# The Competitive Implications of Multimarket Bank Branching

by

Timothy H. Hannan and Robin A. Prager

Board of Governors of the Federal Reserve System
Washington, DC 20551

October 30, 2001

The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Board of Governors or its staff. The authors thank Bob Adams, Dean Amel, Ron Borzekowski, Ken Brevoort, Erik Heitfield, Beth Kiser, Myron Kwast and Steve Pilloff for valuable comments and suggestions. Onka Tenkean provided excellent research assistance.

Abstract

Regulators and research economists typically view retail banking markets as locally limited, spanning an area that can often be approximated by a metropolitan area or rural county. Banks are assumed to set retail prices based on the conditions of supply and demand prevailing within these local market areas. Over the years, a very large number of studies has found evidence consistent with this presumption. However, recent studies have found evidence that large multimarket banking organizations tend to offer uniform interest rates for retail deposit accounts of a particular type throughout the area that they serve, at least within a given state. This uniform pricing phenomenon raises questions about the continued relevance of the concept of local banking markets for both research and antitrust purposes.

We address this issue by developing a model to determine the effects of the presence of multimarket banks in a local geographic market on the deposit interest rates offered by single-market banks serving that same local market. Empirical analysis based on this model yields two key findings. First, deposit interest rates offered by single-market banks tend to be lower in local markets in which multimarket banks account for a greater share of market deposits. Second, even with multimarket banks present in the market, local market concentration influences the pricing behavior of single-market banks; however, the relationship between local concentration and the deposit interest rates offered by single-market banks weakens as the market share of multimarket banks grows.

## I. Introduction

As currently practiced, regulatory analyses of competition among banks rest on the presumption that markets for at least some of the products of banking organizations are local in nature. Over the years, a very large number of studies has found evidence consistent with this presumption. Numerous studies have reported evidence of higher loan rates or lower retail deposit rates, all else equal, in local areas characterized by high levels of market concentration; and surveys of consumers and small businesses have reported consistently that depositors and small businesses typically obtain basic financial services from institutions located a short distance from their home or business.[1]

However, much has changed in the banking industry in recent years. Perhaps most importantly, deregulation has removed many of the previously existing geographic constraints on banking organizations, allowing banks to establish branches across numerous local areas within states and even across state lines and throughout the country. Thus, increasingly, large banking organizations are spreading out over a larger number of the areas typically defined as local banking markets in regulatory analyses, obtaining smaller and smaller proportions of their deposit base from any one of them.

Arguably, this phenomenon would not affect the logic of current regulatory analyses if these multimarket banks offered or charged different rates in different geographic areas,

[1]For studies employing small business commercial loan rates, see Hannan (1991) and Cyrnak and Hannan (1999). For examples of studies employing retail deposit rates, see Berger and Hannan (1989) and Calem and Carlino (1991). Data from the Federal Reserve Board's Survey of Consumer Finances and Survey of Small Business Finances indicate that households and small businesses, respectively, obtain many of their financial services predominantly from local providers. See Kwast, Starr-McCluer, and Wolken (1997) for a full discussion of the results of both of these surveys.

depending on local conditions. Under such circumstances, the structure of a properly defined local market, as might be measured by an index of concentration, could be as relevant to the competitive behavior of banks in that market as it would be if all banks operated only in a single market. There is, however, substantial evidence that, at least in the case of deposit interest rates, many banks offer the same rate for a given type of account in all of the local areas in which they operate. This uniform pricing phenomenon raises questions about the continued relevance of the concept of local banking markets for both research and antitrust purposes.

We believe that these questions can best be addressed by focusing on the pricing behavior of banks that operate in only one local area (which we will refer to as "single-market banks"), taking into account the competitive impact of multimarket banks operating in the same local area.[2] To this end, we develop a model that explains the pricing behavior of single-market banks. Our model yields predictions concerning the role of (1) local market structure, (2) the degree to which multimarket banks operate in the market, and (3) the interaction of market structure and multimarket presence in determining the deposit rates offered by single-market banks. Empirical analyses based on this model yield two fundamental findings. First, deposit rates offered by single-market banks tend to be *lower* in local markets in which multimarket banks account for a greater share of market deposits. Second, even with multimarket banks

[2]The alternative of focusing on the pricing behavior of multimarket banks would present greater empirical problems. Assuming that banking markets are indeed local, multimarket banks offering uniform prices across all of the local markets they serve would presumably establish prices that reflect a weighted average of the market conditions in those markets. Thus, an examination of the determinants of the prices offered by multimarket banks would require that we construct weighted average measures of local market conditions. Tests of any hypotheses concerning the relationships between local market conditions and bank prices would then be joint tests of the hypotheses we are interested in and the hypothesis that we have chosen the correct weights for each local market. In this case, failure to find support for a hypothesis of interest could simply indicate that we have chosen inappropriate weights.

present in the market, local market concentration influences the pricing behavior of single-market banks; however, the relationship between local concentration and the deposit interest rates offered by single-market banks weakens as the market share of multimarket banks grows. Our results suggest that local market structure still matters in explaining the pricing behavior of most single-market banks, but that as multimarket banks come to dominate in more local areas, we can expect that the structure of individual local markets will become less relevant in explaining the behavior of single-market banks operating in those markets.

The remainder of the paper is organized as follows: Section II summarizes the existing evidence with regard to the pricing behavior of multimarket banking organizations. In section III we derive a model for determining the deposit interest rates offered by single-market banks facing competition from both other single-market banks and multimarket banks. Section IV describes our empirical specification and the data employed in our analysis, and Section V presents our results. Section VI summarizes our findings and presents conclusions and policy implications.

## II. Uniform Pricing by Multimarket Banks

Several recent studies investigate the pricing behavior of multimarket banking organizations. Using survey data on deposit interest rates collected by Bank Rate Monitor in various Metropolitan Statistical Areas (MSAs) around the country, Radecki (1998) finds strong evidence of uniform pricing across local markets within a state. In New York state, for example, Radecki reports that Key Bank and Chase Manhattan Bank posted uniform rates for various account types in the five local markets for which data were available: Buffalo, Rochester, Syracuse, Albany, and New York City. The rates offered by Marine Midland Bank and Fleet

Bank were uniform across Buffalo, Rochester, Syracuse, and Albany, but differed between these areas and New York City. In the case of Fleet, this difference reflects the chartering of two different banks, one for New York City and the other for upstate New York. Similar analyses for other large states containing a number of MSAs surveyed by Bank Rate Monitor – Michigan, Texas, California, Pennsylvania, and Florida – also produced strong evidence of uniform pricing across different local markets.[3] Radecki interprets this uniform pricing behavior as evidence that banking markets are not locally limited.

Heitfield (1999), in a reexamination of the Bank Rate Monitor data, confirms Radecki's finding that larger banks often set uniform rates across cities. He notes, however, that this finding does not imply expanded geographic markets, since deposit interest rates offered by banks whose operations are limited to a single metropolitan area are found to vary substantially from one city to another.

Biehl (2000) also uses Bank Rate Monitor data to examine more closely some of the implications of the uniform pricing phenomenon. Using deposit rates offered by single-market banks and multimarket banks operating in five metropolitan areas within New York state, he finds that (1) multimarket banks offer lower deposit rates, on average, than do single-market banks; (2) single-market banks offer rates that are highly correlated with those offered by other single-market banks in the same city; and (3) multimarket banks offer rates that are not correlated with those offered by other banks (either multimarket or single-market) in the same city. His findings suggest that deposit rates offered by single-market banks reflect local market conditions, while those offered by multimarket banks do not.

---

[3]Radecki notes, however, that because of product differentiation, rates do not converge across competitors in the same market.

While the Bank Rate Monitor surveys relate only to large urban areas, the phenomenon of banks pricing uniformly across areas typically considered local markets appears to apply also to more rural areas.  Thus, in their survey of bank rates in Idaho and Montana, Tokle and Tokle (2000) observe that “When conducting the survey, it was noticed that often these chain banks paid the same interest rates on savings deposits and on one- and two-year CDs for all of their branches throughout the state” (p.436).

## III. The Model

For the purpose of this paper, we accept as true the phenomenon of uniform pricing on the part of multimarket banks across local geographic areas.  Given this presumption, we borrow heavily from a model developed by Barros (1999) and derive implications concerning the relationship between the presence of multimarket banks in a local geographic market and the deposit rates offered by banks operating solely in that market (single-market banks).  The feature of the Barros model that we find particularly attractive is that it explicitly addresses the issue of spatial competition among banks (focusing on the location of their branches) while also allowing for the possibility of collusive behavior.

### *A.  Model Derivation*

As with many spatial models, a local market is represented by a one-dimensional characteristics space (circle) of length one.  Geographic location is one important element in the definition of the characteristics space, but not necessarily the only one.  Other characteristics, such as range of services offered and personalization of service, interact in some unspecified way with geographic location to determine the location of each branch in characteristics space. Bank customers are located continuously, with a uniform distribution of density *.  Each customer deposits one unit of money, which has no alternative application. These assumptions, which imply a perfectly inelastic supply of deposits to the market as a whole, are restrictive; thus, our results, at best, will apply only to the range of deposit interest rates that are not so low that depositors opt to forego bank deposits.

Let *B* denote the set of branches in a market and $B_i$ denote the subset of those branches operated by bank *i*, which is assumed to operate only in this one market. Suppose that there are a total of *n* branches in *B*, of which $n_i<n$ are in $B_i$. Branches are not restricted to be symmetrically distributed along the circle. Depositors choose the branch that offers the highest deposit rate, net of transportation costs, where transportation costs are assumed to be linear in distance to the branch. Consider branch *m*, operated by bank *i*, which has neighboring branches designated as *m*+ and *m*-. The distances between branch *m* and its neighboring branches are $d_{m+}$ and $d_{m-}$, respectively. A customer located between branches *m* and *m*+, at a distance *x* from branch *m*, will be indifferent between depositing his or her unit of money at branch *m* and depositing it at branch *m*+ if $r_m - tx = r_{m+} - t(d_{m+} - x)$, where $r_k$ denotes the deposit rate offered at branch *k*, and *t* denotes the transport cost in the market. Likewise, a customer located between *m* and *m*-, at a distance *y* from *m*, will be indifferent between branch *m* and branch *m*- if $r_m - ty = r_{m-} - t(d_{m-} - y)$. The supply of deposits to branch *m* of bank *i*, $D_{mi}$, can be written as

$$D_{mi} = d(x+y) = d\left[\frac{d_{m+} + d_{m-}}{2} - \frac{r_{m+} + r_{m-} - 2r_m}{2t}\right]. \tag{1}$$

Note that the supply of deposits to a branch increases with the density of depositors in the market, the average distance to neighboring branches, and the deposit rate offered at the branch, while it declines with the deposit rates offered at neighboring branches. Increased transportation costs reduce the impact of any differential between the rates offered at a given branch and those offered at neighboring branches.

Let $\bar{r}_i$ denote the interest rate obtained by bank *i* from investing the funds, adjusted for the existence of reserve requirements and net of the real resource cost of maintaining and servicing the deposits and investing the funds. Summing over its $n_i$ branches, the expected profits of bank *i* may be represented as

$$\begin{aligned} E(\Pi_i) &= E\left[D_i(\bar{r}_i - r_i)\right] = E\left[\sum_{m\in B_i} D_{mi}(\bar{r}_i - r_i)\right] \\ &= \sum_{m\in B_i} d\left[d_m - \frac{E(r_{m+}) + E(r_{m-})}{2t} + \frac{r_i}{t}\right](\bar{r}_i - r_i), \end{aligned} \tag{2}$$

where $d_m = E(d_{m+} + d_{m-})/2$, the expected average distance from branch *m* to its neighboring branches. Note that because a branch's location in characteristics space depends on more than just its geographic location, bank *i* is uncertain about the locations, and even the identities, of its neighboring branches.

Banks are assumed to be risk neutral, and the linearity of deposit supply implies that uncertainty about the identity of neighbors is reflected only in the expected interest rate of neighbors. Barros assumes that the likelihood that a neighboring branch will belong to a given bank is simply that bank's share of the *n-1* other branches in the market. Thus,

$$E(r_{m+}) = E(r_{m-}) = \sum_{j\neq i}\left(\frac{n_j}{n-1}\right)r_j + \left(\frac{n_i - 1}{n-1}\right)r_i. \tag{3}$$

To allow for different degrees of collusive behavior among banks, the objective function of bank *i* may be written as

$$V_i = E(\Pi_i) + \sum_{j \neq i} l_{ij} E(\Pi_j) = (\bar{r}_i - r_i) E(D_i) + \sum_{j \neq i} l_{ij} (\bar{r}_j - r_j) E(D_j), \quad (4)$$

with $D_i = \sum_{m \in B_i} D_{mi}$ , and $D_j = \sum_{m \in B_j} D_{mj}$ , where the parameter $8_{ij}$ reflects the extent of bank *i*'s internalization of the effect of its price changes on the profits of others. The value of $8_{ij}$ = $8_{ji}$ = 1 implies perfect collusion between banks *i* and *j*, while values of $8_{ij}$ = $8_{ji}$ = 0 imply Nash-Bertrand behavior.

The optimal choice of deposit rates is determined by the first-order condition associated with the bank *i*'s objective function, or

$$\frac{\P V_i}{\P r_i} = -E(D_i) + (\bar{r}_i - r_i) \frac{\P E(D_i)}{\P r_i} + \sum_{j \neq i} l_{ij} (\bar{r}_j - r_j) \frac{\P E(D_j)}{\P r_i} = 0, \quad (5)$$

where,

$$E(D_i) = \sum_{m \in B_i} dd_m - n_i \frac{d}{t} \sum_{j \neq i} \left( \frac{n_j}{n-1} r_j \right) + \left( \frac{d}{t} \frac{n - n_i}{n-1} n_i \right) r_i \quad (6)$$

$$\frac{\P E(D_i)}{\P r_i} = \frac{d}{t} \frac{n - n_i}{n-1} n_i \quad (7)$$

$$and \quad \frac{\partial E(D_j)}{\partial r_i} = -\frac{n_j}{n-1}\frac{d}{t}n_i . \tag{8}$$

Substituting (6), (7), and (8) into (5), imposing a number of simplifying assumptions to be discussed below, and solving for $r_i$ yields

$$\begin{aligned} r_i^{sm} = & -\frac{td(n-1)}{2(n-n_i)} + \frac{1}{2}(1+l^{sm})\sum_{\substack{j\neq i \\ j\in sm}} \frac{n_j}{n-n_i} r_j^{sm} + \frac{1}{2} r^{mm} \sum_{\substack{j\neq i \\ j\in mm}} \frac{n_j}{n-n_i} \\ & + \frac{1}{2}\bar{r}_i - \frac{1}{2} l^{sm} \bar{r}_{sm} \sum_{\substack{j\neq i \\ j\in sm}} \frac{n_j}{n-n_i}, \end{aligned} \tag{9}$$

where *sm* and *mm* denote the set of single-market and multimarket banks in the market, respectively, and the average distance from a branch to it neighbors, $d_i = \sum_{m\in B_i} d_m / n_i$ in the case of bank *i*, is assumed to be the same ($d$) for all banks in the market. We also assume that the collusion parameter *vis a vis* other single-market banks, $l^{sm}$, is the same for all single-market banks and that the parameter relevant to multimarket banks, $l^{mm}$, is equal to zero. This latter assumption is made in part for simplicity, but it is also quite plausible, since single-market banks may have little reason to fear a price response from multimarket banks that charge the same rates in all markets and have only a small proportion of their deposit base in the market. Equation (9) also reflects the simplifying assumptions of equal net return to invested funds among single-market banks, $\bar{r}_{sm}$, and the same rate offered by all multimarket banks in the market, $r^{mm}$.

Equation (9) expresses the rate offered by single-market bank *i* as a function of a weighted average of the rates offered by the other single-market banks in the market, and, among other things, the share of branches (other than bank *i's* branches) in the market owned collectively by multimarket banks ( $\sum_{\substack{j \neq i \\ j \in mm}} \frac{n_j}{n - n_i}$ ) and the share owned by single-market banks, ( $\sum_{\substack{j \neq i \\ j \in sm}} \frac{n_j}{n - n_i}$ ). In what follows, we denote these shares as $S_i^{mm}$ and $S_i^{sm}$, respectively, with $S_i^{mm} + S_i^{sm} = 1$.

To obtain a simple closed-form solution that allows us to assess the comparative static properties of the model, we will examine specifically the case in which all single-market banks have the same number of branches and the deposit interest rate offered by multimarket banks is exogenously determined.[4] Solving the system of first-order conditions in (9) for this case yields:

$$r^{sm} = \frac{-\dfrac{td(n-1)}{n-n^{sm}} + r^{mm}S^{mm} + \bar{r}_{sm}[1 - l(1 - S^{mm})]}{S^{mm} + [1 - l(1 - S^{mm})]} \tag{10}$$

where $r^{sm}$ denotes the common single-market rate and where, for simplicity, we represent $l^{sm}$

---

[4]We discuss the effects of relaxing the assumption of exogenously determined multimarket bank deposit rates below.

as simply $l$ and drop the subscript $i$ from $S_i^{mm}$ (since it is the same for all single-market banks in the market).

***B. Comparative Statics***

Equation (10) yields a number of testable implications concerning the relationship between the deposit rates of single-market banks and various bank and market characteristics. Consider the first term in the numerator, which captures the spatial aspects of competition among banks. Since the denominator is positive, it can easily be seen that increases in the average distance between branches, $d$, and increases in transport costs, $t$, result in lower deposit rates. This results because, with these changes, switching to a neighboring branch becomes less attractive to the depositor, allowing banks to offer less attractive deposit rates. Note also from (10) that the expression $\frac{n-1}{n-n^{sm}}$ is negatively related to the single-market bank's deposit interest rate. It follows that, given the total number of branches in the market, $n$, deposit rates decline with the number of branches owned by the individual single-market bank, $n^{sm}$. This results because, with such a change, it becomes more likely that depositors will find themselves located between two branches owned by the same bank, allowing the bank to exploit this fact by lowering deposit rates. Note also that in the limit, as $n^{sm}$ approaches $n$, the predicted deposit rate approaches -4. This results because deposit supply under the model is perfectly inelastic.[5] This highlights the fact that (10) applies only to the range of deposit rates that are high enough to induce depositors to hold bank accounts.

The implied relationships between the single-market deposit rate and the branch share of

---

[5]Note from (1) that deposit supply at the branch is unaffected if the rates offered at the branch and at the neighboring branches change by the same amount.

multimarket banks, $S^{mm}$, and between the single-market deposit rate and the "collusion parameter," $\lambda$, are more subtle, but also more policy-relevant. Consider first the relationship between the rate offered by single-market banks and the collusion parameter.

The impact of a change in the collusion parameter, $\lambda$, on $r^{sm}$ may be shown to be

$$\frac{\partial r^{sm}}{\partial \lambda} = -(\bar{r}_{sm} - r^{sm})(1 - S^{mm})\left[S^{mm} + 1 - \lambda(1 - S^{mm})\right]^{-1}. \tag{11}$$

The expression on the right hand side of (11) will be negative as long as the net interest margin, $\bar{r}_{sm} - r^{sm}$, is positive, implying that greater levels of collusion result in lower deposit rates. If the level of recognized interdependence, and therefore collusion, is influenced by market structure, then (11) is simply a formalization of the common prediction of a negative relationship between deposit rates and market concentration.

Next, consider the relationship between the single-market deposit rate and the branch share of multimarket banks, $S^{mm}$. Differentiation of (10) with respect to $S^{mm}$ yields

$$\frac{\partial r^{sm}}{\partial S^{mm}} = \left[(r^{mm} - r^{sm}) + \lambda(\bar{r}_{sm} - r^{sm})\right]\left[S^{mm} + 1 - \lambda(1 - S^{mm})\right]^{-1}. \tag{12}$$

If we presume for a moment that conduct is Nash-Bertrand ($\lambda$=0), then it would follow that the sign of (12) would depend solely on the sign of $(r^{mm} - r^{sm})$. A lower rate for multimarket banks than for single-market banks would lead to a negative relationship between $S^{mm}$ and $r^{sm}$, while a higher rate for multimarket banks than for single-market banks would yield a positive relationship between $S^{mm}$ and $r^{sm}$. This result reflects the fact that, with multimarket banks offering lower rates than single-market banks, an increase in $S^{mm}$ implies an increase in the likelihood that a single-market bank branch's neighbors are multimarket bank branches, and hence a reduction in the expected rate offered by those neighbors. This, in turn, leads to a reduction in the single-market bank's optimal rate. If multimarket banks offer higher rates than single-market banks, the effect is in the opposite direction.

With 8 > 0, the second term in the first bracket is positive, reflecting the fact that as $S^{mm}$ increases, any given level of collusion among single-market banks is less effective in lowering deposit rates, causing $r^{sm}$ to be higher. Thus, with 8 > 0, the sign of (12) will be negative only if $r^{mm}$ is less than $r^{sm}$ by an amount great enough to overcome this effect.

It may be objected that we have treated $r^{mm}$ as exogenous in (12), since the rates of multimarket banks may be affected, at least partially, by conditions in markets that account for even a very small portion of their deposit bases. An examination of the determinants of the deposit rates offered by multimarket banks is beyond the scope of this paper; however, let us suppose that $r^{mm}$ reflects a weighted average of the rates that would be optimal in each market that the multimarket bank serves, plus some term to account for any systematic difference in the rates of single-market and multimarket banks. That is,

$$r^{mm} = r^{sm} p + r^{om}(1-p) + diff\,, \qquad (13)$$

where $p$ is the fraction of the multimarket bank's deposits located in the market in question, $r^{om}$ is the average rate that would be charged in other markets if the multimarket bank operated only there, and *diff* is a term that accounts for any systematic difference in the rates of single-market and multimarket banks not captured by the weighted average. Under this specification, the term $(r^{mm} - r^{sm})$ in (12) would be replaced by $(r^{om} - r^{sm})(1-p) + diff$, indicating that the sign on (12) would depend on whether the rates prevailing in other markets were greater than or less than $r^{sm}$, and the sign and magnitude of any systematic difference in the rates of single-market and multimarket banks (*diff*).

Of particular relevance to policy is the question of how the relationship between $r^{sm}$ and $\lambda$ might be affected by the presence of multimarket firms charging the same rate in all markets in which they operate. Differentiating (11) with respect to $S^{mm}$, substituting from (12), and rearranging terms yields

$$\frac{\partial^2 r^{sm}}{\partial \lambda \, \partial S^{mm}} = \frac{\left\{(r^{mm} - r^{sm}) + (\bar{r}_{sm} - r^{sm})\left[(2 + \lambda - \lambda S^{mm}) / (1 - S^{mm})\right]\right\}(1 - S^{mm})}{\left[S^{mm} + 1 - \lambda(1 - S^{mm})\right]^2} \qquad (14)$$

Since the term in square brackets in the numerator exceeds the value of 2, it follows that (14) is positive unless the multimarket deposit rate falls short of the single-market rate by more than twice the net interest margin of single-market banks, $\bar{r}_{sm} - r^{sm}$. Since this seems unlikely, we expect (14) to be positive under empirically relevant conditions. Employing measures of market concentration as a proxy for *8*, this implies that the negative relationship between market concentration and the deposit rates of single-market banks should become weaker, the more prominent are multimarket banks in the market.

## IV. Empirical Specification and Data

The theoretical model derived above makes several assumptions (such as perfectly inelastic deposit supply and symmetry of single-market banks) that are unlikely to be met in any real-world markets. Nonetheless, we believe that the model captures many of the key variables that are likely to influence the deposit interest rates offered by single-market banks, and that the comparative statics of the model are likely to carry over to more realistic (less restrictive) situations. We therefore estimate a linear equation that incorporates the variables traditionally considered to be determinants of the deposit interest rates offered by banks as well as several additional variables suggested by our theoretical model. Our basic empirical specification is as follows:

$$\begin{aligned} r_i^{sm} = b_0 &+ b_1 CONC + b_2 BANKSIZE_i + b_3 INCOME + b_4 MKTSIZE \\ &+ b_5 RURALDUM + b_6 DISTANCE + b_7 TRANSPORT + b_8 BRANCHVAR_i \\ &+ b_9 MMSHARE_i + b_{10}(MMSHARE_i \times CONC) + e_i . \end{aligned} \tag{15}$$

The dependent variable, $r_i^{sm}$, is the interest rate offered on a particular type of deposit account by single-market bank $i$. The first five right-hand-side variables are the ones traditionally included in studies of the determinants of deposit interest rates. *CONC* is a measure of concentration in the local market; $BANKSIZE_i$ is a measure of the size of bank $i$; *INCOME* and *MKTSIZE* are measures of average income and overall market size, respectively, for the market; and *RURALDUM* is a dummy variable equal to one if the local market is a rural market and zero if it is an MSA. The last five variables are the ones that our theoretical model suggests should be added to the equation. *DISTANCE* is a measure of the average distance between bank branches in the market; *TRANSPORT* is a measure of transportation costs in the market; and $BRANCHVAR_i$ is equal to $\frac{(n-1)}{(n-n_i)}$, where $n$ is the total number of branches in the market and $n_i$ is the number of branches belonging to bank $i$ in the market. These three variables are intended to capture the spatial competition component of our theoretical model. The variables of greatest interest in the context of this paper are the last two, which capture the effects of the presence of multimarket banks on the deposit interest rates offered by single-market banks. $MMSHARE_i$ is the share of the market's branches (excluding the branches of bank $i$) that are operated by firms that are classified as multimarket banks. This variable is allowed to enter the equation both by itself and interacted with the concentration measure, as suggested by the theoretical model.[6]

To assess the robustness of our results over time, we estimate equation (15) using data from two different years – 1996 and 1999. The data were derived from a number of sources, including (i) quarterly Reports of Condition and Income filed by each depository institution; (ii)

[6]Note that we do not include an empirical proxy for $\bar{r}_{sm}$, the net return on invested funds at single-market banks. We have assumed that this is the same across all single-market banks, and is therefore captured in the constant term in our equation. At any rate, we do not have access to any data that would allow us to investigate the impact of any cross-sectional differences in this net return that might actually exist.

the Federal Deposit Insurance Corporation's Summary of Deposits (SOD); (iii) the Office of Thrift Supervision's Branch Office Survey (BOS); and (iv) the Department of Commerce's Regional Accounts Data.

Following the previous literature, we define local banking markets as either Metropolitan Statistical Areas (MSAs or urban markets) or non-MSA counties (rural markets).[7] For purposes of our analysis, we define a single-market bank (thrift) as one that derives at least 90 percent of its deposits from the market being considered, and a multimarket bank (thrift) as one that derives less than 50 percent of its deposits from that market.[8] These definitions are based on the expectation that a bank deriving at least 90 percent of its deposits from a single market will set its deposit interest rates based primarily on conditions prevailing in that particular market, while a bank deriving less than half of its deposits from a particular market will set its deposit interest rates based largely on conditions prevailing in other markets that it serves.

In conducting our analysis, we restrict our sample to commercial banks because thrift institutions may behave differently than commercial banks with regard to setting deposit interest rates. However, we do take into account the branches and deposits held by thrift institutions in determining the values of several of our explanatory variables. Our sample includes 7,700 single-market banks in 1996 and 6,502 single-market banks in 1999.[9] These single-market banks

---

[7]See, for example, Berger and Hannan (1989), Prager and Hannan (1998) and Pilloff and Rhoades (2001).

[8]Institutions deriving at least 50 percent but less than 90 percent of their deposits from the market under consideration are considered neither single-market nor multimarket institutions.

[9]In each year, we excluded from our sample those single-market banks that were monopolists in their local banking markets (65 institutions in 1996 and 45 in 1999) because the variable $BRANCHVAR_i$ is not defined for those observations.

operated in 1,925 different local banking markets in 1996 (288 urban markets and 1,637 rural markets) and 1,806 local markets in 1999 (294 urban markets and 1,512 rural markets).

Deposit interest rate measures were constructed for three types of deposit accounts – NOW accounts, money market deposit accounts (MMDAs) and savings accounts. The method employed to construct these measures from quarterly data on interest expenses and deposit balances (taken from Reports of Condition and Income) is described in detail in the appendix. Note that the data were carefully screened to eliminate implausible interest rate values.

Information about the locations of branches and the deposits held by each depository institution in each local market were obtained from the SOD (for commercial banks) and the BOS (for thrifts).[10] This information was used to determine the share of each institution's deposits held in each market, thereby enabling us to classify each bank (thrift) in our sample as a single-market bank (thrift), multimarket bank (thrift), or neither, and to determine the share of market branches held by institutions classified as multimarket banks or thrifts. Conforming with our theoretical model, the branch share of multimarket banks ($MMSHARE_i$) employed is the share of branches of all banks and thrifts, other than the observed bank, that are owned collectively by multimarket institutions in the market being considered.[11]

Branch level deposit data were also used to construct measures of local market concentration for each banking market. We employ a deposit-based Herfindahl-Hirschmann Index (HHI) for commercial banks (excluding the deposits held at thrift institutions) as our

---

[10]Throughout this paper, the terms "branches" or "branch offices" should be interpreted to include head offices.

[11]For notational simplicity, the subscript "i" hereafter will be dropped from the variable name.

concentration measure.[12] Note that concentration is included in our estimating equation both as one of the traditional determinants of deposit interest rates and as a proxy for 8, the collusion parameter. Because of the dual role that concentration plays in this equation, it is not clear, *a priori*, whether we should use a concentration measure based on the market shares of all banks or one that excludes the shares of multimarket banks. We report results using both approaches. As it turns out, this choice does not affect any of our conclusions.

Bank size is measured as the natural logarithm of total bank deposits. Our income measure is per capita income for the market, as determined from the Department of Commerce's Regional Accounts Data. The natural logarithm of market population is used as a measure of market size. As a rough proxy for the average distance between branches, we employ the ratio of total market area (in square miles, obtained from the Bureau of the Census) to the number of bank and thrift branches in the market. Lacking a reasonable measure of transportation cost per unit of distance for each market, we employ population density (population per square mile) as a crude proxy for average transportation cost, based on the notion that it is more difficult to travel a given distance in more densely populated areas than in less densely populated areas.

Summary statistics for all variables included in our analysis are reported in table 1. Note that the average share of banking offices operated by multimarket banking organizations increased from approximately 40 percent in 1996 to approximately 49 percent in 1999, representing a fairly substantial increase in the importance of multimarket banking over a relatively short time period.

---

[12] Alternative concentration measures, such as HHIs that include thrift institutions with 50% or 100% weights and three-firm concentration ratios weighting thrifts at 0%, 50% and 100% were tried as well. Results were not substantially affected by the choice of concentration measure.

## V. Results

We begin by comparing the deposit interest rates offered by single-market banks in our sample with those offered by multimarket banks serving the same local markets. For each market that is home to at least one single-market bank and one multimarket bank, we compute the average deposit interest rate offered by each type of bank on each type of account, as well as the difference between the average single-market rate and the average multimarket rate in that market. The means and medians of these measures, across all markets, are presented in table 2. Our data show that, on average, deposit interest rates offered by multimarket banks are lower than those offered by single-market banks in both 1996 and 1999, except for the case of MMDA accounts in 1996. The mean differences are significantly different from zero at the 0.05 level in every case.

We test the implications of our model of the determination of deposit interest rates offered by single-market banks by estimating equation (15), using OLS with robust standard errors. This approach produces standard error estimates that allow for the possibility that errors are correlated across banks that operate in the same local market. The results of our estimation for NOW accounts, MMDA accounts and savings accounts are presented in tables 3, 4 and 5, respectively. Each table consists of two panels. The left panel contains results for 1996 and the right panel contains results for 1999. Each panel includes three specifications. The first specification (columns 1 and 4) employs a concentration measure that includes all commercial banks, while the second specification (columns 2 and 5) employs a concentration measure that excludes multimarket banks. The third specification (columns 3 and 6) includes only those variables that are traditionally included in studies of the determinants of deposit interest rates, and is presented for purposes of comparison.

Our comparative static analysis (see section III B, above), leads to the expectation of a negative relationship between local market concentration (a proxy for the collusion parameter) and deposit interest rates. Such a relationship has often been found in previous literature, although some studies suggest that the relationship has weakened or disappeared in recent years.[13] We find a strong negative relationship between concentration and deposit interest rates for each of the two concentration measures employed, for NOW accounts and MMDA accounts in 1996 and for all three account types in 1999. In each case, the inclusion of variables reflecting spatial aspects of competition and the importance of multimarket banks, as suggested by our model, leads to an increase the absolute value of the coefficient on the concentration variable.

The relationship between the share of market branches operated by multimarket banks and the deposit interest rates offered by single-market banks is negative in every case. The estimated coefficient on *MMSHARE* is significantly different from zero at the 0.10 level in eleven of the twelve equations in which it appears, and is significant at the 0.01 level in six cases. This is consistent with the prediction of our model for situations where deposit interest rates offered by multimarket banks are lower than those offered by single-market banks by a sufficiently large margin. Also consistent with our model's prediction, given reasonable values of $r^{sm}$ and $r^{mm}$, we find that the coefficient on the interaction term between concentration and the multimarket bank share is positive and significantly different from zero at the 0.10 level in nine out of twelve cases. Both of these effects are weaker for savings accounts than for NOW or MMDA accounts.

---

[13]See, for example, Radecki (1998).

These results provide strong evidence that multimarket banks influence the deposit interest rates offered by single-market banks with which they compete.[14] An increase in the value of *MMSHARE* by 0.1 (corresponding to a 10 point increase in the percentage of branches, other than bank *i*'s branches, that are operated by multimarket banks) is associated with a 3.7 to 4.7 basis point decline in NOW account interest rates, a 1.8 to 2.8 basis point decline in MMDA interest rates, and a 1.5 to 2.5 basis point decline in savings account interest rates. Our results also indicate that, while local market concentration continues to be an important determinant of deposit interest rates offered by single-market banks, its importance diminishes as the share of branches operated by multimarket banks increases. For NOW accounts, a 0.1 point increase in *MMSHARE* is associated with an 11% to 19% decrease in the absolute value of the coefficient on the concentration measure. For MMDA accounts and savings accounts, the magnitudes of the decreases are 9% to 14% and 5% to 15%, respectively.

Another way to assess the quantitative importance of competition from multimarket banks in influencing the relationship between concentration and deposit interest rates offered by single-market banks is to consider the case where *MMSHARE* = 0. The coefficients of *CONC*

---

[14]We have considered the possibility of reverse causality in explaining this result. That is, multimarket banks might disproportionately enter local markets that exhibit lower deposit rates, in anticipation of higher profits. Such a relationship might be expected if entry into new markets were *de novo*, but multitmarket banks almost always expand into new geographic markets through acquisition. Lower deposit rates in a market should be capitalized into the purchase price of a branch, thus reducing the likelihood of a causal relationship running from deposit rates to multitmarket share.

Nonetheless, given that the average level of MMSHARE increased substantially between 1996 and 1999, we tested for evidence of this process by regressing the change in MMSHARE between 1996 and 1999 on average market deposit rates in 1996, controlling for the level of MMSHARE in 1996. Coefficients of the three deposit rates (NOW, MMDA, and savings) were far from statistically significant and were mixed in sign. Thus, we find no evidence of reverse causality, at least for the period 1996-1999.

(all banks) in columns (1) and (4) are estimates of the impact of concentration on the deposit interest rates offered by single-market banks in this hypothetical situation. As can be seen by comparing the coefficient of this variable in column (1) with that in column (3), and the coefficient in column (4) with that in column (6), the impact of concentration on observed deposit interest rates would have been substantially greater, were it not for the phenomenon of multimarket banks charging uniform prices across markets. Indeed, our results suggest that, in the absence of multimarket banks charging uniform rates across markets, the effect of concentration on deposit interest rates would, in some cases, have been more than twice as large (in absolute value) as that actually observed.

The estimated coefficients on the variables intended to capture the spatial aspects of competition among banks (*DISTANCE*, *TRANSPORT* and *BRANCHVAR*) vary in sign and significance across account types. The coefficient on *DISTANCE* (expected to be negative) is negative and statistically significant in the NOW account equations, but insignificant and generally positive in the MMDA and savings account equations. The coefficient on *TRANSPORT* is negative (as expected) for both NOW accounts and MMDA accounts, with varying levels of significance, but positive and significant at the 0.05 level for savings accounts. The coefficient on *BRANCHVAR* is negative, as predicted, in nine out of twelve equations, but significantly different from zero at the 0.10 level in only four cases.

## VI. Summary and Conclusion

In this paper we develop and empirically test a model for the determination of deposit interest rates offered by single-market banks that face competition in their local markets from multimarket banking organizations that charge the same deposit rates in all of the local areas in which they operate. Our model predicts that, under certain circumstances, the presence of multimarket banks in a local banking market will affect both the level of deposit interest rates offered by single-market institutions operating in that market and the sensitivity of those rates to measures of local market concentration. Our empirical results are consistent with these predictions.

Our first basic finding – that the deposit interest rates offered by single-market banks are lower, the greater the market share of multimarket banks – is consistent with the hypothesis that multimarket banks tend to offer lower rates than do single-market banks and that this allows single-market banks to offer lower rates in markets in which multimarket banks have a significant presence. Consistent with this interpretation, our data indicate that, *within a given market*, multimarket banks do tend to offer lower deposit interest rates than do single-market banks.

These findings lead us to speculate about possible reasons for the lower rates offered by multimarket banks and their implications for social welfare. One hypothesis is that multimarket banks offer more and better services to the retail customer and that these services more than compensate for the slightly lower deposit rates offered. This hypothesis requires an explanation as to why single-market banks would actually lower deposit rates in response to competition from multimarket banks offering a more attractive combination of rates and services. It would seem to require that either single-market banks systematically underestimate the desirability of higher quality services to the retail customer in markets where multimarket banks have little or no presence, or that a change in consumer tastes occurs once the superior services of multimarket banks are observed.

A second hypothesis is that multimarket banks meet each other in many different markets and therefore find it in their interest to compete less vigorously with each other (the “mutual forbearance” argument).[15] A third hypothesis is that multimarket banks are less efficient than single-market banks, perhaps because of diseconomies of scope or scale. Either of these latter two explanations would imply a reduction in social welfare attributable to multimarket banking. A fourth possibility is that multimarket banks do not compete aggressively for retail deposits because they have greater access to low-cost wholesale funds than do single-market banks. In this case, multimarket banking might lead to a reduction in the welfare of retail depositors but an improvement in overall social welfare, as large multimarket banking organizations find that they can fund their investments more efficiently through alternative sources of funds. Investigating the various possible explanations for the observed differences between deposit interest rates offered by single-market banks and multimarket banks serving the same local areas, along with their welfare implications, would seem to be a fruitful avenue for future research.

Our second basic finding – that the relationship between local market concentration and the deposit rates of single-market banks exists, but attenuates as the share of multimarket banks grows – leads us to conclude that local market structure can still be quite relevant to the competitive behavior of market participants, even in the presence of multimarket banks charging uniform prices across many markets. Thus, we do not agree with the argument that the observed phenomenon of banks charging uniform prices across different metropolitan areas implies that the markets used in regulatory analyses should be extended to at least the statewide level. We do find, however, that the relationship between a local market’s structure and the deposit rates offered by single-market banks operating in that market is substantially weaker than it would be

[15] See Bernheim and Whinston (1990) for a thorough treatment of the theory of mutual forbearance.

if the phenomenon of multimarket banks charging uniform prices across markets were not a factor. As the average share of branches in local areas operated by multimarket banks increases over time, we can expect an even greater attenuation in the strength of this relationship.

## Appendix–Construction of Interest Rate Measures

We used data obtained from quarterly Reports of Condition and Income to construct deposit interest rate measures for three types of accounts – NOW accounts, MMDA accounts and savings accounts. We first constructed quarterly interest rates for each type of account by dividing the quarterly expenses associated with that type of account by the average of the current quarter's and previous quarter's end-of-quarter account balances. Prior to doing these calculations, we screened the expense and balance data to eliminate implausible values. The screening process involved the following steps: (1) We eliminated any observations for which the account expenses were negative or the end-of-quarter account balances were less than or equal to zero. (2) We eliminated any observations where the reported expenses for the quarter were less than 25 percent or more than 400 percent of the previous quarter's value.

The annual interest rate was then calculated for each year as the annualized geometric mean of the quarterly interest rates. Observations in the top percentile and bottom percentile were dropped.

Table 1

Summary Statistics

| Variable | 1996 # of obs. | 1996 Mean | 1996 Std. dev. | 1999 # of obs. | 1999 Mean | 1999 Std. dev. |
|---|---|---|---|---|---|---|
| NOW account rate (%) | 6793 | 2.4242 | 0.6052 | 5606 | 2.2274 | 0.7087 |
| MMDA rate (%) | 6437 | 3.3351 | 0.6387 | 5392 | 3.3861 | 0.7146 |
| Savings account rate (%) | 6682 | 2.9346 | 0.6039 | 5579 | 2.7178 | 0.6651 |
| HHI (all banks) | 7700 | 0.2349 | 0.1311 | 6502 | 0.2256 | 0.1283 |
| HHI (excluding multimkt. banks) | 7700 | 0.3080 | 0.2204 | 6502 | 0.3357 | 0.2333 |
| Bank deposits ($1000) | 7700 | 119,305 | 606,383 | 6502 | 135,453 | 795,645 |
| Per capita income ($1000) | 7700 | 21.990 | 4.9460 | 6502 | 24.269 | 5.6853 |
| Population (1000) | 7700 | 1,034 | 2,047 | 6502 | 1,092 | 2,086 |
| Rural market dummy | 7700 | 0.5442 | 0.4981 | 6502 | 0.5306 | 0.4991 |
| Distance (sq. miles/branch) | 7700 | 73.028 | 146.25 | 6471 | 67.725 | 139.93 |
| Population density (1000/sq. mile) | 7700 | 0.3483 | 0.8218 | 6471 | 0.3638 | 0.8547 |
| Branch variable | 7700 | 1.0691 | 0.1943 | 6502 | 1.0658 | 0.1826 |
| Multimarket share | 7700 | 0.3961 | 0.2551 | 6502 | 0.4891 | 0.2541 |

Table 2

Comparison of Interest Rates Offered
by Single-Market and Multimarket Banks

| | 1996 | | | 1999 | | |
|---|---|---|---|---|---|---|
| | NOW | MMDA | SAVINGS | NOW | MMDA | SAVINGS |
| Single-market rate | | | | | | |
| Mean (%) | 2.51 | 3.32 | 2.95 | 2.31 | 3.31 | 2.76 |
| Median (%) | 2.48 | 3.24 | 2.91 | 2.31 | 3.27 | 2.72 |
| Multimarket rate | | | | | | |
| Mean (%) | 2.32 | 3.37 | 2.78 | 2.16 | 3.26 | 2.41 |
| Median (%) | 2.30 | 3.32 | 2.73 | 2.15 | 3.27 | 2.39 |
| Difference between single-market and multimarket rates | | | | | | |
| Mean (percentage pts.) | 0.19 | -0.04 | 0.17 | 0.14 | 0.05 | 0.35 |
| Median (percentage pts.) | 0.17 | -0.06 | 0.14 | 0.13 | 0.02 | 0.32 |

Table 3
Regression Results for NOW Accounts

| Variable | 1996 (1) | 1996 (2) | 1996 (3) | 1999 (4) | 1999 (5) | 1999 (6) |
|---|---|---|---|---|---|---|
| INTERCEPT | 4.1627*** | 4.2065*** | 3.5455*** | 3.7493*** | 3.7238*** | 3.5099*** |
| | (17.76) | (18.32) | (21.39) | (19.64) | (19.46) | (17.33) |
| CONC (all banks) | -0.4407*** | -------- | -0.2003** | -0.4793** | -------- | -0.2288** |
| | (-2.69) | -------- | (-2.20) | (-2.29) | -------- | (-2.13) |
| CONC (excluding multimkt. banks) | -------- | -0.4000*** | -------- | -------- | -0.4388** | -------- |
| | -------- | (-2.99) | -------- | -------- | (-2.50) | -------- |
| BANKSIZE | -0.0302*** | -0.0312*** | -0.0360*** | -0.0354** | -0.0347** | -0.0393*** |
| | (-3.01) | (-3.17) | (-3.58) | (-2.43) | (-2.41) | (-2.76) |
| INCOME | -0.0169*** | -0.1700*** | -0.0165*** | -0.0209*** | -0.0210*** | -0.0192*** |
| | (-4.27) | (-4.21) | (-4.27) | (-5.19) | (-5.09) | (-4.75) |
| MKTSIZE | -0.0657*** | -0.0668*** | -0.0650*** | -0.0674*** | -0.0700*** | -0.0621*** |
| | (-3.92) | (-4.22) | (-3.28) | (-3.74) | (-3.99) | (-3.13) |
| RURALDUM | -0.0547 | -0.0611 | -0.0378 | -0.1232** | -0.1139* | -0.0886 |
| | (-1.09) | (-1.24) | (-0.65) | (-2.04) | (-1.87) | (-1.41) |
| DISTANCE | -0.00015** | -0.00017** | -------- | -0.00034*** | -0.00033*** | -------- |
| | (-2.11) | (-2.40) | -------- | (-4.43) | (-4.28) | -------- |
| | | | | | | -------- |
| TRANSPORT | -0.0370* | -0.0392* | -------- | -0.0196 | -0.0170 | -------- |
| | (-1.83) | (-1.96) | -------- | (-0.97) | (-0.80) | -------- |
| BRANCHVAR | -0.0160 | -0.0218 | -------- | 0.0241 | 0.0412 | -------- |
| | (-0.39) | (-0.54) | -------- | (0.44) | (0.76) | -------- |
| MMSHARE | -0.4722*** | -0.4760*** | -------- | -0.4603*** | -0.3695*** | -------- |
| | (-4.21) | (-4.22) | -------- | (-3.84) | (-2.96) | -------- |
| MMSHARE x CONC (all banks) | 0.8251*** | -------- | -------- | 0.7849*** | -------- | -------- |
| | (3.27) | -------- | -------- | (2.74) | -------- | -------- |
| MMSHARE x CONC (excluding multimkt. banks) | -------- | 0.6472*** | -------- | -------- | 0.4774*** | -------- |
| | -------- | (3.73) | -------- | -------- | (2.30) | -------- |
| # of obs. | 6793 | 6793 | 6793 | 5581 | 5581 | 5606 |
| $R^2$ | 0.1223 | 0.1237 | 0.1082 | 0.0905 | 0.0903 | 0.0796 |

t-statistics in parentheses.
*, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 4
Regression Results for MMDA Accounts

| Variable | 1996 | | | 1999 | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| INTERCEPT | 2.6001*** | 2.6157*** | 2.6624*** | 3.2766*** | 3.2823*** | 3.4593*** |
| | (17.16) | (17.25) | (18.85) | (15.03) | (14.84) | (16.67) |
| CONC (all banks) | -0.4718*** | -------- | -0.3016*** | -0.8087*** | -------- | -0.5376*** |
| | (-3.12) | -------- | (-3.11) | (-4.31) | -------- | (-4.63) |
| CONC (excluding multimkt. banks) | -------- | -0.3535** | -------- | -------- | -0.6535*** | -------- |
| | -------- | (-2.51) | -------- | -------- | (-3.95) | -------- |
| BANKSIZE | 0.0805*** | 0.0798*** | 0.0730*** | 0.0355** | 0.0361** | 0.0238* |
| | (7.87) | (7.66) | (7.33) | (2.44) | (2.49) | (1.71) |
| INCOME | 0.0216*** | 0.0214*** | 0.0195*** | 0.0149*** | 0.0144*** | 0.0134*** |
| | (5.53) | (5.38) | (4.89) | (3.63) | (3.48) | (3.05) |
| MKTSIZE | -0.0631*** | -0.0607*** | -0.0810*** | -0.0458*** | -0.0445*** | -0.0804*** |
| | (-4.33) | (-4.19) | (-5.61) | (-2.79) | (-2.64) | (-4.33) |
| RURALDUM | -0.1360*** | -0.1381*** | -0.1644*** | -0.1780*** | -0.1703*** | -0.2709*** |
| | (-2.68) | (-2.73) | (-3.20) | (-2.98) | (-2.85) | (-3.81) |
| DISTANCE | 0.00008 | 0.00004 | -------- | 0.000007 | -0.00005 | -------- |
| | (1.21) | (0.64) | -------- | (0.08) | (-0.57) | -------- |
| | | | | | | -------- |
| TRANSPORT | -0.0802*** | -0.0849*** | -------- | -0.1044*** | -0.1058*** | -------- |
| | (-3.04) | (-3.19) | -------- | (-3.73) | (-3.47) | -------- |
| BRANCHVAR | -0.0530 | -0.0769** | -------- | -0.0722 | -0.0994** | -------- |
| | (-1.33) | (-1.96) | -------- | (-1.43) | (-2.01) | -------- |
| MMSHARE | -0.2738*** | -0.2809*** | -------- | -0.2141** | -0.1762* | -------- |
| | (-2.81) | (-3.02) | -------- | (-2.32) | (-1.85) | -------- |
| MMSHARE x CONC (all banks) | 0.5856** | -------- | -------- | 0.6952*** | -------- | -------- |
| | (2.48) | -------- | -------- | (2.91) | -------- | -------- |
| MMSHARE x CONC (excluding multimkt. banks) | -------- | 0.5026*** | -------- | -------- | 0.6272*** | -------- |
| | -------- | (3.07) | -------- | -------- | (3.56) | -------- |
| # of obs. | 6437 | 6437 | 6437 | 5363 | 5363 | 5392 |
| $R^2$ | 0.0349 | 0.0350 | 0.0258 | 0.0320 | 0.0314 | 0.0246 |

t-statistics in parentheses.
*, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 5
Regression Results for Savings Accounts

| Variable | 1996 | | | 1999 | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| INTERCEPT | 3.4151*** | 3.4528*** | 3.2395*** | 3.7998*** | 3.7862*** | 3.5522*** |
| | (24.01) | (24.73) | (19.65) | (25.35) | (25.15) | (24.04) |
| CONC (all banks) | -0.1618 | -------- | -0.1104 | -0.5045*** | -------- | -0.2367*** |
| | (-0.93) | -------- | (-1.24) | (-2.93) | -------- | (-2.65) |
| CONC (excluding multimkt. banks) | -------- | -0.1455 | -------- | -------- | -0.3487** | -------- |
| | -------- | (-1.02) | -------- | -------- | (-2.39) | -------- |
| BANKSIZE | -0.0225** | -0.0233** | -0.0279*** | -0.0580*** | -0.5828*** | -0.0603*** |
| | (-2.42) | (-2.49) | (-2.97) | (-5.85) | (-5.85) | (-6.20) |
| INCOME | 0.0083** | 0.0081** | 0.0108*** | -0.0019 | -0.0021 | 0.0007 |
| | (2.30) | (2.19) | (3.02) | (-0.58) | (-0.64) | (0.23) |
| MKTSIZE | -0.0603*** | -0.0588*** | -0.0488*** | -0.0506*** | -0.0483*** | -0.0358** |
| | (-3.83) | (-3.87) | (-2.74) | (-3.47) | (-3.31) | (-2.33) |
| RURALDUM | 0.0041 | 0.0004 | 0.0329 | 0.0021 | 0.0101 | 0.0574 |
| | (0.09) | (0.01) | (0.58) | (0.04) | (0.21) | (1.12) |
| DISTANCE | 0.00007 | 0.00004 | -------- | 0.0001 | 0.00008 | -------- |
| | (1.29) | (0.81) | -------- | (1.53) | (1.03) | -------- |
| | | | | | | -------- |
| TRANSPORT | 0.0430** | 0.0400** | -------- | 0.0452** | 0.0435** | -------- |
| | (2.22) | (2.16) | -------- | (2.24) | (2.37) | -------- |
| BRANCHVAR | -0.0599* | -0.0790** | -------- | 0.0038 | -0.0176 | -------- |
| | (-1.66) | (-2.26) | -------- | (0.08) | (-0.38) | -------- |
| MMSHARE | -0.1472 | -0.2059* | -------- | -0.2476** | -0.2021* | -------- |
| | (-1.25) | (-1.83) | -------- | (-2.46) | (-1.89) | -------- |
| MMSHARE x CONC (all banks) | 0.0870 | -------- | -------- | 0.4023 | -------- | -------- |
| | (0.31) | -------- | -------- | (1.61) | -------- | -------- |
| MMSHARE x CONC (excluding multimkt. banks) | -------- | 0.2214 | -------- | -------- | 0.3096* | -------- |
| | -------- | (1.19) | -------- | -------- | (1.67) | -------- |
| # of obs. | 6682 | 6682 | 6682 | 5551 | 5551 | 5579 |
| $R^2$ | 0.0326 | 0.0327 | 0.0276 | 0.0441 | 0.0434 | 0.0383 |

t-statistics in parentheses.
*, **, *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

## LITERATURE CITED


Barros, Pedro P. “Multimarket Competition in Banking, with an Example from the Portuguese Market,” *International Journal of Industrial Organization* 17 (1999) pp 335-352.

Berger, Allan, and Timothy Hannan. “The Price-Concentration Relationship in Banking,” *Review of Economics and Statistics* 71 (May 1989) pp. 291-299.

Bernheim, B. Douglas, and Michael D. Whinston. “Multimarket Contact and Collusive Behavior,” *The RAND Journal of Economics* 21 (1990) pp. 1-26.

Biehl, Andrew. “The Extent of the Market for Retail Banking Deposits,” (December 2000) unpublished manuscript.

Calem, Paul S., and Gerald A. Carlino. “The Concentration/Conduct Relationship in Bank Deposit Markets,” *Review of Economics and Statistics* 73 ((1991) pp. 268-76.

Cyrnak, Anthony, and Timothy Hannan. “Is the Cluster Still Valid in Defining Banking Markets? Evidence from a New Data Source,” *The Antitrust Bulletin* 14 (1999) pp. 313-331.

Hannan, Timothy H. “Bank Commercial Loan Markets and the Role of Market Structure: Evidence from Surveys of Commercial Lending,” *Journal of Banking and Finance* 15(1) (February 1991) pp. 133-149.

Heitfield, Erik A. “What do Interest Rate Data Say About the Geography of Retail Banking Markets?” *The Antitrust Bulletin* (Summer 1999) pp. 333-347.

Kwast, Myron L., Martha Starr-McCluer, and John D. Wolken. “Market definition and the Analysis of Antitrust in Banking,” *Antitrust Bulletin* 42 (1997) pp. 973-995.

Pilloff, Steven and Stephen A. Rhoades. “Structure and Profitability in Banking Markets,” *Review of Industrial Organization* (forthcoming, 2001)

Prager, Robin A., and Timothy H. Hannan. “Do Substantial Horizontal Mergers Generate Signaificant Price Effects? Evidence from the Banking Industry,” *The Journal of Industrial Economics* XLVI (December 1998).

Radecki, Lawrence J. “The Expanding Geographic Reach of Retail Banking Markets,” *Federal Reserve Bank of New York Economic Policy Review* (June 1998) pp. 15-33.

Tokle, Robert J. and Joanne G. Tokle. “The Influence of Credit Union and Savings and Loan Competition on Bank Deposit Rates in Idaho and Montana,” *Review of Industrial Organization* 17 (December 2000) pp. 427-439.