Comments Welcome

Bank Consolidation and the Dynamics of Consumer Loan Interest Rates*

by

Charles Kahn

Department of Finance
University of Illinois
1407 W. Gregory Drive
Urbana, Illinois 61801

Phone: (217) 333-2813
Email: c-kahn@uiuc.edu

George Pennacchi

Department of Finance
University of Illinois
1407 W. Gregory Drive
Urbana, Illinois 61801

Phone: (217) 244-0952
Email: gpennacc@uiuc.edu

Ben Sopranzetti

Department of Finance
Rutgers University
94 Rockafeller Road
Piscataway, New Jersey 08854

Phone: (732) 445-4188
Email: sopranze@everest.rutgers.edu

Current version: August, 2002

*We are grateful to Bankrate, Inc. for permitting our use of their data. Valuable comments were received from David T. Brown, Oded Palmon, Kwangwoo Park, participants of seminars at the Federal Reserve Bank of Cleveland and the University of Florida, and participants of the 1999 University of Texas Conference on Financial Economics and Accounting, the 2000 Federal Reserve Bank of Chicago Conference on Bank Structure and Competition, the 2001 Federal Reserve Bank of Philadelphia Conference on Consumer Transactions and Credit, and the 2002 Melbourne Business School Conference on the Dollars and Sense of Bank Consolidation. We are indebted to David Becher for help in identifying mergers, and we thank Murillo Campello for research assistance. Sopranzetti acknowledges support from the Rutgers University Research Council.

Bank Consolidation and the Dynamics of Consumer Loan Interest Rates

Abstract

The recent wave of bank mergers has raised concern over its effect on competition. This paper examines the influence of concentration and merger activity on consumer loan interest rates. It uses Bankrate, Inc. survey data on loan rates quoted weekly by large commercial banks in ten major U.S. cities during the period 1989 to 1997. The pricing behavior of banks is analyzed for two types of loans: new automobile loans and unsecured personal loans.

Market concentration has a significant positive impact on the level of personal loan rates, but not on auto loan rates. Auto loan rates show little change around the time of significant bank mergers, suggesting that their relevant market is nationwide. However, consistent with mergers changing the market power and size structure of personal loan markets, the personal loan rates of banks involved in mergers show a significant decline relative to their market rivals during the period prior to the merger's completion. Merger participants' decision to lower personal loan rates could also reflect their desire to gain regulatory approval of the merger.

The paper also tests for the existence of leader-follower relationships in loan pricing and finds that it is more widespread in markets for automobile loans. Interest rates on both types of loans respond asymmetrically to a change in equivalent maturity Treasury security rates, being more sensitive to a rise than a fall. In addition, personal loan rates are less responsive in more concentrated markets.

I. Introduction

The recent wave of bank mergers has spawned research examining whether potentially vulnerable bank customers, such as small businesses and consumers, are hurt by consolidation in banking markets. These studies have tended to focus on the effects of mergers and concentration on small business loans and on consumer bank deposits. In contrast, there has been very little research analyzing how mergers influence banks' consumer lending practices.[1] A reason for the void in research on consumer credit is a lack of data on the quantities and interest rates of specific consumer loans made by banks.

This paper sheds new light on the relationship between bank consolidation and consumer lending by examining a newly constructed database on interest rates charged for two types of consumer loans: new automobile loans and unsecured personal loans. These data were collected by Bankrate, Inc. from weekly surveys of consumer loan rates charged by large banks in various cities across the country. The data enable us to track the effects of changes in concentration and merger activity on bank pricing behavior at a very detailed level. To our knowledge this is the first study that examines the dynamics of consumer loan rates and their relationship to concentration and consolidation in banking.

The paper considers several aspects of consumer loan pricing by performing tests similar to those used in research on consumer deposit rates. First, it analyzes factors that might explain the average level of consumer loan rates in different markets. Market concentration is found to have a positive and significant effect on personal loan rates, but not on auto loan rates. Second, it examines the dynamics of bank pricing decisions during periods around large merger events when substantial changes in concentration and in the size of banks can occur.[2] We find little evidence of systematic changes in auto loan rates at the time of significant mergers. However,

---

[1] The review article by Berger, Demsetz, and Strahan (1999) makes this point.

[2] Unless indicated otherwise, this paper uses the term "merger" to describe both a merger and an acquisition. In a bank merger, two banks' balance sheets are combined into one, whereas a bank

banks participating in mergers appear to reduce their personal loan rates relative to those charged by their market rivals, particularly during the period prior to the merger's completion.

Our study also performs a more general analysis of the dynamics of consumer loan pricing. We find evidence of bank leader-follower behavior in setting loan rates in some markets, especially in the case of auto loans. We also examine the general factors explaining loan rate changes. Personal loan rates are stickier than those for auto loans, and personal rate stickiness is greater in more concentrated markets. Further, banks appear to change both types of loan rates in an asymmetric manner: banks are quicker to raise loan rates in response to a rise in Treasury rates than they are to lower them following a decline in Treasury yields. Perhaps surprisingly, this asymmetric behavior is more prevalent in less concentrated loan markets.

The plan of the paper is as follows. Section II discusses prior research on bank concentration and consolidation and its effect on the pricing of banking services. The data used in our study are described in Section III. Section IV examines the relationship between a market's concentration and the level of consumer loan interest rates charged by banks in that market. Section V then focuses on the specific effects of mergers on consumer loan interest rates. It analyzes the dynamics of loan pricing for banks that merge as well as non-merging banks located in markets where mergers occur. In Section VI, a more general analysis of movements in consumer loan interest rates is presented. It tests for the presence of a bank leader-follower relationship in the setting of consumer loan rates and also studies how these rates respond to yields on Treasury securities. A conclusion is given in Section VII.

II. Prior Research on Bank Concentration and Consolidation

There is a growing literature that examines the market structure and the merger and acquisition activity of the banking sector. Berger, Demsetz, and Strahan (1999) provide a valuable survey and critical analysis of this literature. They conclude that the consensus of

---

acquisition involves the two banks maintaining separate balance sheets within a single bank holding

"static" studies using data from the 1980's is that greater bank concentration at the Metropolitan Statistical Area (MSA) level is correlated with higher rates for small business loans and lower rates for consumer deposits, as well as greater stickiness of rates. They also cite evidence that during the 1990's, the relationship between local market concentration and consumer deposit rates has weakened, but that the link between concentration and small business loan rates is still strong.

Studies that attempt to incorporate "dynamic effects" of merger activity are relatively recent. Berger, Kashyap, and Scalise (1995) analyze the effect of bank mergers on the supply of small business loans using data derived from the Federal Reserve's *Survey of the Terms of Bank Lending to Businesses*, while Strahan and Weston (1996) and Moore (1997) use FDIC *Call Report* data. These studies find that smaller banks tend to invest a greater proportion of their assets in smaller loans than do larger banks. In addition, Berger, Kashyap, and Scalise (1995) find that a loosening of geographical restrictions on banking activity led to a decline in the supply of small business loans. More specifically, Berger, Saunders, Scalise, and Udell (1998) examine the impact of bank mergers on the availability of such loans. They find that although bank mergers do tend to reduce the quantity of credit supplied to small businesses, the reduction is more than offset by an increase in lending by the merging banks' competitors.

Only a few researchers have investigated the impact of bank mergers on pricing in a dynamic framework.[3] Prager and Hannan (1998) examine the impact of bank mergers that had a significant effect on market concentration. They document that (relative to non-merging banks) merging banks tend to decrease retail deposit interest rates significantly during the twelve months prior to and during the twelve months following a merger. They offer this as evidence that merging banks are not passing on efficiency gains to their depositors but, instead, are exercising

company.

[3] In contrast "event studies" documenting the effects of mergers on bank market values and profitability are relatively common—again, see Berger, Demsetz, and Strahan (1999).

monopoly power. Furthermore, they find that non-merging banks located in the geographical markets where the mergers occurred also lowered deposit rates.[4]

Using detailed data on loan contracts between Italian banks and borrowing firms, Sapienza (2002) analyzes the effect of mergers on business lending. She finds that interest rates on business loans tend to fall following within-market mergers between banks with small market shares, evidence that is consistent with efficiency gains from these types of mergers. However, loan rates tend to fall less the greater are the market shares of the merging banks, and, for sufficiently high market shares, mergers lead to loan rate increases. Hence, these findings suggest that when mergers significantly increase concentration, the exercise of market power offsets the benefits of scale economies.

A recent study by Berger, Rosen, and Udell (2001) examines how the cost and availability of small business loans are related to a banking market's "size structure." Size structure refers to the distribution of local market shares of different size classes of banks, whether or not size is achieved entirely in that local market. For example, if a bank operating solely in a given local market is acquired by an out-of-market bank, the local market's size structure is changed but not its level of concentration: the (unchanged) market share previously held by the (smaller) local bank is now held by a larger sized bank. Using firm-level data on small business loans, the authors find that large banks are no less likely to make small business loans than smaller banks. Also, for a given level of market concentration, large banks charge lower interest rates than small banks in markets dominated by large banks. An explanation for this may be that as the number of large banks in a market reaches a critical level, competition between them intensifies and leads to lower loan rates.

[4] Studies using larger sets of data on mergers, including those that do not affect local market concentration, have found that mergers have a much smaller impact. See Simons and Stavins (1998) and Akhavein, Berger and Humphrey (1997).

III. The Data

The loan interest rates in our sample are provided by Bankrate, Inc. from their newsletter *Bank Rate Monitor* (BRM). The data are weekly interest rates on new automobile loans and unsecured personal loans quoted by relatively large commercial banks in 10 cities: Boston, Chicago, Dallas, Detroit, Houston, Los Angeles, New York, Philadelphia, San Francisco, and Washington, D.C. Each week during the August 16, 1989, to August 8, 1997, sample period, BRM surveyed usually four or five individual commercial banks in each city.[5] Table 1 lists the banks in our sample, giving the specific dates that the individual banks were surveyed by BRM. The primary reason that banks dropped into and out of the sample over the 1989 to 1997 period was due to mergers and acquisitions.

The loan rates surveyed by BRM are those that would be charged to walk-in customers having no other banking relationship with the lending institution.[6] Since loan rates can vary from branch to branch, BRM calculates a simple average of the individual branch loan rates when more than one branch exists in any given city. BRM's rates on new auto loans are for four-year loans with a principal amount of $16,000 and a 10 percent down payment. The rates on unsecured personal loans are for two-year loans with a principal value of $3,000. Both the new auto loans and the unsecured personal loans are fixed rate loans.

To establish a benchmark for consumer loan rates, some of our analysis uses market interest rates having similar durations (effective maturities). Due to amortization, the two-year personal loan is measured against a one-year Treasury bill yield and the four-year automobile loan is compared to the three-year (constant maturity) Treasury security yield. Weekly time series of these Treasury yields were obtained from the Federal Reserve Bank of St. Louis's

[5] Specifically, the survey covers 10 markets over a 417-week period. For new automobile loans, of the 4,170 market-week observations, five banks were surveyed 71.15 percent of the time, four banks were surveyed 28.18 percent of the time, and three banks were surveyed 0.67 percent of the time. For unsecured personal loans, the corresponding percentages for five, four, and three banks were 46.86, 43.77, and 9.38, respectively.

Federal Reserve Economic Data (FRED). We also constructed an annual time series of average nation-wide credit card interest rates, as reported in the *Federal Reserve Bulletin*, to use as another benchmark for personal loan rates.[7] Similarly, to help gauge our sample of auto loan rates, a monthly time series of the average rate on new auto loans charged by the finance company subsidiaries of the three major U.S. automobile manufacturers was obtained from the Federal Reserve's Consumer Credit Statistical Release G.19.

For the purpose of measuring market concentration, we define markets in our sample as the city's Primary Metropolitan Statistical Area (MSA). Concentrations within these markets are described by an annual Herfindahl-Hirschman index (HHI) based on the deposits of commercial banks' branches located in the MSA.[8] The deposit data comes from the FDIC's *Summary of Deposits*, which records deposits at the end of June of each year. Also using this branch-level deposit data and FDIC Call Reports, two proxies for the overall level of recent bank consolidation were calculated. A merger activity variable was defined as the share of MSA deposits in banks involved in mergers in which two or more bank charters are consolidated, averaged over the previous three years. Similarly, an acquisition activity variable was defined as the share of MSA deposits in banks involved in acquisitions in which the banks retain their separate charters but change their top-tier bank holding company ownership, averaged over the previous three years.

To help control for market differences, annual demographic data on personal income and population for each MSA was obtained from the Commerce Department's Bureau of Economic Analysis. Our personal income variable was defined as the MSA's per capita personal income as a percentage of the per capita income for the entire United States. Population was measured as

---

[6] Thus a potential advantage of these data is that quoted rates are not sensitive to particular borrowers' risk characteristics.

[7] The Federal Reserve changed its method of computing this average credit card rate in 1994. To create a consistent series, we added the difference between its reported 1994 rates under the old and new methods (24 basis points) to the rate series for 1995-97.

[8] In principle, it would be preferable to calculate concentration measures using consumer loans, rather than deposits. However, data on consumer loans are not available at the branch level, and many banks often do not even report the data at the bank level.

the MSA's population as a percentage of the total U.S. population. Percentages of the corresponding U.S. level were used to control for national trends.

Lastly, we also collected quarterly FDIC Call Report data on the total assets of each bank in our sample. Nominal asset values were converted to real terms (1996 dollars) using the quarterly GDP deflator. This series is used to examine whether individual banks' loan pricing decisions vary by size.

Table 2 provides summary statistics of the data over our eight-year sample period. During this period the data provide weekly rates quoted by over 70 different banks. The average auto loan rate of 9.93 percent is significantly lower than the average unsecured personal loan rate of 16.06. The average auto loan rate also is somewhat lower than the average finance company auto loan rate of 10.55 percent, while the average personal loan rate is around 100 basis points lower than the average credit card rate of 17.04 percent.

Our sample covers a period of bank consolidation. On average 3.73 percent of an MSA's deposits were issued by banks that have been acquired over the previous three year period, while 24.45 percent of deposits were issued by banks that have merged over the past three years. Note that the (Primary) MSAs in our sample are quite large, averaging over two percent of the total U.S. population, and tend to have high per capita personal income, averaging almost 122 percent of average U.S. per capita income. Also note that the banks surveyed by BRM are predominantly large ones, with median total assets (1996 dollars) of $18 billion and average total assets of $34 billion. Hence, our study analyses how large banks price consumer loans, and its results may not be applicable to smaller banks.[9]

[9] Numerous papers such as Strahan and Weston (1998), Haynes, Ou, and Berney (1999), Cole, Goldberg, and White (1999), and Berger, Miller, Petersen, Rajan, and Stein (2001) find evidence that small business lending differs between large and small banks.

IV. Market Concentration and Consumer Loan Rates

Much of our paper's analysis uses tests similar to those performed by studies on consumer deposit rates. As with deposit rate research, our statistical tests for consumer loan rates are constrained by data availability. Our first test explores the relationship between loan rates and market-level factors, and is constrained to annual observations because market characteristics such as bank concentration, merger and acquisition activity, and market demographic variables are available only yearly. In our later tests that focus on non-market determinants of loan rate changes, we take advantage of our high-frequency weekly loan rates and control for market or macro-economic factors using other techniques, such as fixed-effects regressions.

We begin with a static analysis of market characteristics and consumer loan rates by performing tests similar to those of Berger and Hannan (1989) who regress retail deposit interest rates on measures of market concentration. Since market concentration, consolidation, and demographic variables are observed annually, the dependent variables for our regressions are the annual average of loan rates in each market.[10] Since our data spans 10 markets (MSAs) across nine years, this gives us 90 observations for each loan type.

The loan rate averages are regressed on explanatory variables representing bank market concentration, other types of interest rates, demographic information, and proxies for recent bank merger and acquisition activity in the market. As indicated above, our measure of market concentration is the HHI. For new auto loans, funding costs are measured as annual averages of the weekly three-year constant maturity Treasury security rates while for personal loans we use the average of the weekly one-year Treasury bill rates. The auto loan regressions also include the annual average of the spread between the finance company loan rate and the three-year Treasury

[10] Specifically, we calculate the average (auto or personal) loan rate charged by the (five, four, or three) banks in a given market during each week. These weekly averages are then averaged over the year. Regressions were also carried out using the annual average of the weekly median loan rate and the annual average of the weekly minimum loan rate among the banks in a given market. The results of these regressions are essentially identical to those reported in Table 3.

rate, while the personal loan regressions include the annual average spread between credit card rates and the one-year Treasury rate.[11]

The personal income, population, merger activity, and acquisition activity variables described above are used as additional explanatory variables. Because the MSA's per-capita personal income might be a proxy for credit quality, one might expect that greater income would reduce default risk premia, leading to a negative relationship between income and loan rates. Population could proxy for the overall size of the consumer loan market, possibly affecting the potential for (dis-) economies of scale or the level of non-bank competition. The relationship between this variable and loan rates is uncertain. We include measures of recent merger and acquisition (M&A) activity to distinguish between the potentially different effects of consolidation versus concentration. Consolidation leads to larger banks and could change the process by which most banks make loans.[12] Berger, Rosen, and Udell (2001) find that for a given level of market concentration, rates charged on small business loans are lower if large banks dominate the market. Hence, we might expect a negative relationship between consumer loan rates and M&A activity.

One of our regression specifications also includes a yearly time trend. This explanatory variable proxies for structural change in consumer credit markets. For example, securitization of auto loans became more prevalent during our sample period, possibly lowering banks' cost of funding these loans.[13] In addition, credit cards issued by both banks and non-banks became more widely available. Since credit cards are a close substitute for unsecured personal loans, their growth probably intensified competition in the market for unsecured personal credit. Hence, for both auto loans and personal loans, we might expect a downward trend in rates.

[11] As mentioned earlier, in 1994 the Federal Reserve changed its method of constructing the credit card series. The results are not sensitive to our inclusion of the credit card – Treasury spread. In particular, we find that personal loan rates are significantly higher in more concentrated markets even when the credit card spread is omitted from the regressions.

[12] Cole, Goldberg, and White (1999) find evidence that the criteria used to approve small business loans differs by bank size, with larger banks' decisions relying more heavily on businesses' financial statements.

Table 3 provides the regression results. Auto loan rates are the dependent variable in columns 1 through 4 and personal loan rates are the dependent variable in columns 5 through 8. In all regressions, the cost of funds, as proxied by the Treasury security yield, has a coefficient close to 1.0 and is statistically significant. As expected, auto loan rates are positively related to the finance company spread while personal loan rates are positively related to the credit card spread. The coefficients on these spread variables are statistically significant on all regressions except those that include a time trend. In general, these results support the view that banks consider their cost of funds and the rates set by competitors when pricing consumer loans.

In the regressions that include demographic variables, both per capita income and population are positively and significantly related to loan rates. The positive coefficient on per capita income is somewhat puzzling, but might reflect a greater demand for consumer spending and borrowing in higher income markets. The positive population – loan rate relation is consistent with greater costs of making loans in more populous markets, perhaps because it is less likely that a bank loan officer would acquire "soft" information regarding a loan applicant.

Most important from our point of view is the link between concentration and consumer loan rates. Here, a difference between the two types of loans is clear. In none of the auto loan regressions is the HHI statistically significant. In contrast, personal loan rates are positively related to market concentration at the 1 percent significance level in all of the regressions. The magnitudes of these coefficients imply that a 100 point increase in the HHI is associated with a rise in personal loan rates of between 11.9 to 14.5 basis points.

The regressions in columns 3, 4, 7, and 8 of Table 3 include the merger and acquisition activity variables. In most cases, these M&A variables have negative coefficients, as might be predicted from the evidence in Berger, Rosen, and Udell (2001), but they are never statistically significant. Regressions 4 and 8 include a time trend. Its coefficient is negative and statistically

[13] See Pennacchi (1988) for a model showing how bank loan sales reduce a bank's cost of funding.

significant in the auto loan regression, suggesting that structural change may be lowering auto loan rates.

There are several possible reasons for the relative unimportance of concentration in the market for new car loans. First, bank concentration ratios may be a less accurate measure of true concentration in the car loan market if there is effective competition from other financing sources, such as the captive finance companies of auto manufacturers. Second, there may be less scope for monopoly power in the market for car loans. Screening and monitoring by banks are likely to be more important for unsecured personal loans, whose risks are more heterogeneous and less quantifiable by credit-scoring models. Thus, private information and individual expertise may increase the scope for market power in pricing personal loans. In contrast, an auto loan's collateral, underwriting standards, and credit score make the bank's monitoring and screening functions less important. Auto lending is probably more a "transaction-oriented" than a "relationship-oriented" form of lending, as evidenced by the ease of securitizing auto loans.

V. The Dynamics of Loan Rates During Mergers

V.A *Defining Significant Mergers*

This section presents a dynamic analysis of consumer loan pricing, focusing on the relationship between bank mergers and loan rates. We examine whether, around the time of a major bank acquisition, there is a systematic tendency for loan rate changes by acquirers, targets, and other "exposed banks," which we define as banks operating in the merger-affected market. The methodology follows Prager and Hannan (1998) who found evidence that "significant" bank mergers decreased retail deposit rates in the affected deposit markets. An important task in their study and in the present paper is to identify criteria for judging whether bank mergers are "significant" in the sense that they have the potential to influence interest rates. Only such mergers would merit inclusion in our studies.

Recall that the BRM survey covers the largest banks operating in 10 major metropolitan areas. Bank mergers occur frequently in these large MSAs, but most mergers are unlikely to influence market loan rates because they involve small banks. Hence, we need to identify only those mergers that are large enough to have a potential impact on loan rates. We consider three different standards for defining significant mergers. The first, and broadest, defines a significant merger as occurring whenever a bank surveyed by BRM is acquired by another bank, or if a bank surveyed by BRM acquires another bank that is at least 25 percent of its size.[14] These mergers are defined as acquisitions that change control of the bank's top-tier holding company, even if the commercial bank subsidiary's charter is not immediately merged into that of another bank. We used a variety of sources to document these consolidations and their completion dates, including Securities Data Company's Mergers and Acquisitions database, the Federal Reserve System's National Information Center, the FDIC's Institution Directory, and Rhoades (2000).

Based on this definition, Table 4 gives a complete listing of all markets of the target and acquirer banks involving significant mergers. The bank names given in bold type indicate those banks surveyed by BRM. There are a total of 30 qualifying "merger-markets" under this broadest of merger definitions.

The second definition of a significant merger accounts for the likelihood that a merger impacts loan rates only when the level of concentration is sufficiently high, thereby making the exercise of market power feasible. This leads to our restricting the first definition's mergers to those involving domestic banks for which the target bank's MSA has a post-merger HHI exceeding 1400.[15] We exclude mergers involving a foreign bank acquirer because the scope for increasing market power is less likely if the acquirer lacks a previous domestic presence. The first 15 merger-markets listed in Table 4 satisfy this second definition of significant mergers.

[14] In the ten BRM-surveyed markets, we came across no large bank mergers that did not include a BRM-surveyed bank. This reflects BRM's objective of surveying the largest banks within each market.

The third definition imposes yet an additional constraint, namely, that during the year in which the merger was completed, the HHI in the target bank's market increases by at least 100. This condition restricts significant mergers to those within-market mergers that substantially increase concentration. Table 4 shows that 10 merger-markets satisfy these criteria.

In summary, our first definition of a significant merger is the broadest, encompassing all BRM mergers in Table 4. The second imposes an intermediate restriction, HHI > 1400, and the third imposes the most stringent restrictions, HHI > 1400 and ΔHHI > 100.

V.B *Test Methodology*

We now describe the regression model and data for analyzing whether systematic loan rate changes occur around the time of a merger. The model, an extension of Prager and Hannan (1998), involves a time series – cross section regression consisting of observations for all banks covered by the BRM survey. Prager and Hannan examine monthly deposit rate changes during each of the 12 months before, and 12 months after, the month in which a bank merger is completed. Similarly, we base our tests on loan rate changes computed over four-week intervals. Since our sample is taken over 417 weeks, this allows us to construct a time series of exactly 104 four-week loan rate changes. Hereafter, we refer to this four-week interval as a "month," but we emphasize it is not a true calendar month. The reasons for choosing a "monthly" interval, rather than a weekly one, are twofold. First, it allows a closer comparison to Prager and Hannan's monthly analysis. Second, as explained below, it limits the (dummy) variables in our regression to a number that can feasibly be estimated.

The form of our time series – cross section regression is

$$\ln\left(r^i_{l,t}/r^i_{l,t-1}\right) = \sum_{t=1}^{104}\alpha_t \mathrm{M}_t + \sum_{j=-12}^{12}\beta_j \mathrm{Expo}j^i_t + \sum_{j=-12}^{12}\delta_j \mathrm{Acq}j^i_t + \sum_{j=-12}^{6}\gamma_j \mathrm{Tar}j^i_t + \varepsilon^i_t \qquad (1)$$

[15] U.S. Justice Department guidelines state that an HHI exceeding 1800 would subject a merger to a challenge. Prager and Hannan (1998) use the cut-off level of 1800 to define a "substantial" merger and the level of 1400 to define a "less substantial" merger.

where $r_{l,t}^{i}$ is the loan rate charged by the i^{th} bank at the end of month t, so that the dependent variable is the log change in a given bank's loan rate during month t. M_t is one of a set of 104 dummy variables that equals 1 if the current month equals date t, zero otherwise. We include these fixed-effects dummy variables to control for monthly differences in market interest rates and other macro-economic and industry-wide factors that affect loan rates.

To examine systematic loan rate changes by banks operating in a market where a merger occurs, a set of 25 dummy variables, Expoj_t^i, j = -12,…, 12, are included. This variable takes the value 1 if bank i is located in a market where a merger occurs and time t is j months following the completion of that merger, and 0 otherwise.[16] Hence, these variables capture systematic loan rate changes by banks exposed to mergers during the period 12 months before to 12 months after the merger completion month. This set-up allows for merger-related rate changes over a two-year span because the precise timing of such changes is uncertain. Since merger announcements usually occur many months prior to the merger's completion, there is the possibility that effective control by the acquirer occurs before the merger is completed.[17] On the other hand, re-organization of management personnel and the merging of bank charters may occur after the merger's completion, thereby delaying the acquirer's effective control over loan pricing.

If loan rates are strictly a function of market concentration, one might expect that the loan rates of merger participants and those of their rivals would change similarly from merger-induced changes in concentration. But, more generally, there may be differences in how acquirers, targets, and rival banks change their rates. The differences could be due to changes in the size and loan processing operations of merger participants or due to possible strategic behavior by these banks. Equation (1) allows for such differences by including Acqj_t^i , j = -12,…, 12, and Tarj_t^i, j = -12,…, 6, which are sets of dummy variables used to indicate whether loan rate changes

[16] In cases where the same bank is exposed to multiple mergers whose 25-month analysis periods overlap, we attribute loan pricing effects to both mergers during the overlap period. This is implemented by dividing Expo j_t^i by the number of mergers to which the bank is exposed at date t.
[17] In our sample, the median time between the merger's announcement and its completion is 6.2 months.

by acquirer and target banks change systematically during a merger.[18] Acquirer banks' behavior is analyzed 12 months before and after the merger completion month. Target banks' loan pricing is analyzed 12 months before but only 6 months after completion of the merger. We use a shorter post-merger period because many targets drop out of our sample following a merger.

To determine the overall change in bank loan rates associated with a merger, we examine the size and significance of sums of the pre- and post-merger coefficients. The "pre-merger" effects for exposed banks, acquirers, and targets are given by $\sum_{j=-12}^{0}\beta_j$, $\sum_{j=-12}^{0}\left(\beta_j+\delta_j\right)$, and $\sum_{j=-12}^{0}\left(\beta_j+\gamma_j\right)$, respectively. Likewise, the "post-merger" effects for exposed banks, acquirers, and targets are given by $\sum_{j=1}^{12}\beta_j$, $\sum_{j=1}^{12}\left(\beta_j+\delta_j\right)$, and $\sum_{j=1}^{6}\left(\beta_j+\gamma_j\right)$.

In estimating equation (1), a concern arises regarding independence of the error term for loan rates quoted by the same bank but in different cities. As Radecki (1998) points out, many banks having offices in multiple cities located within the same state quote identical deposit and loan rates statewide.[19] We examined such cases in our data, which involved a bank operating in both Dallas and Houston or in both Los Angeles and San Francisco. In cases where a bank's statewide loan rates were uniform, we treated its quotes as a single time series, rather than two.[20]

[18] Prager and Hannan (1998) group acquirers and targets together, defining them as "banks participating in mergers." We allow for the possibility of different loan pricing by acquirers and targets.

[19] Radecki (1998) analyzes rates during 1996-97 using BRM survey data covering instances where rates of the same bank were surveyed in multiple cities within a state.

[20] With exceptions at only a couple dates, the banks that had offices in both Los Angeles and San Francisco, which are Bank America, First Interstate, Sanwa, Sumitomo, Union Bank of CA, and Wells Fargo, quoted the same auto and personal loan rates in both cities. However, not all banks having offices in both Dallas and Houston quoted identical rates in both cities. While, with only a few exceptions, Bankamerica and Nationsbank quoted identical rates in Dallas and Houston, First City typically quoted different rates in these two cities during the 8/16/89 to 2/10/93 period prior to its acquisition by Texas Commerce. Bank One quoted different rates in the two cities prior to 2/23/94, but switched to identical quotes thereafter. Similarly, Texas Commerce's quotes differed between the two cities prior to 5/16/90, but then became uniform after this date. Thus, early in the sample period there were a number of banks quoting different rates in Dallas and Houston, but during the latter half of the sample, all banks with offices in both cities quoted uniformly. Many banks where surveyed by BRM in multiple cities located in different states. These banks were Bankamerica, Comerica, First Interstate, First Union, Nationsbank, PNC, and Wells Fargo. In all cases, these banks did not price auto loans or personal loans uniformly across state lines.

V.C *Results*

The regression results using auto loan rates are reported in Table 5. Panels A, B, and C of the table summarize the results from regressions based on the broadest, intermediate, and most stringent merger definitions, respectively. Each panel gives the estimated proportional loan rate changes for exposed banks, acquirers, and targets during the pre- and post-merger periods. It also presents estimates of the relative loan rate changes for acquirers versus exposed banks, targets versus exposed banks, and acquirers versus targets.

There is virtually no evidence of systematic changes in auto loan rates during mergers. The only marginally significant result (t-statistic = 1.93, p value = 0.053) appears to be that acquirers raise loan rates by 5.17 percent during the year following a merger, but only when mergers are defined under the broadest of criteria (Panel A). However, when both pre- and post-merger periods are combined, acquirers' increase in auto loan rates of 2.2 percent is not statistically significant.

Table 6 presents similar regressions using changes in unsecured personal loan rates. In general, the evidence for systematic movements during mergers is also sparse in personal loans; however acquirer banks appear to significantly lower their personal loan rates, relative to exposed banks, during the pre-merger period. The magnitude of this effect is greatest when mergers are restricted to those in concentrated markets: a 9.56 percent drop by acquirers vis-à-vis their rivals for mergers with HHI > 1400 and ΔHHI > 100; and a 7.84 percent drop by acquirers relative to rivals when for all mergers where HHI > 1400. While under both of these merger definitions, acquirers show a net relative decline in personal loan rates over the total 25- month merger period

---

There was one situation where BRM surveyed two banks in Washington, D.C. that were under the same bank holding company: Maryland National Bank and American Security Bank, both owned by MNC Corp as of 3/16/87 when it acquired American Security Corp. Up until 8/8/90, the two banks' rates typically differed, with Maryland National always being at least as high as American Security. On 8/15/90, American Security raised its auto loan rate from 11.25 to 12.25 and its personal rate from 16.00 to 17.90 to exactly match Maryland National's higher rates. From that point until 9/28/94, when both banks were acquired by Nationsbank, their rates were exactly the same. Thus, as of 8/15/90, we treat American Security and Maryland National as one bank.

(7.61 and 6.71 percent, respectively), these changes are not statistically significant. Targets also lower their rates relative to exposed banks over both the pre-merger and total periods, but the decline is not statistically significant.

Figures 1 and 2 provide graphical confirmation of the statistical results of Tables 5 and 6. Each panel of a figure matches the merger definition used in the corresponding panel of a table. Three loan rate spreads are graphed in each panel: the average of acquirers' rates minus the average of contemporaneous rates charged by all other banks outside of each acquirer's market; the average of targets' rates minus the average of contemporaneous rates charged by all other banks outside of each target's market; and the average of exposed banks' rates minus the average of contemporaneous rates charged by all other banks outside of each exposed bank's market. These spreads are graphed for the period 42 weeks prior to and following the merger completion week, except for targets whose spreads are terminated 10 weeks following the completed merger.[21]

In Figure 1, as in Table 5, there appears to be no significant changes in the three types of banks' auto loan rates. The possible exception occurs under the broadest definition of mergers (Panel A), where there is somewhat of an increase in acquirers' auto loan rates following the merger. The pre- to post-merger jump in the targets' interest rate spread apparent in panels A and B is not statistically significant

Figure 2 helps clarify the estimated loan rate dynamics summarized in Table 6. Well before the merger, acquirers and exposed banks appear to charge similar personal loan rates, on average. However, when mergers are restricted to those occurring in highly concentrated markets

[21] The graph of these spreads is only suggestive in that the sample of acquirers, targets, and exposed banks can change at any point as the BRM survey sample changes. The targets' average spread ends early because many targets cease to quote loan rates following the merger. Because the number of acquirers for which quotes are observed also declines farther away from the merger completion date, we limit the graph to 42 weeks before and after the merger.

(Panels B and C), we find that targets' average loan rates are lower than others in their market.[22] On average, targets appear to be pricing loans relatively aggressively. As the merger's completion approaches, targets' and acquirers' personal loan rates converge, with acquirers' rates departing from those of other banks in the market, leading to a significant relative decline. These dynamics fit the size structure evidence on small business lines of credit found by Berger, Rosen, and Udell (2001). As banks become larger, they appear to compete more intensively for personal loans, relative to other banks in the market. Our evidence suggests that this occurs when acquirers choose targets that are already quite competitive in pricing personal loans.

Another possible explanation for the relative decline in acquirers' personal loan rates is that acquirers choose to cut their margins on these loans to curry favor with regulators. All mergers require approval by regulators who must consider each merger's impact on consumers. Since, for the mergers in our sample, regulatory approval occurs prior to each merger's completion date, the acquirers' tendency to reduce their rates during the pre-merger period could be a strategy for indicating consumer-friendliness. Along with their choice of targets that set relatively low rates on personal loans, such behavior could circumvent opposition to mergers. It is interesting to note that similar behavior is documented by Bostic, Mehran, Paulson, and Saidenberg (2002) in the case of Community Reinvestment Act lending. They find that banks increase the quantity of their CRA mortgage lending in the year leading up to an acquisition, and that this effect is strongest for large banks. Moreover banks that are destined to be targets do not change their behavior in this way.

[22] There were 10 merger markets having an HHI exceeding 1400 and having the target bank's personal loan rate being surveyed by BRM during the week prior to the merger announcement date. In seven cases the target's rate was lower than the average of the other banks in its market, in one case it was the same, and in two cases the target's rate was higher than the other banks' average. The average difference between the average of the other banks' rates and the target just prior to the merger announcement was 71 basis points.

As a check for robustness, we re-estimated the regressions in Tables 5 and 6 but imposed the constraint that $\delta_j = \gamma_j \; \forall \; j$, that is, we treat acquirers and targets as a single class of banks.[23] This assumption of categorizing banks in a merger market as either "exposed banks" or "merger participants" was made by Prager and Hannan (1999). Making this assumption for the case of auto loans, the results (not reported) show no statistically significant pre- or post-merger changes in rates by merger participants or exposed banks. However, when acquirers and targets are grouped together in the regressions for personal loans, the results indicate a significant decline in merger participants' rates, relative to those of exposed banks, during the pre-merger period for all three merger definitions. These results are reported in Table 7. For the broadest, intermediate, and narrowest definitions of mergers, participants' rates fall significantly relative to those of exposed banks by 5.4, 7.1, and 7.8 percent, respectively, during the pre-merger period.[24] As in the case when a distinction is made between acquirers and targets, the total effect for the relative change in participants' versus exposed banks' rates is negative but not statistically significant.

In summary, mergers do not appear to have significant effects on auto loan rates. However, merger participants appear to lower their personal loan rates relative to other banks operating in their market, particularly during the year prior to the merger's completion. This behavior is consistent with a size structure effect that leads the now larger merger participants to lower their personal loan rates. But it is also consistent with the merging banks acting in a consumer-friendly manner, thereby increasing the chance for regulatory approval of the merger.

VI. More on the Dynamic Behavior of Consumer Loan Rates

VI.A *Evidence of Leader/Follower Relationships*

By using relatively high frequency weekly data on individual banks' consumer loan rates, we can analyze various aspects of the dynamics of loan rate changes. In this section we test for

[23] We also estimated auto and personal loan regressions imposing the constraint $\delta_j = \gamma_j = 0 \; \forall \; j$, which restricts the behavior of all banks in the merger-affected market to be the same. In this case, there were no statistically significant pre-, post-, or total merger effects for either type of loan.

the presence of a leader/follower relationship in each consumer loan market. We define a bank to be a leader if the change in its consumer loan rate predicts a change in the average consumer loan rate of the other banks in its MSA. This predictability is analyzed using a Granger causality test. More specifically, for each bank in our sample, we construct two weekly time series: one being the change in the loan rate charged by the particular leader "candidate" bank and the other being the change in the average loan rate charged by the other rival banks in the same market. The change in the average loan rate of the rival banks is regressed on eight lags of itself and eight lags of the change in the loan rate of the candidate bank. We then perform an F-test of the hypothesis that the coefficients of the lagged changes in the candidate bank's loan rate are all zero. The candidate bank is considered a leader if we reject this hypothesis with 95 percent confidence.

Table 8 summarizes the results. Panel A indicates that 15 different banks behaved as leaders in their respective markets for auto loans and Panel B shows that three different banks could be considered leaders in their personal loan markets.[25] In addition to reporting the F-test statistic of the hypothesis that the coefficients of the lagged changes in the candidate bank's loan rate are all zero, Table 8 reports the sum of these lagged coefficients and a *t*-test of the hypothesis that this sum equals zero. As shown in column 2 of Table 8, the sums of these coefficients are positive for all banks, as one would expect if a leadership relationship exists. In addition, column 3 indicates that, in most cases, the sums of these coefficients are statistically significant.

The greater number of market leaders for auto loans relative to personal unsecured loans is consistent with there being more intense competition between banks in the auto loan market. There may be higher consumer switching costs in the personal loan market that make the personal loan rate set by a given bank to be less responsive to its competitors' rates.

VI.B *The Rigidity of Consumer Loan Rates*

---

[24] The *p*-values are 0.044, 0.044, and 0.060, respectively.

[25] Note that due to mergers, many of these banks operated in particular markets for only part of the August 1989 to August 1997 sample period.

Several studies, including Hannan and Berger (1991), Neumark and Sharpe (1992), Hannan (1994), Jackson (1997), and Rosen (2002), analyze how banks adjust consumer deposit rates in response to wholesale market interest rates such as Treasury bill rates. This research finds that deposit rates are slower to adjust in more concentrated markets, that is, less competition leads to greater stickiness in retail deposit rates. Moreover, this stickiness tends to be asymmetric: deposit rates are slower to increase when other market interest rates rise than they are to decrease when market rates fall.[26]

Mester and Saunders (1995) analyze changes in the prime interest rate and also find evidence of asymmetric rate setting. The nationwide prime rate rises more quickly than it falls in response to changes in macroeconomic variables.[27] While the asymmetry is in the opposite direction to that of deposit rates, it is consistent with banks displaying "opportunistic" behavior by delaying changes that would shrink their profit margins (interest rate spreads). Scholnick (1999) examines the average loan and deposit rates of six Canadian banks and finds asymmetric rate setting for the average new car loan rate and the average savings deposit rate, but not for the average mortgage or long-maturity deposit rates.

Asymmetric and opportunistic pricing has been documented outside of banking. Borenstein, Cameron, and Gilbert (1997) find that gasoline prices respond more quickly to crude oil price increases than decreases. Peltzman (2000) analyzes a broad range of producer and consumer goods and finds that the prices of more than two-thirds of these products rise more quickly in response to input cost increases than they decline in response to input cost decreases. Taken together, the evidence suggests firms engage in opportunistic pricing for many, but not all, consumer goods and services. We now examine whether this tendency extends to the auto and

[26] For an alternative approach to analyzing rigidities in consumer deposit rates, see Kahn, Pennacchi, and Sopranzetti (1999).
[27] Since the prime interest rate is set nationwide, not on a market-by-market basis, the effect of market concentration is not relevant.

personal loans in our sample, and, if so, whether it is related to variables such as market concentration and bank size.

This paper follows previous empirical tests of asymmetry by employing a qualitative choice model of consumer loan rate adjustments. Weekly loan rate changes, $r_{l,t}-r_{l,t-1}$, are divided into three categories: a decrease, no change, or an increase. To explain these changes, we consider six different variables related to market interest rates and the characteristics of individual banks and their markets. The first variable is the weekly change in the wholesale market rate, $r_t - r_{t-1}$, which for auto loans equals the change in the three-year (constant maturity) Treasury security rate and which for personal loans equals the change in the one-year Treasury bill rate. Since wholesale rates reflect the bank's cost of funds, one would expect this variable to have a positive impact on loan rate changes. A second variable is the spread between the current Treasury security rate and the bank's loan rate for the previous week, $r_t - r_{l,t-1}$. This variable captures the potential disequilibrium between the market rate and the bank's loan rate. An increase in this spread would put upward pressure on bank loan rates and, hence, one also expects a positive relationship between this variable and changes in the bank's loan rate.

The last four explanatory variables are variations of the first two. To test whether market concentration affects the speed of loan rate adjustments, we interact the HHI of each bank's market with the market rate change and the spread, producing $(r_t - r_{t-1})HHI$ and $(r_t - r_{l,t-1})HHI$. We also consider whether the bank's size, as measured by the natural logarithm of the real value of its assets, affects its tendency to change loan rates. Therefore, the variables $(r_t - r_{t-1})LnAssets$ and $(r_t - r_{l,t-1})LnAssets$ are included. To summarize, if we let $\Delta r_{l,t}^{*}$ be a latent variable representing a particular bank's propensity to change its loan rate during week *t*, then our general model assumes

$$\begin{aligned}\Delta r_{l,t}^{*} = {} & \alpha_1 (r_t - r_{t-1}) + \alpha_2 (r_t - r_{l,t-1}) + \alpha_3 (r_t - r_{t-1}) HHI_t + \alpha_4 (r_t - r_{l,t-1}) HHI_t \\ & + \alpha_5 (r_t - r_{t-1}) LnAssets_t + \alpha_6 (r_t - r_{l,t-1}) LnAssets_t + \varepsilon_t\end{aligned} \tag{2}$$

Two types of probit models of loan rate adjustments are estimated. The first type assumes that the explanatory variables affect loan rate increases and decreases in a symmetric manner. In other words, banks are assumed to raise loan rates when market rates are rising at the same speed at which they lower loan rates when market rates are falling. This implies a three category (decrease, no change, increase) ordered probit model. The second type of model allows the explanatory variables to have asymmetric effects on rate increases versus rate decreases. This is accomplished by separately estimating two different two-category probit models. In one case, a model using only observations where there is no change or an increase in loan rates is estimated. In the other case, we estimate the model restricting the observations to be either no changes or decreases in loan rates.

Table 9 gives the results of estimating these probit models using weekly changes in auto loan rates quoted by 71 different banks over the August 1989 to August 1997 sample period. Of the 18,943 total observations, 90.1 percent are observations where there was no change, 4.5 percent are observations where there was an increase, and 5.3 percent are observations where there was a decrease. Columns 1 and 4 of the table report results assuming that the explanatory variables affect positive and negative loan rate changes in a symmetric manner. The positive and statistically significant coefficients for $(r_t - r_{t-1})HHI$ and $(r_t - r_{l,t-1})HHI$ indicate that banks in more concentrated markets are quicker to adjust auto loan rates in response to changes in Treasury yields or Treasury yield spreads than banks in less concentrated markets. This result runs counter to previous findings that consumer deposit rates are stickier in more concentrated markets. The results in column 4 also provide evidence that larger banks are quicker to adjust rates in response to changes in Treasury rates but slower to adjust rates based on the spread between Treasuries and loan rates. Columns 1 and 4 further report the total derivatives of auto loan rates with respect to $(r_t - r_{t-1})$ and $(r_t - r_{l,t-1})$ at the sample averages of the explanatory variables *HHI* and *LnAssets*. This confirms that loan rates respond to these variables in the expected positive manner.

Columns 2, 3, 5, and 6 present evidence of asymmetry in the response of auto loan rate increases versus decreases. Examining the total derivatives of auto loan rates with respect to ($r_t - r_{t-1}$) and ($r_t - r_{l,t-1}$) for the case of loan rate increases versus loan rate decreases, one sees that banks are quicker to raise auto loan rates when market rates are high or rising than they are to lower loan rates when market rates are low or are falling. This result is consistent with Mester and Saunders (1995) and the opportunistic behavior banks display in setting consumer deposit rates. However, in contrast to the deposit rate evidence, banks in more concentrated markets engage in *less* of this asymmetric behavior: the coefficient estimates on ($r_t - r_{t-1}$)*HHI* and ($r_t - r_{l,t-1}$)*HHI* are higher for decreases than for increases. Differences in the coefficients on the variables ($r_t - r_{t-1}$) *LnAssets* and ($r_t - r_{l,t-1}$)*LnAssets* in columns 5 and 6 also show that large banks are relatively quicker to lower loan rates in response to declines in Treasuries but respond more slowly to lower rates when the Treasury spread is low.

In review, the evidence indicates that banks are quicker to increase auto loan rates in a high or rising market rate environment than to decrease them when market rates are low or falling. Banks in more concentrated markets, however, are less likely to engage in such asymmetric behavior. We now turn to the results of a similar analysis using personal loan rates.

Table 10 reports the results of the same types of probit models estimated using 17,516 observations of weekly changes in unsecured personal loan rates quoted by 71 banks from August 1989 to August 1997. Personal loan rates appear to be even more sticky, in general, than auto loan rates since almost 95.9 percent of the observations have no change and only 2.2 percent and 1.9 percent are increases and decreases, respectively. Assuming the explanatory variables affect loan rates increases and decreases symmetrically, columns 1 and 4 provide evidence that personal loan rates are stickier in more concentrated markets, a result just opposite of that for auto loans but consistent with previous findings for consumer deposit rates. In particular, the negative coefficient on ($r_t - r_{l,t-1}$)*HHI* is statistically significant at better than the 5 percent level when the *LnAssets* variables are excluded, and the negative coefficients on ($r_t - r_{t-1}$)*HHI* and ($r_t - r_{l,t-1}$)*HHI*

are statistically significant at better than the 10 percent level when the *LnAssets* variables are included. However, similar to the auto loan results, column 4 shows that larger banks are quicker to adjust rates in response to changes in Treasury rates but slower to adjust rates based on the spread between Treasuries and loan rates. Note also that the total derivatives of personal loan rates with respect to $(r_t - r_{t-1})$ and $(r_t - r_{l,t-1})$ at the sample averages of the explanatory variables *HHI* and *LnAssets* are of the expected positive sign.

Comparing the total derivatives of personal loan interest rates with respect to $(r_t - r_{t-1})$ and $(r_t - r_{l,t-1})$ in columns 2 versus 3 and columns 5 versus 6 shows that asymmetry also exists for personal loans. Consistent with our results on auto loans and Mester and Saunders's (1995) results on the prime rate, banks appear quicker to raise personal loan rates than to decrease them. In addition, similar to our auto loan results, but unlike the previous results on deposit rates, banks in more concentrated markets appear to engage in this asymmetry less.[28] Finally, differences in the coefficients on $(r_t - r_{t-1})$*LnAssets* and $(r_t - r_{l,t-1})$*LnAssets* in columns 5 and 6 also show that large banks are relatively quicker to lower personal loan rates in response to declines in Treasuries but respond more slowly to lower rates when the Treasury spread is low. Hence, our results for personal loans track those for auto loans with the important exception that personal loan rates are stickier in more concentrated markets.

VII. Conclusion

It is simplistic to presume that bank consolidation affects different types of banking services in a uniform manner. Even within the somewhat narrow category of consumer credit services, bank mergers can have a disparate impact. Some consumer borrowers may benefit, while others may be harmed, from bank mergers. Thus, public policy regarding mergers cannot avoid weighing the gains against the losses to various bank customers. The evidence presented in this paper suggests that mergers have little effect on rates charged for auto loans because the auto

loan market is national in scope. In contrast, interest rates charged on unsecured personal loans appear to be influenced by local market concentration, and can change around the time of major bank mergers. The personal loan rates of banks involved in mergers show a significant decline relative to their market rivals during the period prior to the merger's completion. Because the merging banks become larger in size, this result is consistent with a size structure effect, though the strength of this effect appears to diminish over time. An alternative explanation is that merger participants' decision to lower personal loan rates reflects their desire to gain regulatory approval of the merger.

Other analyses in this study point to marked differences in the pricing of auto versus personal loans. Leader-follower pricing behavior is more widespread in auto lending markets, suggesting that segmentation across banks is less than in markets for personal loans. Auto loan rates also are less sticky than personal loan rates. Further, personal, but not auto, loan rates are more rigid in more concentrated markets. However, both auto and personal loans are similar in that banks set both loans' rates in an opportunistic fashion: banks are slower to lower consumer loan rates when warranted by declines in other market rates than they are to raise consumer loan rates when other market rates rise. Given prior empirical evidence that banks, as well as non-financial firms, tend to change prices in an opportunistic, asymmetric manner, theoretical research exploring a rationale for such behavior would be welcome.

[28] Peltzman (2000) examines a broad range of goods and finds no systematic relationship between the degree of price asymmetry for a product and the product's market concentration.

References

Akhavein, J.D., Allen N. Berger, and David B. Humphrey (1997) "The Effects of Megamergers on Efficiency and Prices: Evidence from a Profit Function," *Review of Industrial Organization* 12, 95-139.

Berger, Allen N., Rebecca S. Demsetz, and Phillip E. Strahan (1999) "The Consolidation of the Financial Services Industry: Causes, Consequences, and Implications for the Future," *Journal of Banking and Finance* 23, 135-194.

Berger, Allen N. and Timothy H. Hannan (1989) "The Price-Concentration Relationship in Banking," *Review of Economics and Statistics* 71, 291-9.

Berger, Allen N., Nathan H. Miller, Mitchell A. Petersen, Raghuram G. Rajan, and Jeremy C. Stein (2001) "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks," NBER working paper No. w8752.

Berger, Allen N., Richard J. Rosen, and Gregory F. Udell (2001) "The Effect of Market Size Structure on Competition: The Case of Small Business Lending," FEDS working paper 2001-63, Board of Governors of the Federal Reserve System.

Berger, Allen N., Anthony Saunders, Joseph M. Scalise, and Gregory F. Udell (1998) "The Effects of Bank Mergers and Acquisitions on Small Business Lending," *Journal of Financial Economics* 50, 187-229.

Berger, Allen N., Joseph M. Scalise, and Anil K. Kashyap (1995) "The Transformation of the U.S. Banking Industry: What a Long, Strange Trip It's Been," *Brookings Papers on Economic Activity* 2, 55-218.

Borenstein, Severin, A. Colin Cameron, and Richard Gilbert (1997) "Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes?" *Quarterly Journal of Economics* 112, 305-39.

Bostic, Raphael, Hamid Mehran, Anna Paulson, and Marc Saidenberg (2002) "Regulatory Incentives and Consolidation: The Case of Commercial Bank Mergers and the Community Reinvestment Act," Working Paper 2002-06, Federal Reserve Bank of Chicago.

Cole, Rebel A., Lawrence G. Goldberg, and Lawrence J. White (1999) "Cookie-cutter versus Character: The Micro Structure of Small Business Lending by Large and Small Banks," in J.L. Blanton, A. Williams, and S.L.W. Rhine, eds.: *Business Access to Capital and Credit*, Federal Reserve System Research Conference.

Hannan, Timothy H. (1994) "Asymmetric Price Rigidity and the Responsiveness of Customers to Price Changes: The Case of Deposit Interest Rates," *Journal of Financial Services Research* 8, 257-67.

Hannan, Timothy H. and Allen N. Berger (1991) "The Rigidity of Prices: Evidence from the Banking Industry," *American Economic Review* 81, 938-945.

Haynes, George W., Charles Ou, and Robert Berney (1999) "Small Business Borrowing from Large and Small Banks," in J.L. Blanton, A. Williams, and S.L.W. Rhine, eds., *Business Access to Capital and Credit* (Federal Reserve System Research Conference), 287-327.

Jackson, William E. III (1997) "Market Structure and the Speed of Price Adjustments: Evidence of Non-monotonicity," *Review of Industrial Organization* 12, 37-57.

Kahn, Charles M., George G. Pennacchi, and Ben J. Sopranzetti (1999) "Bank Deposit Rate Clustering: Theory and Empirical Evidence," *Journal of Finance* 54, 2185-2214.

Mester, Loretta J. and Anthony Saunders (1995) "When Does the Prime Rate Change," *Journal of Banking and Finance* 19, 743-64.

Moore, Robert R. (1997) "Bank Acquisition Determinants: Implications for Small Business Credit," Financial Industry Studies Working Paper 2-97, Federal Reserve Bank of Dallas.

Neumark, David and Steven A. Sharpe (1992) "Market Structure and the Nature of Price Ridigity: Evidence from the Market for Consumer Deposits," *Quarterly Journal of Economics* 107, 657-80.

Peltzman, Sam (2000) "Prices Rise Faster than They Fall," *Journal of Political Economy* 108, 446-502.

Pennacchi, George G. (1988) "Loan Sales and the Cost of Bank Capital," *Journal of Finance* 43, 375-96.

Prager, Robin A. and Timothy H. Hannan (1998) "Do Substantial Horizontal Mergers Generate Significant Price Effects? Evidence from the Banking Industry," *Journal of Industrial Economics* 46, 433-52.

Radecki, Lawrence J. (1998) "The Expanding Reach of Geographic Banking Markets," *Economic Policy Review* 4 (June), 15-34, Federal Reserve Bank of New York.

Rhoades, Stephen A. (2000) "Bank Mergers and Banking Structure in the United States, 1980-98," Staff study 174, Board of Governors of the Federal Reserve System.

Rosen, Richard J. (2002) "What Goes Up Must Come Down? Asymmetries and Persistence in Bank Deposit Interest Rates," *Journal of Financial Services Research* (forthcoming).

Sapienza, Paola (2002) "The Effects of Bank Mergers on Loan Contracts," *Journal of Finance* 57, 329-69.

Scholnick, Barry (1999) "Interest Rate Asymmetries in Long-Term Loan and Deposit Markets," *Journal of Financial Services Research*, 16:1 5-16.

Simons, Katerina and Joanna Stavins (1998) "Has Antitrust Policy in Banking Become Obsolete?" *New England Economic Review*, Federal Reserve Bank of Boston 13-26.

Strahan, Phillip E. and James P. Weston (1996) "Small Business Lending and Bank Consolidation: Is There Cause for Concern?," *Current Issues in Economics and Finance* 2, Federal Reserve Bank of New York, 1-6.

Strahan, Phillip E. and James P. Weston (1998) “Small Business Lending and the Changing Structure of the Banking Industry,” *Journal of Banking and Finance* 22, 821-45.

Table 1

Banks Surveyed by Bank Rate Monitor

Bank Name	Begin Survey	End Survey
Boston		
Bank of Boston	8/16/1989	8/13/97
Bank of New England	8/16/1989	7/10/1991
BayBank	8/16/1989	5/21/1997
Century Bank & Trust	5/28/1997	8/13/1997
Fleet	7/17/1991	8/13/1997
PNC	4/24/1996	8/13/1997
Shawmut	8/16/1989	3/27/1996
US Trust	4/3/1996	8/13/1997
Chicago		
Bank of America	4/30/1997	8/13/1997
First Chicago / NBD[1]	8/16/1989	8/13/1997
Harris Trust	8/16/1989	8/13/1997
LaSalle	8/16/1989	8/13/1997
Northern Trust	8/16/1989	8/13/1997
Dallas		
Bank of America	2/17/1993	8/13/1997
Bank One	8/16/1989	8/13/1997
Comerica	12/2/1992	8/13/1997
First City	8/16/1989	2/10/1993
NCNB / Nationsbank[2]	8/16/1989	8/13/1997
Team	8/16/1989	11/25/1992
Texas Commerce[3]	8/16/1989	8/13/1997
Detroit		
Comerica	8/16/1989	8/13/1997
First of America	8/16/1989	8/13/1997
Huntington	5/18/1994	8/13/1997
Manufacturers National	8/16/1989	9/9/1992
Michigan National	8/16/1989	8/13/1997
First Chicago / NBD[1]	8/16/1989	8/13/1997
Security Bank & Trust	9/16/1992	5/11/1994
Houston		
Bank of America	2/17/1993	8/13/1997
Bank One	8/16/1989	8/13/1997
First City	8/16/1989	2/10/1993
First Interstate	8/16/1989	7/31/1996
NCNB / Nationsbank[2]	8/16/1989	8/13/1997
Texas Commerce[3]	8/16/1989	8/13/1997
Wells Fargo	8/7/1996	8/13/1997

Bank Name	Begin Survey	End Survey
Los Angeles		
Bank of America	8/16/1989	8/13/1997
First Interstate	8/16/1989	7/31/1996
Sanwa	5/13/1992	8/13/1997
Security Pacific[4]	8/16/1989	5/6/1992
Sumitomo	8/7/1996	8/13/1997
Union Bank of CA	8/16/1989	8/13/1997
Wells Fargo	8/16/1989	8/13/1997
New York		
Bank of New York	8/16/1989	8/13/1997
Chase Manhattan	8/16/1989	8/28/1996
Chemical / Chase Manhattan[5]	8/16/1989	8/13/1997
Citibank	8/16/1989	8/13/1997
European American	9/4/1996	8/13/1997
Manufacturers Hanover	8/16/1989	8/5/1992
Republic of New York[4]	9/15/1993	8/13/1997
Philadelphia		
Continental / Midlantic[6]	10/10/1990	7/17/1996
First Fidelity	8/16/1989	2/7/1996
First Pennsylvania	8/16/1989	10/3/1990
First Union	2/14/1996	8/13/1997
Frankford / Keystone[7]	7/24/1996	8/13/1997
Mellon	8/16/1989	8/13/1997
Philadelphia / Corestates[8]	8/16/1989	8/13/1997
Provident / PNC[9]	8/16/1989	8/13/1997
San Francisco		
Bank of America	8/16/1989	8/13/1997
First Interstate	8/16/1989	7/31/1996
Sanwa	8/7/1996	8/13/1997
Sumitomo	5/13/1992	8/13/1997
Union Bank of CA	8/16/1989	8/13/1997
Wells Fargo	8/16/1989	8/13/1997
Washington, D.C.		
American Security[10]	8/16/1989	8/15/1990
Crestar	10/5/1994	8/13/1997
First American	8/16/1989	11/10/1993
First NB of Maryland	7/31/1996	8/13/1997
First Union	11/24/1993	8/13/1997
Maryland NB/Am. Security[10]	8/16/1989	9/28/1994
NCNB / Nationsbank[2]	1/8/1992	8/13/1997
Riggs	8/16/1989	8/13/1997
Signet	10/5/1994	8/13/1997
Sovran / C&S Sovran	8/16/1989	12/31/1991

Notes:
[1] NBD acquired First Chicago in 1995 and both were renamed First Chicago / NBD.

[2] NCNB was renamed Nationsbank in 1992.
[3] Texas Commerce was purchased by Chemical in 1987.
[4] BRM obtained only new car loan quotes from Security Pacific and only unsecured personal loan quotes from Republic of New York.
[5] Following Chemical's acquisition of Chase Manhattan in 1996, it was renamed Chase Manhattan.
[6] Midlantic acquired Continental in 1987. The Continental / Midlantic series is treated as one bank.
[7] Frankford was renamed Keystone in 1997.
[8] Philadelphia National Bank was renamed Corestates in 1990.
[9] Provident was purchased by PNC in 1983. The Provident / PNC series is treated as one bank.
[10] Maryland National and American Security came under the same holding company in 1987. Starting on 8/15/1990, they quoted identical rates. Thus, they are treated as one bank starting at this date.

Table 2

Summary Statistics of Data

Variable	Mean	Median	Minimum	Maximum	Std. Dev.
New Automobile Loan Rate	9.93	9.50	6.49	15.90	1.81
Unsecured Personal Loan Rate	16.06	15.75	8.24	24.00	2.32
1-Year Treasury Yield	5.62	5.67	3.04	8.76	1.52
3-Year Treasury Yield	6.27	6.17	4.09	9.02	1.23
Finance Company Rate	10.55	10.40	5.93	13.27	1.66
Credit Card Rate	17.04	16.83	15.87	18.23	1.00
Herfindahl – Hirschman Index	1393	1275	538	2930	551
MSA Per Capita Income (% of U.S.)	121.84	117.00	99.60	163.90	15.95
MSA Population (% of U.S.)	2.05	1.79	0.62	3.56	0.91
Acquisition Activity	0.0373	0.0142	0.0000	0.2169	0.0489
Merger Activity	0.2445	0.2131	0.0134	0.5754	0.1515
Bank Assets (Millions 1996 $)	33,950	18,150	636	285,477	45,319

Notes: New automobile and unsecured personal loan rates are those surveyed by Bank Rate Monitor. The 1-year and 3-year Treasury yields represents the one- and three-year constant maturity Treasury bond rates obtained from the Federal Reserve Bank of St. Louis database. Finance company rate is taken from the Federal Reserve's Consumer Credit Statistical Release G.19, which is the average yield on new automobile loans charged by the finance company subsidiaries of the three major U.S. automobile manufacturers. The average credit card rate is reported in various issues of the *Federal Reserve Bulletin*. The Herfindahl-Hirschman index is computed from end-of-June FDIC *Summary of Deposits* data of all commercial bank branches within the MSA. MSA per capita income is its per capita income as a percentage of the per capita income of the entire United States. MSA Population is its population as a percentage of the total population of the United States. These data were obtained from the Commerce Department's Bureau of Economic Analysis. Merger activity is the share of local market deposits in banks involved in mergers in which two or more banks charters are consolidated, averaged over the previous three years. Acquisition activity is the share of local market deposits in banks involved in acquisitions in which the banks retain their separate charters but changed their top-tier bank holding company ownership, average over the previous three years. Bank assets are obtained from quarterly FDIC Call Reports and converted to real terms by the quarterly GDP deflator.

Table 3

Determinants of Interest Rates for Automobile Loans and Unsecured Personal Loans

	New Automobile Loans				**Unsecured Personal Loans**			
Variable	Coefficient (*t*-statistic in parentheses)				Coefficient (*t*-statistic in parentheses)			
Constant	1.231 (1.48)	-2.806 (-2.58)	-2.156 (-1.77)	16.114 (2.44)	-0.536 (-0.15)	-8.869 (-2.68)	-9.711 (-2.68)	-3.102 (-0.13)
Treasury yield	1.144 (12.19)	1.150 (13.98)	1.170 (13.95)	0.966 (8.93)	0.987 (4.76)	1.012 (5.75)	1.082 (6.02)	0.954 (1.99)
Finance co. spread	0.368 (4.17)	0.387 (4.99)	0.376 (4.73)	0.155 (1.42)				
Credit card spread					0.823 (3.89)	0.855 (4.76)	0.911 (4.93)	0.794 (1.77)
HHI	-0.107 (-0.05)	1.548 (0.76)	0.218 (0.095)	1.081 (0.48)	12.519 (3.63)	14.502 (4.29)	11.946 (3.14)	12.085 (3.13)
Personal income		0.021 (3.28)	0.020 (3.05)	0.020 (3.19)		0.045 (4.26)	0.047 (4.34)	0.047 (4.32)
Population		0.551 (4.81)	0.468 (3.59)	0.503 (4.01)		0.984 (5.16)	0.941 (4.37)	0.947 (4.35)
Merger activity			-0.507 (-0.74)	-0.183 (-0.27)			1.095 (0.95)	1.122 (0.96)
Acquisition activity			-3.154 (-1.33)	-2.730 (-1.19)			-4.62 (-1.17)	-4.54 (-1.14)
Year				-0.176 (-2.81)				-0.049 (-0.29)
Observations	90	90	90	90	90	90	90	90
R^2	0.669	0.753	0.759	0.780	0.249	0.481	0.500	0.501

Notes: The dependent variable is the annual average of the loan rate in a particular market for a given year. The sample consists of 10 cities (markets) for the years 1989 to 1997, resulting in 90 observations for each loan type. "Treasury yield" represents the three-year constant maturity Treasury bond rate for the case of new automobile loans and the one-year, annually-compounded Treasury bill secondary market yield for the case of personal unsecured loans. Both yields are from the Federal Reserve Bank of St. Louis database. "Finance co. spread" is the average yield on new automobile loans charged by the finance company subsidiaries of the three major U.S. automobile manufacturers (taken from the Federal Reserve's Consumer Credit Statistical Release G.19) minus the three-year Treasury rate. "Credit card spread" is the average credit card rate (reported in the Federal Reserve Bulletin) minus the one-year Treasury rate. "HHI" is the Herfindahl-Hirschman index divided by 1000 computed from end-of-June FDIC *Summary of Deposits* data of all commercial bank branches within the PMSA. "Personal income" is the MSA's per capital income as a percentage of the per capita income of the entire United States. "Population" is the MSA's population as a percentage of the total population of the United States. These data were obtained from the Commerce Department's Bureau of Economic Analysis. "Merger activity" is the share of local market deposits in banks involved in mergers in which two or more banks charters are consolidated, averaged over the previous three years. "Acquisition activity" is the share of local market deposits in banks involved in acquisitions in which the banks retain their separate charters but changed their top-tier bank holding company ownership, average over the previous three years. "Year" is a time trend ranging from 89 to 97.

Table 4

Bank Mergers

Market	Target Name	Acquirer Name	Merger Announced	Merger Completed	Post Merger HHI	ΔHHI
		Mergers of Domestic Banks with HHI > 1400 and ΔHHI > 100				
Los Angeles	**Security Pacific**	**BankAmerica**	8/12/1991	4/22/1992	**1808**	**765**
New York	**Chase Manhattan**	**Chemical**	8/28/1995	3/31/1996	**2041**	**702**
Philadelphia	**Continental/Midlantic**	**PNC**	7/10/1995	1/2/1996	**1749**	**567**
Philadelphia	**First Fidelity**	**First Union**	6/19/1995	1/2/1996	**1749**	**567**
Philadelphia	Meridian	**Corestates**	10/10/1995	4/9/1996	**1749**	**567**
Boston	**BayBank**	**Bank of Boston**	12/12/1995	7/29/1996	**2222**	**494**
Boston	Walden	**UST**	8/30/1996	1/3/1997	**2222**	**494**
Detroit	**Manufacturers NB**	**Comerica**	10/29/1991	6/19/1992	**2096**	**481**
New York	**Manufacturers Hanover**	**Chemical**	7/15/1991	12/31/1991	**1426**	**309**
Boston	**Shawmut**	**Fleet**	2/21/1995	11/30/1995	**1728**	**307**
		Additional Mergers of Domestic Banks with HHI > 1400				
Los Angeles	**First Interstate**	**Wells Fargo**	10/18/1995	4/1/1996	**1557**	**97**
San Francisco	**First Interstate**	**Wells Fargo**	10/18/1995	4/1/1996	**2684**	**40**
Dallas	**First City**[1]	**Texas Commerce**		2/13/1993	**1556**	**64**
Dallas	**Team**	**Bank One**	3/23/1992	12/1/1992	**1556**	**64**
Detroit	**Security Bank & Trust**	**First of America**	9/12/1991	5/1/1992	**1614**	**-85**
		All Other Mergers				
Houston	**First City**[1]	**Texas Commerce**		2/13/1993	**1260**	**267**
Boston	**Bank of New England**[1]	**Fleet**	1/6/1991	7/14/1991	**1256**	**164**
Philadelphia	**First Pennsylvania**	**Philadlephia/Corestates**	9/18/1989	3/5/1990	**1126**	**159**
Houston	**First Interstate**	**Wells Fargo**	10/18/1995	4/1/1996	**1034**	**-51**
D.C.	**Maryland NB/Am. Security**	**Nationsbank**	7/20/1992	10/5/1993	**997**	**277**
D.C.	**First American**	**First Union**	2/26/1993	9/30/1993	**997**	**277**
D.C.	**C&S Sovran**	**NCNB / Nationsbank**	6/26/1991	12/31/1991	**761**	**-87**
D.C.	Equitable	**Maryland National**	7/13/1989	1/18/1990	**845**	**30**
Chicago	**First Chicago**	**NBD**	7/13/1995	12/1/1995	**695**	**55**
D.C.	Citizens & Southern	**Sovran**	10/13/1989	8/31/1990	**849**	**3**
Detroit	**First Chicago**	**NBD**	7/13/1995	12/1/1995	**2138**	**-17**
Boston	National Westminster	**Fleet**	12/19/1995	5/1/1996	**1728**	**307**
Detroit	**Michigan National**	National Australia	2/6/1995	11/2/1995	**2138**	**-17**
Los Angeles	**Union Bank of CA**[2]	Mitsuibishi	2/16/1996	4/1/1996	**1557**	**97**
San Francisco	**Union Bank of CA**[2]	Mitsuibishi	2/16/1996	4/1/1996	**2684**	**40**

Notes: Banks in **bold** type are ones surveyed by Bank Rate Monitor.
[1] First City and Bank of New England were failed bank mergers that obtained FDIC assistance.
[2] Bank of Toyko purchased Union in 1988. Mitsuibishi Bank acquired Bank of Tokyo in 1996, thereby acquiring Union.

Table 5

Impact of Mergers on Automobile Loan Rates

Panel A: All BRM Mergers						Obs. = 4140, R^2 = 0.164
	Sum of Coefficients (*t*-statistics in parentheses)					
Effect	**Exposed Banks**	**Acquirer Banks**	**Target Banks**	**Acquirer - Exposed**	**Target – Exposed**	**Acquirer – Target**
Pre-merger	0.005 (0.21)	-0.029 (-0.92)	-0.008 (-0.26)	-0.034 (-1.03)	-0.013 (-0.39)	-0.022 (-0.57)
Post-merger	0.011 (0.51)	0.052 (1.93)	0.022 (0.76)	0.041 (1.47)	0.011 (0.45)	0.011 (0.38)
Total	0.016 (0.45)	0.022 (0.51)	0.014 (0.33)	0.007 (0.15)	-0.001 (-0.03)	-0.011 (-0.23)

Panel B: BRM Mergers with HHI > 1400						Obs. = 4140, R^2 = 0.166
	Sum of Coefficients (*t*-statistics in parentheses)					
Effect	**Exposed Banks**	**Acquirer Banks**	**Target Banks**	**Acquirer - Exposed**	**Target – Exposed**	**Acquirer – Target**
Pre-merger	0.004 (0.12)	-0.027 (-0.74)	0.010 (0.27)	-0.031 (-0.76)	0.006 (0.15)	-0.037 (-0.77)
Post-merger	0.006 (0.21)	0.022 (0.66)	0.011 (0.26)	0.016 (0.45)	0.005 (0.13)	0.008 (0.19)
Total	0.010 (0.22)	-0.004 (-0.09)	0.021 (0.37)	-0.014 (-0.25)	0.011 (0.19)	-0.029 (-0.47)

Panel C: BRM Mergers with HHI > 1400 and ΔHHI > 100						Obs. = 4140, R^2 = 0.159
	Sum of Coefficients (*t*-statistics in parentheses)					
Effect	**Exposed Banks**	**Acquirer Banks**	**Target Banks**	**Acquirer - Exposed**	**Target – Exposed**	**Acquirer – Target**
Pre-merger	-0.007 (-0.21)	-0.033 (-0.78)	-0.005 (-0.11)	-0.025 (-0.53)	0.002 (0.04)	-0.028 (-0.47)
Post-merger	-0.002 (-0.06)	0.023 (0.57)	0.033 (0.73)	0.024 (0.56)	0.034 (0.82)	-0.022 (-0.49)
Total	-0.009 (-0.19)	-0.010 (-0.17)	0.028 (0.43)	-0.001 (-0.01)	0.037 (0.53)	-0.050 (-0.67)

Notes: The pre-merger effect is the proportional loan rate change for the period 13 months prior to and including the merger completion month. The post-merger effect is the proportional loan rate change for the period 12 months following the merger completion month for exposed banks and acquirers, and is the proportional loan rate change for the period 6 months following the merger completion month for targets. The total effect is the sum of pre- and post-merger effects.

Table 6

Impact of Mergers on Personal Loan Rates

Panel A: All BRM Mergers						Obs. = 3851, R^2 = 0.047
	Sum of Coefficients (*t*-statistics in parentheses)					
Effect	**Exposed Banks**	**Acquirer Banks**	**Target Banks**	**Acquirer - Exposed**	**Target – Exposed**	**Acquirer – Target**
Pre-merger	0.026 (1.07)	-0.036 (-1.02)	-0.012 (-0.68)	-0.062 (-1.82)	-0.046 (-1.44)	-0.017 (-0.42)
Post-merger	0.010 (0.48)	0.027 (1.02)	0.027 (0.97)	0.017 (0.62)	0.018 (0.70)	-0.015 (-0.53)
Total	0.036 (1.04)	-0.010 (-0.23)	0.007 (0.172)	-0.045 (-1.01)	-0.028 (-0.69)	-0.031 (-0.65)

Panel B: BRM Mergers with HHI > 1400						Obs. = 3851, R^2 = 0.050
	Sum of Coefficients (*t*-statistics in parentheses)					
Effect	**Exposed Banks**	**Acquirer Banks**	**Target Banks**	**Acquirer - Exposed**	**Target – Exposed**	**Acquirer – Target**
Pre-merger	0.039 (1.22)	-0.039 (-1.08)	-0.020 (-0.52)	-0.078 (-1.94)	-0.059 (-1.31)	-0.020 (-0.40)
Post-merger	-0.007 (-0.24)	0.005 (0.14)	0.014 (0.36)	0.011 (0.32)	0.021 (0.57)	-0.020 (-0.51)
Total	0.032 (0.74)	-0.035 (-0.70)	-0.005 (-0.10)	-0.067 (-1.20)	-0.038 (-0.63)	-0.040 (-0.63)

Panel C: BRM Mergers with HHI > 1400 and ΔHHI > 100						Obs. = 3851, R^2 = 0.045
	Sum of Coefficients (*t*-statistics in parentheses)					
Effect	**Exposed Banks**	**Acquirer Banks**	**Target Banks**	**Acquirer - Exposed**	**Target – Exposed**	**Acquirer – Target**
Pre-merger	0.033 (0.95)	-0.063 (-1.45)	-0.018 (-0.38)	-0.096 (-1.97)	-0.051 (-0.92)	-0.045 (-0.73)
Post-merger	-0.011 (-0.34)	0.009 (0.23)	0.005 (0.12)	0.020 (0.46)	0.016 (0.38)	-0.006 (-0.13)
Total	0.022 (0.47)	-0.054 (-0.93)	-0.013 (-0.20)	-0.076 (-1.12)	-0.035 (-0.50)	-0.051 (-0.67)

Notes: The pre-merger effect is the proportional loan rate change for the period 13 months prior to and including the merger completion month. The post-merger effect is the proportional loan rate change for the period 12 months following the merger completion month for exposed banks and acquirers, and is the proportional loan rate change for the period 6 months following the merger completion month for targets. The total effect is the sum of pre- and post-merger effects.

Table 7

Impact of Mergers on Personal Loan Rates

Panel A: All BRM Mergers			Obs. = 3851, R^2 = 0.040
	Sum of Coefficients (*t*-statistics in parentheses)		
Effect	**Exposed Banks**	**Merger Participants**	**Merger Participants - Exposed Banks**
Pre-merger	0.026 (1.10)	-0.027 (-1.13)	-0.054 (-2.02)
Post-merger	0.010 (0.48)	0.027 (1.16)	0.017 (0.68)
Total	0.037 (1.06)	-0.000 (-0.01)	-0.037 (-0.98)

Panel B: BRM Mergers with HHI > 1400			Obs. = 3851, R^2 = 0.044
	Sum of Coefficients (*t*-statistics in parentheses)		
Effect	**Exposed Banks**	**Merger Participants**	**Merger Participants - Exposed Banks**
Pre-merger	0.040 (1.26)	-0.030 (-1.07)	-0.071 (-2.01)
Post-merger	-0.009 (-0.34)	0.013 (0.41)	0.022 (0.65)
Total	0.031 (0.70)	-0.018 (-0.42)	-0.049 (-0.95)

Panel C: BRM Mergers with HHI > 1400 and ΔHHI > 100			Obs. = 3851, R^2 = 0.041
	Sum of Coefficients (*t*-statistics in parentheses)		
Effect	**Exposed Banks**	**Merger Participants**	**Merger Participants - Exposed Banks**
Pre-merger	0.035 (1.02)	-0.043 (-1.28)	-0.078 (-1.88)
Post-merger	-0.015 (-0.47)	0.016 (0.46)	0.031 (0.76)
Total	0.020 (0.43)	-0.027 (-0.56)	-0.048 (-0.78)

Notes: The pre-merger effect is the proportional loan rate change for the period 13 months prior to and including the merger completion month. The post-merger effect is the proportional loan rate change for the period 12 months following the merger completion month for exposed banks and acquirers, and is the proportional loan rate change for the period 6 months following the merger completion month for targets. The total effect is the sum of pre- and post-merger effects.

Table 8

Evidence of Market Leadership

Panel A: New Automobile Loans

Bank	Market	F Test of Predictability	Sum of Lagged Coefficients	*t*-statistic of Sum of Lagged Coefficients
Security Bank & Trust	Detroit	10.34	1.269	4.15
Northern Trust	Chicago	5.69	0.680	5.03
First City	Houston	3.82	0.401	1.87
Riggs	Washington, D.C.	3.00	0.479	4.02
First City	Dallas	2.90	0.600	3.23
First Chicago / NBD	Chicago	2.87	0.376	4.08
Texas Commerce	Dallas	2.66	0.575	3.48
BayBank	Boston	2.41	0.335	2.72
Continental / Midlantic	Philadelphia	2.35	0.418	2.03
First Union	Washington, D.C.	2.19	0.093	0.78
Bank of New York	New York	2.18	0.240	1.81
Bank of Boston	Boston	2.17	0.158	2.04
Bank of New England	Boston	2.10	0.325	1.14
Crestar	Washington, D.C.	2.03	0.229	1.34
First of America	Detroit	2.00	0.209	1.85

Panel B: Unsecured Personal Loans

Bank	Market	F Statistic for Test of Predictability	Sum of Lagged Coefficients	*t* Statistic for Non-zero Sum Coefficients
First Chicago / NBD	Chicago	2.33	0.282	2.51
Harris Trust	Chicago	2.26	0.235	2.63
Texas Commerce	Dallas	1.98	0.168	1.00

Notes: The table reports the results of Granger causality tests of whether the log change in a given bank's loan rate predicts the log change in the average loan rate of the other banks in its market (MSA). The change in the average loan rates of the other banks is regressed on eight lags of itself and eight lags of the change in the loan rate of the target bank. This is done on a weekly basis over the period August 1989 to August 1997. The F statistic tests the hypothesis that the coefficients of the lagged changes in the target bank's loan rate are all zero. The target bank is considered a leader and reported in this table if the hypothesis can be rejected at greater than the 95 percent confidence level. Panels A and B list market leaders for new automobile loans and unsecured personal loans, respectively. Also reported is the sum of the coefficients of the lagged changes in the target bank's loan rate, and a t statistic for a test of the hypothesis that this sum equals zero.

Table 9

Changes in New Automobile Loan Rates

(*t*-statistics in parentheses)

Independent Variables	Symmetric Changes	Increase	Decrease	Symmetric Changes	Increase	Decrease
$r_t - r_{t-1}$	-0.462 (-1.75)	0.151 (0.36)	-0.520 (-1.48)	-3.385 (-2.59)	-4.956 (-2.45)	-1.006 (-0.56)
$r_t - r_{l,t-1}$	0.157 (13.03)	0.437 (24.41)	0.017 (1.06)	0.734 (15.21)	1.139 (14.36)	0.439 (7.15)
$(r_t - r_{t-1})$HHI	4.882 (3.05)	1.591 (0.63)	3.042 (1.35)	4.198 (2.54)	0.583 (0.22)	2.945 (1.25)
$(r_t - r_{l,t-1})$HHI	0.188 (3.45)	-0.818 (-9.00)	0.746 (10.58)	0.359 (6.45)	-0.670 (-7.31)	0.868 (11.82)
$(r_t - r_{t-1})$LnAssets				0.175 (2.22)	0.308 (2.60)	0.026 (0.23)
$(r_t - r_{l,t-1})$LnAssets				-0.033 (-12.25)	-0.041 (-9.44)	-0.024 (-6.94)
Total Derivatives at Sample Averages:						
$r_t - r_{t-1}$	0.226	0.376	-0.0911	0.126	0.267	-0.158
$r_t - r_{l,t-1}$	0.184	0.322	0.1220	0.239	0.362	0.168
Observations:						
Increase	858	858	0	858	858	0
No Change	17,076	17,076	17,076	17,076	17,076	17,076
Decrease	1,009	0	1,009	1,009	0	1,009

Notes: The table gives estimates for probit models of changes in loan rates quoted weekly by 71 banks during the period August 1989 to August 1997. The estimates for the "Symmetric Changes" case are the results of an ordered probit with the dependent variable being a negative change, no change, or a positive change in the loan rate. The estimates for the "Increase" case are the results of a probit model with the dependent variable being no change or a positive change in the loan rate. The estimates for the "Decrease" case are the results of a probit model with the dependent variable being a negative change or no change in the loan rate. "HHI" is the Herfindahl-Hirschman index divided by 1000. The total derivative with respect to $r_t - r_{t-1}$ equals $c_1 + c_2\overline{\text{HHI}} + c_3\overline{\text{LnAssets}}$ where c_1, c_2, and c_3 are the coefficient estimates for $r_t - r_{t-1}$, $(r_t - r_{t-1})$HHI, and $(r_t - r_{t-1})$LnAssets, respectively, and $\overline{\text{HHI}}$ and $\overline{\text{LnAssets}}$ are the sample averages of the respective variables. The total derivative with respect to $r_t - r_{l,t-1}$ is calculated in a similar manner.

Table 10

Changes in Unsecured Personal Loan Rates

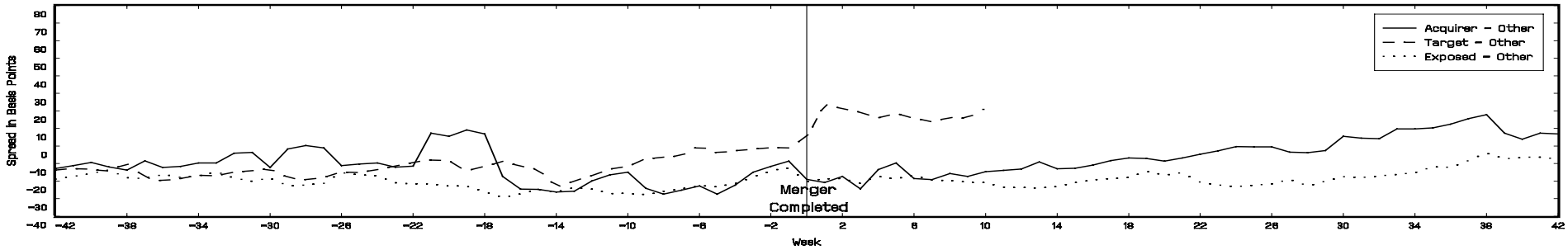
(*t*-statistics in parentheses)

Independent Variables	Symmetric Changes	Increase	Decrease	Symmetric Changes	Increase	Decrease
$r_t - r_{t-1}$	1.013 (2.75)	1.547 (3.01)	0.856 (1.74)	-4.49 (-3.12)	-5.856 (-3.57)	-4.062 (-1.42)
$r_t - r_{l,t-1}$	0.068 (8.10)	0.101 (8.35)	0.035 (3.03)	0.147 (5.61)	0.314 (8.60)	-0.004 (-0.10)
$(r_t - r_{t-1})$HHI	-3.571 (-1.40)	-5.537 (-1.58)	-3.342 (0.94)	-4.60 (-1.69)	-7.864 (-2.11)	-4.149 (-1.05)
$(r_t - r_{l,t-1})$HHI	-0.068 (-2.57)	-0.160 (-4.06)	0.010 (0.27)	-0.054 (-1.94)	-0.125 (-2.98)	4.6×10^{-4} (0.01)
$(r_t - r_{t-1})$LnAssets				0.334 (3.68)	0.464 (4.42)	0.292 (1.69)
$(r_t - r_{l,t-1})$LnAssets				-0.004 (-3.20)	-0.012 (-6.05)	0.002 (1.11)
Total Derivatives at Sample Averages:						
$r_t - r_{t-1}$	0.511	0.768	0.386	0.436	0.771	0.218
$r_t - r_{l,t-1}$	0.058	0.078	0.036	0.065	0.098	0.032
Observations:						
Increase	386	386	0	386	386	0
No Change	16,794	16,794	16,794	16,794	16,794	16,794
Decrease	336	0	336	336	0	336

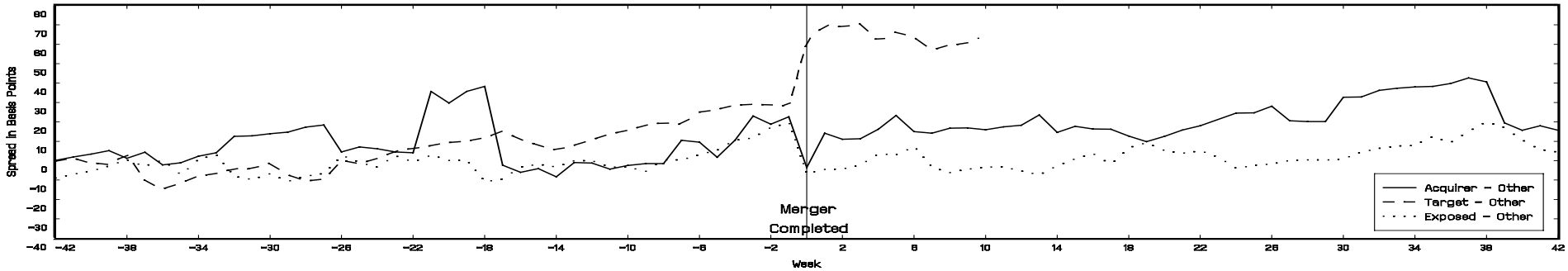
Notes: The table gives estimates for probit models of changes in loan rates quoted weekly by 71 banks during the period August 1989 to August 1997. The estimates for the "Symmetric Changes" case are the results of an ordered probit with the dependent variable being a negative change, no change, or a positive change in the loan rate. The estimates for the "Increase" case are the results of a probit model with the dependent variable being no change or a positive change in the loan rate. The estimates for the "Decrease" case are the results of a probit model with the dependent variable being a negative change or no change in the loan rate. "HHI" is the Herfindahl-Hirschman index divided by 1000. The total derivative with respect to $r_t - r_{t-1}$ equals $c_1 + c_2\overline{\text{HHI}} + c_3\overline{\text{LnAssets}}$ where c_1, c_2, and c_3 are the coefficient estimates for $r_t - r_{t-1}$, $(r_t - r_{t-1})$HHI, and $(r_t - r_{t-1})$LnAssets, respectively, and $\overline{\text{HHI}}$ and $\overline{\text{LnAssets}}$ are the sample averages of the respective variables. The total derivative with respect to $r_t - r_{l,t-1}$ is calculated in a similar manner.

Figure 1

Panel A: Auto Loan Spreads for All BRM Mergers



Panel B: Auto Loan Spreads for Mergers with HHI > 1400



Panel C: Auto Loan Spreads for Mergers with HHI > 1400 and ΔHHI > 100

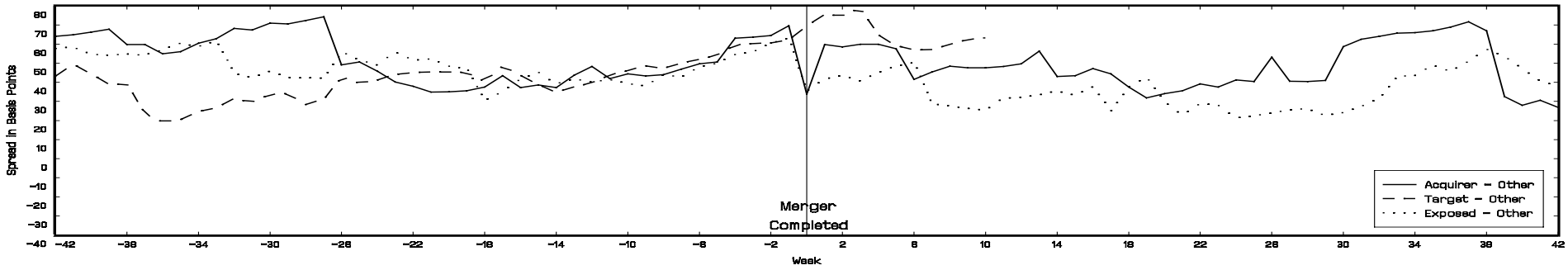
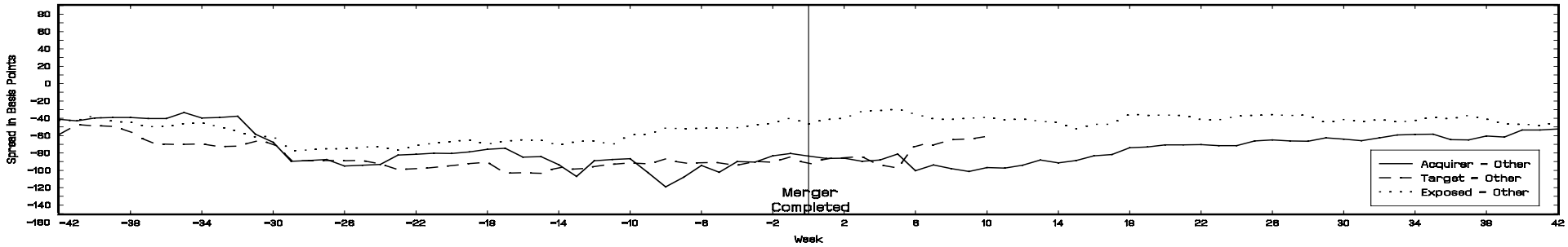
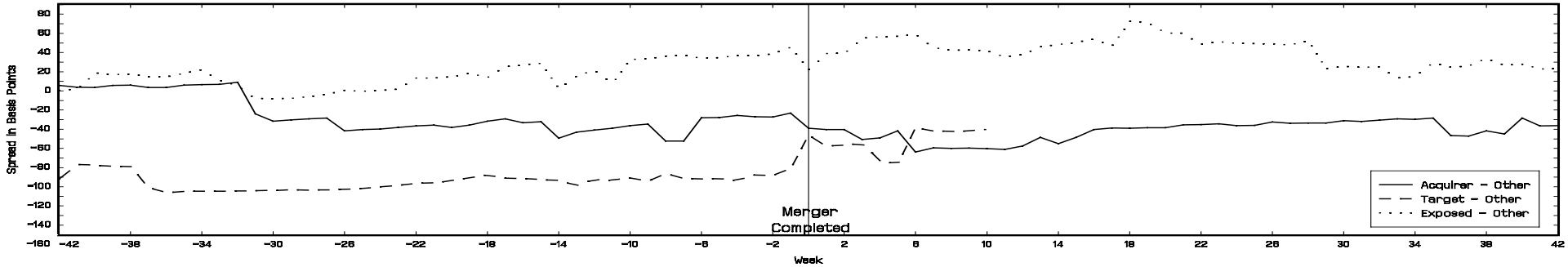


Figure 2

Panel A: Personal Loan Spreads for All BRM Mergers



Panel B: Personal Loan Spreads for Mergers with HHI > 1400



Panel C: Personal Loan Spreads for Mergers with HHI > 1400 and △HHI > 100