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Bank Consolidation and Consumer Loan Interest Rates

by
Charles Kahn
George Pennacchi
Ben Sopranzetti

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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

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Bank Consolidation and Consumer Loan Interest Rates

Abstract

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

Market concentration is found to have a positive and significant impact on the level of personal loans, but not automobile loans. Consistent with the exercise of market power, we find that personal loan rates rise in markets following a significant merger. However, there is a significant decrease in automobile loan rates charged by banks participating in within-market mergers, a finding consistent with economies of scale in the origination of automobile loans.

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

Banks merge for a variety of reasons, among them to realize increases in efficiency through exploitation of economies of scale or scope, to spread best-practice techniques and expertise to less profitable participants, and to reap the benefits of market share and decreases in competition. The fundamental policy question regarding mergers is whether the benefits are social or private in nature, and if social, whether they accrue to the banks alone or whether part of the benefits are enjoyed by the banks' customers as well.[1]

The recent merger wave 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.[2] A reason for the void in research on consumer credit is a lack of data on the quantities of specific consumer loans made by banks.

This paper sheds new light on the relationship between bank consolidation and consumer lending by examining data on interest rates charged for two types of consumer loans: new automobile loans and unsecured personal loans. This data was collected by *Bank Rate Monitor*, Inc., a company that conducts 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 impact of bank consolidation on rates charged for consumer loans.

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[1] Throughout this paper, the term "mergers" is meant to describe both mergers and acquisitions. In a bank merger, two banks' balance sheets are combined into one, whereas a bank acquisition involves the two banks maintaining separate balance sheets within a single bank holding company.

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

The paper considers several aspects of consumer loan pricing. First, it analyzes factors that might explain the average level of loan rates in different markets. Market concentration is found to have a positive and significant effect on the level of personal loans, but not automobile loans. Second, it examines the dynamics of bank pricing decisions during periods around large merger events when the concentration in a banking market can change significantly. We find evidence that mergers lead to greater market power in the pricing of personal loans. In contrast, banks participating in within-market mergers significantly reduce automobile loan rates following a merger. This latter evidence is consistent with economies of scale in originating automobile loans, a hypothesis that is made more plausible given that a large proportion of automobile loans is securitized. Hence, mergers appear to have a disparate impact on different consumer loans.

Our study also provides an additional, more general, analysis of the dynamics of consumer loan pricing. We find evidence of a leader-follower relationship in some markets, especially for the case of new automobile loans. Also, there is substantial rigidity in personal loan rates, and this stickiness is greater in more concentrated markets. In addition, banks appear to change both types of loans 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. Moreover, this asymmetric, "opportunistic" behavior is more prevalent in less concentrated loan markets.

The plan of the paper is as follows. Section II discusses prior research on bank consolidation and its effect on the pricing of banking services. The data used in our study is 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 Consolidation

There is a growing literature that examines the many mergers and acquisitions that have recently occurred in the banking sector. Berger, Demsetz, and Strahan (1999) provide a valuable survey and critical analysis of this literature. They conclude that the consensus of "static" studies using data from the 1980's is that greater concentration in banking activity at the Metropolitan Statistical Area (MSA) level is correlated with higher rates for small business loans and lower rates for retail deposits, as well as greater stickiness of rates. They also cite evidence that during the 1990's, the relationship between local market concentration and deposit interest rates has weakened, but that the link between concentration and small business loan rates is still strong.

Studies that attempt to incorporate "dynamic effects"—that is, to examine the effects over time of changes in banking concentration due to 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 led to a decline in the supply of small business loans (loans with a principal amount of less than $1 million). 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 significantly decrease retail deposit interest rates 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 clientele but, instead, are exercising 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 (1998) 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, the greater are the market shares of the merging banks, the less interest rates tend to fall, and for sufficiently high market shares, mergers lead to loan rate increases. Hence, these findings suggest that when mergers produce significant increases in concentration, banks exercise market power.

III. The Data

The loan interest rates in our sample are provided by *Bank Rate Monitor*, Inc (BRM). The data are weekly interest rates on new automobile loans and unsecured personal loans quoted by 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

[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).

[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).

banks in each city.[5] These loan rates are those that would be charged to walk-in customers having no other banking relationship with the lending institution. Loan rates can vary from branch to branch, so when more than one branch exists in any given region, BRM calculates a simple average of the individual branch loan rates.

BRM's rates on new automobile 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 automobile loans and the unsecured personal loans are fixed rate loans. During our eight-year sample period, the mean and standard deviation of new automobile loan rates are 9.73 percent and 2.76 percent, respectively. The mean and standard deviation of unsecured personal loan rates are 14.14 percent and 5.60 percent, respectively.

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 security yields were obtained from the Federal Reserve Bank of St. Louis's Federal Reserve Economic Data (FRED). In addition, a monthly time series of the average yield on new automobile 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 Consolidated Metropolitan Statistical Areas (CMSAs). A CMSA, rather than the narrower MSA or the broader State geographic area, is likely to be the most relevant market for consumer loans

[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

faced by the relatively large banks in BRM's 10 city survey. Concentrations within these markets are described by a Herfindahl-Hirschman index (HHI) based on the deposits of commercial banks' branches located in the CMSA.[6] The deposit data comes from the FDIC's *Summary of Deposits*, which records deposits at the end of June of each year. Annual data on personal income and population for each CMSA was also obtained from the Commerce Department's Bureau of Economic Analysis.

For each of the banks surveyed by BRM, we obtained quarterly FDIC Call Report data on the bank's size, as measured by the natural log of its assets, and the bank's capital ratio, as measured by its ratio of Tier 1 capital to total assets. Our analysis uses these variables to help explain a particular bank's loan pricing behavior.

IV. Market Concentration and Consumer Loan Rates

We begin with a static analysis of the BRM automobile and personal loan rates by examining their relationship to market concentration. Our analysis is similar to that of Berger and Hannan (1989) who regress retail deposit interest rates on measures of market concentration. Since our market concentration variable is observed annually, the dependent variables for our regressions are the annual average of loan rates in each market.[7] Therefore, because our data spans 10 markets (CMSAs) over nine years, this gives us 90 observations for each loan type.

We regress these loan rate averages on independent variables representing market concentration, other types of interest rates, and demographic information about the market. As indicated above, our measure of market concentration is the HHI computed from end-of-June

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personal loans, the corresponding percentages for five, four, and three banks were 46.86, 43.77, and 9.38, respectively.

[6] 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 even at the bank level this data is often not reported by many banks.

[7] Specifically, we calculate the average (personal or automobile) 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 1.

deposit balances of the commercial bank branches in the CMSA. We also include proxies for banks' cost of funds. For new automobile loans, funding costs are measured by the three-year constant maturity Treasury security rate while for personal unsecured loans we use the one-year Treasury bill rate. For the case of new automobile loans, we also include a measure of automobile finance company loan rates: the average automobile loan rate charged by the finance company subsidiaries of the three major U.S. automobile manufactures. Finally, explanatory variables that control for demographic factors include the per capita income and the population of the CMSA.

The regression results are reported in Table 1. The cost of funds measure, as proxied by the Treasury security rate, has the proper sign in both regressions, although it is not significant in the personal loan regression. Banks' interest rates on new car loans also increase significantly with loan rates charged by automobile finance companies. In both regressions, population is positively and significantly correlated with loan rates, while CMSA personal income is negatively and significantly correlated, especially for unsecured personal loans. One explanation for the significance of this latter variable is that higher personal income reflects better credit quality such that consumer loans require a lower premium for default risk.

Most important from our point of view is the link between concentration and consumer loan rates. For both types of consumer loans the relationship is positive, suggesting that greater market concentration leads to higher loan rates. However, the coefficient on HHI is significantly greater than zero only for the case of personal loans. The HHI coefficient for personal loans implies that a 100 point increase in the HHI is associated with a rise in personal loan rates of 18.7 basis points.

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, notably the captive finance companies of automobile 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 give more scope for market power in pricing personal loans. In contrast, for automobile loans, collateral, underwriting standards, and credit scoring make the monitoring and screening functions of banks less important. More significant sources of cost savings may lie in techniques for securitization and scale economies in origination. Hence, concentration may lead to cost reductions, offsetting the effect of increased market power.

V. Bank Mergers and Consumer Loan Rates

This section presents a dynamic analysis of consumer loan pricing, focusing on the relationship between bank mergers and loan rates. The methodology follows that of Prager and Hannan (1998) who find evidence that "significant" bank mergers increase monopoly power in retail deposit markets. An important task in their study and in the present paper is to identify criteria for determining which 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 10 CMSAs, but most mergers are unlikely to influence market loan rates because they involve small banks. Hence, we need to identify only those mergers which 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 or merged with another bank which is then surveyed by BRM.[8] For instance, this includes the case in which BRM surveys

[8] More specifically, significant mergers were identified by first investigating instances when BRM made some change in the banks that it surveyed in a particular CMSA. A search of the FDIC's *Changes to FDIC Financial Institutions and Office Structure – Business Combinations* was then made to verify that a merger involving the particular bank was consummated during this period. As a check for accuracy, we cross-

only one of the merging banks in the CMSA prior to the merger and then replaces it with its merger partner following the merger. It also includes the case in which both merger partners are surveyed by BRM prior to the merger and, subsequently, only one of the merger partners survives in the survey. Basically, the types of merger activity that are excluded from this definition involve a bank in the BRM survey combining with a bank that is not previously or subsequently in the survey or a merger between two non-surveyed banks. The justification for these exclusions is that banks outside of the survey tend to be smaller banks, since BRM attempts to include the largest banks in each CMSA. Thus, mergers and acquisitions involving non-surveyed banks are less likely to have much impact on market loan rates.

Based on this definition, Table 2 gives a complete listing of all BRM banks involved in significant mergers. For example, the first two rows indicate that Bank of New England was surveyed from the beginning of the sample period, August 16, 1989, until July 10, 1991 at which time it was acquired by Fleet National Bank. This is indicated by both of these banks having a matching merger partner symbol of "A." Fleet was then surveyed by BRM from July 17, 1991 until the end of the sample period, August 13, 1997. In the third row of the table, we see that Shawmut Bank was surveyed from the beginning of the sample period until March 27, 1996 at which time it also was acquired by Fleet. This is indicated by both of these banks having the matching merger partner symbol of "B." Hence the first three rows of the table indicate two mergers events: Bank of New England with Fleet in the third quarter of 1991 and Shawmut Bank with Fleet in the first quarter of 1996. In total, the table indicates 17 significant mergers based on our first definition.

The second definition of a significant merger accounts for the possibility that a merger impacts loan rates only in a market where the level of concentration is sufficiently high. This idea is implemented by restricting the mergers identified under the first definition to those in

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referenced this information with the Federal Reserve Bank of Chicago's Bank Merger and Acquisitions file and the Federal Reserve's National Information Center bank structure data base.

which the CMSA's post-merger HHI exceeds 1400.[9] As shown in the fourth column of Table 2, this second definition narrows the set of significant mergers to a total of 10. The third definition imposes yet an additional restriction, namely, that during the year in which the merger occurred, the HHI must increase by at least 100. This condition restricts significant mergers to those within-market mergers that substantially increase concentration. As indicated in the fifth column of Table 2, there are six significant mergers under this last definition.

In summary, our first definition of a significant merger is the broadest, encompassing all BRM mergers in Table 2. The second imposes an intermediate restriction, HHI > 1400, and the third imposes the most stringent restrictions, HHI > 1400 and ΔHHI > 100.

Similar to Prager and Hannan (1998), we estimate a time series – cross section regression consisting of observations for all banks and quarterly time periods covered by the BRM survey. The dependent variable is the natural log of an individual bank's average loan rate for the current quarter divided by its previous quarter's average loan rate.[10] To control for possible bank-specific and market effects, we include proxies for the rate of change in the bank's total assets, Δ*LnAssets*, and for the rate of change in the bank's equity to asset ratio, Δ*LnKratio*, as explanatory variables, where $\Delta LnAssets_t^i \equiv \ln\left(\frac{Assets_t^i}{Assets_{t-1}^i}\right)$, $\Delta LnKratio_t^i \equiv \ln\left(\frac{Kratio_t^i}{Kratio_{t-1}^i}\right)$, and $Assets_t^i$ and $Kratio_t^i$ denote bank *i*'s assets and Tier 1 capital ratio, respectively, at the end of quarter *t*.[11]

[9] U.S. Justice Department guidelines state that a Herfindahl index 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.

[10] A quarterly interval is chosen because bank balance sheet data that is used to construct our control variables is available only at a quarterly frequency. In addition, we examine the log difference in the quarterly averages of loan rates (rather than the log difference in loan rates observed at the first, last, or middle week of the quarter) because the average of loan rates is more representative of a bank's overall loan pricing policy.

[11] Changes in bank size might be associated with lower loan rates, since banks that wish to expand may price loans more aggressively. Changes in bank capital could also influence pricing behavior. Lower capital could lead banks to shrink assets (reducing loans by increasing loan rates) in order to meet capital requirements. Alternatively, lower capital might increase moral hazard, leading banks to increase their loan risk. Higher risk would be reflected in an increase in loan rates.

A sequence of quarterly time-dummy variables is also included to control for time fixed effects. The remaining explanatory variables are the focus of our analysis since they account for loan pricing differences between merging and non-merging banks. They consist of a dummy variable that equals one if the bank merged with another bank during the current quarter (*Merge*), four leading dummy variables that equal one if the quarter was one of the four quarters previous to a quarter when the bank merged (*Lead*4, *Lead*3, *Lead*2, *and Lead*1), and four lagged dummy variables that equal one if the quarter was one of the four quarters following a quarter when the bank merged (*Lag*1, *Lag*2, *Lag*3, *and Lag*4).

In addition to having leading, contemporaneous, and lagging dummy variables that indicate whether a bank participated in a merger in a given quarter, we also create leading (*Elead*), contemporaneous (*Emerge*), and lagging (*Elag*) dummy variables indicating whether a bank was "exposed" to a merger in a given quarter. For example, the exposed dummy variable *Emerge* equals one if a bank is not currently participating in a merger, but is located in a CMSA in which another bank is currently merging. The leading and lagging exposed dummy variables are created in a similar manner to those used for banks participating in mergers.

To summarize, the regression equation is of the form:

$$\ln\left(\frac{r_{l,t}^{i}}{r_{l,t-1}^{i}}\right) = \sum_{t=1}^{T}\alpha_t Q_t + \beta_1 \Delta LnAssets_t^i + \beta_2 \Delta LnKratio_t^i + \sum_{j=1}^{4}\delta_j Lead\,j_t^i + \varphi Merge_t^i + \sum_{j=1}^{4}\gamma_j Lag\,j_t^i + \sum_{j=1}^{4}\kappa_j Elead\,j_t^i + \lambda Emerge_t^i + \sum_{j=1}^{4}\varsigma_j Elag\,j_t^i + \varepsilon_t^i \quad (1)$$

where the superscript "*i*" refers to the i^{th} bank, the subscript "*t*" refers to the t^{th} quarter of the sample period, $r_{l,t}^{i}$ is the average loan rate charged by the i^{th} bank in quarter *t*, and Q_t is a time fixed-effects dummy variable that equals 1 if the current quarter equals date *t*, zero otherwise.

To determine the overall change in bank loan rates associated with a merger, we examine the size and significance of sums of the leading, lagged, and contemporaneous merger quarter

dummy variables. The "pre-merger" effect is calculated as the sum of the coefficients on the four leading quarter dummy variables, $\sum_{j=1}^{4} \delta_j$ for participating banks and $\sum_{j=1}^{4} \kappa_j$ for exposed banks, respectively. Similarly, the "post-merger" effect on pricing is the sum of the four lagged quarter dummy variables' effect on the change in loan rates, $\sum_{j=1}^{4} \gamma_j$ for participating banks and $\sum_{j=1}^{4} \varsigma_j$ for exposed banks, respectively. Lastly, the total effect associated with the merger is the sum of these pre-merger and post-merger dummy variable coefficients along with the merger quarter dummy variable coefficients, φ and λ.

The results of the ordinary least squares regressions using new automobile loan rates and unsecured personal loans are reported in Tables 3, 4, and 5 for the broadest, intermediate, and most stringent merger definitions, respectively. For each of these tables, Panel A reports the regression results. Note that the control variables $\Delta LnAssets$ and $\Delta LnKratio$ are never significantly different from zero, though a number of the dummy variables associated with the participating and exposed banks are significant.[12] Therefore, our discussion focuses on Panels B and C, which summarize the results of these variables which differentiate between merger participants, exposed banks, and other (non-exposed and non-participating) banks. As it turns outs, the qualitative results are similar regardless of which merger definition is employed, though the quantitative effects are greater for the more stringent merger definitions.

Panel B of Tables 3, 4, and 5 indicate that merging banks tend to decrease their new automobile loan rates in the quarter when the merger occurs. This result is particularly evident when the most stringent merger definition is employed: on average, merger participants lower auto loan rates by 6.10 percent during the quarter of the merger and a further 4.28 percent in the following four quarters. Overall, there is a statistically significant decline in automobile loan rates of 13.88 percent around the time of the merger. Interestingly, as shown in Panel C of the

tables, the automobile loan rates charged by exposed banks are not significantly affected by mergers in their CMSAs. Figure 1 confirms these statistical findings.[13] It graphs the spread between the average loan rate of merger participants and the average loan rate of all other banks outside of the merger CMSA for each week during the nine quarters around the time of a merger. It also graphs the spread between the average loan rate of exposed banks and all other banks outside of the merger CMSA. As shown in the bottom graph of Figure 1, the decline in loan rates by merger participants is especially strong under the most stringent merger criterion.

The results are consistent with merging banks finding it profitable to pass along economies of scale, but non-merging banks, which do not benefit from these economies, finding it unprofitable to follow suit. As discussed in Section IV, merging banks may realize economies of scale from originating a large quantity of automobile loans that can then be pooled and securitized. An explanation for why this efficiency could reduce loan rates the most when mergers are defined by the most stringent criterion (within-market mergers in highly concentrated markets) is that, initially, competition is less and profit margins are greater in these automobile loan markets. Therefore, within-market mergers, which should generate the highest efficiency gains in originating loans, make it feasible for banks to reduce loan rates by the greatest degree.

The results are markedly different for unsecured personal loans, where they, in fact, mirror those of Prager and Hannan (1998) for retail bank deposits. As shown in Panel B of Tables 3, 4, and 5, participating banks tend to lower their personal loan rates significantly in the four quarters prior to the merger and then subsequently raise their rates significantly in the four quarters following the merger. The graphs in Figure 2, which show a fall and subsequent rise in participants' personal loan rates, confirm these regression results. The post-merger increase in

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[12] The results are robust to excluding $\Delta LnAssets$ and $\Delta LnKratio$ from the regression. Doing so produces a negligible change in the size and significance of the other coefficient estimates.

[13] When comparing the figure's weekly time series of loan rate spreads to the regression results, recall that the dependent variable in the regression is the log of the bank's *average* loan rate in the quarter minus the log of its *average* loan rate in the previous quarter.

participants' rates is particularly strong under the most stringent merger criterion, where they rise by 10.4 percent.

Consistent with a general decline in competition, the overall increase in personal loan rates charged by merger participants extends to exposed banks as well. Panel C of the tables shows that exposed banks tend to significantly increase their unsecured personal loan rates in the four quarters following the merger. Moreover, the total impact of mergers on exposed banks' personal loan rates is positive and significant: a rise of 5.96 percent, 5.17 percent, and 7.08 percent for the broadest, intermediate, and most stringent merger criteria, respectively. The graphs in Figure 2 illustrate this general upward trend in exposed banks' personal loan rates.

In summary, bank mergers lead to an overall decrease in automobile loan rates for participating banks, especially for within-market mergers in the most concentrated markets. In contrast, mergers appear to increase rates on unsecured personal loans charged by all banks in the merger markets. The former result is consistent with mergers creating economies of scale in the origination of automobile loans while the latter result is evidence of mergers generating increased market power in personal loans.

VI. 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 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 CMSA. 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 "target" bank and the other being the change in the average loan rate charged by the other banks in the same market. The change in the

average loan rate 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. We then perform an F-test of 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 if we can reject this hypothesis at the 95 percent confidence level.

Table 6 summarizes the results of this analysis. Panel A indicates that 16 different banks behaved as leaders in their respective markets for new automobile loans and Panel B shows that three different banks could be considered leaders in their personal loan markets.[14] In addition to reporting the F-test statistic of the hypothesis that the coefficients of the lagged changes in the target bank's loan rate are all zero, Table 6 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 6, the sum of these coefficients are positive for each bank, as one would expect if a leadership relationship exists. In addition, column 3 indicates that, in most cases, the sum of these coefficients is statistically significant.

The greater number of market leaders for automobile loans relative to personal unsecured loans is consistent with there being more intense competition between banks in the automobile 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*

Several studies, including Hannan and Berger (1991), Neumark and Sharpe (1992), Hannan (1994), Jackson (1997), and Rosen (1998), 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

[14] 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.

asymmetric: deposit rates are slower to increase when other market interest rates rise than they are to decrease when market rates fall.[15]

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.[16] 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 automobile and 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

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

banks and their markets. The first variable is the weekly change in the wholesale market rate, $r_t - r_{t-1}$, which for automobile 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 Herfindahl-Hirchman index 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 measure by the natural logarithm 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 7 gives the results of estimating these probit models using weekly changes in automobile loan rates quoted by 80 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 automobile 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 automobile 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 automobile loan rate increases versus decreases. Examining the total derivatives of automobile 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 automobile 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 automobile loan rates in a high or rising market rate environment than to decrease automobile loan rates 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 unsecured personal loan rates.

Table 8 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 78 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 automobile 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 automobile 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 automobile 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 automobile loan results, but unlike the previous results on deposit rates, banks in more concentrated markets appear to engage in this asymmetry less.[17] 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 automobile loans with the important exception that personal loan rates are stickier in more concentrated markets.

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

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. The evidence presented in this paper suggests that mergers lead to efficiency gains in the origination of automobile loans and that these gains are passed on to consumers in the form of lower loan rates. In contrast, banks tend to raise interest rates on unsecured personal loans following a significant merger. Such behavior can be explained as banks exercising greater market power. Hence, 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 analyses performed in this study consistently point to marked differences in the pricing of automobile versus personal loans. The automobile loan market appears more competitive. The lack of a significant relationship between automobile loan rates and local market concentration is evidence that non-bank lenders and/or economies of scale may play an important role in the provision of automobile credit. In addition, because leader-follower pricing behavior is more widespread in automobile lending markets, segmentation across banks appears to be less than in markets for personal loans.

Personal loan rates are stickier than automobile loan rates, and consistent with empirical research on consumer deposits, personal loan rates are more rigid in more concentrated markets. However, both automobile 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.

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Table 1

Determinants of Interest Rates for Automobile Loans and Unsecured Personal Loans

	New Automobile Loans			Unsecured Personal Loans		
Variable	Coefficient	*t*-statistic	*p*-value	Coefficient	*t*-statistic	*p*-value
Constant	0.431	0.563	0.575	10.322	13.601	0.000
Treasury yield	0.758	6.917	0.000	0.112	1.155	0.251
Finance co. yield	0.326	3.865	0.000			
HHI	1.819	1.001	0.320	18.724	6.732	0.000
Personal income	-0.00115	-1.726	0.088	-0.00660	-7.365	0.000
Population	0.0630	2.655	0.009	0.272	8.397	0.000

Note: 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. The R^2's of the new automobile loan regression and unsecured personal loan regression are 0.763 and 0.572, respectively. "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. yield" 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. "HHI" is the Herfindahl-Hirschman index computed from end-of-June FDIC *Summary of Deposits* data of all commercial bank branches within the CMSA. "Personal income" and "Population" are the per capita personal income and population, respectively, for the CMSA, which were obtained from the Commerce Department's Bureau of Economic Analysis.

Table 2

Banks Involved in Mergers

Bank Name	Market	Merger Year:Quarter	Post-Merger HHI Level	ΔHHI in Merger Year	Merger Partners	First BRM Date	Last BRM Date
Bank of New England NA	Boston	1991:III	1,174	+164	A	16/08/89	10/7/91
Fleet NB	Boston	1991:III / 1996:I	1,174 / 1,728	+164 / +307	A /B	17/07/91	13/08/97
Shawmut BK NA	Boston	1996:I	1,728	+307	B	16/08/89	27/03/96
First American BK of VA	D.C.	1993:IV	927	+277	C	16/08/89	17/11/93
First Union NB of MD	D.C.	1993:IV	927	+277	C	24/11/93	13/08/97
American Security BK	D.C.	1994:I	997	+277	D	16/08/89	28/09/94
Nationsbank of MD	D.C.	1994:I / 1994:II	997 / 1,066	+277 / +277	D / E	08/01/92	13/08/97
Maryland NB	D.C.	1994:II	1,066	+277	E	16/08/89	28/09/94
Bank One TX NA	Dallas	1992:IV	1,540	+64	F	16/08/89	13/08/97
Team BK	Dallas	1992:IV	1,540	+64	F	16/08/89	25/11/92
First City TX-Dallas	Dallas	1993:I	1,501	-74	G	16/08/89	10/02/93
Texas Commerce BK NA	Dallas	1993:IV	1,501	-74	G	16/08/89	13/08/97
Comerica BK-Detroit	Detroit	1992:IV	1,855	+481	H	16/08/89	13/08/97
Manufacturers NB Detroit	Detroit	1992:IV	1,855	+481	H	16/08/89	09/09/92
First City TX Houston NA	Houston	1993:I	1,964	-129	I	16/08/89	10/02/93
Texas Commerce BK NA	Houston	1993:IV	1,964	-129	I	16/08/89	13/08/97
First Interstate BK of TX NA	Houston	1996:II	1,021	-51	J	16/08/89	31/07/96
Wells Fargo BK (TX) NA	Houston	1996:II	1,021	-51	J	07/08/96	13/08/97
Security Pacific NB	Los Angeles	1992:II	1,999	+765	K	16/08/89	06/05/92
Bank of America NT&SA	Los Angeles	1992:II	1,999	+765	K	16/08/89	13/08/97
First Interstate BK of CA	Los Angeles	1996:II	1,581	+97	L	16/08/89	31/07/96
Wells Fargo BK NA	Los Angeles	1996:II	1,581	+97	L	16/08/89	13/08/97
Manufacturers Hanover TC	New York	1992:II	1,423	+309	M	16/08/89	05/08/92
Chase Manhattan BK	New York	1992:II / 1996:II	1,423 / 2,143	+309 / +718	M /N	16/08/89	13/08/97
Chemical BK	New York	1996:II	2,143	+718	N	16/08/89	28/08/96
Corestates BK NA	Philadelphia	1990:IV	1,099	-53	O	10/10/90	13/08/97
Philadelphia NB	Philadelphia	1990:IV	1,099	-53	O	16/08/89	03/10/90
First Fidelity BK NA	Philadelphia	1996:I	1,749	+567	P	16/08/89	07/2/96
First Union NB	Philadelphia	1996:I	1,749	+567	P	14/02/96	13/08/97
Continental BK	Philadelphia	1994:III	1,106	+154	Q	10/10/90	14/09/94
PNC NB of NJ	Philadelphia	1994:III	1,106	+154	Q	17/02/93	13/08/97

Table 3

Panel A Regression Results for CMSAs Exposed to Mergers: All BRM Mergers

The dependent variable is the natural log of the current quarter's average loan rate divided by the previous quarter's average loan rate charged by an individual bank. ΔLnAssets is the natural log of the ratio of the current quarter's bank's total assets to those of the previous quarter, while ΔLnKratio is the natural logarthm of the ratio of the current quarter's level of bank's equity capital to assets ratio to that of the previous quarter. For banks participating in mergers, Merge = 1 for the quarter when the merger occurs, Lead*i* =1 for the i^{th} quarter prior to the merger, and Lag*i* =1 for the i^{th} quarter following the merger. For non-participating banks located in markets that are exposed to mergers, Emerge = 1 for the quarter when the merger occurs, Elead*i* =1 for the i^{th} quarter prior to the merger, and Elag*i* =1 for the i^{th} quarter following the merger. For all banks, quarterly dummy variables are included in the regression (results not reported) to remove fixed effects.

	New Automobile Loans			Unsecured Personal Loans		
Variable	Coefficient	*t*-statistic	*p*-value	Coefficient	*t*-statistic	*p*-value
ΔLnAssets	-0.0047	-1.110	0.267	0.0010	0.219	0.827
ΔLnKratio	-0.0144	-1.178	0.239	0.0051	0.384	0.701
Lead4	-0.0041	-0.536	0.592	-0.0101	-1.241	0.215
Lead3	-0.0081	-0.854	0.393	-0.0025	-0.250	0.802
Lead2	0.0063	0.592	0.554	-0.0077	-0.689	0.491
Lead1	-0.0104	-0.947	0.344	-0.0377	-3.272	0.001
Merge	-0.0350	-3.131	0.002	-0.0061	-0.524	0.600
Lag1	-0.0047	-0.418	0.676	-0.0098	-0.839	0.401
Lag2	0.0231	1.909	0.057	0.0239	1.893	0.059
Lag3	0.0031	0.243	0.808	-0.0103	-0.771	0.441
Lag4	0.0075	0.674	0.500	0.0284	2.341	0.019
Elead4	0.0067	1.173	0.241	0.0045	0.709	0.478
Elead3	-0.0151	-2.641	0.008	-0.0092	-1.485	0.138
Elead2	0.0019	0.329	0.742	0.0023	0.361	0.718
Elead1	0.0083	1.448	0.148	0.0085	1.371	0.171
Emerge	0.0037	0.652	0.514	0.0101	1.648	0.100
Elag1	0.0105	1.866	0.062	-0.0022	-0.359	0.720
Elag2	0.0048	0.791	0.429	0.0275	4.150	0.000
Elag3	0.0075	1.167	0.244	0.0120	1.735	0.083
Elag4	-0.0088	-1.450	0.147	0.0061	0.932	0.351

Panel B Impact of Mergers on Participating Banks' Loan Rates: All BRM Mergers

Pre-merger is the four quarters immediately preceding the merger quarter. Post merger is the four quarters immediately following the merger quarter. Total is the combined effect on loans over the pre-merger, merger, and post-merger quarters.

	New Automobile Loans			Unsecured Personal Loans		
Effect	Coefficient	*t*-statistic	*p*-value	Coefficient	*t*-stat	*p*-value
pre merger	-0.0163	-0.863	0.388	-0.0580	-2.918	0.004
merger	-0.0350	-3.131	0.002	-0.0061	-0.524	0.600
post merger	0.0290	1.314	0.189	0.0322	1.379	0.168
total	-0.0223	-0.713	0.476	-0.0320	-0.967	0.334

Panel C Impact of Mergers on Exposed Banks' Loan Rates: All BRM Mergers

Pre-merger is the four quarters immediately preceding the merger quarter. Post merger is the four quarters immediately following the merger quarter. Total is the combined effect on loans over the pre-merger, merger, and post-merger quarters.

	New Automobile Loans			Unsecured Personal Loans		
Effect	Coefficient	*t*-statistic	*p*-value	Coefficient	*t*-statistic	*p*-value
pre merger	0.0018	0.168	0.866	0.0061	0.520	0.603
merger	0.0037	0.652	0.514	0.0101	1.648	0.100
post merger	0.0141	1.259	0.208	0.0435	3.635	0.000
total	0.0196	1.176	0.240	0.0596	3.343	0.001

Table 4

Panel A Regression Results for CMSAs Exposed to Mergers: HHI >1400

The dependent variable is the natural log of the current quarter's average loan rate divided by the previous quarter's average loan rate charged by an individual bank. ΔLnAssets is the natural log of the ratio of the current quarter's bank's total assets to those of the previous quarter, while ΔLnKratio is the natural logarthm of the ratio of the current quarter's level of bank's equity capital to assets ratio to that of the previous quarter. For banks participating in mergers, Merge = 1 for the quarter when the merger occurs, Lead*i* =1 for the i^{th} quarter prior to the merger, and Lag*i* =1 for the i^{th} quarter following the merger. For non-participating banks located in markets that are exposed to mergers, Emerge = 1 for the quarter when the merger occurs, Elead*i* =1 for the i^{th} quarter prior to the merger, and Elag*i* =1 for the i^{th} quarter following the merger. For all banks, quarterly dummy variables are included in the regression (results not reported) to remove fixed effects.

	New Automobile Loans			Unsecured Personal Loans		
Variable	Coefficient	*t*-statistic	*p*-value	Coefficient	*t*-statistic	*p*-value
ΔLnAssets	-0.0062	-1.453	0.146	0.0015	0.334	0.739
ΔLnKratio	-0.0179	-1.491	0.136	0.0061	0.464	0.643
Lead4	-0.0056	-0.573	0.567	-0.0100	-0.947	0.344
Lead3	-0.0007	-0.057	0.955	-0.0131	-1.062	0.288
Lead2	0.0135	0.999	0.318	-0.0272	-1.906	0.057
Lead1	-0.0242	-1.786	0.074	-0.0346	-2.423	0.016
Merge	-0.0360	-2.638	0.008	-0.0130	-0.902	0.367
Lag1	0.0055	0.404	0.686	-0.0041	-0.285	0.775
Lag2	0.0104	0.665	0.506	0.0166	1.010	0.313
Lag3	-0.0105	-0.616	0.538	-0.0097	-0.537	0.591
Lag4	-0.0085	-0.499	0.618	0.0681	3.370	0.001
Elead4	0.0021	0.273	0.785	0.0206	2.308	0.021
Elead3	-0.0110	-1.400	0.162	-0.0077	-0.880	0.379
Elead2	0.0040	0.502	0.616	0.0008	0.090	0.928
Elead1	0.0141	1.726	0.085	0.0046	0.495	0.620
Emerge	0.0048	0.599	0.549	-0.0003	-0.036	0.971
Elag1	0.0140	1.785	0.075	0.0114	1.299	0.194
Elag2	0.0092	1.074	0.283	0.0124	1.273	0.203
Elag3	0.0066	0.700	0.484	0.0091	0.862	0.389
Elag4	-0.0251	-2.790	0.005	0.0009	0.086	0.931

Panel B Impact of Mergers on Participating Banks' Loan Rates: HHI >1400

Pre-merger is the four quarters immediately preceding the merger quarter. Post merger is the four quarters immediately following the merger quarter. Total is the combined effect on loans over the pre-merger, merger, and post-merger quarters.

	New Automobile Loans			Unsecured Personal Loans		
Effect	Coefficient	*t*-statistic	*p*-value	Coefficient	*t*-statistic	*p*-value
pre merger	-0.0169	-0.683	0.494	-0.0849	-3.234	0.001
merger	-0.0360	-2.638	0.008	-0.0130	-0.902	0.367
post merger	-0.0032	-0.101	0.919	0.0709	2.031	0.043
total	-0.0561	-1.304	0.193	-0.0270	-0.581	0.561

Panel C Impact of Mergers on Exposed Banks' Loan Rates: HHI > 1400

Pre-merger is the four quarters immediately preceding the merger quarter. Post merger is the four quarters immediately following the merger quarter. Total is the combined effect on loans over the pre-merger, merger, and post-merger quarters.

	New Automobile Loans			Unsecured Personal Loans		
Effect	Coefficient	*t*-statistic	*p*-value	Coefficient	*t*-statistic	*p*-value
pre merger	0.0092	0.604	0.546	0.0183	1.072	0.28439
merger	0.0048	0.599	0.549	-0.0003	-0.036	0.971
post merger	0.0047	0.297	0.767	0.0337	1.940	0.053
total	0.0187	0.843	0.400	0.0517	2.127	0.034

Table 5

Panel A Regression Results for CMSAs Exposed to Mergers: HHI > 1400, ΔHHI > 100

The dependent variable is the natural log of the current quarter's average loan rate divided by the previous quarter's average loan rate charged by an individual bank. ΔLnAssets is the natural log of the ratio of the current quarter's bank's total assets to those of the previous quarter, while ΔLnKratio is the natural logarthm of the ratio of the current quarter's level of bank's equity capital to assets ratio to that of the previous quarter. For banks participating in mergers, Merge = 1 for the quarter when the merger occurs, Lead*i* =1 for the i^{th} quarter prior to the merger, and Lag*i* =1 for the i^{th} quarter following the merger. For non-participating banks located in markets that are exposed to mergers, Emerge = 1 for the quarter when the merger occurs, Elead*i* =1 for the i^{th} quarter prior to the merger, and Elag*i* =1 for the i^{th} quarter following the merger. For all banks, quarterly dummy variables are included in the regression (results not reported) to remove fixed effects.

	New Automobile Loans			Unsecured Personal Loans		
Variable	Coefficient	*t*-statistic	*p*-value	Coefficient	*t*-statistic	*p*-value
ΔLnAssets	-0.0061	-1.420	0.156	0.0010	0.211	0.833
ΔLnKratio	-0.0189	-1.571	0.117	0.0058	0.442	0.659
Lead4	-0.0113	-0.924	0.356	-0.0260	-1.917	0.056
Lead3	-0.0062	-0.428	0.669	-0.0166	-1.088	0.277
Lead2	-0.0092	-0.544	0.587	-0.0158	-0.887	0.375
Lead1	-0.0082	-0.485	0.628	-0.0320	-1.788	0.074
Merge	-0.0610	-3.601	0.000	-0.0460	-2.570	0.010
Lag1	-0.0011	-0.066	0.947	0.0143	0.798	0.425
Lag2	-0.0065	-0.341	0.733	0.0106	0.529	0.597
Lag3	-0.0201	-0.918	0.359	0.0158	0.684	0.494
Lag4	-0.0151	-0.688	0.491	0.0633	2.221	0.027
Elead4	-0.0031	-0.313	0.755	0.0220	1.986	0.047
Elead3	-0.0022	-0.220	0.826	0.0060	0.541	0.589
Elead2	0.0048	0.500	0.617	0.0129	1.165	0.244
Elead1	0.0037	0.365	0.715	0.0075	0.634	0.526
Emerge	0.0082	0.828	0.408	-0.0011	-0.103	0.918
Elag1	0.0084	0.850	0.396	0.0086	0.751	0.453
Elag2	-0.0092	-0.835	0.404	0.0001	0.004	0.997
Elag3	0.0005	0.035	0.972	0.0116	0.741	0.459
Elag4	-0.0374	-2.816	0.005	0.0034	0.215	0.830

Panel B Impact of Mergers on Participating Banks' Loan Rates: HHI > 1400, ΔHHI > 100
Pre-merger is the four quarters immediately preceding the merger quarter. Post merger is the four quarters immediately following the merger quarter. Total is the combined effect on loans over the pre-merger, merger, and post-merger quarters.

	New Automobile Loans			Unsecured Personal Loans		
Effect	Coefficient	*t*-statistic	*p*-value	Coefficient	*t*-statistic	*p*-value
pre merger	-0.0349	-1.130	0.259	-0.0904	-2.747	0.006
merger	-0.0610	-3.601	0.000	-0.0460	-2.570	0.010
post merger	-0.0428	-1.055	0.292	0.1041	2.258	0.024
total	-0.1388	-2.562	0.011	-0.0323	-0.539	0.590

Panel C Impact of Mergers on Exposed Banks' Loan Rates: HHI > 1400, ΔHHI > 100
Pre-merger is the four quarters immediately preceding the merger quarter. Post merger is the four quarters immediately following the merger quarter. Total is the combined effect on loans over the pre-merger, merger, and post-merger quarters.

	New Automobile Loans			Unsecured Personal Loans		
Effect	Coefficient	*t*-statistic	*p*-value	Coefficient	*t*-statistic	*p*-value
pre merger	0.0033	0.160	0.873	0.0484	2.083	0.038
merger	0.0082	0.828	0.408	-0.0011	-0.103	0.918
post merger	-0.0377	-1.533	0.126	0.0236	0.819	0.413
total	-0.0262	-0.771	0.441	0.0708	1.806	0.071

Table 6

Evidence of Market Leadership

Panel A: New Automobile Loans

Bank	Market (CMSA)	F Test of Predictability	Sum of Lagged Coefficients	*t*-statistic of Sum of Lagged Coefficients
Security Bank & Trust	Washington, D.C.	10.343	1.269	4.154
Northern Trust Bank	Chicago	5.685	0.680	5.029
New First City	Houston	3.819	0.401	1.874
Riggs National Bank	Washington, D.C.	2.998	0.479	4.017
New First City	Dallas	2.901	0.600	3.234
First National Bank of Chicago	Chicago	2.874	0.376	4.077
Texas Commerce Bank	Dallas	2.662	0.575	3.481
BayBank	Boston	2.409	0.335	2.715
Continental Bank	Philadelphia	2.353	0.418	2.032
Midlantic Bank	Philadelphia	2.212	0.786	1.831
First Union	Washington, D.C.	2.191	0.093	0.777
Bank of New York	New York	2.180	0.240	1.809
BankBoston	Boston	2.167	0.158	2.037
Bank of New England	Boston	2.102	0.325	1.143
Crestar Bank	Washington, D.C.	2.026	0.229	1.335
First of America Bank MI	Washington, D.C.	1.997	0.209	1.852

Panel B: Unsecured Personal Loans

Bank	Market (CMSA)	F Statistic for Test of Predictability	Sum of Lagged Coefficients	*t* Statistic for Non-zero Sum Coefficients
First National Bank of Chicago	Chicago	2.332	0.282	2.508
Harris Trust & Savings	Chicago	2.255	0.235	2.625
Texas Commerce Bank	Dallas	1.980	0.168	0.955

Note: 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 (CMSA). 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 7

Changes in New Automobile Loan Rates

(*t*-statistics in parentheses)

Independent Variables	Symmetric Changes	Increase	Decrease	Symmetric Changes	Increase	Decrease
$r_t - r_{t-1}$	-0.4623 (-1.749)	0.1514 (0.361)	-0.5202 (-1.484)	-3.5462 (-2.740)	-5.1738 (-2.562)	-1.0755 (-0.602)
$r_t - r_{l,t-1}$	0.1571 (13.029)	0.4373 (24.409)	0.0168 (1.064)	0.7172 (14.979)	1.1134 (14.059)	0.4250 (7.013)
$(r_t - r_{t-1})$HHI	4.8823 (3.047)	1.5911 (0.627)	3.0418 (1.349)	4.0992 (2.481)	0.4940 (0.190)	2.9052 (1.230)
$(r_t - r_{l,t-1})$HHI	0.1880 (3.447)	-0.8177 (-8.998)	0.7458 (10.575)	0.3651 (6.544)	-0.6621 (-7.217)	0.8721 (11.838)
$(r_t - r_{t-1})$LnAssets				0.1862 (2.369)	0.3229 (2.720)	0.0306 (0.277)
$(r_t - r_{l,t-1})$LnAssets				-0.0320 (-11.993)	-0.0397 (-9.112)	-0.0230 (-6.806)
Total Derivatives at Sample Averages:						
$r_t - r_{t-1}$	0.2264	0.3758	-0.0911	0.1299	0.2681	-0.1566
$r_t - r_{l,t-1}$	0.1836	0.3220	0.1220	0.2363	0.3595	0.1654
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

Note: The table gives estimates for probit models of changes in loan rates quoted weekly by 80 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. 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 8

Changes in Unsecured Personal Loan Rates

(*t*-statistics in parentheses)

Independent Variables	Symmetric Changes	Increase	Decrease	Symmetric Changes	Increase	Decrease
$r_t - r_{t-1}$	1.0131	1.5474	0.8560	-4.7355	-6.1253	-4.0621
	(2.748)	(3.005)	(1.735)	(3.271)	(-3.723)	(-1.421)
$r_t - r_{l,t-1}$	0.0677	0.1009	0.0347	0.1465	0.3175	-0.0078
	(8.098)	(8.350)	(3.026)	(5.630)	(8.735)	(-0.218)
$(r_t - r_{t-1})$HHI	-3.5705	-5.5374	-3.3424	-4.7417	-8.0799	-4.2400
	(-1.404)	(-1.578)	(0.937)	(1.738)	(-2.166)	(-1.073)
$(r_t - r_{l,t-1})$HHI	-0.0682	-0.1603	0.0097	-0.0527	-0.1212	-0.0010
	(-2.573)	(-4.060)	(0.273)	(1.894)	(-2.870)	(-0.026)
$(r_t - r_{t-1})$LnAssets				0.3515	0.4834	0.2938
				(3.834)	(4.576)	(1.690)
$(r_t - r_{l,t-1})$LnAssets				-0.0045	-0.0122	0.0024
				(3.213)	(-6.183)	(1.236)
Total Derivatives at Sample Averages:						
$r_t - r_{t-1}$	0.5105	0.7679	0.3855	0.4512	0.7882	0.2342
$r_t - r_{l,t-1}$	0.0581	0.0783	0.0361	0.0641	0.0973	0.0320
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

Note: The table gives estimates for probit models of changes in loan rates quoted weekly by 78 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. 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

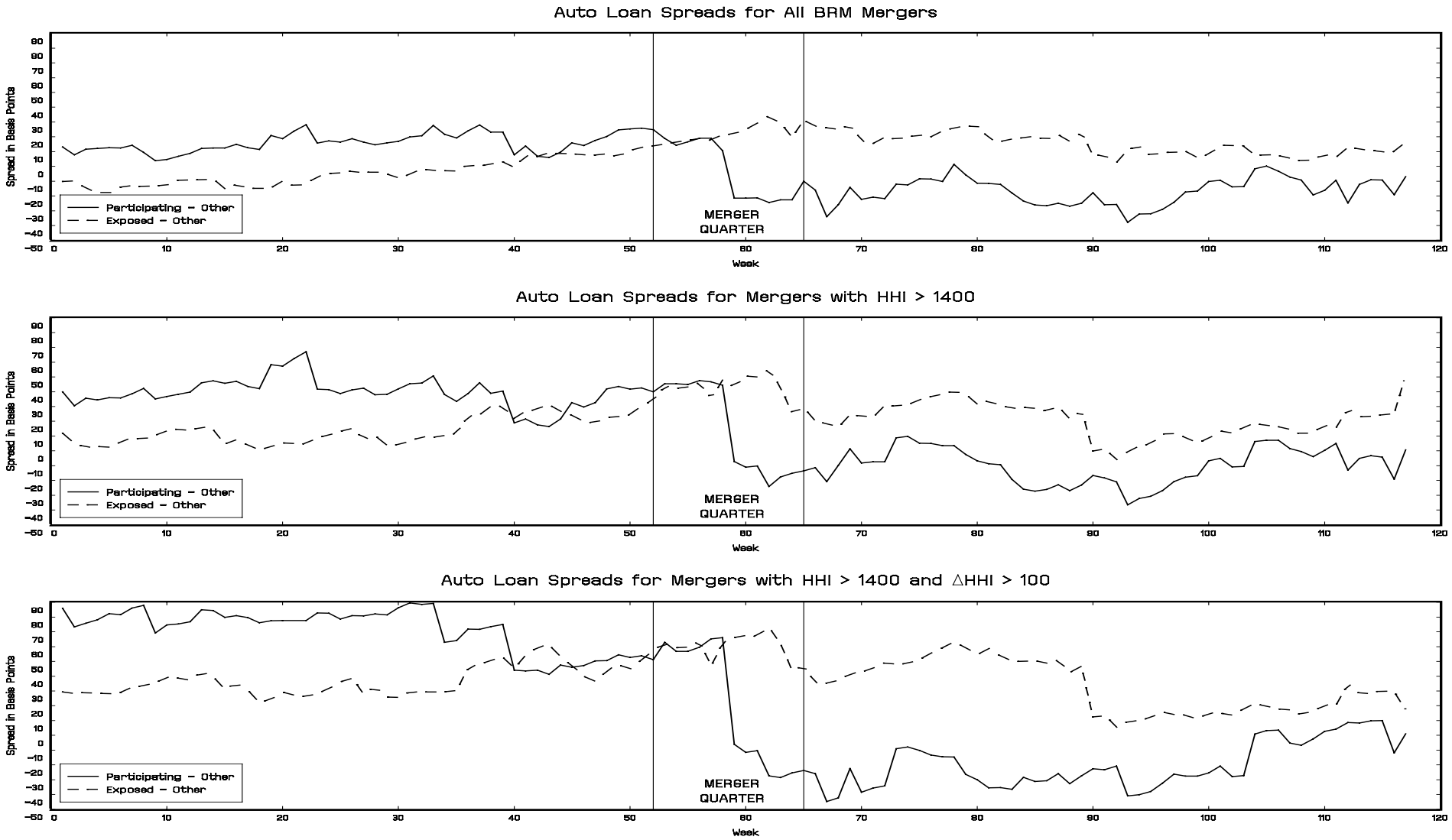
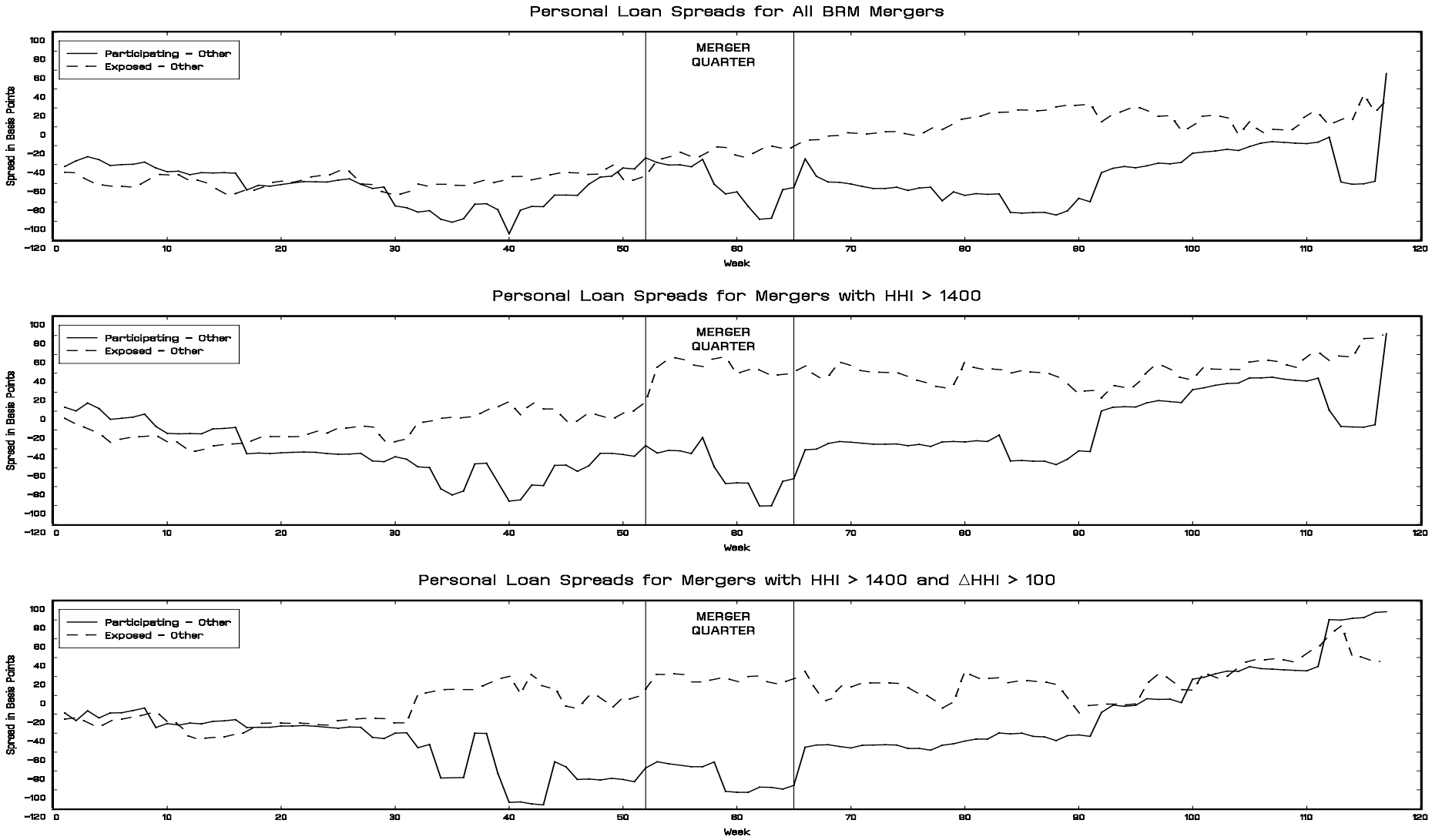

Auto Loan Spreads for All BRM Mergers
Spread in Basis Points
Week
Participating - Other
Exposed - Other
MERGER
QUARTER
Auto Loan Spreads for Mergers with HHI > 1400
Spread in Basis Points
Week
Participating - Other
Exposed - Other
MERGER
QUARTER
Auto Loan Spreads for Mergers with HHI > 1400 and △HHI > 100
Spread in Basis Points
Week
Participating - Other
Exposed - Other
MERGER
QUARTER

Figure 2


Personal Loan Spreads for All BRM Mergers
Participating − Other
Exposed − Other
MERGER
QUARTER
Spread in Basis Points
Week
Personal Loan Spreads for Mergers with HHI > 1400
Participating − Other
Exposed − Other
MERGER
QUARTER
Spread in Basis Points
Week
Personal Loan Spreads for Mergers with HHI > 1400 and ΔHHI > 100
Participating − Other
Exposed − Other
MERGER
QUARTER
Spread in Basis Points
Week