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Abstract: This paper addresses the impact market conditions on bank deposit interest rates. Examining data for 1988-2000, we find that rates are affected by market size structure (defined as the distribution of market shares of banks of different sizes whether or not the market share is achieved entirely in that local market). This is in addition to the effects of market concentration noted in earlier work. We also find large differences between urban and rural markets. In rural areas, changes in market concentration have no effect on deposit rates. These findings have implications for antitrust policy in banking.

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Banking Market Conditions And Deposit Interest Rates

I. Introduction

This paper addresses the relationship between conditions in local banking markets and the interest rates offered by banks on deposit products. This is a timely question because banking has been in a period of rapid change in recent years. From 1988 to 2000, there were a record number of bank mergers. In large part because of the merger activity, the average size of a bank tripled during that period. At the same time as banks were getting larger, local banking market concentration stayed roughly constant.[1] This suggests that a main effect of the merger wave on local markets was to replace small banks with large banks. We explore how the growing presence of large banks affects deposit rates and competitive conditions within markets.

Most depositors look for a bank in their local market (Amel and Starr-McCluer, 2002). Thus, the distribution of banks in a local market may affect deposit pricing. We examine two aspects of the structure of a local banking market: market concentration and the size distribution of banks in the market. Traditional models of market conditions – including those used for antitrust analysis – focus on local market concentration. Thus, such models would predict little change in deposit rates from a rapid increase in bank size that left local market concentration little changed. However, the changes in bank size might impact deposit rates if large regional or nationwide organizations compete in different ways than small, local institutions, even when the large and small organizations have similar local market shares. To test this, we examine whether deposit interest rates are affected by the *market size structure* of a local market, defined as the distribution of market shares of banks of different sizes whether or not the market share is achieved entirely in that local market (Berger, et. al., 2003).

In this paper, we look at interest rate setting at banks in the United States over the period 1988-2000 using two deposit instruments, interest-bearing checking (NOW) accounts and money market deposit accounts (MMDAs). These two instruments reflect different depositor bases. NOWs are among the most widely held deposit products but individual accounts can be small. MMDAs, on the other hand, are less widely held, but individual accounts can be large and

[1] After dropping markets with fewer than five banks, the average Herfindahl was 0.223 in 1988 and 0.226 in 2000.

potentially very profitable for banks.[2] Moreover, many MMDA holders also have other products at a bank, while this is true less often for checking accounts (Amel and Starr-McCluer, 2002). Thus, by examining both NOWs and MMDAs we can see whether interest rates are set based on similar factors for two different types of instrument.

Our goal is to determine how deposit interest rates offered by a bank are affected by changes in the structure of a local market and bank-specific factors including its size. This offers a potential contribution both to our understanding of how prices are set and to antitrust regulation of banks. Antitrust regulators are concerned with how changes in market conditions affect depositors. Traditionally, antitrust analysis focuses on the effect on deposit rates of market concentration, as measured by the Herfindahl index. As an application, bank mergers are subject to different levels of scrutiny depending on the pre-merger Herfindahl in each local market the banks operate in and how much the merger would affect each Herfindahl. The results in this paper suggest that the focus of antitrust analysis be broadened since some markets react to changes differently than others.

When looking at all banks, we find that more concentrated markets are associated with lower deposit interest rates. This is consistent with earlier literature (see, e.g., Berger and Hannan, 1989). However, it turns out that this result is due to competition in urban markets only. When we divide markets into urban and rural ones, we find that there is no significant relationship between market concentration and deposit rates in rural markets.

We also find that bank size matters. In both urban and rural markets, growing banks tend to offer higher interest rates on deposits.[3] Moreover, having more large banks in a market generally increases rates *at all banks*. This is evidence that, contrary to conventional wisdom, having more large banks in a market can be good for depositors. It also implies that simple measures of market concentration may not be sufficient to predict how changes in markets, such as those that result from mergers, will affect deposit rates.

As the market share of large banks increases, deposit rates become more sensitive to changes in market concentration. All else equal, an increase in market concentration reduces deposit rates

[2] According to the 1998 Survey of Consumer Finances, 72.9 percent of depositors have a checking account at their primary financial institution while only 51.7 percent have a money market account there (Amel and Starr-McCluer, 2002).

[3] While growing banks offer higher rates, we show that large banks might offer lower rates than small banks.

more in a market when it has a bigger proportion of large banks. This may be relevant when considering the antitrust implications of bank consolidation.

The remainder of the paper is as follows. The next section briefly reviews the literature. Section III describes the data and sets out the hypotheses. The empirical results are presented in Section IV. Section V presents a series of robustness tests. Finally, the last section offers some concluding comments.

II. Literature

The traditional approach to examining the impact of market structure on deposit interest rates is to focus on market concentration (see Gilbert and Zaretsky, 2003, for a more extensive survey of the literature). The structure-conduct-performance paradigm that lies at the root of antitrust analysis implies that as competition diminishes, prices increase (Tirole, 1988). A number of papers have tested the paradigm using data on bank deposits and loans. Previous work in this area typically finds that banks in more concentrated markets offer lower interest rates on deposits (e.g., Berger and Hannan, 1989) and higher interest rates on loans (e.g., Hannan, 1991). This is true even when market concentration is changing because of mergers (Prager and Hannan, 1998).

More recent studies focus on two related complicating factors. First, many banks operate in more than one local market. Radecki (1998) points out that many of these so-called multimarket banks set a single interest rate in all markets. Thus, interest rates for these banks may be related to conditions in a particular local market, but they are unlikely to be tied to conditions as closely as for banks operating only in that market.

Hannan and Prager (2003) and Park and Pennacchi (2003) address a second question about banks operating in more than one market. They explore whether multimarket banks have an external effect, that is, whether multimarket banks affect pricing at other banks in the markets where they operate. These studies model and find that interest rates at other banks tend to be inversely related to the local market share of multimarket banks. They offer several possible explanations for this finding having to do with funding advantages and with organization and efficiency issues. Several of these explanations, such as funding advantages and diseconomies of scale or scope, are not specific to banks operating in many markets. Funding advantages have to do with access to wholesale markets, which is in turn, partially a function of bank size.

Economies of scale and scope are a function of the size and product mix of a bank, not the number of markets it operates in. They could exist at any large bank. In this paper, we attempt to isolate the impact of banks that operate in multiple markets after controlling for the effects of bank size.

There is evidence of an external effect from large bank presence. Berger, et. al. (2003) show that market size structure matters in small business loan pricing. In markets with a bigger share of large banks, small business loan rates are lower, all else equal. Since multimarket banks are generally larger than single-market banks, it is possible that the results in Hannan and Prager reflect the presence of large banks or that those in Berger, et. al., come from the presence of multimarket banks. One contribution of this paper is that we control for both the local market shares of large banks and of multimarket banks. Thus, we can distinguish between the two external effects.

Another contribution of this paper is that we explicitly examine changes in banks over time by using a panel data set rather than taking the approach of most previous studies that use cross sectional analysis to infer changes over time. As we describe below, we think that this methodology is better suited to address important questions having to do with bank consolidation.

III. Data and methodology

We want to examine the relationship between bank deposit interest rates and competitive conditions in a banking market. To test this relationship, we need to define what a banking market is and develop measures of competitive conditions. This section defines the scope of our analysis and explains the sample we use.

Regulatory authorities typically assume that banks compete for deposits primarily in their local market (Amel and Starr-McCluer, 2002). The local market is defined as a Metropolitan Statistical Area (MSA) or, for banks not in an MSA, a county. Consistent with previous literature, we adopt this definition of markets for our analysis (see, e.g., Berger and Hannan, 1989, and Hannan and Prager, 2003).[4]

[4] Radecki (1998) and Biehl (2002) argue that banks set the same interest rate in many local markets within the same state. Thus, it may be more appropriate to use larger geographic areas to define markets. To the extent that this is true, it should add noise to our results.

When evaluating market structure, regulators typically look at measures of local market concentration including the Herfindahl index, which is defined as the sum of the squared market shares of all banks in a local market. We use the Herfindahl as our measure of market concentration. To focus on markets with some competition, we drop any market where there are fewer than five banks or where the Herfindahl index is greater than 0.50, indicating a dominant bank in the market.

One objective of this paper is to see whether banking market size structure (henceforth, size structure) should be examined in addition to the Herfindahl index. Size structure is meant to capture the idea that large banks may compete in different ways than smaller banks. The size structure of a banking market is measured using the relative proportions of banks of different asset sizes (see Berger, et. al., 2003). To define size structure, we divide banks into two size classes: small banks (less than $1 billion in assets) and large banks (greater than $1 billion in assets).[5] We discuss the robustness of this division later. We use the size classes to define our size structure variable: SIZE STRUCTURE is the proportion of deposits in a local market held by large banks (where we include assets held outside the local market to classify banks).

Banks may compete for deposits locally, but they can operate in multiple markets. There is a potential issue with this since the interest rate data is only provided at the aggregate bank level. This means that we do not know the interest rate in every market a bank operates in. However, to the extent that banks operate in multiple markets, they generally have the vast majority of their deposits in their home market (the market where the bank has the greatest amount of deposits). Over 80 percent of banks have at least 90 percent of their deposits in their home market and fewer than five percent have more than half of all deposits outside their home market. For these reasons, we focus on a bank's home market and assume that the average interest rate for the bank is the interest rate offered in the home market (there is evidence that a bank charges the same interest rate in each of its markets, see Radecki, 1998). We eliminate from our sample all multimarket banks, that is, those with significant activity outside their home market (defined as over 25 percent of deposits outside the home market). Although we drop multimarket banks and all bank activity outside home markets from the sample, we include all deposits when calculating the market concentration and size structure variables.

[5] All data are 2000 dollars.

The data we use comes from the Reports of Condition and Income (the Call Reports) from 1988 - 2000. One advantage of using an extended time period like this is that it helps control for the facts that interest rates move cyclically and that the spread between bank interest rates and market interest rates can vary over time (Rosen, 2002). We match the Call Report data with information on market structure from the Federal Deposit Insurance Corporation's Summary of Deposits. Our sample includes 89,166 observations from 13,317 banks in 1,664 different markets. Table 1 gives descriptive statics for the sample. The mean HERFINDAHL in the sample is 0.184 and the mean SIZE STRUCTURE is 0.350.[6]

We look at on two deposit products: interest-paying transaction (NOW) accounts and money market deposit accounts (MMDAs). Banks are required to report quarterly average balances and interest payments on these two deposit products. We use these data to calculate an annual interest rate, computed as the average of the quarterly interest payments divided by the quarterly balances. To match the deposit data, which is as of the end of June, we compute the interest rates for the period July through June (all other annual variables are constructed similarly). As shown in Table 1, the average NOW rate in the sample is 3.340% and the average MMDA rate is 4.139%. The interest rate on a deposit account alone does not indicate the profit a bank earns, since the return on investing the deposits varies over time with the interest rate cycle. To illustrate the profit on these deposit products, we use the spread of the deposit interest rate over a short-term market interest rate, in this case, the three-month Treasury bill rate.[7] As shown in Table 1, the spreads are generally negative, as one would expect, indicating that banks generally pay less than the Treasury rate on NOW accounts and MMDAs.

One reason that regulators analyze market conditions is to predict how changes in a particular market affect prices (e.g., interest rates) in that market. This is often done by looking across markets with different structures at a given point in time. This is the approach taken by previous studies, which either analyzed data from different years in separate regressions (e.g., Hannan and Prager, 2003) or use pooled data (e.g., Biehl, 2002). Since our sample is a panel, we have the

[6] This does not indicate that large banks control 35 percent of all deposits in the banking system. Since there are a large number of small banks in our sample and these banks tend to be in markets with other small banks, the sample mean overstates the market share of small banks. During the sample period, large banks had 67 percent of deposits, while small banks had 33 percent.

[7] Because we include year dummies, the results on the variables of interest would be identical if we used the spread rather than the deposit rate for the main regressions.

ability to look at how markets evolve over time.[8] We do this by using fixed effect regressions. The coefficients in the regressions reflect the effect on banks of the changes in the independent variables over time. In Section V, we compare the fixed effects results to those obtained from cross sectional regressions.

Our baseline empirical model is:

$$\text{DEPOSIT INTEREST RATE}_{i,m,t} = f(\text{HERFINDAHL}_{m,t}, \text{SIZE STRUCTURE}_{m,t},$$
$$\text{market structure controls}_{m,t}, \text{bank-specific controls}_{i,m,t}, \text{market condition controls}_{m,t}) \quad (1)$$

for bank i in market m during year t.

We use two controls for market structure beyond the Herfindahl and size structure. Hannan and Prager (2003) argue that multimarket banks may compete differently than single-market banks, possibly because these banks set a single interest rate for each deposit product across all markets (Radecki, 1998). If this is true then, it is possible that size structure is capturing the effects of multimarket banks since 46 percent of large banks are multimarket banks compared to 13 percent for small banks. To test whether the size structure of a market has an effect independent of whether large banks operate in many markets, we define MULTIMARKET SHARE as the share of deposits in a local market at banks that have at least 25 percent of their deposits outside their home market (whether or not the local market is the bank's home market). Banks with a major presence in outside their home market are less likely to base interest rate decisions solely on conditions in their local market. The results are not sensitive to the exact cutoff for a multimarket bank.

Our second control for market structure is the size of the local market. Market size, measured by the log of total deposits in the market (LOG MKT SIZE), has been found to be associated with lower interest rates in previous studies (e.g., Hannan and Prager, 2003). We examine whether this holds when we examine markets across time rather than just looking across markets at a point in time as in earlier studies.

A number of bank-specific factors may also affect deposit rates. First, we include a bank's share of the local market (LOCAL SHARE) as a control. This is in part a measure of the bank's local market power. Dick (2001) notes that many banking markets are characterized by a small

[8] One other paper that uses a panel data approach is Corvoisier and Gropp (2002), which examines bank interest rates in Europe.

number of dominant (price-setting) banks and a competitive fringe. This would imply a negative coefficient on LOCAL SHARE, since banks with market power could offer lower deposit rates. Alternatively, a bank could achieve a larger local share because it offers higher deposit rates. This could be a strategic objective or it could reflect a more efficient bank. Either way, there would be a positive correlation between LOCAL SHARE and deposit rates.

Bank size may be correlated with deposit rates since larger banks may have access to more non-deposit sources of liabilities and may have different strategic incentives than small banks. Size has been found to influence deposit interest rates in previous studies. We control for bank size by including the log of total assets (LOG ASSETS).

The next set of bank-specific factors covers non-interest features of bank accounts. The utility depositors get from a bank account is a function both of the net payments they receive and of the associated services the bank provides. Deposit accounts sometimes include fees (Hannan, 2002), and there may be a tradeoff between interest paid and lower fees. To control for fees, define DEPOSIT FEE RATIO as the ratio of these fees to total deposits.[9] Although this does not separate out fees on NOWs and MMDAs (banks do not report fees broken down by deposit product), it indicates whether a bank is a high-fee or low-fee bank. If banks can compensate for higher interest rates by charging higher fees, there will be a positive relationship between DEPOSIT FEE RATIO and interest rates.

Additionally, banks provide an array of services to depositors. For example, a customer may value a bank that is open long hours or has a broad ATM network. Thus, there is likely to be a tradeoff between interest payments and services provided. We use NON INT EXP RATIO, the ratio of non-interest expenses to total assets, as a control for services. The level of service also may be a function of how well staffed a branch is (we use EMPLOYEES PER BRANCH) and how many customers it serves (which we proxy with DEPOSITS PER BRANCH). We expect a negative relationship between higher service levels and interest rates.

A bank sets deposit rates, its fee schedule, and its service level jointly. Thus, there may be endogeneity problems from introducing the fee and service level variables. However, the results are robust to their exclusion. We discuss the choice of fees and service levels more in Section V.

[9] Fees include revenues in domestic offices from ATM fees, deposit account maintenance charges, minimum balance failure charges, per check charges, bounced check charges, stop payment orders, and certified check fees.

The final group of bank-specific factors we include are those related to the health of the bank. We capture bank health using the return on assets (ROA) and the ratio of nonperforming loans to total loans (NONPERFORMING RATIO). It is important to control for bank health, since a weak bank may not be able to bid aggressively for deposit share by offer high interest rates. If weak banks are unable to offer high deposit rates, then we expect a negative coefficient on NONPERFORMING RATIO. The expected sign on ROA is less clear since a healthy bank may offer higher deposit rates, all else equal, but banks can boost their ROA directly by paying less interest on deposits.

The market-specific factors we include mirror the bank-specific factors. We take average values in each local market of the bank-specific factors (except LOG ASSETS, which is captured by the market structure variable LOG MKT SIZE). The variables have the same names as their bank-specific counterparts with 'MKT' added as a prefix.

Finally, we use year dummies to capture changes in overall economic conditions.

IV. Results

A. Market concentration and market size

Since our fixed effect approach is different from previous studies, as a first step in our analysis, we check whether market concentration has the same effect as in studies that use a cross-sectional approach. To do this, we estimate a simpler version of (1):

$$\text{DEPOSIT INTEREST RATE}_{i,m,t} = f(\text{HERFINDAHL}_{m,t}, \text{LOG MKT SIZE}_{m,t}, \text{bank-specific controls}_{i,m,t}, \text{market condition controls}_{m,t}) \quad (2)$$

for bank i in market m during year t. This ignores any external effects of size structure and multimarket banks.

Table 2 presents the results for the regressions of (2) using fixed effects. The dependent variables are the NOW rate and the MMDA rate. We are interested primarily in the effect of market concentration as reflected by the coefficients on HERFINDAHL. The coefficients of –0.776 and –0.465 imply that an increase in market concentration reduces deposit rates. To gauge the potential magnitude impact of changing market concentration, a one standard deviation increase in the HERFINDAHL (0.085) generates a seven basis point decrease in NOW rates (-0.776×0.085)

and a four basis point decrease in MMDA rates (-0.465 × 0.085). However, as we see below, we must be careful when interpreting these numbers because this assumes that the effect of market concentration on deposit rates is similar across markets, which it is not.

We discuss the control variables briefly. There are positive coefficients on LOG MKT SIZE for both the NOW and MMDA regressions. This implies that deposit rates are higher in growing markets. A one standard deviation increase in the log of market size (0.913) leads to a 19 basis point increase in NOW rates and a 20 basis point increase in MMDA rates.

We find positive coefficients on LOCAL SHARE. Banks with a growing local presence, holding market concentration constant, offer higher deposit rates. However, we do not know which way causation runs. Banks could be getting more deposits because they offer higher deposit rates.

The coefficient on LOG ASSETS, our measure of bank size, comes in with opposite signs in the two regressions in Table 2. We discuss why this occurs and how to interpret it below.

The other variables come in with the expected signs with one major exception. We find that banks with higher fees offer lower deposit rates. A one standard deviation increase in DEPOSIT FEE RATIO (0.006) is associated with a decrease of five basis points in NOW rates and nine basis points in MMDA rates. This implies that, after controlling for market structure changes, as banks gain more pricing power, they choose to both reduce deposit rates and increase fees. The results do not provide evidence for the hypothesis that banks trade off deposit rates and fees.

B. Urban versus rural markets

Studies have found significant differences between banks in urban and rural markets, both in the composition of their deposit portfolios (e.g., DeYoung, et. al, 2004) and in the interest rates they pay (e.g., Berger and Hannan, 1989; Hannan and Prager, 2003). We may partially capture this in LOG MKT SIZE, since urban markets are more likely to be large and rural ones small. To examine whether different factors influence deposit rate evolution in urban and rural markets, we split our sample by whether the local market is in an MSA.[10] We follow convention by classifying local markets in MSAs as urban and those in non-MSA counties as rural. There are 351 urban markets and 1,286 rural markets. The urban markets, not surprisingly, have more

[10] The results are similar if we divide markets based on size. This is not surprising, since urban markets tend to be much larger than rural markets (although not all urban markets are large and not all rural markets are small).

banks per market. Overall, we have 47,202 observations from urban markets and 41,964 from rural markets. Table 3 has summary statistics for the urban and rural market subsamples.

One conclusion that jumps out when we estimate (2) separately for urban and rural markets is that the HERFINDAHL is only significant for urban markets. Table 4 has the regression results for urban and rural markets. For both NOW accounts and MMDAs, an increase in market concentration significantly reduces deposit rates in urban markets. However, as shown in the columns (2) and (4) of Table 4, the coefficient on HERFINDAHL is insignificant for rural markets. This surprising result calls into question whether mergers or other changes to market concentration have any effect on deposit rates in rural markets. It also leads us to analyze urban and rural markets separately.

Another interesting difference between urban and rural markets concerns the bank size variable. Increasing bank size leads to higher deposit rates except for NOW accounts in rural markets. The other control variables generally have the same signs as in the full sample regressions.

C. Market size structure

To examine the impact of size structure on interest rates, we use (1) to regress NOW and MMDA rates on market concentration, size structure, and controls. We present results for urban markets and for rural markets. The full sample results, not presented, have coefficients that are midway between those for the two subsamples.

The first and fourth columns of Table 5 present the urban market results adding SIZE STRUCTURE to the model reported in Table 4. The coefficients on the HERFINDAHL variable in the two regressions are both negative, significant, and of a similar magnitude to those in the regressions without the size structure variable. This suggests that size structure is picking up something different from market concentration.

The coefficients on the size structure variables are both positive and statistically significant. An increase in the deposit share of large banks, SIZE STRUCTURE, leads to an increase in deposit rates. Adding one standard deviation to SIZE STRUCTURE (0.263) increases NOW rates by four basis points and MMDA rates by seven basis points *at all banks in the market*. These results suggest that competition is more intensive in markets where large banks have a bigger deposit share.

The second and fifth columns in Table 5 give the results when we add HERF * SIZE STR, HERF * LOCAL SHARE, and SIZE STR * LOCAL SHARE, interaction variables among market concentration, size structure, and local market share. The coefficients on the HERF * SIZE STR and HERF * LOCAL SHARE are negative and significant. Thus, the direction and magnitude of the effect of a change in market concentration or size structure on deposit rates depends on the conditions in the particular market. We evaluate the impact of changes on deposit rates using the derivative of the particular deposit rate with respect to the change evaluated at the sample means. Taking the derivative of the NOW rates as given in (1) with respect to the HERFINDAHL gives the marginal effect on interest rates of moving to a higher market concentration. The derivative is

$$\frac{\partial NOW\ \ RATE}{\partial HERFINDAHL} = 0.092 - 1.260 \text{ SIZE STRUCTURE} - 5.109 \text{ LOCAL SHARE}. \qquad (3)$$

Evaluating (3) at the sample mean in urban markets of SIZE STRUCTURE (0.566) and the LOCAL SHARE (0.028) shows that the interest rate on NOW accounts is predicted to decrease by a statistically significant 0.948 basis points per 0.01 increase in the HERFINDAHL. Using the same approach, an increase on 0.01 in SIZE STRUCTURE at the sample means predicts an increase of 0.191 basis points in the NOW rate at all banks in the market. These results are similar in magnitude to those in column (1) Table 4.

The effects of changes in market concentration and size structure on MMDA rates in urban markets show the same pattern. At the sample means, the interest rate on NOW accounts is predicted to decrease by 0.646 basis points per 0.01 increase in the HERFINDAHL and increase by 0.331 basis points per 0.01 increase in SIZE STRUCTURE.

Once we introduce the interaction terms, market size no longer has a significant effect on deposit rates but growing banks (as measured by LOG ASSETS) still are predicted to offer larger deposit rates.

These results offer something of a paradox regarding the effects of large banks on deposit rates. On the one hand, as banks get larger, they offer higher deposit rates and increasing the share of large banks in a market generally increases deposit rates at all banks in the market. This suggests that growth in bank size, such as during the recent consolidation, can be good for depositors, even those at small banks. On the other hand, large banks appear to amplify the

negative effects of market concentration. Increasing the deposit share of large banks means that interest rates fall more when concentration increases, something that is bad for depositors.

The third and sixth columns of Table 5 presents the results for urban markets of regressions that include MULTIMARKET SHARE and HERF * MULTI SHARE, an interaction term between the HERFINDAHL and MULTIMARKET SHARE. Column (3) presents the results for NOW accounts and column (6) presents the results for MMDAs. Given the coefficients on the multimarket variables, at the sample means, a 0.01 increase in the MULTIMARKET SHARE is predicted to increase the interest rate on NOW accounts by 0.082 basis points and the interest on MMDAs by 0.122 basis points. These results are different than those in Hannan and Prager (2003), in large part because of a difference in controls and the fact that we focus on urban markets.[11]

Introducing the multimarket variables does not change the qualitative impact of the size structure variables. Thus, there is a role for size structure above that due to the fact that many large banks operate in multiple markets.

When we examine rural markets, the picture is very different. The rural markets results are reported in Table 6. Changes in market concentration do not have the expected effect in rural markets. Increasing the Herfindahl is predicted to have little change on NOW rates and to have little change or increase MMDA rates. The predicted effect of changes in size structure is different for NOWs and MMDAs. An increase in SIZE STRUCTURE reduces NOW rates but increases MMDA rates.

It seems clear that competition works differently in rural markets than in urban markets (and than in standard industrial organization models). This may be due to structural considerations. For example, rural markets are generally less densely developed and populated than urban markets. This may increase the cost for depositors to shop around, making deposit rates less sensitive to competitive conditions. However, there is much that needs to be understood about the differences between urban and rural markets.

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[11] When we use all markets and regress deposit rates on the market concentration, the multimarket variables, bank size, and market size for 1996 and 1999 (the two years in the Hannan and Prager study), we find a negative cross sectional relationship between the multimarket share and deposit rates. However, by introducing the size structure variables and other controls, this relationship disappears, even when we include both urban and rural markets. In addition, when we run the regression without size structure and the controls, but exclude rural markets, we get a positive effect from increasing multimarket share. Finally, some differences between Hannan and Prager and this study may occur because we use fixed effects rather than a cross section as in Hannan and Prager. See Section V for a discussion of this.

V. Robustness

This section shows that the major results on the relationship between changes in market structure and deposit interest rates are robust. Previous studies of the effect of market conditions on interest rates have used cross-sectional analysis rather than the fixed effect approach here. We run pooled cross section regressions to mimic the approach of the earlier work. Also, as noted in the introduction, there have been a large number of bank mergers over our sample period. We see how introducing merger variables affect our results. The next set of robustness tests focuses on fees and services. Deposit products are packages that include interest, fees, and services. We examine whether market concentration and size structure affect the provision of fees and services. Finally, we look at other tests of robustness.

We report results for the urban market sample only. The results for rural markets are similar (after factoring the differences described earlier) except that statistical significance is weaker. To simplify the presentation, we run all the regressions in this section without interaction terms. The results are qualitatively similar with the interaction terms.

A. Cross sectional analysis

One question implicit, if not explicit, in many earlier studies of deposit rates is how changes in market structure, such as those resulting from a merger, affect deposit rates. We argue that fixed effect regression often is a more appropriate methodology to answer this question than is the cross sectional analysis that is typically used. Cross sectional analysis assumes that we can look across banks with different values of a control variable to deduce the effect of changes in the variable at a particular bank. However, if there are missing controls in the analysis, then comparing banks may not provide a good measure of what will happen at a single bank. Fixed effect analysis, on the other hand, explicitly examines what happens to a bank over time as the control variables – such as market structure – change.

There are issues where cross sectional analysis might be the appropriate approach. For example, if you want to know whether, on average, deposit rates at a point in time are higher at large or small banks (as opposed to how deposit rates might evolve as a bank grows). For these reasons, and to show where the predictions of the two approaches differ, we run the analysis in the previous section using a pooled cross sectional approach (that is, using our panel, but without

fixed effects). Table 7 presents the results for the cross sectional regressions and, for comparison, results for the same regressions using fixed effects.[12]

For the two major market structure variables, the cross sectional regressions paint a similar picture to the fixed effect regressions. Increasing market concentration reduces deposit rates while increasing large banks' share of local deposits, SIZE STRUCTURE, generally increases deposit rates in both sets of regressions.

When we turn to the other controls, however, the results differ between the two methodologies. In general, looking across markets using the cross-sectional analysis, we find that larger markets and larger banks have lower rates. However, the fixed effect regressions imply that higher deposit rates are associated with growing markets and growing banks. For example, the coefficient on LOG ASSETS is negative in the cross section and positive for fixed effects. So, *larger* banks pay lower deposit rates but *growing* banks pay higher rates. To put it another way, banks of any size that want to grow, do so by offering higher rates, but all else equal, large banks offer lower deposit rates.

The differences between the two methodologies reiterate the importance of tailoring the technique to the question being asked. The fixed effect approach is appropriate for many of the questions asked by antitrust regulators. For example, it allows them to predict what will happen to interest rates in a market if two banks merge.

B. Mergers

During the sample period, the banking industry was going through a consolidation. There were over 3,000 mergers between banks during the sample period. A number of studies have shown that mergers can affect deposit pricing (Prager and Hannan, 1998) and small business lending (Berger, et. al., 1998). In this section, we introduce measures of merger activity to our analysis.

Merger activity had a substantial effect on the local markets we examine, although it was stronger in the urban markets we focus on here. Our measure of aggregate merger activity in a local market is PERCENT ACQUIRED, the percentage of deposits in a local market that is acquired during the preceding three years.[13] On average, 11.6 percent of deposits are acquired during a

[12] Note that the p-values may be overstated for the pooled cross section since the errors terms over time at a particular bank can be correlated.

[13] Years are defined from July through June to match the deposit data.

three-year period in an urban local market (compared to 6.6 percent in a rural market). However, only 65.1 percent of urban markets have a merger in an average three-year period (22.1 percent in rural markets). In these markets, merger targets account for 17.8 percent of deposits (29.7 percent in rural markets). Thus, where they occur, mergers can have a large impact on a market. The effect of a merger on deposit prices in a market may depend on whether the acquirer is entering the market with the merger or whether the acquirer already has a presence in the market. We call the latter acquisitions in-market mergers. In the sample period, 65.9 percent of urban mergers were in market (19.8 percent for rural markets), but the targets of these mergers tend to be small. In-market mergers account for 30.1 percent of all assets acquired in urban markets (8.6 percent in rural markets). Let PERCENT ACQUIRED IN MARKET be the percent of assets acquired in a market by in-market mergers during the preceding three years.

Table 8 presents the results of regressions that include the merger variables. Increasing merger activity generally pushes NOW rates in a different direction than it does MMDA rates. In-market mergers increase NOW rates, but there is no effect from other mergers. For MMDAs, all mergers have a negative impact on rates, with in-market mergers reducing rates by more.

Comparing Table 8 with earlier results shows that the introduction of the merger variables has little qualitative effect on the coefficients for the size structure and market concentration variables. Thus, to the extent that merger activity affects interest rates, it does not take away from the impact of size structure and market concentration.

C. Fees and services

Banks can charge fees and provide services to depositors. Depositors should select banks based on the package of deposit rates, fees, and services. Thus, the same market- and bank-specific factors that affect deposit rates should influence fees and service levels. We test this by replacing deposit rates with measures of fees or services in our baseline model:

$$\text{Fee or service}_{i,m,t} = f(\text{HERFINDAHL}_{m,t}, \text{SIZE STRUCTURE}_{m,t}, \text{market structure controls}_{m,t}, \text{bank-specific controls}_{i,m,t}, \text{market condition controls}_{m,t}), \quad (4)$$

for bank i in market m during year t. We report results with DEPOSIT FEE RATIO as our measure of fees and NON INT EXP RATIO, EMPLOYEES PER BRANCH, and DEPOSITS PER BRANCH as our measures of services. We use all the controls in equation (1) expect that we exclude the

interaction terms to simplify the discussion and we leave out the market average of the dependent variable.

When market conditions change to allow a bank to offer lower deposit rates, we expect the bank to also increase fees and reduce services. So, when competition decreases, fees should rise and services fall. This is because when banks have an opportunity to increase profit, they should do so using a package of rate decreases, fee increases, and service decreases. Again, the expected signs on the coefficients are a function of the fixed-effect analysis used here. If we were to look across banks in a given market, we might find some banks specializing in high deposit rates with few services and high fees while others specialize in high services and low fees with low deposit rates.

The results of the regressions are presented in Table 9. The findings are mixed, in part because our proxies for services are inexact.

We get the predicted relationships for deposit fees. There is a positive coefficient on HERFINDAHL and a negative coefficient on SIZE STRUCTURE. Increasing the HERFINDAHL by one standard deviation implies a predicted increase in fees of 1.7 percent while a one standard deviation increase in SIZE STRUCTURE reduces fees by 2.4 percent.

The ratio of non-interest expense to total assets is increasing in HERFINDAHL and decreasing in SIZE STRUCTURE. This is the opposite of what we expect if banks are forced to offer more services in more competitive environments. However, NON INT EXP RATIO can be high either because a bank provides services that depositors value or because the bank is inefficient. There is some evidence that banks in less concentrated markets are less efficient (Hannan and Berger, 1998), which is consistent with our results. Similarly, the negative coefficient on HERFINDAHL when EMPLOYEES PER BRANCH is the dependent variable is consistent with a negative correlation between concentration and efficiency.

DEPOSITS PER BRANCH may be our best measure of service levels for two reasons. First, depositors like to bank close to home (Amel and Starr-McCluer, 2002), so having more branches per deposit is likely to place branches close to depositors. Second, DEPOSITS PER BRANCH is the only one of the service proxies to be measured at the branch rather than bank level. The results for DEPOSITS PER BRANCH are presented in the final column of Table 9. The signs on the coefficients for HERFINDAHL and SIZE STRUCTURE are consistent with more services in

competitive markets, although only the coefficient on the Herfindahl is significant. A one standard deviation increase in the HERFINDAHL is predicted to increase deposits per branch by 2.7 percent.

Overall, there is some evidence that the non-interest portions of the package of payments and services react to changes at banks in a manner consistent with the effects on deposit rates. This suggests that banks view deposit rates, fees, and services as a package that they adjust as market conditions change.

D. Other robustness checks

We also do several other robustness checks. The results are summarized in this section.

In the main sample, we exclude multimarket banks (although their deposits are counted in the market concentration and size structure variables). These banks are excluded because we do not have interest rates on a market-level basis. Thus, given the significant deposits outside the home market, we cannot be sure that the average interest rate for the bank as a whole is similar to the interest rate in the home market. However, when we run the main regressions including multimarket banks in their home market, we find that the qualitative results are similar.

We also explore the division of banks into size classes. The results are robust to changes in the division between large and small banks. There does not appear to be a reason to have more than two size classes. For example, we split large banks into two subclasses: somewhat large banks (total assets between $1 billion and $10 billion) and very large banks (total assets above $10 billion). Three size structure variables are created based on this division into small, somewhat large, and very large banks. When we run regressions of (1) for NOW rates and MMDA rates using the new size classes, the results show that there are few significant differences between somewhat large and very large banks (for NOW accounts, the very large banks offer slightly higher rates while for MMDAs, size structure has a smaller but still positive effect for very large banks).

There are a large number of small banks in our sample. To ensure that our results hold for all banks, not just small banks, we run our baseline regressions dropping all small banks. When using a minimum size of either $500 million in assets or $1 billion in assets, we get qualitatively the same results as for the full sample (whether or not we include multimarket banks). This suggests that the results hold for all banks, not just for small banks.

There is evidence that the interest rates banks offer on deposit products move sluggishly with market rates and that the speed of adjustment of deposit rates to market rates may depend on the spread between them (Neumark and Sharpe, 1991; Rosen, 2002). Examining the average spread between the bank deposit rate and the three-month Treasury bill rate (or other market rates) shows that bank deposit rates were much lower relative to the Treasury rate in 1991-1993 than in the other years of the sample. To see whether the effects of size structure and market concentration depend on the spread, we run the main regressions of (1) for the 1991-1993 period only. We find qualitatively similar results to those reported earlier.

Overall, the qualitative results on the importance of size structure are robust to changes in the sample.

VI. Conclusions

The recent bank consolidation increased the average size of banks without having much impact on local market concentration, the focus of antitrust scrutiny. This paper explores whether the consolidation nevertheless had an impact on bank deposit interest rates. We find that deposit rates can be affected when local markets change, even if the changes do not alter market concentration.

We show that the size of the banks in a local market matters, even when that size is achieved outside the local market. Changing the size structure of the market by increasing the share of large banks in a market leads to higher deposit rates *at all banks* in the market, even when market concentration is held constant. Size structure can affect deposit rates in another way as well. As the share of large banks increases, interest rates become more sensitive to changes in market concentration.

There is also a second way that the size of banks in a local market affects deposit rates. We find that growing banks tend to offer higher interest rates on deposits, all else equal.

An interesting result in this paper is that the urban and rural markets react very differently to changes in market conditions. For example, previous studies find that increasing market concentration leads to higher interest rates. However, we find that this is true in urban markets only. Changes in market concentration do not seem to have a significant affect on deposit rates in

rural markets. This is important since rural markets tend to be concentrated, and thus it is more likely that proposed mergers in these markets will generate antitrust concerns.

Finally, we use a panel data set rather than the cross sectional (or pooled) data sets in most previous work. One advantage of a panel is that it allows us to use fixed effect regressions. These give explicit comparisons of changes within markets rather than inferring what would happen in a market by looking across markets. Cross sectional analysis may not be appropriate if the goal is to predict the effects of changes in market conditions.

In this paper, we show that market conditions have an important impact on how banks set deposit rates, but that the impact is more complex than previously thought. This has implications for antitrust policy. For example, as noted, we find no relationship between market concentration and deposit rates in rural banking markets. Also, we find that the movement toward larger banks has some beneficial effects for depositors. However, deposit rates become more sensitive to market concentration as the share of large banks in a market increases. Thus, while consolidation may offer some benefits to depositors as large banks replace small banks in local markets without changing market concentration, it also means that antitrust regulators have to be more aware of any changes in market concentration.

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Table 1. Summary statistics
Summary statistics for the full sample of 89,166 bank-year observations. Includes all banks except those with more than 25 percent of deposits outside their home market and those in markets with fewer than five banks or a Herfindahl of 0.50 or greater. All interest rates (NOW and MMDA) and spreads are in percentages. All dollar values are in 2000 dollars.

Variable	Mean	Std. dev.	Min	Max
NOW rate	3.348	1.349	0.383	8.922
Spread: NOW rate – 3 month T-bill rate	-2.223	1.392	-5.936	2.519
MMDA rate	4.139	1.308	0.000	10.860
Spread: NOW rate – 3 month T-bill rate	-1.433	1.265	-6.150	3.014
Herfindahl index (HERFINDAHL)	0.184	0.085	0.033	0.500
Market share of small banks	0.650	0.325	0.000	1.000
Market share of large banks (SIZE STRUCTURE)	0.350	0.325	0.000	1.000
Market share of banks with at least 25 percent of deposits outside home market (MULTIMARKET SHARE)	0.299	0.278	0.000	0.997
Log of banking market size (LOG MKT SIZE)	9.265	0.903	7.523	11.493
Share of bank in local market (LOCAL SHARE)	0.092	0.111	0.000	0.663
Log of total assets of a bank (LOG ASSETS)	7.834	0.448	5.952	10.153
Fees on deposits divided by total deposits (DEPOSIT FEE RATIO)	0.009	0.006	0.000	0.038
Ratio of non-interest expense to total assets (NON INT EXP RATIO)	0.033	0.013	0.000	0.472
Employees per branch, thousands (EMPLOYEES PER BRANCH)	0.020	0.026	0.001	3.130
Deposits per branch, $ millions (DEPOSITS PER BRANCH)	0.037	0.061	0.000	5.324
Return on assets (ROA)	0.008	0.011	-0.376	0.129
Ratio of nonperforming loans to total loans (NONPERFORMING RATIO)	0.015	0.021	0.000	0.697
Percent of assets acquired in mergers in the prior three years (PCT ACQUIRED)	0.079	0.137	0.000	1.788
Percent of assets acquired in mergers in the prior three years by banks in the local market (PCT ACQUIRED IN MKT)	0.028	0.057	0.000	0.551

Table 2. Regressions of deposit interest rates on market concentration using (2).
Regressions of (2) using fixed-effects model. Year dummies not shown. There are 89,166 observations. Includes all banks except those with more than 25 percent of deposits outside their home market and those in markets with fewer than five banks or a Herfindahl of 0.50 or greater. All interest rates (NOW and MMDA) and spreads are in percentages. All dollar values are in 2000 dollars. Asymptotic p values are in parentheses.

	NOW rates (1)	**MMDA rates (2)**
HERFINDAHL	-0.776	-0.465
	(<.001)	(<.001)
LOG MKT SIZE	0.210	0.245
	(<.001)	(<.001)
LOCAL SHARE	1.638	0.999
	(<.001)	(<.001)
LOG ASSETS	-0.093	0.240
	(<.001)	(<.001)
DEPOSIT FEE RATIO	-8.976	-14.504
	(<.001)	(<.001)
NON INT EXP RATIO	-1.939	-0.891
	(<.001)	(0.001)
EMPLOYEES PER BRANCH	0.289	0.333
	(0.001)	(0.002)
DEPOSITS PER BRANCH	0.224	0.157
	(0.001)	(0.046)
ROA	-1.253	-1.334
	(<.001)	(<.001)
NONPERFORMING RATIO	-0.311	-1.059
	(0.002)	(<.001)
MKT DEPOSIT FEE RATIO	-1.416	-16.513
	(0.210)	(<.001)
MKT NON INT EXP RATIO	-1.170	-1.100
	(0.014)	(0.049)
MKT EMPLOYEES PER BRANCH	-0.242	-0.179
	(0.020)	(0.144)
MKT DEPOSITS PER BRANCH	0.096	0.013
	(0.022)	(0.799)
MKT ROA	-5.819	-1.059
	(<.001)	(0.061)
MKT NONPERFORMING RATIO	-1.543	-0.242
	(<.001)	(0.317)
R-squared	0.808	0.769

Table 3. Summary statistics by type of market

Summary statistics broken down by type of market. Urban markets are those in MSAs while rural markets are non-MSA counties. Includes all banks except those with more than 25 percent of deposits outside their home market and those in markets with fewer than five banks or a Herfindahl of 0.50 or greater. All interest rates (NOW and MMDA) and spreads are in percentages. All dollar values are in 2000 dollars.

	Urban markets		Rural markets	
Variable	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**
NOW rate	3.280	1.406	3.425	1.278
MMDA rate	4.176	1.349	4.097	1.259
HERFINDAHL	0.139	0.063	0.235	0.077
SIZE STRUCTURE	0.566	0.263	0.106	0.184
MULTIMARKET SHARE	0.372	0.295	0.216	0.231
LOG MKT SIZE	9.977	0.632	8.464	0.264
LOCAL SHARE	0.028	0.054	0.164	0.115
LOG ASSETS	7.966	0.477	7.686	0.359
DEPOSIT FEE RATIO	0.011	0.007	0.008	0.005
NON INT EXP RATIO	0.036	0.015	0.029	0.009
EMPLOYEES PER BRANCH	0.023	0.034	0.016	0.012
DEPOSITS PER BRANCH	0.042	0.080	0.031	0.024
ROA	0.007	0.013	0.010	0.008
NONPERFORMING RATIO	0.016	0.023	0.014	0.019
PCT ACQUIRED	0.106	0.149	0.050	0.116
PCT ACQUIRED IN MKT	0.047	0.067	0.007	0.031
Observations	47,202		41,964	

Table 4. Regressions of deposit interest rates on market concentration using (2), sample divided by market type.

Regressions of (2) using fixed-effects model. Year dummies not shown. Urban markets are those in MSAs while rural markets are non-MSA counties. Includes all banks except those with more than 25 percent of deposits outside their home market and those in markets with fewer than five banks or a Herfindahl of 0.50 or greater. There are 47,202 observations for the large market sample, and 41.964 for the small market sample. All dollar values are in 2000 dollars. Asymptotic p values are in parentheses,

	NOW rates		**MMDA rates**	
	Urban (1)	**Rural (2)**	**Urban (3)**	**Rural (4)**
HERFINDAHL	-0.816 (<.001)	-0.118 (0.170)	-0.718 (<.001)	0.058 (0.577)
LOG MKT SIZE	0.084 (0.001)	0.718 (<.001)	0.130 (<.001)	0.540 (<.001)
LOCAL SHARE	0.617 (<.001)	1.207 (<.001)	0.683 (<.001)	0.539 (<.001)
LOG ASSETS	0.085 (<.001)	-0.190 (<.001)	0.238 (<.001)	0.364 (<.001)
DEPOSIT FEE RATIO	-8.418 (<.001)	-11.986 (<.001)	-15.898 (<.001)	-9.279 (<.001)
NON INT EXP RATIO	-1.245 (<.001)	-3.448 (<.001)	-1.444 (<.001)	2.617 (<.001)
EMPLOYEES PER BRANCH	0.146 (0.126)	1.935 (0.001)	0.256 (0.019)	-1.057 (0.146)
DEPOSITS PER BRANCH	0.115 (0.106)	0.213 (0.546)	-0.003 (0.969)	2.970 (<.001)
ROA	-1.594 (<.001)	-0.299 (0.475)	-1.662 (<.001)	-0.113 (0.825)
NONPERFORMING RATIO	-0.440 (0.001)	0.029 (0.854)	-1.249 (<.001)	-0.589 (0.002)
MKT DEPOSIT FEE RATIO	-2.798 (0.073)	1.581 (0.370)	-14.777 (<.001)	-11.578 (<.001)
MKT NON INT EXP RATIO	-0.125 (0.844)	-0.562 (0.502)	1.178 (0.106)	-4.248 (<.001)
MKT EMPLOYEES PER BRANCH	-0.784 (<.001)	-1.227 (0.044)	-0.511 (<.001)	-1.071 (0.149)
MKT DEPOSITS PER BRANCH	0.103 (0.021)	0.652 (0.038)	0.038 (0.464)	-0.390 (0.307)
MKT ROA	-3.969 (<.001)	-5.176 (<.001)	0.180 (0.835)	-1.376 (0.109)
MKT NONPERFORMING RATIO	-0.986 (0.004)	-1.515 (<.001)	0.776 (0.048)	-0.329 (0.316)
R-squared	0.818	0.820	0.825	0.765

Table 5. Regressions of deposit interest rates on market concentration and size structure variables using (1), urban markets only.

Regressions of (1) using fixed-effects model for urban markets. Year dummies not shown. There are 47,202 observations. Includes all banks in MSAs except those with more than 25 percent of deposits outside their home market. All interest rates (NOW and MMDA) and spreads are in percentages. All dollar values are in 2000 dollars. Asymptotic p values are in parentheses.

	NOW rates			MMDA rates		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
HERFINDAHL	-0.884	0.092	0.157	-0.831	0.797	0.908
	(<.001)	(0.615)	(0.392)	(<.001)	(<.001)	(<.001)
SIZE STRUCTURE	0.171	0.366	0.404	0.284	0.678	0.765
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
HERF * SIZE STR		-1.260	-1.879		-2.430	-3.580
		(<.001)	(<.001)		(<.001)	(<.001)
MULTIMARKET SHARE			-0.018			-0.067
			(0.635)			(0.129)
HERF * MULTI			0.718			1.364
			(0.001)			(<.001)
LOG MKT SIZE	0.033	0.037	0.044	0.046	0.037	0.042
	(0.213)	(0.165)	(0.112)	(0.136)	(0.229)	(0.182)
LOCAL SHARE	0.535	1.728	1.710	0.546	1.344	1.308
	(0.001)	(<.001)	(<.001)	(0.004)	(0.001)	(0.001)
HERF * LOCAL SHARE		-5.109	-5.255		-2.379	-2.672
		(<.001)	(<.001)		(0.096)	(0.061)
SIZE STR * LOCAL SHARE		0.005	0.159		-0.369	-0.115
		(0.985)	(0.595)		(0.277)	(0.735)
LOG ASSETS	0.096	0.084	0.083	0.255	0.245	0.245
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
DEPOSIT FEE RATIO	-8.285	-8.177	-8.145	-15.677	-15.415	-15.350
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
NON INT EXP RATIO	-1.213	-1.195	-1.184	-1.391	-1.364	-1.345
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
EMPLOYEES PER BRANCH	0.143	0.154	0.147	0.252	0.259	0.249
	(0.133)	(0.106)	(0.122)	(0.021)	(0.017)	(0.022)
DEPOSITS PER BRANCH	0.121	0.015	0.162	0.007	0.049	0.069
	(0.089)	(0.034)	(0.024)	(0.932)	(0.548)	(0.397)
ROA	-1.568	-1.516	-1.503	-1.620	-1.558	-1.539
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
NONPERFORMING RATIO	-0.437	-0.422	-0.429	-1.245	-1.224	-1.233
	(0.001)	(0.001)	(0.001)	(<.001)	(<.001)	(<.001)
MKT DEPOSIT FEE RATIO	-3.234	-2.904	-3.425	-15.501	-15.004	-15.938
	(0.038)	(0.063)	(0.028)	(<.001)	(<.001)	(<.001)
MKT NON INT EXP RATIO	-0.356	-0.490	-0.695	0.795	0.520	0.209
	(0.577)	(0.443)	(0.278)	(0.276)	(0.476)	(0.774)
MKT EMPLOYEES PER BRANCH	-0.750	-0.730	-0.744	-0.455	-0.410	-0.442
	(<.001)	(<.001)	(<.001)	(<.001)	(0.001)	(0.001)
MKT DEPOSITS PER BRANCH	0.102	0.094	0.085	0.035	0.012	-0.006
	(0.023)	(0.036)	(0.058)	(0.5)	(0.81)	(0.907)
MKT ROA	-3.851	-3.960	-3.958	0.377	0.090	0.128
	(<.001)	(<.001)	(<.001)	(0.664)	(0.917)	(0.882)
MKT NONPERFORMING RATIO	-0.773	-0.725	-0.644	1.130	1.201	1.311
	(0.025)	(0.036)	(0.062)	(0.004)	(0.002)	(0.001)
R-squared	0.817	0.816	0.816	0.785	0.784	0.783

Table 6. Regressions of deposit interest rates on market concentration and size structure variables using (1), rural markets only.

Regressions of (1) using fixed-effects model for rural markets. Year dummies not shown. There are 41,964 observations. Includes all banks in non-MSA counties except those with more than 25 percent of deposits outside their home market and those in markets with fewer than five banks or a Herfindahl of 0.50 or greater. All interest rates (NOW and MMDA) and spreads are in percentages. All dollar values are in 2000 dollars. Asymptotic p values are in parentheses. The derivatives are defined in the text.

	NOW rates			**MMDA rates**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
HERFINDAHL	-0.132	-0.157	-0.180	0.075	0.602	0.652
	(0.124)	(0.201)	(0.15)	(0.476)	(<.001)	(<.001)
SIZE STRUCTURE	-0.112	-0.473	-0.431	0.127	0.343	0.246
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(0.009)
HERF * SIZE STR		1.875	1.815		-0.873	-0.545
		(<.001)	(<.001)		(0.005)	(0.143)
MULTIMARKET SHARE			-0.074			0.138
			(0.183)			(0.042)
HERF * MULTI			0.125			-0.441
			(0.556)			(0.087)
LOG MKT SIZE	0.738	0.761	0.757	0.518	0.564	0.569
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
LOCAL SHARE	1.174	1.745	1.739	0.577	1.549	1.556
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
HERF * LOCAL SHARE		-1.422	-1.445		-2.702	-2.657
		(0.007)	(0.006)		(<.001)	(<.001)
SIZE STR * LOCAL SHARE		-0.705	-0.728		0.018	0.023
		(<.001)	(<.001)		(0.934)	(0.919)
LOG ASSETS	-0.186	-0.182	-0.182	0.359	0.303	0.302
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
DEPOSIT FEE RATIO	-12.001	-11.779	-11.795	-9.263	-9.181	-9.174
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
NON INT EXP RATIO	-3.440	-3.261	-3.280	2.609	2.438	2.456
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
EMPLOYEES PER BRANCH	1.873	1.793	1.874	-0.988	-0.667	-0.724
	(0.002)	(0.003)	(0.002)	(0.174)	(0.362)	(0.323)
DEPOSITS PER BRANCH	0.337	0.027	0.258	2.830	2.700	2.710
	(0.342)	(0.440)	(0.466)	(<.001)	(<.001)	(<.001)
ROA	-0.297	-0.221	-0.224	-0.115	-0.113	-0.106
	(0.477)	(0.597)	(0.591)	(0.821)	(0.824)	(0.835)
NONPERFORMING RATIO	0.025	0.026	0.024	-0.584	-0.582	-0.579
	(0.877)	(0.870)	(0.880)	(0.003)	(0.003)	(0.003)
MKT DEPOSIT FEE RATIO	1.769	1.139	1.050	-11.791	-11.495	-11.375
	(0.316)	(0.519)	(0.552)	(<.001)	(<.001)	(<.001)
MKT NON INT EXP RATIO	-0.545	-0.676	-0.638	-4.267	-4.204	-4.212
	(0.515)	(0.419)	(0.446)	(<.001)	(<.001)	(<.001)
MKT EMPLOYEES PER BRANCH	-1.216	-1.206	-1.379	-1.084	-1.275	-1.169
	(0.046)	(0.048)	(0.025)	(0.144)	(0.087)	(0.119)
MKT DEPOSITS PER BRANCH	0.459	0.481	0.500	-0.172	-0.154	-0.163
	(0.146)	(0.127)	(0.113)	(0.654)	(0.689)	(0.671)
MKT ROA	-5.124	-5.084	-5.092	-1.435	-1.420	-1.389
	(<.001)	(<.001)	(<.001)	(0.095)	(0.098)	(0.106)
MKT NONPERFORMING RATIO	-1.536	-1.484	-1.504	-0.305	-0.330	-0.308
	(<.001)	(<.001)	(<.001)	(0.354)	(0.316)	(0.348)
R-squared	0.821	0.819	0.819	0.765	0.764	0.764

Table 7. Comparison of cross sectional and fixed effect regressions for urban markets.
Regressions of (1) using pooled time series (cross sectional) model and panel (fixed effects) model for urban markets. Year dummies not shown. There are 47,202 observations. Includes all banks in MSAs except those with more than 25 percent of deposits outside their home market. All interest rates (NOW and MMDA) and spreads are in percentages. All dollar values are in 2000 dollars. Asymptotic p values are in parentheses.

	NOW rates		**MMDA rates**	
	Cross section (1)	**Fixed effects (2)**	**Cross section (3)**	**Fixed effects (4)**
HERFINDAHL	-0.918 (<.001)	-0.895 (<.001)	-0.704 (<.001)	-0.847 (<.001)
SIZE STRUCTURE	0.288 (<.001)	0.123 (<.001)	0.145 (<.001)	0.210 (<.001)
MULTIMARKET SHARE	-0.158 (<.001)	0.086 (<.001)	-0.088 (<.001)	0.131 (<.001)
LOG MKT SIZE	-0.165 (<.001)	0.053 (0.052)	-0.049 (<.001)	0.075 (0.015)
LOCAL SHARE	-0.191 (0.012)	0.611 (<.001)	0.134 (0.100)	0.662 (0.001)
LOG ASSETS	-0.203 (<.001)	0.092 (<.001)	-0.043 (<.001)	0.249 (<.001)
DEPOSIT FEE RATIO	-8.960 (<.001)	-8.288 (<.001)	-13.293 (<.001)	-15.681 (<.001)
NON INT EXP RATIO	-4.001 (<.001)	-1.208 (<.001)	-2.075 (<.001)	-1.383 (<.001)
EMPLOYEES PER BRANCH	0.536 (0.025)	0.135 (0.155)	0.140 (0.348)	0.240 (0.027)
DEPOSITS PER BRANCH	0.060 (0.501)	0.121 (0.089)	0.362 (<.001)	0.007 (0.933)
ROA	-1.838 (<.001)	-1.552 (<.001)	-4.564 (<.001)	-1.596 (<.001)
NONPERFORMING RATIO	0.685 (<.001)	-0.447 (0.001)	-1.186 (<.001)	-1.260 (<.001)
MKT DEPOSIT FEE RATIO	23.681 (<.001)	-3.382 (0.03)	4.365 (<.001)	-15.726 (<.001)
MKT NON INT EXP RATIO	-12.395 (<.001)	-0.568 (0.375)	0.453 (0.396)	0.472 (0.518)
MKT EMPLOYEES PER BRANCH	-0.382 (0.008)	-0.735 (<.001)	0.318 (0.01)	-0.432 (0.001)
MKT DEPOSITS PER BRANCH	0.263 (<.001)	0.108 (0.016)	-0.153 (<.001)	0.044 (0.394)
MKT ROA	0.645 (0.454)	-3.933 (<.001)	-4.989 (<.001)	0.252 (0.771)
MKT NONPERFORMING RATIO	0.201 (0.580)	-0.652 (0.059)	-4.572 (<.001)	1.314 (0.001)
R-squared	0.842	0.816	0.810	0.784

Table 8. Regressions of deposit interest rates using (1) with merger variables, urban markets only. Regressions of (1) with the addition of merger variables using fixed-effects model for urban markets. Year dummies not shown. There are 47,202 observations. Includes all banks in MSAs except those with more than 25 percent of deposits outside their home market. All interest rates (NOW and MMDA) and spreads are in percentages. All dollar values are in 2000 dollars. Asymptotic p values are in parentheses.

	NOW rates (1)	**MMDA rates (2)**
HERFINDAHL	-0.942	-0.760
	(<.001)	(<.001)
SIZE STRUCTURE	0.119	0.218
	(<.001)	(<.001)
MULTIMARKET SHARE	0.089	0.136
	(<.001)	(<.001)
PCT ACQUIRED	-0.003	-0.093
	(0.898)	(<.001)
PCT ACQUIRED IN MARKET	0.115	-0.138
	(0.005)	(0.003)
LOG MKT SIZE	0.049	0.074
	(0.069)	(0.018)
LOCAL SHARE	0.606	0.669
	(<.001)	(<.001)
LOG ASSETS	0.092	0.255
	(<.001)	(<.001)
DEPOSIT FEE RATIO	-8.324	-15.634
	(<.001)	(<.001)
NON INT EXP RATIO	-1.188	-1.418
	(<.001)	(<.001)
EMPLOYEES PER BRANCH	0.137	0.237
	(0.149)	(0.029)
DEPOSITS PER BRANCH	0.125	-0.004
	(0.079)	(0.96)
ROA	-1.544	-1.598
	(<.001)	(<.001)
NONPERFORMING RATIO	-0.449	-1.249
	(0.001)	(<.001)
MKT DEPOSIT FEE RATIO	-3.332	-16.400
	(0.033)	(<.001)
MKT NON INT EXP RATIO	-0.568	0.524
	(0.375)	(0.473)
MKT EMPLOYEES PER BRANCH	-0.734	-0.423
	(<.001)	(0.001)
MKT DEPOSITS PER BRANCH	0.106	0.044
	(0.018)	(0.386)
MKT ROA	-3.769	-0.0002
	(<.001)	(0.999)
MKT NONPERFORMING RATIO	-0.736	1.529
	(0.034)	(<.001)
R-squared	0.816	0.783

Table 9. Regressions of fees and services using (4), urban markets only.
Regressions of (4) using fixed-effects model for urban markets. Year dummies not shown. There are 47,202 observations. Includes all banks in MSAs except those with more than 25 percent of deposits outside their home market. All interest rates (NOW and MMDA) and spreads are in percentages. All dollar values are in 2000 dollars. Asymptotic p values are in parentheses.

	DEPOSIT FEE RATIO (1)	NON INT EXP RATIO (2)	EMPLOYEES PER BRANCH (3)	DEPOSITS PER BRANCH (4)
HERFINDAHL	0.003	0.003	-0.023	0.018
	(<.001)	(0.016)	(<.001)	(0.007)
SIZE STRUCTURE	-0.001	-0.002	-0.003	-0.003
	(<.001)	(0.021)	(0.043)	(0.224)
MULTIMARKET SHARE	0.0001	0.0004	0.002	-0.004
	(0.344)	(0.264)	(0.021)	(0.026)
LOG MKT SIZE	-0.001	0.0002	-0.002	-0.004
	(<.001)	(0.736)	(0.169)	(0.073)
LOCAL SHARE	0.0004	0.002	-0.113	0.208
	(0.756)	(0.367)	(<.001)	(<.001)
LOG ASSETS	0.0001	-0.014	0.006	0.030
	(0.593)	(<.001)	(<.001)	(<.001)
DEPOSIT FEE RATIO		0.773	-0.039	-0.531
		(<.001)	(0.299)	(<.001)
NON INT EXP RATIO	0.119		0.062	-0.046
	(<.001)		(<.001)	(0.027)
EMPLOYEES PER BRANCH	-0.002	0.007		0.254
	(0.009)	(<.001)		(<.001)
DEPOSITS PER BRANCH	-0.006	-0.005	0.138	
	(<.001)	(0.001)	(<.001)	
ROA	0.049	-0.329	0.019	0.052
	(<.001)	(<.001)	(0.141)	(<.001)
NONPERFORMING RATIO	0.018	0.007	0.004	0.016
	(<.001)	(0.001)	(0.520)	(0.004)
MKT DEPOSIT FEE RATIO		0.071	-0.042	-0.932
		(0.007)	(0.617)	(0.105)
MKT NON INT EXP RATIO	0.021		0.003	-0.118
	(<.001)		(0.914)	(<.001)
MKT EMPLOYEES PER BRANCH	-0.809	-0.002		-0.029
	(<.001)	(0.399)		(0.013)
MKT DEPOSITS PER BRANCH	-0.001	0.001	-0.001	
	(0.059)	(0.014)	(<.001)	
MKT ROA	-0.001	0.083	-0.106	0.186
	(0.881)	(<.001)	(0.009)	(0.001)
MKT NONPERFORMING RATIO	-0.003	0.024	-0.038	0.121
	(0.243)	(<.001)	(0.042)	(<.001)
R-squared	0.187	0.255	0.160	0.331

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