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Do Bank Mergers Affect Federal Reserve Check Volume?

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Abstract: The recent decline in the Federal Reserve's check volumes has received a lot of attention. Although switching to electronic payments methods and electronic check-processing has been credited for much of that decline, some of it could be caused by changes following bank mergers involving Federal Reserve customer banks. This paper evaluates the effect of bank mergers on Federal Reserve check-processing volumes.

Using inflow-outflow and regression methods, we find that mergers between two or more Reserve Bank customers have resulted in volume losses, especially during the first quarter following the merger. On average, the estimated cumulative loss of volume during the first five post-merger quarters was 2.6 million checks. While the overall number of checks in the United States has declined during the past few years, the Federal Reserve has lost additional check-processing volume because of bank mergers.

Keywords: Bank mergers, Federal Reserve check processing
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I. Introduction

Prior to the 1990s, U.S. banking markets were protected from entry by out-of-state depository institutions. The deregulation of unit banking and branch banking took place over several years and ended with passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act in 1994. The number of mergers, already high in the 1980s, increased substantially in the 1990s. Between 1980 and 2003, the number of banking organizations decreased by half. The mergers raised concentration levels in banking markets. During that time, the share of deposits held by the ten largest commercial banking organizations grew from 19 percent to 41 percent (Pilloff 2004).

Mergers have caused banks to change their internal payments processing. As Roger Ferguson, the Vice Chairman of the Board of Governors of the Federal Reserve System noted in his speech, "Financial consolidation is affecting the market structures for payment and securities settlement as well as banks' internal systems and procedures for payment and back-office activities." (Ferguson 2002). One of the major changes in bank back-office payment processing is in the way banks handle interbank checks. When Bank A merges with Bank B, interbank checks that were previously drawn on Bank A and deposited at B become "on-us" and are processed inside the newly formed institution. Thus, if the interbank checks were previously sent to a Reserve Bank for processing, the volume of checks received by Reserve Banks will decline following that bank merger, all else being constant. On the other hand, a small depository institution that previously used a correspondent bank to process its checks might start sending its checks to a Reserve Bank for processing if the correspondent bank merged with another institution and raised its check processing fees.

The number of checks processed by Reserve Banks has declined in the last few years. Similar trends have been observed by commercial banks. Although statistics on the volume of checks collected in the United States are scarce, the number of checks seems to be falling, caused in part by a growing number of electronic payments

gradually eroding the large number of paper checks still written. However, at least some of the decline in checks may be caused by mergers between commercial banks.

Although the literature on effects of bank mergers is vast, most of it focuses on the impact of mergers on market competition (Simons and Stavins 1998, Prager and Hannan 1998, Amel and Liang 1997, Calem and Nakamura 1995); on efficiency (Berger, Demsetz, and Strahan 1999, Berger and Humphrey 1997, Rhoades 1998, and DeYoung, Hasan, and Kirchoff 1998); on market entry (Berger, Bonime, Goldberg, and White 2000); and on credit availability (Whalen 2001, and Berger, Demsetz, and Strahan 1999). To our knowledge, there are no papers on the effect of bank mergers on the volume of checks processed.

A depositing bank has several ways to collect funds: It can present checks directly to the paying institution, use a correspondent bank or a clearinghouse, or send its checks to a Reserve Bank for collection. Because direct presentment is fairly costly to banks, only large banks find it cost effective to present checks directly.[1] The remaining banks use a correspondent bank, a clearinghouse, or a Reserve Bank.

Given the size breakdown of banks, the majority of mergers take place between two small banks. All else being constant, small banks present and receive fewer checks than large banks, and they exchange fewer checks among themselves than do large banks. A merger between two small banks would therefore create relatively few new, on-us checks and is thus unlikely to have a significant impact on the volume of checks processed by the Reserve Banks.

At the other extreme, the largest depository institutions may have substantial volumes of checks exchanged among themselves. These checks do become on-us when the banks merge. In some of those cases, however, the banks already exchanged checks directly prior to the merger. Such a merger would not alter the Federal Reserve's processing volumes. In cases where the banks did not exchange checks directly before

[1] The Federal Reserve's Retail Product Office estimates that it costs approximately $25 per day to present directly to a single endpoint, not including variable per-item costs. A bank would have to present at least 200 checks a day to make direct presentment cost effective.

the merger (for operations outside their main service territories, for example), they may continue to use Reserve Banks until their internal systems become fully integrated. In some cases, the Federal Reserve gains new customers as a result of large bank mergers. Smaller banks that used to present to the large banks prior to a merger may turn to a Reserve Bank as a result of deteriorated service quality or increased prices. For example, following the BankBoston-Fleet merger, some institutions that used to deposit directly with BankBoston switched to the Federal Reserve Bank of Boston.

In between are medium-size institutions, whose mergers are most likely to affect the Federal Reserve check processing volumes. The Federal Reserve is most vulnerable to volume losses resulting from mergers between two institutions of different types, such as when a money center buys a regional bank, or a regional bank buys a community bank. This is because one of the merging banks, typically the larger institution, may have already been bypassing the Federal Reserve by presenting directly and receiving direct presentments and may be a clearinghouse member. Following the merger, this bank may continue to use its pre-merger check-processing method for all checks from both institutions. The smaller bank's volume would be processed the same way as the larger partner's volume had been processed previously.

When a Federal Reserve customer bank merges with a bank that is not a Federal Reserve customer, the outcome depends on their respective roles in the merger. If the acquirer bank was a Federal Reserve customer, the Federal Reserve typically gains the new institution's on-others checks. The merged institution is then likely to continue to use the Federal Reserve's services to process its checks, rather than joining a clearinghouse or presenting directly. On the other hand, if the acquirer was not a Federal Reserve customer before the merger, the Federal Reserve typically loses all of the combined volume within three to six months.

The decline in the Federal Reserve's check-processing volume has had other causes as well, such as conversion of paper checks to ACH debits at the point of sale or at the lockbox. This paper focuses only on the effects of bank mergers on the Federal Reserve's check volumes.

2. Data

We used quarterly observations on individual depository institutions in the United States, compiled from multiple sources. The panel data cover a six-year period from the second quarter of 1996 through the third quarter of 2002 and contain observations on approximately 8,000 individual depository institutions that used Federal Reserve paper check-processing services, together with information on individual bank attributes, merger status, and a set of variables controlling for regional economic conditions.

We obtained the data on individual paper check and ACH volumes from the Federal Reserve Information System (FRIS). FRIS records the number of paper checks and ACH transactions processed by the Federal Reserve for every depository institution each month. FRIS check-volume data were matched with individual bank records from the quarterly Consolidated Reports of Condition and Income (Call Reports) filed by commercial banks with the Federal Deposit Insurance Corporation (FDIC) or the Comptroller of the Currency, containing data on the institution's name, location, assets, deposits, loans, and number of accounts. For credit unions, check data were matched with records from the quarterly or semiannual Statements of Financial Condition filed with the National Credit Union Administration (NCUA).[2] Check data on thrifts were matched with the quarterly Thrift Financial Reports filed with the Office of Thrift Supervision (OTS).

To control for national and regional economic conditions, the following exogenous variables were used: real GDP growth, employment, unemployment rates, population, and real per capita income. To approximate the value of check float, the data contain quarterly observations on the federal funds effective rate.

Institutions participating in mergers were identified based on information from the National Information Center (NIC) maintained by the Federal Reserve. NIC data

[2] Since some credit unions file semiannual rather than quarterly reports, their assets, deposits, loans, and number of accounts were linearly interpolated, and, in some cases, extrapolated. In cases where the extrapolation resulted in imputed negative volumes, the last non-zero volume record was used as a proxy for the volume lost because of the merger.

contain the date of each merger and the identities of the merging institutions, listing multiple acquisitions by the same institution as different transactions. In some cases where the institutions were not Federal Reserve customers, we could not verify the number of institutions acquired. For that reason, one of two different approaches was used to to measure check-volume loss, with the choice depending on whether all the institutions participating in a merger were Federal Reserve customers or not. It is easier to identify the effect of the merger in the first case than in the second. Both approaches are outlined in more detail below.

Figure 1 shows the volume of checks processed by the Federal Reserve in each quarter. Although there was a substantial decline in check volume in 1994, the Federal Reserve did not start losing customers until much later.[3] Figure 2 shows the number of financial institutions—commercial banks, credit unions, and savings banks—that used the Federal Reserve's check processing in each quarter. Following a steady increase in the number of customers in the late 1990s, the Federal Reserve lost customers in 2002 and 2003. Figure 3 shows the number of bank mergers in each quarter. Despite the large variation, bank mergers were not more frequent towards the end of the sample period than they were at the beginning. In fact, Federal Reserve customer banks appear to have engaged in fewer mergers after 2000 than prior to 2000 (see Figure 4). Thus, the loss of customer banks in the last years of the sample does not seem to have been caused by bank mergers.

3. Estimating Merger Effects

Bank mergers can affect Federal Reserve check volume in two ways: directly, if a Federal Reserve customer bank switches to a different provider following a merger,[4] or

[3] The reason for the volume decline was the introduction of the same-day settlement rule in January 1994. The rule increased the ability of correspondent banks to compete with the Federal Reserve Banks in collecting checks.

[4] That is especially likely to happen if one of the merging institutions used a non-Federal Reserve service provider prior to the merger.

indirectly, if the post-merger check volume is reduced because checks previously exchanged between two Reserve Bank customers are processed as on-us checks. While the first case deals with additions and losses of check volume due to institutions joining or leaving the Federal Reserve customer base, the second case deals exclusively with the volume effect of mergers between continuing Reserve Bank clients. We calculate the direct volume loss using an inflow-outflow approach, while the indirect volume loss is estimated using regression analysis.

The Inflow-Outflow Approach

Here, we focus on the direct effect of bank mergers on Federal Reserve check-processing volume. Following a merger with a non-Federal Reserve customer, a customer bank can switch to another service provider or it can attract its merger partner to the Federal Reserve. The former would result in volume loss, while the latter would result in volume gain. Because both a target and an acquirer participate in a merger, four distinct cases are possible:

(1) Acquirer enters (target is a Reserve Bank customer);

(2) Acquirer exits (target is not a Reserve Bank customer);

(3) Target enters (acquirer is a Reserve Bank customer); and

(4) Target exits (acquirer is not a Reserve Bank customer).

An acquirer or a target exits when it drops Federal Reserve check-processing following its merger. An acquirer or target enters when it joins a current Federal Reserve customer following a merger. Cases (2) and (4) measure outflow, while cases (1) and (3) capture inflow of banks. The net effect of these inflows and outflows can result in either net volume gain (as was the case in the 1997 to 1999 period) or net volume loss (as was the case during most of the 1999 to 2002 period).

Exits and entries of merging institutions are flagged based on merger information from NIC, recording the date of the merger and the identities of the target and the acquirer. An event is defined as an exit if a bank participates in a merger in the

following quarter, and the current date is the institution's last date appearing in the data. Similarly, an event is defined as an entry if an institution participates in a merger in the current quarter, and the current quarter is its first date in the data. The endpoints of the data series—1996:Q2 and 2002:Q3—are excluded, since the start and end dates in those quarters cannot be reliably determined.

Inflows to and outflows from the customer pool can be measured either in terms of number of institutions or in terms of volume gain or loss. Volume loss is measured as the exiting bank's last recorded volume. Volume gain is calculated differently. If Bank A merges with Bank B, and Bank A was a Federal Reserve customer but Bank B was not, we want to measure the volume gain due to Bank B's entry. We calculate it as the first recorded volume of the merged entity minus Bank A's volume in the last period before the merger. We assume that Bank A will continue processing the same number of checks in the period of the merger because data on its actual check volume during the quarter of the merger cannot be separated from the combined volume of the newly formed institution.

Figure 5 shows quarterly net gains (and losses) in Federal Reserve check-processing volumes due to merger activity. When the line is above zero, the volume of checks increased when a Reserve Bank customer merged with a non-customer and the new entity continued to use Federal Reserve check processing. When the line is below zero, the volume of checks dropped when a Reserve Bank customer merged with a non-customer and stopped using Federal Reserve check-processing services.

The Federal Reserve gained check volume as a result of bank mergers during the 1997 to 1999 period, but lost volume in most quarters during the 1999 to 2002 period. Despite substantial quarter-to-quarter variation, net volume losses increased over time. Almost the entire change in volume was due either to target banks leaving the Federal Reserve following a merger with a non-customer acquirer bank or to target banks joining the Federal Reserve following a merger with a customer acquirer. Acquirer banks tended not to change their check-processing provider following a merger.

Figure 6 shows the number of depository institutions that were "gained" or "lost" by Reserve Banks as a result of mergers in each quarter. Over the period shown in the chart, there was a net gain of about 30 institutions per quarter, on average. However, the net number of target banks joining the pool of Federal Reserve customers declined after 2001. The number of acquirers joining the Federal Reserve declined steadily throughout the sample period, while the number of acquirers leaving increased slightly. As a result, the Federal Reserve, on net, lost acquirer customers, although the magnitude of that change is small relative to the net effect of target volume.

Some of the overall decline in check volume was caused by a shift to electronic payments, such as automated clearinghouse (ACH). However, checks and ACH transactions processed by Reserve Banks for commercial banks changed in a similar way following bank mergers. For both checks and ACH , Figure 7 plots the percentage of volume that was either lost or gained following a bank merger. As the figure shows, volume dipped in the first quarter following a merger—by approximately 15 percent—and then rebounded. The section below shows the results of econometric analysis examining what happens to check volume following mergers, controlling for other factors.

Regression analysis

We use data on banks that were Reserve Bank customers prior to the merger as well as after the merger to assess check volume decline due to the resulting consolidation of operations. When banks merge, they typically process more on-us checks and thus send fewer checks to outside processors, including Reserve Banks. Restricting our data to mergers among existing Reserve Bank customers enables us to use regression analysis.

In order to estimate the effect of on-us checks on the Federal Reserve check-processing volume, it is necessary to compare the pre-merger volume of each merger participant with the post-merger volume of the combined institution. Prior to the merger, the dependent variable is the sum of the individual volumes, while after the

merger, it is the actual volume of the newly formed entity. For every pair of merging institutions, individual volumes are summed up one quarter before the merger and regressed on a vector of quarterly time-dummies, with dummy variables indicating the quarter of the merger and four subsequent quarters. Banks not participating in a merger provide a control group. Of the 8,000 Federal Reserve customers in a quarterly cross-section, typically about 5 percent participate in a merger or acquisition. The results are described in the next section.

Specifications

We estimated several regression specifications. To test whether banks participating in mergers tend to have higher check volumes, even when controlling for their assets and deposits, we included a dummy variable equal to 1 if the bank had ever merged. The coefficient on that dummy variable was positive and significant in all specifications, indicating that there are systematic differences between merging and non-merging banks that are not accounted for by other variables.

In some specifications, we included bank assets and deposits to control for financial institution size, either as continuous variables or as sets of dummy variables indicating size. However, fixed-effects regressions produced a better fit. Therefore, our preferred specification is a fixed-effects regression with individual bank effects. We estimated level regressions and rate-of-change regressions. In level regressions, the volume of checks was regressed on a set of dummy variables indicating whether the bank participated in a merger in the current quarter or in any of the previous four quarters.

When five quarterly merger-dummy variables were included, the results showed a statistically significant drop in check volume during each of the five quarters. The drop was larger in the first three quarters and smaller in the two quarters that followed. The results of this regression are shown in Table 1. On average, the number of checks dropped by 600 thousand to 700 thousand in each of the first three post-merger quarters.

The estimated cumulative average decline in the first five post-merger quarters was 2.6 million.

In a rate-of-change specification, the dependent variable was a quarterly percentage change in check volume. The results (Table 2) indicate an approximately 15-percent drop in check volume in the quarter of the merger relative to the previous quarter, with substantially smaller decreases in each of the four following quarters. When we limited the sample to banks that merged at any time, the first-quarter drop in checks was smaller—9 percent—but the cumulative drop in the five quarters was approximately 18 percent, compared with over 21 percent in the total sample regression.

In all the specifications, most of the decline in check volume took place in the quarter of the merger or in the following quarter. However, merging banks' check volumes seem to be generally higher than those of banks that do not participate in mergers, even after controlling for bank size and location.

4. Conclusion

Although paper checks continue to dominate U.S. non-cash payments, their number has been declining in recent years. Some of the decline has come as consumers have gradually replaced checks with other payment methods, but some of the decline results from a change in the way checks are processed. In particular, banks often transform their internal operations following a merger with another depository institution. This paper focuses on the effect of bank mergers on Federal Reserve check-processing volume, using data on Federal Reserve check processing from 1996 to 2002.

We analyze two types of effects: changes in check volume following mergers between Reserve Bank customer banks and non-customer banks and changes following mergers between Reserve Bank customers. We find that mergers of the first type resulted in volume gains early in the sample, but generated volume losses during the last two years. However, mergers between two or more Reserve Bank customers have resulted in volume losses, especially during the first quarter after the merger. On average, the estimated cumulative loss of volume during the first five post-merger

quarters was 2.6 million checks. While the overall number of checks in the United States has declined during the past few years, the Federal Reserve has lost additional check-processing volume because of bank mergers.

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Table 1. The Effect of Bank Mergers on Federal Reserve Check Volume (Fixed Effects Regression)

Dependent variable: Quarterly check volume ('000)	
Time Dummy for Quarter of Merger	-629.6 (-14.8)
Time Dummy for 1 Qtr. after Merger	-719.6 (-16.6)
Time Dummy for 2 Qtrs. after Merger	-611.2 (-13.9)
Time Dummy for 3 Qtrs. after Merger	-381.9 (-8.5)
Time Dummy for 4 Qtrs. after Merger	-268.2 (-5.8)
Bank's ACH volume ('000)	0.0005 (214.9)
Federal Funds effective rate	-22.9 (-4.2)
Percent change in core CPI (SAAR)	53.6 (2.9)
Percent change in real GDP (SAAR)	-22.6 (-5.6)
State nonfarm employment (SA)	0.0 (3.2)
State unemployment rate (SA)	10.5 (1.7)
State real income per capita	-0.05 (-7.4)
Dummy for unmatched acquiring bank	197.9 (10.5)
Dummy for unmatched target bank	-23.5 (-0.3)
Intercept	1426.9 (7.9)
Quarterly Time Dummies ? Fixed Effects for Bank ?	Yes Yes
Number of Observations F-Statistic	206,755 1323.4

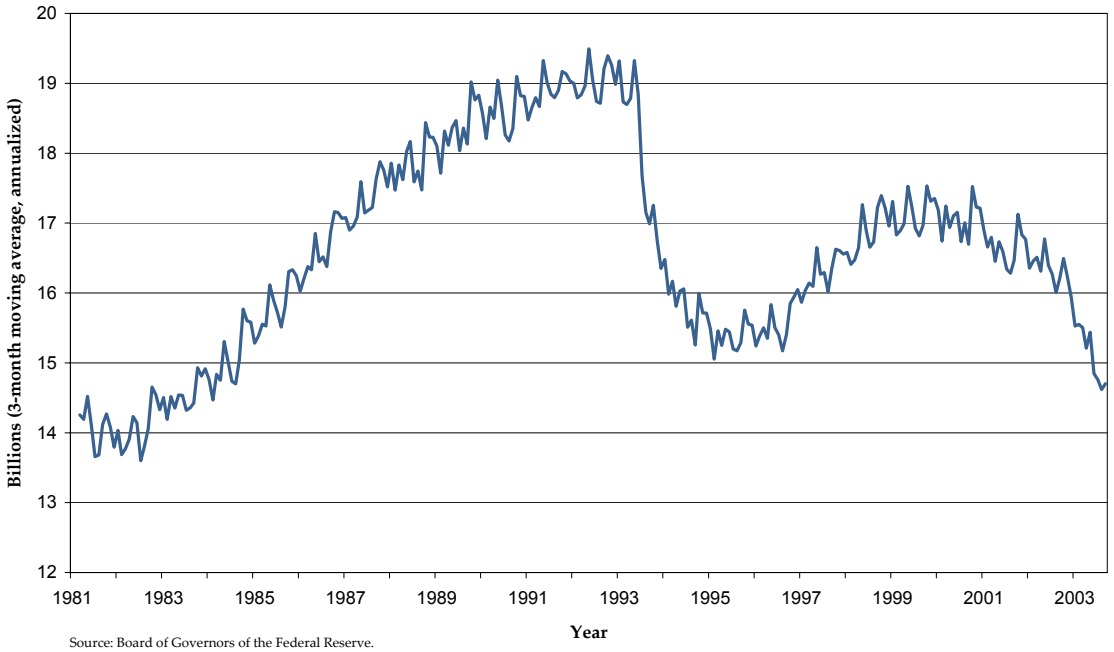
Note: t-statistics are given in parentheses.

Table 2. The Effect of Bank Mergers on Federal Reserve Check Volume
(Fixed Effects Regressions)

Dependent variable: Quarterly percent change in check volume *	
Time Dummy for Quarter of Merger	-14.9 (-10.1)
Time Dummy for 1 Qtr. after Merger	-1.8 (-1.2)
Time Dummy for 2 Qtrs. after Merger	0.0 (0.0)
Time Dummy for 3 Qtrs. after Merger	-3.8 (-2.5)
Time Dummy for 4 Qtrs. after Merger	-1.1 (-0.7)
Bank's ACH volume ('000)	0.8 (421.5)
Federal Funds effective rate	-0.2 (-0.6)
Percent change in core CPI (SAAR)	8.3 (13.1)
Percent change in real GDP (SAAR)	0.4 (4.0)
State nonfarm employment (SA)	0.0 (1.2)
State unemployment rate (SA)	-0.2 (-0.4)
State real income per capita	-0.20 (-3.4)
Dummy for unmatched acquiring bank	0.3 (0.5)
Dummy for unmatched target bank	-1.1 (-0.4)
Intercept	-21.1 (-13.2)
Quarterly Time Dummies ? Fixed Effects for Bank ?	Yes Yes
Number of Observations F-Statistic	169,157 5163.3

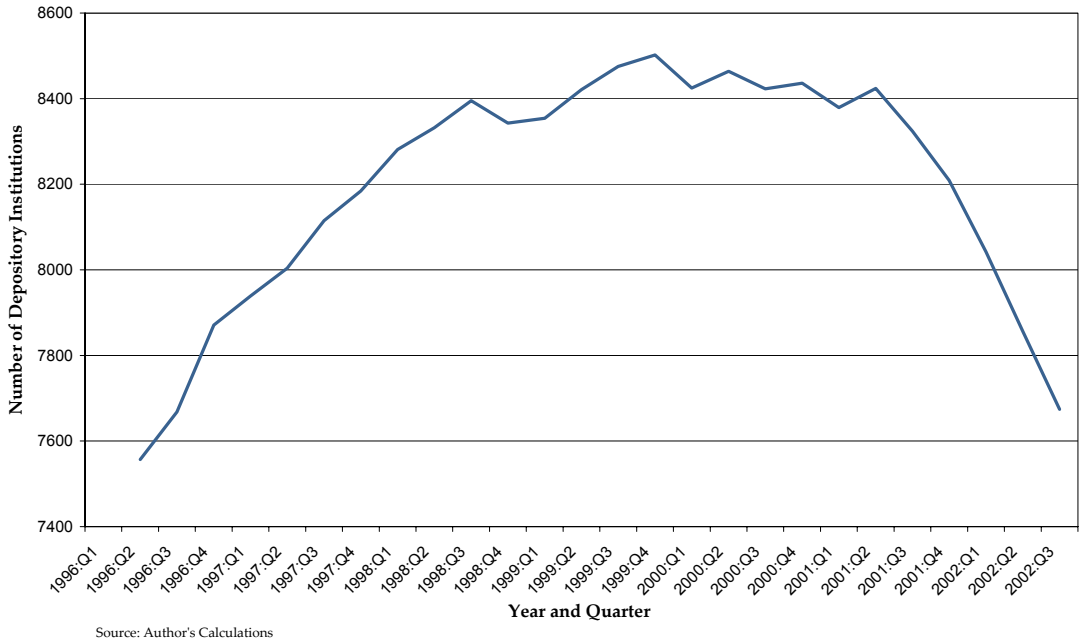
Note: t-statistics are given in parentheses.
* Both LHS and RHS variables are defined here as percent change from the previous quarter, with the exception of state unemployment rates and the federal funds rate, for which first differences are used. We calculate percent change as the difference of the two values divided by their mean.

Figure 1. Monthly Check Volume Processed by the Federal Reserve System, 1981-2004



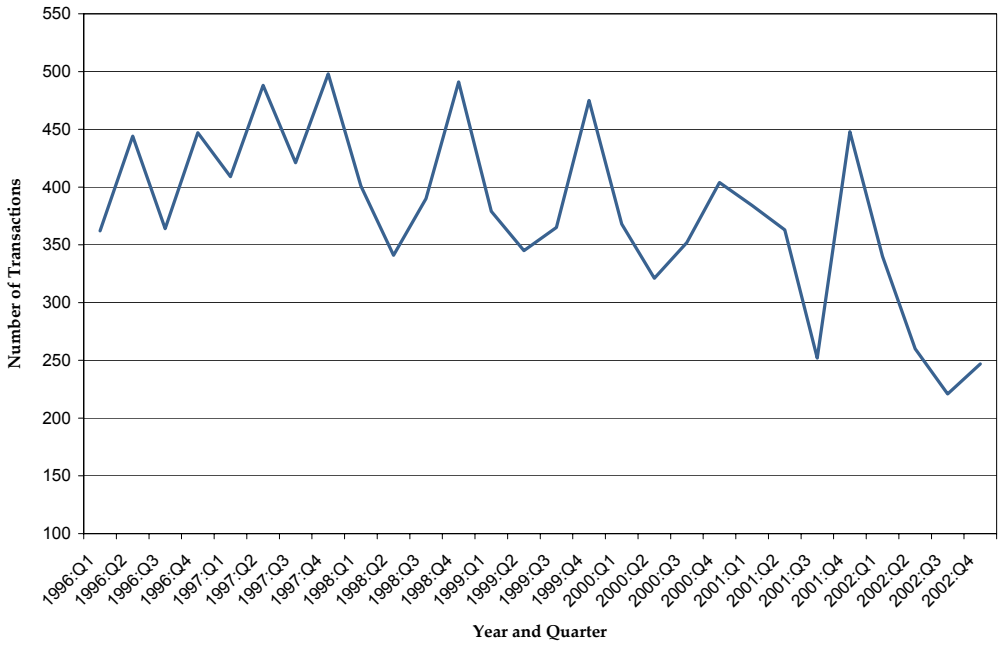
Source: Board of Governors of the Federal Reserve.

Figure 2. Number of Depository Institutions Using Federal Reserve Check Processing, 1996-2002



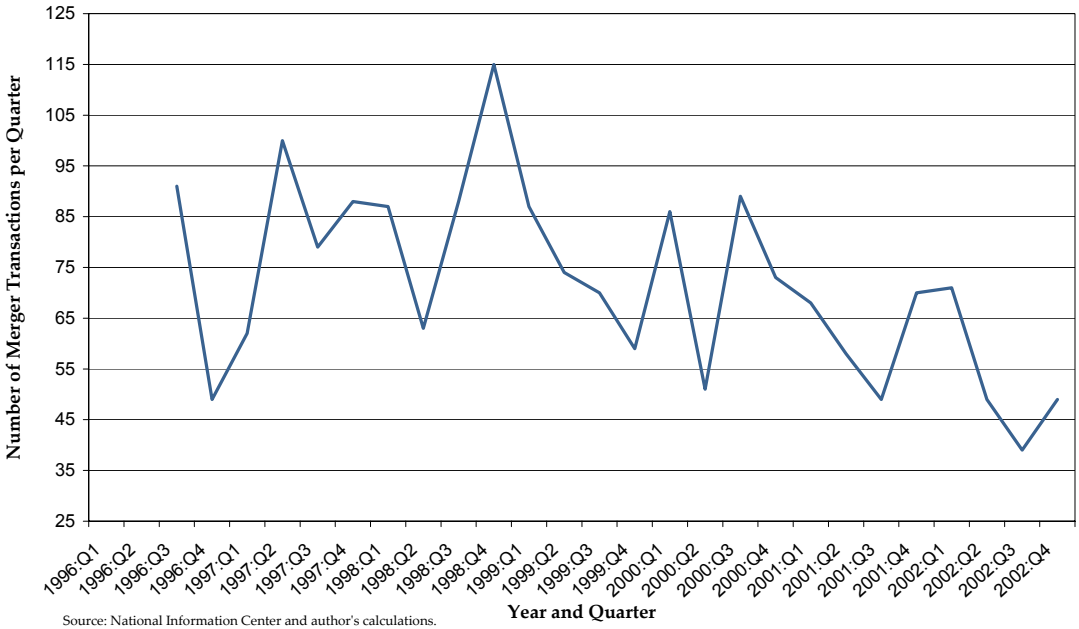
Source: Author's Calculations

Figure 3. Number of Bank Merger Transactions per Quarter, 1996-2002



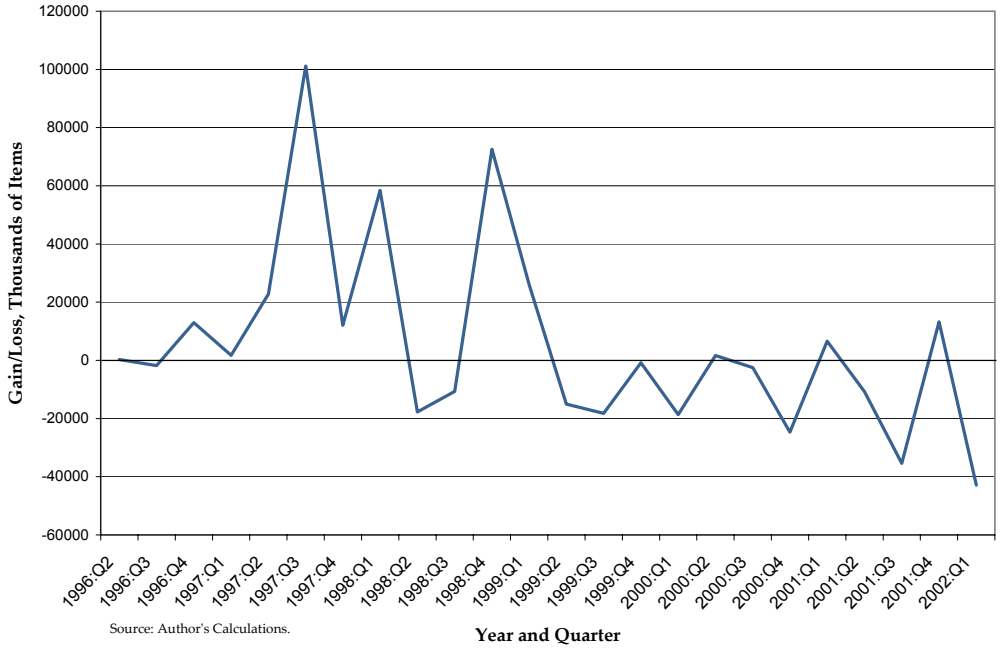
Source: National Information Center of the Federal Reserve

Figure 4. Number of Merger Transactions Among Federal Reserve Client Banks, 1996-2002



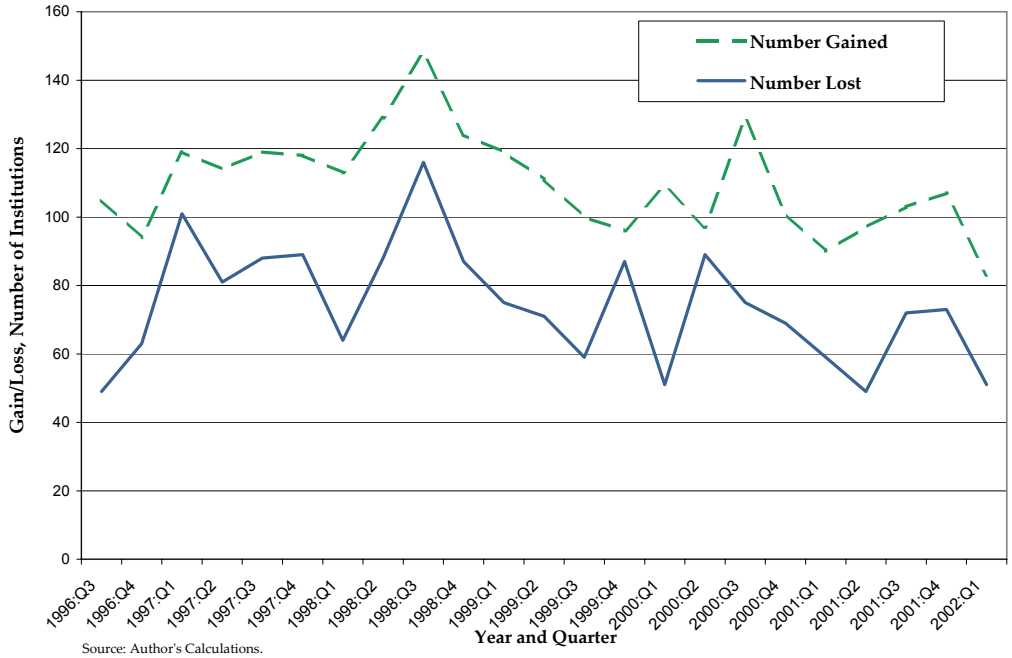
Source: National Information Center and author's calculations.

Figure 5. Quarterly Net Gain (Loss) in Federal Reserve Check Volume Due to Merger Activity, 1996 - 2002



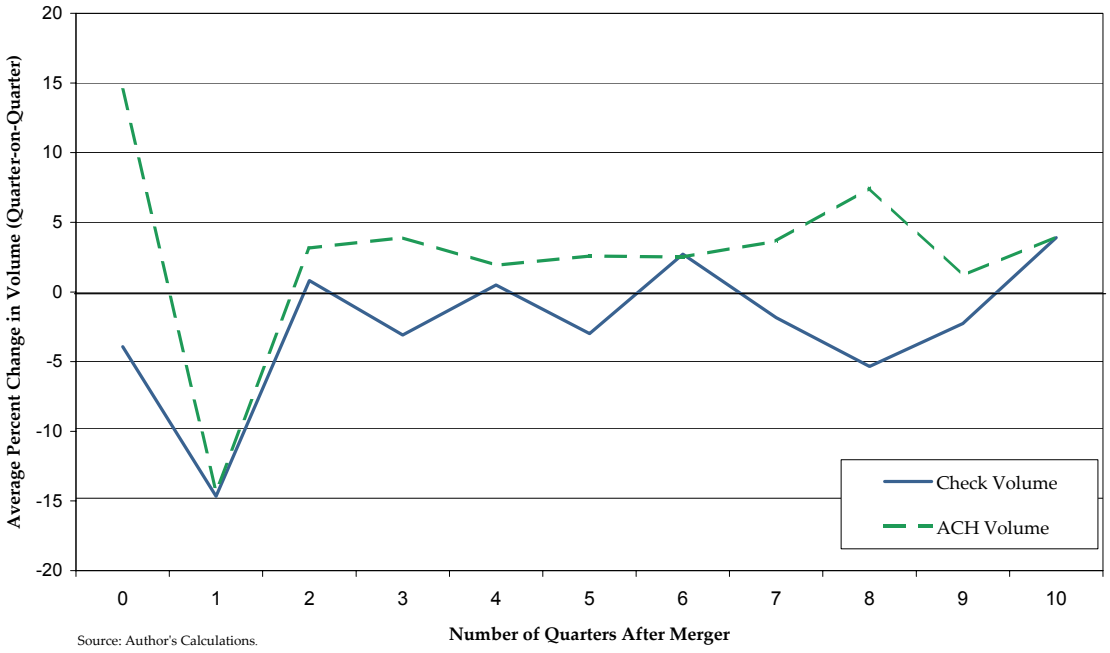
Source: Author's Calculations.

Figure 6. Number of Institutions Gained and Lost per Quarter Due to Merger Activity, 1996 - 2002



Source: Author's Calculations.

Figure 7. Percentage Check and ACH Volume Gained (Lost) After Merger, 1996 - 2002



Source: Author's Calculations.