (0.619)	-0.582 (0.677)	1.049 (0.740)	0.847 (1.193)	-0.001 (1.095)	0.266 (0.773)	-0.961 (0.845)	-0.893 (0.847)	0.179 (0.740)
Trading Assets / Assets	1.176 (1.029)	-3.774*** (1.072)	-0.026 (2.330)	0.422 (1.947)	1.450 (2.996)	-6.514*** (2.197)	-2.824 (2.238)	-1.564 (1.781)	0.640 (1.475)
Retail Loans / Total Loans	1.101*** (0.369)	0.092 (0.421)	0.514 (0.488)	1.126* (0.618)	-0.389 (0.666)	-0.143 (0.435)	0.661 (0.672)	0.459 (0.613)	-0.643 (0.716)
C&I Loans/Total Loans	1.227*** (0.435)	-0.668 (0.549)	0.113 (0.512)	2.129*** (0.787)	-0.820 (0.747)	-0.264 (0.521)	0.461 (0.715)	0.366 (0.648)	-0.744 (0.750)
Non-residential Real Estate/ Total Loans	1.319*** (0.398)	0.132 (0.419)	0.522 (0.521)	1.346* (0.684)	-0.475 (0.688)	-0.403 (0.509)	0.771 (0.742)	0.741 (0.649)	-0.338 (0.754)
Loans to Depositories/ Total Loans	2.528*** (0.891)	2.376** (1.091)	-1.222 (2.789)	2.674 (2.429)	1.644 (3.040)	3.650 (2.812)	-0.602 (1.629)	-1.880 (2.108)	-2.317 (2.100)
Non-performing Loans / Total Loans	0.941 (2.342)	0.850 (3.580)	-1.252 (4.306)	-1.829 (7.234)	-6.006 (4.980)	-4.468 (5.483)	0.569 (6.319)	-1.773 (4.375)	-6.300** (3.094)
Non-interest Income / Operating Income	0.349 (0.280)	-0.416 (0.328)	0.157 (0.399)	0.255 (0.501)	-1.551*** (0.484)	-0.560* (0.323)	-0.024 (0.347)	0.414 (0.366)	0.440 (0.523)
Log(Salary per Employee)	0.002 (0.135)	-0.110 (0.126)	0.208 (0.163)	0.143 (0.211)	-0.020 (0.169)	-0.089 (0.145)	0.143 (0.186)	0.041 (0.169)	0.083 (0.206)
Log(Premises Expense/ Branch)	-0.078* (0.045)	0.019 (0.054)	-0.071 (0.076)	-0.096 (0.090)	0.014 (0.072)	0.113 (0.078)	-0.011 (0.056)	-0.032 (0.062)	0.112* (0.068)
Assets from Mergers	-0.086 (0.139)	-0.177 (0.109)	0.055 (0.130)	0.024 (0.184)	-0.257 (0.173)	0.017 (0.147)	0.162 (0.286)	0.046 (0.137)	0.098 (0.165)
Log(Number of Entities)	0.029 (0.031)	-0.058 (0.037)	0.031 (0.041)	0.035 (0.045)	-0.030 (0.041)	-0.043 (0.042)	-0.004 (0.040)	-0.083** (0.035)	-0.061 (0.040)
<i>Market Characteristics</i>									
State Personal Income Growth	0.275 (1.380)	1.693 (1.442)	1.136 (1.227)	3.943*** (1.474)	1.900 (1.309)	-2.993** (1.236)	-2.931* (1.498)	-0.103 (1.404)	1.757 (1.330)
Average MSA HHI	-0.509 (0.504)	0.058 (0.533)	0.374 (0.701)	-1.055 (0.804)	-0.102 (0.754)	-0.315 (0.508)	-2.092*** (0.657)	-0.815 (0.608)	0.049 (0.701)

**Table 7: Risk-Adjusted Market Return, 1995-2003 (Continued)**

	2003	2002	2001	2000	1999	1998	1997	1996	1995
<b>PANEL B</b>									
<i>Branch Network Characteristics</i>									
Number of States	-0.006 (0.016)	0.009 (0.018)	-0.020 (0.026)	0.028* (0.016)	0.008 (0.013)	-0.034 (0.022)	0.004 (0.028)	0.072** (0.032)	-0.003 (0.029)
Number of MSAs	0.000 (0.001)	-0.000 (0.001)	0.001 (0.002)	-0.001 (0.001)	-0.004*** (0.001)	0.006* (0.003)	0.000 (0.002)	0.001 (0.002)	0.001 (0.002)
Average Branches per Capita	0.730 (0.985)	-0.183 (1.186)	-0.780 (1.560)	0.282 (1.336)	0.817 (1.562)	1.213 (1.214)	3.107** (1.253)	1.416 (1.269)	-0.134 (1.478)
In-store Share	0.315 (0.329)	-0.025 (0.224)	0.238 (0.395)	-0.072 (0.336)	0.536 (0.407)	-0.374* (0.197)	0.167 (0.408)	-3.521 (4.391)	-0.729 (0.716)
<i>Branch Network Size:</i>									
11 to 50 Branches	0.167** (0.075)	-0.175* (0.090)	-0.138 (0.108)	-0.010 (0.153)	0.270** (0.120)	0.076 (0.130)	-0.077 (0.119)	-0.067 (0.099)	0.049 (0.097)
51 to 100 Branches	0.181** (0.071)	-0.100 (0.104)	-0.270** (0.106)	-0.008 (0.153)	0.198* (0.115)	0.308** (0.122)	-0.131 (0.099)	-0.077 (0.104)	0.066 (0.098)
501 to 1000 Branches	-0.208* (0.109)	-0.031 (0.089)	0.178 (0.193)	-0.200 (0.221)	0.208 (0.237)	0.056 (0.212)	-0.085 (0.113)	0.102 (0.098)	-0.094 (0.145)
More than 1000 Branches	-0.324* (0.179)	-0.129 (0.162)	0.313** (0.156)	-0.198 (0.260)	0.225 (0.245)	-0.069 (0.358)	-0.622** (0.242)	-0.661* (0.383)	0.164 (0.280)
Number of Observations	270	274	257	258	250	233	230	242	228
R-squared	0.16	0.18	0.15	0.24	0.25	0.20	0.17	0.21	0.14
F-test	0.02	0.32	0.01	0.89	0.18	0.01	0.06	0.03	0.78

Notes: Regressions are estimated with robust standard errors, which are in parentheses. \*\*\*, \*\* and \* indicate significance at the 1%, 5%, and 10% levels. The F-test row reports the p-values of a test of the joint significance of the branch network size dummy variables. The omitted asset size group is organizations with under \$500 million in assets and the omitted branch network size group is organizations with 101 to 500 branches. Risk-adjusted market return is in percent per week. Total capital, loans to assets, non-performing loans to total loans, non-interest income to operating income, retail loans to total loans, trading assets to total assets, assets acquired via merger, in-store share, and state personal income growth are ratios. HHI variables are expressed from 0 to 1. Branches-per-capita variables are branches per thousand people. Risk-adjusted returns are based on weekly stock returns from the third quarter of the year in question.