Journal of Agricultural and Applied Economics, 31,2(August 1999):215–227

Independent Commercial Bank Mergers and Agricultural Lending Concentration

Bruce L. Ahrendsen, Bruce L. Dixon, and LaDerrek T. Lee

ABSTRACT

In an era of rapid consolidation in banking, the effect of mergers on the availability of credit to agricultural businesses is unclear. Commercial bank mergers have profoundly altered the urban credit marketplace and are positioned to do the same for the agricultural credit marketplace. Adjustment models are estimated with data on independent bank consolidations from 1988 through 1995. The regression results bode well for agricultural lending if acquiring banks have larger concentrations of assets in agriculture than acquired banks. Conversely, if acquiring banks have smaller concentrations than acquired banks, acquisitions have a negative impact on agricultural lending. Since most acquiring banks have smaller agricultural loan concentrations than acquired banks, there is concern for agricultural lending. However, other lenders are likely to fill credit gaps that develop.

Key Words: acquisition, agricultural loan portfolio, banks, consolidation, merger

Mergers are taking place rapidly throughout the economy. Perhaps there is no better example of merger and acquisition activity than in the banking industry. Recent examples of merger and acquisition activity are Citibank and Travelers Group forming CitiGroup, Wells Fargo and Norwest forming Wells Fargo, and NationsBank and Bank America forming Bank of America. However, for every one of these nationally and internationally newsworthy mega-mergers and acquisitions there may be tens if not hundreds of smaller bank mergers and acquisitions that take place. It is important to determine what if any effects bank acquisitions have on local businesses and agriculture.

Credit in the form of agricultural loans is a key input in production agriculture. In recent years commercial bank agricultural lending has increased from $42.7 billion in 1988 to $64.4 billion in 1997 (USDA). Also, commercial banks have increased their market shares of farm debt from 30.6 percent in 1988 to 39.7 percent in 1997. However, there are concerns as to whether or not financial institutions will continue to increase or maintain their level of agricultural lending in the face of commercial bank mergers and acquisitions (Rose).

Bank mergers and acquisitions have a long history. However, since the passage of the Riegle-Neal Interstate Banking and Branching

Bruce L. Ahrendsen is associate professor of agricultural economics and Bruce L. Dixon is professor of agricultural economics and economics at the University of Arkansas. LaDerrek T. Lee is a bank examiner at the Federal Reserve Bank of Kansas City. In addition, Professors Ahrendsen and Dixon are principals of the Center for Farm and Rural Business Finance which is jointly sponsored by the Department of Agricultural Economics and Agribusiness at the University of Arkansas and the Department of Agricultural and Consumer Economics at the University of Illinois.

The assistance of Diana Danforth is gratefully acknowledged. This material is based on work supported by the Economic Research Service, United States Department of Agriculture, under Agreement No. 43-3AEN-6-80106.

Act of 1994 and its implementation in 1997, these mergers and acquisitions are expected to increase rapidly over the next years (LaDue and Duncan). This Act has created an opportunity for the continuation and acceleration of commercial bank acquisition and branching in the United States.

Only a few studies in the literature have evaluated the impact of commercial bank mergers and acquisitions on agricultural lending. The objective of this study is to evaluate the impact of bank acquisitions on agricultural lending practices of commercial banks in the United States. Competing hypotheses of this study are (1) consolidated banks target their agricultural loan-to-asset ratios to be similar to other banks in the consolidated bank's size category and (2) consolidated banks target their agricultural loan-to-asset ratios to be similar to that of the acquiring bank prior to acquisition.

The study is organized as follows. The first section reviews the commercial bank acquisition literature. The second section introduces the adjustment model used to test the two hypotheses considered. The third section presents and discusses the commercial bank data. The following section presents and interprets the estimated model. Finally, concluding comments are presented.

Commercial Bank Acquisition Literature

The general public is concerned that bank consolidation results in a lack of competition. However, does the evidence bear this out? Certainly bank regulators and antitrust authorities are concerned when a commercial bank dominates a geographical area. For instance, the acquisition of Barnett Bank in the southeast United States by NationsBank in 1997 triggered the sale of bank assets in parts of Florida because of the dominant position the acquisition created for NationsBank in those areas. Although the United States is not considered to be a concentrated market because of the large number of commercial banks it has, the level of concentration has increased. From 1988 to 1997 the number of total commercial banks decreased 32 percent from 13,505 to 9183. Likewise, the number of agricultural banks decreased 29 percent from 4480 to 3203 (USDA).

Moore discussed the relaxation of geographic restrictions and its effects on small banks from 1982 to 1995. He found evidence that casts doubt on the view that the reduction in geographic banking restrictions has been the driving force behind the declining presence of small banks' market share in the banking industry. These results suggest that the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994, which drastically reduced interstate banking restrictions, is not likely to have a major impact on the presence of small banks in the industry since small banks were already experiencing a decline in market share in almost every state since the early 1980s.

Does a declining number of small banks as a result of acquisition by other banks necessarily mean that there will be less credit available for small businesses, particularly agricultural businesses and farms? Berger and Udell found that as banks become larger and more complex they reduce credit services to small businesses. Most farm and agricultural loans would certainly fall within the small business definition (Walraven). Several studies argue that the cultivation of borrower-lender relationships is extremely important in small business and agricultural lending and that small banks have a competitive advantage over large banks since small bank lenders are more likely to be familiar with their borrowers (Neff and Ellinger and Strahan and Weston). In fact, Peek and Rosengren argue that historical lending relationships are not of interest to large acquiring banks. They found a decline in small business lending after most acquisitions by larger banks in the New England area.

Are agricultural banks acquisition targets? And if they are, does their loan concentration in agriculture decrease following acquisition? Neff and Ellinger found that banks with a significant volume of agricultural loans in their portfolio are not usually targets of bank acquisitions. Gilbert and Belongia examined the effects of affiliation with bank holding companies on the agricultural lending of subsidi-

ary banks for 1975, 1980, and 1985. They found that banks that were subsidiaries of large bank holding companies did not hold as large a proportion of their assets in agricultural loans as did independent banks at a given time. Moreover, Gilbert and Belongia did not find evidence to support the hypothesis that subsidiaries of bank holding companies reduced their farm loan investments relative to independent banks from 1980 to 1985. Yet Gilbert and Belongia argued that an increase in acquisitions by large bank holding companies would reduce the supply of agricultural credit from commercial banks because of increased diversification opportunities. Featherstone discussed the post-acquisition agricultural lending patterns of rural banks acquired by bank holding companies from 1987 through 1993. He discovered that agricultural banks and small banks are often acquired by holding companies that reflect similar agricultural lending activity. Thus, there is not any impetus for major changes in lending philosophy. Featherstone's analysis concluded that an acquired bank's agricultural lending did not decrease three years after an acquisition by a bank holding company. In fact, smaller banks and agricultural banks increased the intensity and volume of agricultural lending after the acquisition. However, Featherstone noted that the increase in agricultural lending generally followed the overall industry trend.

Does a credit gap form as a result of mergers and acquisitions? Keeton examined mergers in the Federal Reserve System's Tenth District states for the period 1986 to 1995. He found that acquisitions by nearby banks did not significantly change lending to businesses and farmers. There was evidence that out-of-state acquisitions of banks by urban holding companies significantly reduced lending to local businesses and farmers. However, Keeton suggests that other banks competing in the same market may gain an advantage in their loan market shares by increasing their lending to satisfy the demands of local businesses and farmers. Berger and Udell found a reduction in small business lending when banks become larger and more complex. They note that just because larger banks reduce small business lending does not mean that this segment of the business community will be neglected since other lending institutions may pick up the slack in small business lending.

Walraven evaluated the importance of bank size for acquisitions from June 1993 to June 1996. He found that, on average, small acquirers of rural banks held fewer agricultural loans than the banks they acquired.[1] Furthermore, he found that small banks, as well as medium-sized banks, are the main purchasers of rural banks and that they tend to be aggressive lenders to agricultural enterprises. These purchasers of rural banks are also likely to be located nearby. In addition, Walraven found that large acquirers accounted for relatively few purchases of small or medium-sized rural banks.

As a result of the passage of the Riegle-Neal Act of 1994, direct acquisition of a bank by another bank will likely be more common than the acquisition of a bank by a multibank holding company. The direct acquisition of one bank by another bank is the type of acquisition considered in the present study. Also, the present study concentrates on the effect of bank acquisition on all commercial bank agricultural lending over a longer period, not just rural commercial bank agricultural lending over a short period as was done by Walraven. Moreover, additional explanatory factors are considered here.

Adjustment Model

It is hypothesized that (1) the consolidated bank, consisting of an acquiring bank (Bank A) and an acquired bank (Bank B), adjusts its agricultural loan-to-asset ratio to be similar to other banks in the consolidated bank's size category or (2) when a bank (Bank A) acquires a bank (Bank B), the agricultural loan-to-asset ratio of the consolidated bank adjusts

[1] In Walraven, small banks have less than $250 million of assets, medium-sized banks have from $250 million to $5 billion of assets and large banks have greater than $5 billion of assets. A bank whose headquarters is within a metropolitan statistical area (MSA) is urban, otherwise it is rural. Agricultural loans are those that are originally less than one million dollars.

to the agricultural loan-to-asset ratio of the acquiring bank (Bank A) if Bank A had not been involved in an acquisition. Gilbert and Belongia and others have observed that larger banks tend to allocate a smaller portion of their assets to agricultural loans than do smaller banks. This is the genesis of the first hypothesis. However, Walraven and Ahrendsen, Dixon, and Priyanti have suggested that the lending philosophy of acquiring banks prior to acquisition is imposed on the assets of acquired banks, causing an adjustment in the asset portfolio of the acquired bank to that of the acquiring bank. This is the origin of the second hypothesis. This study determines if there is empirical support for either hypothesis, i.e., is there a lowering of the consolidated bank agricultural loan-to-asset ratio after acquisition since larger banks tend to have a smaller ratio, or is the agricultural loan-to-asset ratio of the acquiring bank imposed on the assets of acquired banks?

The relationship between agricultural loan-to-asset ratio and bank acquisitions can be explained in an adjustment model adopted from Walraven:

$$(1) \quad AB_t - AB_0 = f(\overline{AB}_t - AB_0, A_0 + \hat{A}_t - AB_0, K_t - \overline{K}_t),$$

where AB_t is the agricultural loan-to-asset ratio of the consolidated bank AB t quarters after the acquisition, AB_0 is the agricultural loan-to-asset ratio at the composite bank (bank A + bank B) one quarter prior to the acquisition, $\overline{AB}_t$ is the average agricultural loan-to-asset ratio for banks in the same size category as composite bank AB t quarters after the acquisition. The variable A_0 is the agricultural loan-to-asset ratio of the acquiring bank one quarter prior to acquisition, $\hat{A}_t$ is the average change in agricultural loan-to-asset ratios for banks in the same size category as bank A from the quarter prior to acquisition to t quarters after the acquisition, K_t is the growth rate of assets for bank AB from the quarter prior to acquisition to t quarters following acquisition, and $\overline{K}_t$ is the average growth rate of assets for banks of similar size as bank AB from the quarter prior to acquisition to t quarters following acquisition.[2]

The dependent variable in equation (1) is $AB_t - AB_0$, which is the change in the agricultural loan-to-asset ratio from one quarter prior to the acquisition to $t + 1$ quarters from that quarter. One- and two-year adjustments in the agricultural loan-to-asset ratio are considered since some of the adjustments by commercial banks may not be completed after only one year (Featherstone). Equation (1) is estimated as a linear regression.

The first independent variable of the model is $\overline{AB}_t - AB_0$, which is the targeted change in the agricultural loan-to-asset ratio for the consolidated bank if it adjusts its agricultural loan-to-asset ratio to the mean of other banks in the same size class as the consolidated bank. A coefficient of 1 would indicate perfect adjustment for the first hypothesis. A positive relationship is consistent with the first hypothesis but a coefficient in excess of 1 would indicate over-adjustment.

The second independent variable is $A_0 + \hat{A}_t - AB_0$. Under the second hypothesis it would have a coefficient of one. If adjustment by the consolidated bank to the acquiring bank's (and other banks of the same size category as Bank A) loan-to-asset ratio is less than perfect, but still in that direction, a positive coefficient would be expected. Therefore, a positive coefficient is consistent with the second hypothesis. As with the variable $\overline{AB}_t - AB_0$, a coefficient much larger than 1 indicates over-adjustment.

The final independent variable is $K_t - \overline{K}_t$, which is the difference in the asset growth rates between the consolidated bank and banks of its same size category. The variable is included in the model to account for different asset growth rates that are assumed to be independent of the asset allocation decision. The independent variable has an ambiguous relationship with the dependent variable. Consider the example where Consolidated Bank AB is experiencing a greater growth rate in assets

[2] The variables $\overline{AB}_t$, $\hat{A}_t$, and $\overline{K}_t$ exclude observations on banks involved in a simple acquisition during the time period.

than is the average bank of the same size category. The agricultural loan-to-asset ratio decreases at the consolidated bank if the increase in assets is directed to agricultural loans at a lesser rate than was done prior to acquisition and a negative relationship results. However, if the increase in assets is directed to agricultural loans at a greater rate than was done prior to acquisition, a positive relationship between the independent and dependent variable is expected. Therefore, the direction of the relationship is ambiguous.

Others factors may influence the change in the agricultural loan-to-asset ratio—e.g., the particular quarter in which the acquisition occurred, the macroeconomic effects during the years of acquisition and adjustment, whether the banks involved in the acquisition are located in urban or rural areas, and the type of agriculture in the area as indicated by the particular region of the acquiring bank. These factors are measured by time, rural-urban, and regional variables.

Data and Descriptive Analysis

Data and Sources

The data used to construct variables are taken from the Consolidated Reports of Condition and Income (Call Report) and Merger and Acquisition (M&A) databases on the web page of the Federal Reserve Bank of Chicago. The Call Report database contains data for all banks regulated by the Federal Reserve System, Federal Deposit Insurance Corporation, and the Comptroller of the Currency, which includes nearly all commercial banks in the United States. The quarterly Call Report contains detailed bank information such as the income statement, balance sheet, loan classifications, bank location, and bank holding company affiliation. The M&A data contain information that is used to identify bank acquisitions that occurred from 1988 through the third quarter of 1997. These data are cross referenced with Call Report data by using the survivor and non-survivor identifier numbers in the M&A data. To construct a useable data set, the data consist of lags of one quarter and leads of three and seven quarters from the quarter of acquisition. Therefore, the sample period of acquisitions is the second quarter of 1988 through the fourth quarter of 1995.

The 3758 commercial bank acquisitions from the sample period are divided into two categories, simple and complex. A simple acquisition is a bank acquisition where Bank A purchases Bank B, and Bank A and Bank B have not been involved in previous or subsequent acquisitions during the sample period. A complex acquisition is when a bank acquires another bank and is subsequently acquired or when a bank is involved in more than one acquisition during the sample period.

There were 760 (20%) simple bank acquisitions and 2998 (80%) complex acquisitions (Table 1). The 760 and 2998 bank acquisitions are then divided into two more categories, unaffiliated and affiliated. An unaffiliated acquisition is when Bank A and Bank B are not affiliated with the same bank holding company, and an affiliated acquisition is when Bank A and Bank B are affiliated with the same bank holding company. Therefore, simple unaffiliated acquisitions (420 of 760, 55%) are simple bank acquisitions where Bank A and Bank B are not affiliated with the same bank holding company. Otherwise, the simple bank acquisitions are identified as simple affiliated acquisitions (340 of 760, 45%). Complex unaffiliated acquisitions (993 of 2998, 33%) are complex bank acquisitions where the acquiring and acquired banks involved in an acquisition are not associated with the same bank holding company. Otherwise, the complex bank acquisitions are identified as complex affiliated acquisitions (2005 of 2998, 67%).

Commercial banks involved in simple commercial bank acquisitions during the sample period are considered for the regression analysis because of difficulty in tracking comparable agricultural loan-to-asset ratios over time for complex acquisitions. Furthermore, only simple unaffiliated bank acquisitions are used because the lending philosophy of the bank holding company is most likely imposed on the acquired bank at the time of the bank holding company acquisition rather than at a later date when a bank within the bank holding

Table 1. Commercial Bank Acquisitions Per Year

	Simple Acquisitions			Complex Acquisitions		
Year	Unaffiliated Banks	Affiliated Banks	Total	Unaffiliated Banks	Affiliated Banks	Total
1988[1]	39	21	60	146	359	505
1989	62	35	97	119	249	368
1990	40	36	76	136	203	339
1991	44	51	95	89	257	346
1992	53	42	95	126	206	332
1993	62	42	104	136	239	375
1994	71	45	116	161	318	479
1995	49	68	117	80	174	254
Total	420	340	760	993	2005	2998

[1] Includes only quarters two, three, and four.

company acquires the bank. Hence, the data consist of 420 observations over the eight years.

Descriptive Analysis

The data on simple unaffiliated acquisitions, presented in Table 2, indicate acquiring banks are headquartered in rural areas for 60 percent (252 of 420) of the total acquisitions while the remaining 40 percent (168 of 420) are acquisitions by urban banks. Rural banks are acquired 61 percent (255 of 420) of the time and urban banks 39 percent (165 of 420) of the time. Furthermore, the data contain information about the urban-rural interface in regard

Table 2. Percentage of Agricultural Loans to Total Assets for Acquiring and Acquired Unaffiliated Banks Involved in Simple Acquisitions by MSA Class, Size, and Region

	Acquiring Bank		Acquired Bank	
	Mean	Median	Mean	Median
Bank MSA Class				
Rural-Rural[1] (N = 229)	15.47	12.62	15.64	11.64
Rural-Urban (N = 23)	9.75	6.11	6.61	3.43
Urban-Rural (N = 26)	3.76	0.41	10.11	5.30
Urban-Urban (N = 142)	1.71	0.14	1.38	0.10
Bank Size ($000,000 assets)				
0–50 (N = 161)[2]	17.16	15.69	15.97	12.59
51–250 (N = 203)	6.28	2.41	7.52	2.38
251–5000 (N = 53)	1.25	0.44	1.72	0.54
More than 5000 (N = 3)	1.06	0.74	1.22	0.56
Bank Region				
South (N = 151)[3]	5.21	1.90	4.35	1.81
Midwest (N = 194)	15.93	13.46	17.10	14.18
West (N = 47)	4.71	0.28	4.16	0.24
Northeast (N = 28)	0.62	0.32	1.01	0.24

N = 420

[1] The MSA status of the acquiring bank is given first and then the MSA status of the acquired bank is given last. For example "Rural-Urban" denotes a rural bank acquiring an urban bank.

[2] Number of acquiring banks of this size.

[3] Number of acquiring banks in the indicated region.

Table 3. Number of Acquiring and Acquired Unaffiliated Banks Involved in Simple Acquisitions by Size and Region

	Acquired Bank Size ($000,000 assets)				
Acquiring Bank Size ($000,000 assets)	0–50	51–250	251–5000	More than 5000	Total
0–50	152	9	0	0	161
51–250	163	38	2	0	203
251–5000	20	27	6	0	53
More than 5000	1	0	1	1	3
Total	336	74	9	1	420
	Acquired Region				
Acquiring Region	South	Midwest	West	Northeast	Total
South	151	0	0	0	151
Midwest	0	193	1	0	194
West	0	0	47	0	47
Northeast	0	0	0	28	28
Total	151	193	48	28	420

to acquisitions. The data indicate that of the 252 acquisitions by rural banks, 91 percent (229 of 252) are rural banks acquiring other rural banks and nine percent (23 of 252) are rural banks acquiring urban banks. The data also indicate that of 168 acquisitions by urban banks, 85 percent (142 of 168) are urban banks acquiring other urban banks and 15 percent (26 of 168) are urban banks acquiring rural banks. Therefore, banks are most often acquiring banks that are in a similar area, i.e., rural or urban, as they are.

The Metropolitan Statistical Area (MSA) definition is used to construct four MSA classes of acquiring and acquired banks. The MSA classes are rural-rural for rural banks acquiring rural banks, rural-urban for rural banks acquiring urban banks, urban-rural for urban banks acquiring rural banks, and urban-urban for urban banks acquiring urban banks. Table 2 presents the percentage of agricultural loans to assets for acquiring and acquired bank by MSA class. Not surprisingly, the data indicate that rural banks tend to have a higher percentage of their assets devoted to agriculture than do urban banks. For example, rural-rural and rural-urban acquiring banks held 15.47 percent and 9.75 percent of their assets in agricultural loans at the mean compared with 3.76 percent and 1.71 percent for urban-rural and urban-urban acquiring banks.

Bank size categories are constructed based on bank assets. Small banks have less than $50 million of assets, medium banks have $51 million to $250 million of assets, large banks have $251 million to $5 billion of assets, and extra-large banks have greater than $5 billion of assets. The numbers of banks by size of acquiring and acquired banks are presented in Table 3. Acquiring banks are mostly medium-sized banks (203 of 420, 48%) followed by small banks (161 of 420, 38%), large banks (53 of 420, 13%), and extra-large banks (3 of 420, 1%). However, small banks are the most often acquired banks (336 of 420, 80%) followed by medium-sized banks (74 of 420, 18%), large banks (9 of 420, 2%) and extra-large banks (1 of 420, 0.2%). Medium and small banks play a major role in the number of acquisitions.[3] As expected, it is much more common for a bank to be acquired by a larger bank than by a smaller bank.

Table 2 presents the percentage of agricul-

[3] Of course the role of large and extra-large banks becomes more important if the volume and number of agricultural loans involved in acquisitions are to be considered.

tural loans to total assets of acquiring and acquired banks by size category. Smaller banks tend to have a higher concentration of agricultural loans than larger banks. Small acquiring banks held 17.16 percent of their assets in agricultural loans compared with 6.28 percent, 1.25 percent, and 1.06 percent for medium, large, and extra-large acquiring banks. Small acquired banks held 15.97 percent of their assets in agricultural loans compared with 7.52 percent, 1.72 percent, and 1.22 percent for medium, large, and extra-large acquired banks. Furthermore, Table 2 indicates that acquired banks tend to have a higher concentration of agricultural loans than do similarly sized acquiring banks, with the exception of small banks. Medium, large, and extra-large acquired banks devoted 1.24, 0.47, and 0.16 percentage points more to agricultural loans than their cohort acquiring banks did. However, small acquired banks devoted 1.19 percentage points less of their assets to agricultural loans than did small acquiring banks.

The ten agricultural production regions as defined by the USDA are combined to construct four bank regions. South is represented by states in the Appalachian, Southeast, Delta, and Southern Plains regions; Midwest is represented by states in the Lake States, Corn Belt, and Northern Plains regions; West is represented by states in the Pacific and Mountain regions; and Northeast is represented by states in the Northeast region. The number of bank acquisitions by region of the acquirer and acquired is presented in Table 3. The majority of acquiring banks are located in the Midwest (194 of 420, 46%) and South (151 of 420, 36%) regions followed by the West (47 of 420, 11%) and Northeast (28 of 420, 7%) regions. The regional locations of the acquired banks are almost identical to the regional location of the acquiring banks with the lone exception of a Midwest bank that acquired a West bank. Thus, the acquisitions are predominately intra-regional.

The percentages of agricultural loans to assets for acquiring and acquired banks by region are provided in Table 2. The table indicates that acquiring and acquired banks located in the Midwest have a higher concentration of agricultural loans than banks located in other regions. For example, acquiring banks located in the Midwest held 15.93 percent of their assets in agricultural loans, while acquiring banks located in the South, West, and Northeast held 5.21 percent, 4.71 percent, and 0.62 percent of their assets in agricultural loans. Acquired banks located in the Midwest held 17.10 percent of their assets in agricultural loans, while acquired banks in the South, West, and Northeast held 4.35 percent, 4.16 percent, and 1.01 percent of their assets in agricultural loans, respectively.

The descriptive statistics presented in this section on simple unaffiliated acquisitions have been compared with other classifications of bank acquisitions that occurred during the sample period (Lee). Similar relationships to those discussed here are found when only simple affiliated acquisitions are considered. Two exceptions are that rural-rural and small simple affiliated acquisitions are less concentrated in agricultural lending than are comparable simple unaffiliated acquisitions. There are many more complex urban-urban acquisitions than simple urban-urban acquisitions, since it is expected that banks from urban areas are more likely to be involved in multiple acquisitions than in only one acquisition. Also, there are more acquisitions involving larger banks for complex acquisitions than there are for simple acquisitions. Another difference between simple and complex acquisitions is that unlike simple acquisitions, all size categories for complex acquisitions have lower agricultural loan-to-asset ratios for acquirer banks than for acquired banks. Finally, major regions for acquisitions are in the South and Midwest; however, the Midwest is the number one region for simple acquisitions and the South is the number one region for complex acquisitions.

Descriptive Statistics of Model Variables

Table 4 presents descriptive statistics of the dependent and independent variables used to estimate the adjustment model in equation (1) and the variables used to compute the dependent and independent variables. $AB_3 - AB_0$ is

Table 4. Descriptive Statistics of Model Variables

Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
AB_0	0.0981	0.1151	$AB_3 - AB_0$	0.0048	0.0253
AB_3	0.1029	0.1257	$\overline{AB}_3 - AB_0$	−0.0390	0.1010
AB_7	0.1071	0.1326	$A_0 + \hat{A}_3 - AB_0$	0.0008	0.0358
A_0	0.0978	0.1226	$K_3 - \overline{K}_3$	−0.0477	0.1711
$\hat{A}_3$	0.0011	0.0023	$AB_7 - AB_0$	0.0090	0.0374
$\hat{A}_7$	0.0020	0.0036	$\overline{AB}_7 - AB_0$	−0.0383	0.1009
$\overline{AB}_3$	0.0591	0.0371	$A_0 + \hat{A}_7 - AB_0$	0.0017	0.0360
$\overline{AB}_7$	0.0597	0.0378	$K_7 - \overline{K}_7$	−0.0474	0.2813
K_3	0.0251	0.1717			
K_7	0.1031	0.2830			
$\overline{K}_3$	0.0728	NA			
$\overline{K}_7$	0.1506	NA			

the dependent variable for the one-year adjustment model and has a mean value of 0.0048. This suggests that consolidated banks increased their concentration in agricultural lending on average by 0.48 percentage points following acquisition.

$\overline{AB}_3 - AB_0$ is the first independent variable in equation (1) when $t = 3$ and has a mean of −0.0390. This value indicates that the average agricultural loan-to-asset ratio of banks similar in size to Bank AB for three quarters following an acquisition less the initial agricultural loan-to-asset ratio of composite Bank AB one quarter prior to acquisition is −3.9 percent. The implication is that banks that are not involved in simple acquisitions are not as concentrated in agricultural lending as those that are involved in simple acquisitions.

$A_0 + \hat{A}_3 - AB_0$ forms the second independent variable and has a mean value of 0.0008 for the one-year adjustment model. This mean is only slightly less than the mean of the dependent variable, indicating that the constructed change in the agricultural loan-to-asset ratio for the acquiring bank if it had remained independent is about the same as the change that actually occurred for the consolidated bank. The implication is that consolidated banks follow the concentration in agricultural lending of the acquiring banks even after acquiring other banks.

The third independent variable when $t = 3$ is $K_3 - \overline{K}_3$ and has a mean of −0.0477. This mean indicates that the growth rate of assets for consolidated banks is 4.77 percentage points less than the average growth rate of assets for banks of the same size categories as consolidated banks not involved in simple acquisitions.

The descriptive statistics of the dependent and independent variables used to estimate the two-year adjustment model ($t = 7$) are similar to those for the one-year adjustment model ($t = 3$).

Results

Regression Diagnostics

A linear form of the adjustment model in equation (1) with an intercept and error term is estimated to test the hypotheses: 1) a consolidated bank targets its agricultural loan-to-asset ratio to be similar to other banks in the same size category as the consolidated bank and 2) a consolidated bank targets its agricultural loan-to-asset ratio to be similar to that of the acquiring bank.

The White test is used to check for the presence of heteroscedasticity. The results of the White test indicate a problem of heteroscedasticity for regression model estimates. White's consistent estimator of the variance-covariance matrix is used to provide consistent estimates and asymptotically valid t-statistics for all regression coefficients.

Observations from simple unaffiliated and affiliated bank acquisitions are not pooled.

Table 5. Regression Coefficient Estimates of Adjustment Model

Independent Variable	Coefficient	"t" Statistic
	One Year Estimates	
Constant	0.0010	1.090
$\overline{AB_3} - AB_0$	−0.0720	−4.620
$A_0 + \hat{A}_3 - AB_0$	0.2365	3.440
$K_3 - \overline{K_3}$	−0.0159	−1.380
$R^2 = 0.2351$		
Adjusted $R^2 = 0.2296$		
	Two Year Estimates	
Constant	0.0038	3.140
$\overline{AB_7} - AB_0$	−0.1065	−5.070
$A_0 + \hat{A}_7 - AB_0$	0.3408	2.490
$K_7 - \overline{K_7}$	−0.0113	−1.450
$R^2 = 0.2238$		
Adjusted $R^2 = 0.2182$		

Only observations on simple, unaffiliated acquisitions are used. From a theoretical point of view it makes sense to exclude affiliated bank acquisitions because any adjustment in a bank's portfolio as a result of acquisition is most likely to occur when the acquired bank was first acquired by the holding company.

Regression Results

Table 5 presents coefficient estimates for the one-year and two-year versions of the regression model. For the one-year adjustment model the estimated coefficient for the target adjustment in the agricultural loan-to-asset ratio for banks of the same size category as the consolidated bank is −0.0720 and significant at the one percent level. Since $\overline{AB_3}$ has a lower mean than AB_3, the average agricultural loan-to-asset ratio of all banks in the same size category is lower than the average agricultural loan-to-asset ratio of consolidated banks. The regression results indicate that the greater AB_0 is relative to the target $\overline{AB_3}$, the larger the increase in the agricultural loan-to-asset ratio, $AB_3 - AB_0$. This indicates that the agricultural loan-to-asset ratio for the consolidated bank is moving away from the target ratio for banks of its size not involved in acquisitions, $\overline{AB_3}$. Thus, the result does not support the first hypothesis. The same result is found for the two-year model. The relative magnitudes of the estimated coefficients from the one- and two-year regressions suggest that as time passes following an acquisition, the portfolios of the consolidated banks continue to change since the absolute value of the coefficient from the two-year regression is greater than the absolute value of the coefficient from the one-year regression and the means of $\overline{AB_3} - AB_0$ and $\overline{AB_7} - AB_0$ are nearly identical. However, the rate of change over time is declining.

The coefficient estimate for the target adjustment associated with what the acquiring bank's pre-purchase concentration of agricultural loans would be if extended three quarters is 0.2365 and significant at the one-percent level. This indicates that acquiring banks have some tendency to follow the same lending practices after acquiring a bank and imposes those practices on acquired banks but not perfectly since the coefficient is significantly different from 1. The same result is found for the two-year model. These results support the second hypothesis.

The estimated coefficient associated with the rate of growth of assets at banks that acquired a bank relative to other banks in their size category is negative and insignificant. This inverse relationship indicates that as the change in assets at consolidated banks increases relative to that at comparably sized banks, the change in the concentration of the consolidated bank's agricultural loans decreases, but this effect is not statistically significant for either the one- or two-year model.

As noted earlier, other factors are likely to have an impact on the change in the agricultural loan-to-asset ratio at consolidated banks. We test for these effects by augmenting equation (1) with appropriate variables in additional regression models. For instance, seasonality and trend may have an impact. Agricultural loan balances are quite seasonal, particularly in areas where crop production dominates. Banks usually record their largest agricultural loan-to-asset ratio at the end of the third quarter. Although the change in the agricultural loan-to-asset ratio is for either one or two years, it still may be possible that the change

in the agricultural loan-to-asset ratio is influenced by the quarter of acquisition. Therefore, seasonal dummy variables are included in the model. Likewise, the agricultural sector is affected by macroeconomic factors and experiences cycles like most other sectors of the economy. The U.S. agricultural sector, in general, experienced an upward trend in profitability during the sample period. Also, the overall economy has generally been strong during this period except for the recession in 1990 and 1991. Therefore, a year (trend) variable was included in the model to account for these macroeconomic and trend effects (Lee). The results from these regression models imply that seasonality and trend are not significant determinants in explaining the variation in the proportion of post acquisition agricultural lending.

In another attempt to identify factors that may have an impact on the change in the agricultural loan-to-asset ratio, one-year and two-year regression models are specified with various regional binary variables for the acquiring bank. The models first included the ten agricultural production areas as defined by the USDA and then South, Midwest, West, and Northeast as defined earlier. None of the *t*-ratios for these binary variables are significantly different from zero in any model (Lee). As with seasonality and trend, region is not a significant determinant in explaining the variation in the change in the agricultural loan-to-asset ratio at consolidated banks.

In a third attempt to determine if additional dummy variables may offer any statistical significance in explaining the variation in the dependent variable, four MSA class dummy variables are included to see if the rural-urban location of acquiring and acquired banks is important. The only significant regression result indicates that changes in the agricultural loan-to-asset ratio for rural banks acquiring urban banks are lower (negative coefficient) than for rural banks acquiring rural banks (Lee). This may imply that rural banks that acquire urban banks are interested in expanding into non-agricultural lending.

The coefficient estimates for the variables in equation (1) are robust for all regression model specifications. The signs and significance levels of the coefficient estimates do not change in the models when variables for seasonality, trend, and region are included. Therefore, the first hypothesis is consistently rejected and the second hypothesis is consistently not rejected.

Concluding Comments

Many bank mergers and acquisitions have occurred over the past ten years. The passage of the Riegle-Neal Interstate Banking and Branching Act of 1994 and its implementation in 1997 is expected to continue or even accelerate the number of mergers and acquisitions that occur. Liberalization of branching regulations has allowed an ongoing competition among commercial banks by allowing banks to acquire other banks and establish new bank branches throughout the United States. With the passage of the 1994 Act, state charters for banking are of lesser importance since banks are allowed to convert existing banks into bank branches and open new bank branches in most other states.

Two hypotheses were tested in this study: (1) consolidated banks target their agricultural loan-to-asset ratios to be similar to other banks in the consolidated bank's size category and (2) consolidated banks target their agricultural loan-to-asset ratios to be similar to that of the acquiring bank's lending practices. The results from the one- and two-year adjustment models indicate that consolidated banks move away from the average agricultural loan-to-asset ratio for banks of their size. The results also indicate that the change in the agricultural loan-to-asset ratio from before acquisition to one and two years following an acquisition is dependent on the lending practices of the acquiring bank. Thus, the regression results fail to support the first hypothesis and support the second hypothesis.

What does this mean for the agricultural loan-to-asset ratio of a bank that has been acquired and what impact will commercial bank mergers and acquisitions have on the availability of credit to agriculture? The answer depends on the bank doing the acquiring. If the

acquiring bank has a larger concentration of its assets in agriculture than the acquired bank, then the acquisition should have a positive impact on the agricultural lending of the acquired bank. Conversely if the acquiring bank has a smaller concentration of its assets in agriculture than the acquired bank, the acquisition should have a negative impact on the agricultural lending of the acquired bank. For the sample of simple acquisitions between unaffiliated banks studied here, small acquiring banks tend to have a larger agricultural loan-to-asset ratio than small acquired banks. Therefore, on average, acquisitions of small banks by other small banks may have a positive impact on agricultural lending. However, most acquiring banks have smaller agricultural loan-to-asset ratios than do acquired banks. This result suggests that the agricultural lending of commercial banks will decrease in most instances since the smaller agricultural loan-to-asset ratio of their acquirers may be imposed. Nevertheless, this does not mean that agricultural credit demand will not be satisfied in an area if a bank with a small agricultural loan-to-asset ratio acquires the local bank with a large ratio. If a gap in agricultural lending develops, other new and existing commercial banks as well as other agricultural lenders may step in and fill the gap.

The regression results of this study only used data on banks that had a single acquisition of an unaffiliated bank during the sample period. Although simple acquisitions involved a significant percentage of rural acquisitions, simple acquisitions only constituted 20 percent of commercial bank acquisitions during the study period. Future research should use a similar model as used here but with a focus on banks with multiple acquisitions. Also, since this study only focused on commercial banks, future studies should focus on the agricultural lending practices of other financial institutions—such as saving and loan banks, credit unions, and the Farm Credit System—after mergers and acquisitions occur. The inclusion of these other lending institutions would provide a more complete assessment of the effect that financial firm acquisitions has on agricultural lending. These other lending institutions as well as new commercial banks may enter the market to fill any credit gaps that arise as the financial industry evolves.

References

Ahrendsen, Bruce L., Bruce L. Dixon, and Atien Priyanti. "Growth in Agricultural Loan Market Share for Arkansas Commercial Banks." *Journal of Agricultural and Applied Economics* 26(December 1994):430–442.

Berger, Alan N. and Gregory F. Udell. "Universal Banking and the Future of Small Business Lending." in *Financial System Design: The Case for Universal Banking.* edited by Anthony Saunders and Ingo Walter, Irwin Publishing, Burr Ridge, IL, 1996.

Featherstone, Allen M. "Post-Acquisition Performance of Rural Banks." *American Journal of Agricultural Economics* 78(August 1996):728–733.

Gilbert, R. Alton and Michael T. Belongia. "The Effects of Affiliation with Large Bank Holding Companies on Commercial Bank Lending to Agriculture." *American Journal of Agricultural Economics* 70(February 1988):69–78.

Keeton, William R. "Do Bank Mergers Reduce Lending to Businesses and Farmers? New Evidence from Tenth District States." Federal Reserve Bank of Kansas City, *Economic Review* 81(Third Quarter 1996):63–75.

LaDue, Eddy and Marvin Duncan. "The Consolidation of Commercial Banks In Rural Markets." *American Journal of Agricultural Economics* 78(August 1996):718–720.

Lee, LaDerrek T. "The Impact of Simple Commercial Bank Acquisitions on Agricultural Lending in the United States." Unpublished M.S. thesis. University of Arkansas, Fayetteville. 1998.

Moore, Robert R. "Does Geographic Liberalization Really Hurt Small Banks?" Federal Reserve Bank of Dallas, *Financial Industry Studies,* December 1995.

Neff, David L. and Paul N. Ellinger. "Participants in Bank Consolidations." *American Journal of Agricultural Economics* 78(August 1996):721–727.

Peek, Joe and Eric S. Rosengren. "Small Business Credit Availability: How Important Is Size of Lender?" *Universal Banking: Financial System Design Reconsidered,* Chicago: Irwin Professional Publishing, 1996.

Rose, Peter S. "Implications for Future Research on Bank Consolidations in Rural Markets: Dis-

cussion." *American Journal of Agricultural Economics* 78(August 1996):736–737.

Strahan, Philip E. and James Weston. "Small Business Lending and Bank Consolidation: Is There Cause for Concern?" Federal Reserve Bank of New York, *Current Issues In Economics and Finance,* March 1996.

United States Department of Agriculture, Economic Research Service. *Agricultural Income and Finance: Situation and Outlook Report.* Pub. No. AIS-68. Washington, D.C., February 1998.

Walraven, Nicholas A. "Lending By Rural Banks Involved In Mergers." Board of Governors of the Federal Reserve System. Draft working paper, September 1996.