The Effects of Bank Mergers on
Commercial Bank Agricultural Lending

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Abstract
Regression analysis is used to estimate static and dynamic restructuring, direct and external effects of mergers from 1994 to 2001 on bank agricultural loan-to-asset ratios. Results indicate that mergers have a negative effect on agricultural loan ratios. The effect is less pronounced for smaller than larger bank mergers and more pronounced for mergers of banks affiliated with the same holding company than other merger types.

Key Words: bank, merger, consolidation, agricultural loan portfolio

The liberalization of geographic restrictions on U.S. banking institutions has allowed a rapid consolidation of the banking industry (LaDue and Duncan). In 1994, Congress passed the Riegle-Neal Interstate Banking and Branching Act. The implementation of this act in 1997, together with the Gramm-Leach-Bliley Financial Services Modernization Act of 1999, created the opportunity for accelerating commercial bank mergers.

One result of mergers is that they have contributed to the rapid reduction of commercial bank numbers. From 1986 to the second quarter of 2001, the number of total commercial banks declined 40% from 14,008 to 8,096. Contributing to the net decrease of 5,912 banks during this period were the 4,130 banks that ceased to exist because they were merged into other banks. Also over this period, the number of agricultural banks (banks with an agricultural loan-to-asset ratio of 0.17 or more) declined 40%, from 4,593 to 2,744. Commercial banks, Farm Credit System, Farm Service Agency and insurance companies are the four major providers of agricultural credit (USDA, ERS). Of these, commercial banks are the largest providers of agricultural loans, increasing their market share from 21% in 1981 to 41% in 2001. Furthermore, smaller, locally owned commercial banks typically have stronger relationships with borrowers and have more expertise to service local agricultural lending than larger banks do (Neff and Ellinger).

This study addresses an issue that has been the subject of considerable debate and concern for policy makers, financial institutions and their clients—what effect does the consolidation of banks have on agricultural lending by commercial banks? There has long been a populist notion in the United States that banking consolidation is a threat to the viability of small businesses, including farm businesses, since bank credit is more important for small businesses than for large businesses (Berger et al.). There are some studies that have addressed the impact of banking consolidation on the access to credit for small businesses, and only a few studies have focused on bank agricultural lending.

Peek and Rosengren investigated how mergers influence the willingness of a banking organization to lend to small businesses. Using bank data from 1993 through 1996, they found that consolidated banks tended to redirect their small business loan portfolio share subsequent to a merger toward the pre-merger portfolio share of the acquirer. However, in their analysis, the acquirer in almost half the mergers had a larger small business loan portfolio share than their target banks. Walraven using data from the same time period found similar results.

Strahan and Weston investigated the relationship between bank lending to small businesses, bank size and complexity, and bank consolidation. They constructed a sample

of 563 banks active in merger and acquisition (M&A) activity and compared changes in their small business lending before and after the consolidation with banks not involved in any M&A activity over the same period. They found that consolidation among small banks serves to increase bank lending to small businesses, while other types of mergers or acquisitions have little effect.

Berger et al. examined the effects of bank M&As on small business lending using data on over 6,000 U.S. bank M&As from 1979 through 1994. Berger et al. were the first to decompose the impact of M&As into the static effect from simply melding the pre-M&A institutions and the dynamic effects associated with post-M&A refocusing of the consolidated institutions. They were also the first to examine the external effect—the impact of M&As on small business lending by other banks in the same local market. They found that the static effect was associated with a considerable negative impact on the proportion of assets invested in small business lending. The external reaction of other banks in the same local markets appeared to offset all, and perhaps more than all, of the negative static effect, whereas the dynamic restructuring and direct effects on lending by the consolidating banks themselves appear to be relatively minor. Hence, they concluded that the total supply of small business credit associated with M&As is either unchanged or perhaps positive.

Gilbert and Belongia examined whether the agricultural loan ratios of rural subsidiaries of large bank holding companies (BHCs) differed from the ratios of other banks in the same rural counties. Their study indicated that banks in rural areas that were subsidiaries of large bank holding companies tended to invest smaller percentages of their assets in agricultural loans than other banks in the same counties. They concluded that an increase in acquisitions by large banking organizations of small commercial banks in rural areas would tend to reduce the supply of agricultural credit through commercial banks.

Neff and Ellinger using data on 1200 M&As from 1987 to 1994 concluded that rural banks with considerable agricultural lending had not been the primary targets of acquiring institutions involved in interstate acquisitions. Also, they concluded that the pace of bank consolidation in rural areas was slower than that of banks in urban areas and the lender-borrower relationships were more likely to affect the agricultural lending by rural banks.

Featherstone examined 206 banks operating between 1987 and 1993 that had agricultural lending activity and had been acquired by a holding company during the period. Featherstone concluded that acquiring holding companies were generally larger, more profitable, and had relatively less agricultural lending than the acquired banks. However, he also noticed that banks with a greater percentage of lending activity in agriculture generally were acquired by holding companies that have larger percentages of their loans in agriculture than bank holding companies on average. From his analysis of pre- and post-acquisition activity, Featherstone concluded banks involved in consolidation generally did not decrease their agricultural lending three years after acquisition. Also, smaller banks and agricultural banks increased lending to agriculture both in terms of volume and intensity after acquisition.

Ahrendsen, Dixon and Lee analyzed mergers of independent banks from 1988 through 1995. Based on regression results that allowed adjustments in bank portfolios two years following consolidation, they found that consolidated banks tended to target

their agricultural loan-to-asset ratios to be similar to those of the acquiring banks' ratios. Therefore, if an acquiring bank had a larger concentration of its assets in agriculture than the acquired bank, then the acquisition had a positive impact on the agricultural lending of the acquired bank. However, most acquiring banks had smaller agricultural loan-to-asset ratios than did acquired banks, which suggested that agricultural lending by commercial banks decrease in most instances following acquisition.

Keeton examined the effect of banking mergers on farm and business lending in the Federal Reserve System's Tenth District states for the period 1986 to 1995. He found that one important group of mergers—out of state acquisitions of banks owned by urban organizations—had a tendency to reduce lending to small businesses and farmers. These mergers had less effect in the 1990s than the 1980s. However, he suggests that other banks competing in the same market may increase their lending to satisfy the demand of local businesses and farmers.

Previous literature about the effect of commercial bank mergers on the proportion of assets invested in agriculture is limited. Many of these studies, with the exception of Featherstone and Ahrendsen, Dixon and Lee, have focused on the static effect, that is, combining the banks' pre-merger assets into one larger banking institution and comparing the proportion of assets invested in agricultural lending with each bank's pre-merger proportion of assets invested in agricultural lending. Following Berger et al., the present study includes not only the static effect that recognizes large banks tend to have smaller agricultural loan ratios than do small banks, but also three dynamic effects over a three-year period following a merger. The three dynamic effects of: 1) restructuring, 2) refocusing (direct) and 3) lending by other banks in the area (external) are considered over three years, since most post-merger banks need that long to adjust their lending philosophy. The results of the current study provide some insights into how the static effects and dynamic effects affect commercial banks' loan portfolio decisions.

Model
Model and Variables
This study adopts the econometric modeling framework of Berger et al., which was applied to commercial bank small business lending, to explain the variation in commercial bank agricultural loan-to-asset ratios as a function of bank and organization size, financial characteristics and competitive position, organizational complexity, the bank's previous merger activity, the previous merger activity of banks in the local market, time and environmental variables. Separate regression models are specified to estimate the static and dynamic effects of mergers on bank agricultural loan ratios. Also, separate models are estimated with total agricultural loan-to-asset, agricultural production loan-to-asset, and agricultural loans secured by real estate-to-asset ratios as the dependent variables to detect if portions of the agricultural loan portfolio are affected differently following mergers occurring from 1994 to 2001.

The effects of M&As on agricultural lending are decomposed into static and dynamic (restructuring, direct and external) effects. The static effect is the change in lending portfolio, which results from the combination of pre-M&A banks' balance sheets and competitive positions. According to previous research, large banking institutions tend to make relatively fewer small business and agricultural loans than small banking institutions, so the static effect should have a negative effect on agricultural lending. The

restructuring effect is related to the adjustment made by the consolidated institution following M&A. It is a dynamic effect due to the changes in institution size, financial condition, and competitive position of the banking institution. These post-consolidation adjustments may affect the institution's direction to make agricultural loans. For example, if a consolidated banking institution intends to increase the proportion of assets invested in agriculture after an M&A, it can realize the objective by reducing the size (assets) of the banking institution. Because these adjustments after M&A may take several years to complete, a three-year interval is needed to measure dynamic effects (Featherstone and Berger et al.). The direct effect is the difference between the agricultural lending of a bank involved in a recent M&A and the agricultural lending of another bank of the same size, same financial condition and same competitive position as the restructured bank that has not been involved in a recent M&A. The external effect is the dynamic effect that measures the reactions of other local lenders to the changes in competitive conditions created by the M&As involving local banks. This effect is extremely important to estimate since other local banks may pick up some loans no longer made by the consolidated bank.

This research distinguishes between the effects of bank mergers and bank holding company (BHC) acquisitions. If two or more banks with separate charters are consolidated under a single bank charter, the practice is called a 'merger'. A bank has been acquired if it retains its charter but obtains a different top-tier holding company. This is called an 'acquisition'. The reason for this differentiation is that different kinds of M&As may have different effects on the supply of agricultural lending. But for some mixed cases, for instance, if bank A affiliated to bank holding company Y is merged with independent bank B and bank A's charter is retained and bank B's charter is terminated, this is counted as a merger instead of an acquisition.

The base regression is of the form:

(1) $LN(P_{it}/(1-P_{it})) = f_i($BANK AND ORG SIZE$_{t-1}$, BANK AND ORG FINANCIAL$_{t-1}$, BANK AND ORG COMP POSITION$_{t-1}$, ORG COMPLEXITY$_{t-1}$, PAST M&A$_{t-1,t-2,t-3}$, MARKET PAST M&A$_{t-1,t-2,t-3}$, TIME$_{t-1}$, ENVIRONMENT$_{t-1}) + \varepsilon_{it}$, i = 1, 2, 3,

where LN indicates natural log, P_i represents the proportion of bank gross total assets (GTA) invested in agricultural loans. Three different regressions are estimated indexed by i (i = 1 indicates total agricultural loans, i = 2 indicates agricultural production and i = 3 indicates real estate loans secured by farmland). The dependent variables are log-odds ratios. All right-hand-side variables except for PAST M&A and MARKET M&A are lagged one year relative to the agricultural lending proportion on the left-hand-side to avoid endogeneity effects. All of the independent variables take the values as of year-end t-1, which is before the lending on the left-hand-side. The variables used in equation (1) are defined in Table 1.

The BANK SIZE variables include LNGTA, which is the natural log of gross total assets, and dummies for bank size. In this study, all banks are classified into four size categories: SMALLBANK (GTA < $50 million), MEDBANK ($50 million ≤ GTA < $100 million), LARGEBANK ($100 million ≤ GTA < $500 million), and HUGEBANK

(GTA ≥ $500 million). The different classes of bank size may have different effects on agricultural lending. The variable of SMALLBANK is excluded from the regression equation as the base case. Following Berger et al. (page 199), "the inclusion of bank size as a continuous variable and as size class dummies allows for both small effects and large changes at the size class level." The ORG SIZE variables include similar variables as the BANK SIZE except that ORGGTA includes all the banking assets that are controlled by the bank holding company organization. For independent banks and BHCs that control only one bank, BANK SIZE equals ORG SIZE.

The BANK AND ORG FINANCIAL variables are mainly used to measure equity position and loan portfolio quality. They are specified in three ways: (1) bank equity to GTA ratio; (2) bank loan loss reserve to total loan ratio; and (3) bank non-performing loans to total loan ratio. The financial condition of a bank can directly affect its ability to supply credit. A bank with a higher equity ratio and lower non-performing loan ratio should have greater competitive power in the credit market. ORG FINANCIAL variables are the same as the BANK FINANCIAL variables except at the organizational level instead of the bank level.

The BANK AND ORG COMP POSITION variables use the Herfindahl index of local market bank concentration and the bank's share of market deposits to examine the local market competitive position. In this study the market is the Metropolitan Statistical Area (MSA) or non-MSA county where the bank's deposits are located. A bank's market share (MS) is calculated as the proportion of total deposits held by a bank in a market area so that all banks active in the same market area have individual MSs. A bank's Herfindahl index (HHI) is calculated for each market area so that all banks active in the same market area have the same HHI. MS and HHI are weighted by the proportion of the bank's deposits in each of its markets to compute the overall MS and HHI for a given bank and organization.

The ORG COMPLEXITY variables consist of three dummy variables. BHCOWNED equals one if the bank is owned by a bank holding company; MUTILEVELBHC equals one if there are at least two layers of banking holding companies; and OUT-OF-STATE equals one if the bank's top-tier holding company is located in another state.

The PAST M&A variables measure the effect of past merger and acquisition activity on the agricultural loan-to-asset ratio. These variables include several different types of merger and acquisition 0-1 dummies. MERGEDk, k = 1,2,3, denotes whether the bank survived one or more mergers k years ago. The variables MERGEDk-EQ, k = 1,2,3, indicate whether the bank survived 'mergers of equals' in which the survivor bank had between 1/3 and 2/3 of the total pro forma bank's GTA k years ago. The variable MERGEDk-FAM, k=1,2,3, measures whether banks involved in mergers were owned by the same top-tier bank holding company, which means the banks were affiliated with each other prior to merger. The variable ACQUIREDk indicates that a bank was acquired (changed high holder) k years ago, k = 1,2,3. The variable ACQUIREDk-OUT denotes whether the bank was acquired by a high holder in another state k years ago, k=1,2,3. The variables MERGEDk-FAM and ACQUIREDk-OUT are of particular interest because they reflect the effects of interstate banking and branching, especially after the Riegle-Neal Interstate Banking and Branching Act took effect in 1997. All of these variables are used for measuring dynamic effects of M&As.

The MARKET PAST M&A variables are used to measure external effects of M&As and include MAR-MERGEDk, MAR-MERGEDk-EQ, MAR-MERGEDk-FAM, MAR-ACQUIREDk, MAR-ACQUIREDk-OUT. The MARKET PAST M&A variables are calculated as a weighted average proportion of PAST M&A variables, where the weights are the bank's shares of deposits in those market areas (MSA and/or non-MSA county) where the bank has a branch.

This regression model also includes binary variables to control for changes in macroeconomic conditions, policies, regulations and technology. Time variables (YEAR$_t$) are all 0-1 dummy variables, one for each year. Environmental variables include INMSA and STATE$_n$. INMSA differentiates between banks in a Metropolitan Statistical Area or rural county. STATE$_n$ includes all U.S. states and the District of Columbia, except for California, which is excluded as the base case. The STATE$_n$ variables control for different state regulations that may impact the supply of credit.

Estimates of the Four Effects
Static Effect

The estimated static effect is the agricultural loan-to-asset ratio predicted by equation (1) for the pro forma bank less the agricultural loan-to-asset ratio predicted by equation (1) for the pre-merger banks. The pro forma bank results from simply adding together pre-merger banks' balance sheets of the merging parties. For instance, if bank A has pre-merger GTA of $150 million and bank B has $100 million, the total pro forma GTA equals $250 million as of year-end t-1. If both banks A and B are independent banks, i.e., no bank holding company affiliation, the pro forma ORGGTA is also $250 million.

The proportion of GTA for the pro forma bank predicted to be invested in agricultural loans i in year t is predicted by:

$$(2)\ \ LN(P_{it}^{PF}/(1-P_{it}^{PF})) = f_i\wedge (\text{BANK AND ORG SIZE}_{t-1}^{PF},\ \text{BANK AND ORG FINANCIAL}_{t-1}^{PF},\ \text{BANK AND ORG COMP POSITION}_{t-1}^{PF},\ \text{ORG COMPLEXITY}_{t-1}^{PF},\ \text{PAST M\&A}_{t-1,t-2,t-3}^{PF},\ \text{MARKET PAST M\&A}_{t-1,t-2,t-3}^{PF},\ \text{TIME}_{t-1},\ \text{ENVIRONMENT}_{t-1}^{PF}),\ \ \ i = 1, 2, 3,$$

where $f_i\wedge$ implies that these are predicted figures using the estimated parameters from equation (1) and PF indicates pro forma. For the variable categories, bank and organization size use the total assets in the pre-merger banks, in the above example $250 million; financial ratios, past M&A and market past M&A activity numbers are weighted averages of the year-end t-1 figures for bank A (weight = 0.6 = $150 million/$250 million) and bank B (weight = 0.4 = $100 million/$250 million); and competitive position, organizational complexity and environmental variables employ the values for the consolidated institution.

Likewise, the proportion of assets predicted to be invested in loans to agricultural category i during year t for bank A is given by:

$$(3)\ \ LN(P_{it}^{A}/(1-P_{it}^{A})) = f_i\wedge (\text{BANK AND ORG SIZE}_{t-1}^{A},\ \text{BANK AND ORG FINANCIAL}_{t-1}^{A},\ \text{BANK AND ORG COMP}$$

$$\text{POSITION}_{t-1}{}^A, \text{ORG COMPLEXITY}_{t-1}{}^A,$$
$$\text{PAST M\&A}_{t-1,t-2,t-3}{}^A, \text{MARKET PAST M\&A}_{t-1,t-2,t-3}{}^A,$$
$$\text{TIME}_{t-1}, \text{ENVIRONMENT}_{t-1}{}^A), \qquad i = 1, 2, 3.$$

The predicted proportion for bank B can be similarly computed. So the estimated static effect for the proportion of GTA allocated to loan category i in period t is:

$$(4) \text{ Static Effect} = P_{it}{}^{PF} - 0.6*P_{it}{}^A - 0.4*P_{it}{}^B \qquad\qquad i = 1, 2, 3.$$

Restructuring Effect

The restructuring effect is the first of three separate dynamic effects to be estimated. The restructuring effect results from lending changes associated with institution changes in size, financial condition and competitive position after completing a merger. That is, after a merger the consolidated bank may choose to shrink its size or increase its size. This matters because smaller banks tend to have a greater share of assets devoted to agricultural lending and larger banks have lower shares. To complicate the process of estimating dynamic effects, changes in macroeconomic conditions, management techniques and risk preferences may affect the consolidated bank's lending philosophy. These post-consolidation changes may make the bank adjust its lending to agriculture. For example, a change in the macroeconomic environment may cause a bank to reallocate its assets, independently of whether or not it had undergone a merger. These secular changes in a bank's portfolio are estimated separately from changes that are a result of a bank redirecting its assets because of a merger.

To estimate the restructuring and secular changes, it is necessary to predict the expected changes in bank size, financial condition and competitive position over time. Equation (5) represents the change in the log of GTA over q years after t-1:

$$(5) \Delta\text{LNGTA}_{t+q-1} = g^q (\text{BANK AND ORG SIZE}_{t-1}, \text{BANK AND ORG}$$
$$\text{FINANCIAL}_{t-1}, \text{BANK AND ORG COMP POSITION}_{t-1},$$
$$\text{ORG COMPLEXITY}_{t-1}, \text{PAST M\&A}_{t-1,t-2,t-3}, \text{MARKET}$$
$$\text{PAST M\&A}_{t-1,t-2,t-3}, \text{TIME}_{t-1}, \text{ENVIRONMENT}_{t-1},$$
$$\text{CURRENT M\&A}_t, \text{MARKET CURRENT M\&A}_t) + e^q{}_{t+q-1}$$
$$q = 3,$$

where the left-hand-side variable $\Delta\text{LNGTA}_{t+q-1}$ equals LNGTA_{t+q-1}-LNGTA_{t-1}. Similar equations are estimated for changes in LNORGGTA, financial ratios and competitive positions. The difference between the independent variables of equation (5) and equation (1) is that equation (5) includes variables CURRENT M&A and MARKET CURRENT M&A for year t. The current M&A activities take place during year t while the dependent variables are measured at the end of year t or later years so there is not a problem of endogeneity. Equations (5) are estimated for all banks in the Call Report dataset. To measure changes in size, condition and competitive position for banks involved in mergers, the data on right-hand-side and LNGTA_{t-1} on left-hand-side use the pro forma bank data. In this study, a three-year interval is used to measure the merger activity effects, so q = 3.

The secular change in LNGTA for banks involved in mergers (6) is predicted from the estimated parameters of equation (5):

(6) $\Delta LNGTA_{t+q-1}^{SEC} = g^{q\wedge}$ (BANK AND ORG SIZE$_{t-1}^{PF}$, BANK AND ORG FINANCIAL$_{t-1}^{PF}$, BANK AND ORG COMP POSITION$_{t-1}^{PF}$, ORG COMPLEXITY$_{t-1}^{PF}$, PAST M&A$_{t-1,t-2,t-3}^{PF}$, MARKET PAST M&A$_{t-1,t-2,t-3}^{PF}$, TIME$_{t-1}$, ENVIRONMENT$_{t-1}$, $\underline{0}$, MARKET CURRENT M&A$_t$),   q = 3.

In equation (6), all the t-1 values and PAST M&A values are set to those of the pro forma bank and CURRENT M&A values are set to zero. In another words, we assume the bank was not in a current M&A. Thus the secular change reflects how the pro forma bank's LNGTA would change from year t - 1 to year t + q - 1. Equation (6) is also used to predict the changes in LNORGGTA , financial ratios and competitive positions. These changes are plugged into equation (1) to obtain the predicted effects on bank agricultural loan-to-asset ratios:

(7) $LN(P_{it+q}^{SEC}/(1- P_{it+q}^{SEC})) = f_{i}^{\wedge}$ (BANK AND RGSIZE$_{t-1}^{PF}$ + ΔBANK AND ORG SIZE$_{t+q-1}^{SEC}$, BANK AND ORG FINANCIAL$_{t-1}^{PF}$ + ΔBANK AND ORG FINANCIAL$_{t+q-1}^{SEC}$, BANK AND ORG COMP POSITION$_{t-1}^{PF}$ + ΔBANK AND ORG COMP POSITION$_{t+q-1}^{SEC}$, ORG COMPLEXITY$_{t-1}^{PF}$, PAST M&A$_{t+q-1,t+q-2,t+q-3}^{PF}$, MARKET PAST M&A$_{t+q-1,t+q-2,t+q-3}^{PF}$, TIME$_{t+q-1,}$ ENVIRONMENT$_{t+q-1}^{PF}$), i = 1, 2, 3; q = 3.

Thus, the estimated secular change in the proportion of GTA invested in agricultural loan i q years after merger is specified by :

(8) Secular Change = $P_{it+q}^{SEC} - P_{it}^{PF}$.

To estimate the restructuring effect, the above process is repeated with the exception that CURRENT M&A variables are set to actual values instead of zero. For example, the predicted change in LNGTA from period t - 1 to t + q - 1 is specified as:

(9) $\Delta LNGTA_{t+q-1}^{RES} = g^{q\wedge}$ (BANK AND ORG SIZE$_{t-1}^{PF}$, BANK AND ORG FINANCIAL$_{t-1}^{PF}$, BANK AND ORG COMP POSITION$_{t-1}^{PF}$, ORG COMPLEXITY$_{t-1}^{PF}$, PAST M&A$_{t-1,t-2,t-3}^{PF}$, MARKET PAST M&A$_{t-1,t-2,t-3}^{PF}$, TIME$_{t-1}$, ENVIRONMENT$_{t-1}$, CURRENT M&A$_t$, MARKET CURRENT M&A$_t$), q = 3.

The predicted lending proportions inclusive of the restructuring effect as well as secular change and static effect are given by substituting these predicted changes to bank and organization size, financial ratios and competitive position into the estimated equation (1). Thus, the predicted agricultural lending in period t + q is specified as:

(10) $LN(P_{it+q}^{RES}/(1- P_{it+q}^{RES})) = f_{i}^{\wedge}$ (BANK AND ORG SIZE$_{t-1}^{PF}$ + ΔBANK AND ORG SIZE$_{t+q-1}^{RES}$, BANK AND ORG FINANCIAL$_{t-1}^{PF}$ + ΔBANK AND ORG FINANCIAL$_{t+q-1}^{RES}$, BANK

AND ORG COMP POSITION$_{t-1}^{PF}$ + ΔBANK AND ORG COMP POSITION$_{t+q-1}^{RES}$, ORG COMPLEXITY$_{t-1}^{PF}$, PAST M&A$_{t+q-1,t+q-2,t+q-3}^{PF}$, MARKET PAST M&A$_{t+q-1,t+q-2,t+q-3}^{PF}$, TIME$_{t+q-1}$, ENVIRONMENT$_{t+q-1}^{PF}$), i = 1, 2, 3; q = 3.

The estimated restructuring effect is then obtained by subtracting the proportion of GTA allocated to agricultural loans as a result of the secular change and static effect:

$$(11) \text{ Restructuring Effect} = P_{it+q}^{RES} - P_{it+q}^{SEC} \qquad i = 1, 2, 3; q = 3.$$

Direct Effect

The direct effect is the change in lending attributable to a direct refocusing of attention toward or away from agricultural loans for the consolidated bank. The direct effect of a merger is the difference between a bank's proportion of agricultural lending to GTA after consolidation and the proportion for another bank of the same size, financial condition and competitive position that has not been involved in a merger. The predicted proportion of GTA invested in agricultural loans is:

$$(12) \text{ LN}(P_{it+q}^{DIR} /(1- P_{it+q}^{DIR}) = f_i^{\wedge} \text{ (BANK AND ORG SIZE}_{t-1}^{PF} + \Delta\text{BANK AND ORG SIZE}_{t+q-1}^{RES}, \text{ BANK AND ORG FINANCIAL}_{t-1}^{PF} + \Delta\text{BANK AND ORG FINANCIAL}_{t+q-1}^{RES}, \text{ BANK AND ORG COMP POSITION}_{t-1}^{PF} + \Delta\text{BANK AND ORG COMP POSITION}_{t+q-1}^{RES}, \text{ ORG COMPLEXITY}_{t-1}^{PF}, \text{ PAST M&A}_{t+q-1,t+q-2,t+q-3}^{CUR}, \text{ MARKET PAST M&A}_{t+q-1,t+q-2,t+q-3}^{PF}, \text{ TIME}_{t+q-1,} \text{ ENVIRONMENT}_{t+q-1}^{PF}), \quad i = 1, 2, 3 ; q = 3.$$

The inclusion of PAST M&A$_{t+q-1,t+q-2,t+q-3}^{CUR}$ into equation (12) indicates that current M&As in period t are included. The current M&A effect can be designated by putting ones into the PAST M&A vector to the appropriate years back.

The estimated direct effect is obtained by subtracting the proportion of GTA allocated to agriculture, which includes the static effect, secular changes and restructuring effect:

$$(13) \text{ Direct Effect} = P_{it+q}^{DIR} - P_{it+q}^{RES}, \qquad i = 1, 2, 3; q = 3.$$

External Effect

The external effect captures the reaction of other banks in the same market as banks involved in mergers the past three years. If loans dropped by a consolidated bank can generate positive net present value for other local banks, it is very likely that these banks will make such loans. But the external effect is more difficult to estimate than the static, restructuring and direct effects. To predict the external effects exactly, we must trace the effect of each individual M&A to every other bank in the local market and determine how each of these banks respond to each M&A event. Instead, a simple reduced form response to the percentage of bank assets in a local market that experienced an M&A is measured for every bank in the nation. From this we can get a general

estimate of how banks respond to M&A activity in their market by perhaps picking up agricultural loans that may be dropped by consolidated banks. However, the estimate is not exact. Therefore the estimate should be considered as qualitative in nature rather than quantitative.

Another limitation of the estimated external effect is that it assumes all agricultural loans are made by commercial banks. Although commercial banks as a group are the largest suppliers of credit to agriculture, they are by no means the sole providers of credit to agriculture. Other suppliers of credit to agriculture include the cooperative Farm Credit System, insurance companies, USDA Farm Service Agency and individuals among others. Therefore, any estimate of the external effect using only commercial bank data is likely to be understated. However, the external effect estimate taken together with the static, restructuring and direct effect estimates does indicate how commercial banks as a group supply credit to agriculture in response to mergers.

Equation (1) is used to estimate the external effect. Up until now the MARKET PAST M&A variables have been used as control variables. To estimate the proportion of GTA allocated to agriculture if there had been no M&As in the local market over the past three years, the MARKET PAST M&A vector is set to zero:

$$(14)\ LN(\ P_{it}^{NOEXT}/(1-\ P_{it}^{NOEXT}) = f_i\wedge\ (\ BANK\ AND\ ORG\ SIZE_{t-1,}\ BANK\ AND\ ORG\ FINANCIAL_{t-1},\ BANK\ AND\ ORG\ COMP\ POSITION_{t-1,}\ ORG\ COMPLEXITY_{t-1},\ PAST\ M\&A_{t-1,t-2,t-3,}\ \underline{0},\ TIME_{t-1,}\ ENVIRONMENT_{t-1}),\qquad i = 1, 2, 3.$$

The proportion of GTA allocated to agriculture incorporating the external effect is estimated by setting MARKET PAST M&A variables to their actual values:

$$(15)\ LN(\ P_{it}^{EXT}/(1-\ P_{it}^{EXT}) = f_i\wedge\ (\ BANK\ AND\ ORG\ SIZE_{t-1,}\ BANK\ AND\ ORG\ FINANCIAL_{t-1},\ BANK\ AND\ ORG\ COMP\ POSITION_{t-1,}\ ORG\ COMPLEXITY_{t-1},\ PAST\ M\&A_{t-1,t-2,t-3,}\ MARKET\ PAST\ M\&A_{t-1,t-2,t-3,}\ TIME_{-1,}\ ENVIRONMENT_{t-1}),\qquad i = 1, 2, 3.$$

The external effect is the difference between P_{it}^{EXT} and P_{it}^{NOEXT} :

$$(16)\ External\ Effect = P_{it}^{EXT} - P_{it}^{NOEXT},\qquad\qquad i = 1, 2, 3.$$

Data and Descriptive Analysis
Data and Sources

The data used to construct variables are taken from four sources: Consolidated Report of Condition and Income (Call Report) for Banks, Consolidated Report of Condition and Income for Bank Holding Companies, Federal Deposit Insurance Corporation (FDIC) Summary of Deposits, and Mergers and Acquisition data. The Call Report datasets and M&A data are available on the web page of the Federal Reserve Bank of Chicago. Beginning with 1994 data, the FDIC Summary of Deposits data are available through the web page of the FDIC.

The M&A data contain information that can be used to identify all bank mergers and acquisitions that have occurred from 1986 through 2001. These data are used to identify survivor and non-survivor (target) banks involved in mergers during the study period, and use bank holding company merger information to identify organizations involved in acquisitions during the study period. For some cases, if bank holding company A acquired bank holding company B, and there were many banks affiliated to bank holding company B, we count each bank that was acquired as a separate acquisition, because this study examines lending at the level of the individual bank.

The quarterly call reports completed by FDIC insured banks contain detailed bank level information such as total assets, agricultural loans, total equity, loan loss reserve, loans past due 90 days or more and still accruing, and non-accrual loans. For this study, only the second quarter data are used. FDIC Summary of Deposits contains deposit data for more than 85,000 branches/offices of FDIC insured institutions. FDIC collects deposit balances for commercial and saving banks as of June 30 each year. Bank market share and bank market Herfindahl index (HHI) are computed from the FDIC Summary of Deposits.[1]

The units of observation in this study are commercial banks on an annual basis. In the dataset, the M&As range from 1994 to 2001. M&As are assigned to the previous time period of each year. For example, if a merger occurred between July 1, 1998 and June 30, 1999, then the merger information is stored for June 30, 1998, which is the end of period t-1. To construct a useable data set, the data consist of lags of three years and leads of two years from the year of bank mergers. Therefore, the actual time period for bank mergers put into the estimation sample begins July 1, 1997 and ends June 30, 1999. Two data sets are used in this study to estimate different models. The first data set includes all commercial banks in the Call Reports of June 30, 1997 and 1998. The second data set includes all commercial banks with complete information involved in bank mergers from July 1, 1997 through June 30, 1999.

In this study, 1,062 banks merged to form 453 surviving banks. More than half of the bank charters disappeared because there were multiple targets (non-survivor banks with identification numbers that ceased to exist) in the same year for some survivor banks (banks involved in mergers and their identification numbers continued to exist). In this case, 453 surviving banks represent the number of pro forma banks. Originally, the merger data set consisted of 591 observations. However, some of the pro forma banks had to be removed from the sample because they had at least one variable with a missing observation.

Descriptive Analysis

Table 2 presents the general information for all M&As from 1994 through 2000. A total of 2,085 banks survived a merger during the time period. Among the 2,085 mergers, 553 (26%) are mergers of equals, where the GTA of the surviving bank was between 1/3 and 2/3 of the consolidated institution. There are 983 (47%) family mergers, which means surviving and non-surviving banks of the merger had the same high holder company. Different types of mergers should have different effects on agricultural lending. Family mergers are of particular interest because they may bear on the effects of

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[1] See Luo for details. Ideally, asset data would be used in constructing a bank's market share and a local market bank concentration, however, asset data are not available at the branch level.

interstate banking as banks held by the same bank holding company are merged across state lines.

A bank's geographic location determines the economic and demographic characteristics of its marketing region. The MSA definition is used to construct four classes of mergers for the present study.[2] These classes are: 1) rural survivor bank targets a rural bank for merger (rural-rural merger); 2) rural survivor bank targets an urban bank (rural-urban merger); 3) urban survivor bank targets a rural bank (urban-rural merger); and 4) urban survivor bank targets an urban bank (urban-urban merger). Table 3 provides the number of surviving banks and individual target banks involved in mergers by rural or urban. There were multiple targets for some survivors in the same year. Each target bank for one survivor is presented separately instead of combining them together as a composite target bank, since the composite of targets could include both urban and rural banks. For mergers taking place from July 1, 1997 to June 30, 1999, surviving banks were in rural areas for 22% (237 of 1,062) of the total bank mergers while the remaining 78% (825 of 1,062) of banks were in urban areas. The numbers indicate that urban banks are more active as survivors in bank mergers than rural banks. For target banks, about 41% (440 of 1,062) were in rural areas, and 59% (622 of 1,062) were in urban areas. In addition, Table 3 contains information about the urban-rural interface for bank mergers. Of 237 mergers by rural surviving banks, 78% (186 of 237) were rural banks acquiring other rural banks and 22% were rural banks acquiring urban banks. The data also indicate that of 825 mergers by urban surviving banks, 69% (571 of 825) were urban banks acquiring other urban banks and 31% were urban banks acquiring rural banks. These data indicate that surviving banks are more often targeting banks for merger that are in a similar rural or urban area, i.e., rural banks are more likely to merge with rural banks and urban banks are more likely to merge with urban banks.

Table 4 presents the pre-merger percentage of agricultural loans to total assets for survivor banks and individual target banks involved in mergers by the four MSA rural/urban classes. Rural-rural surviving banks have a mean of 15.05% and target banks have a mean of 15.50% of their total assets invested in agricultural loans. Urban-urban surviving banks and target banks devoted 1.07% and 1.40% to agricultural loans, respectively. Obviously, rural banks had higher agricultural loan to total asset ratios than urban banks. The same conclusion could also be obtained from rural-urban and urban-rural. Rural-urban surviving banks and target banks held 8.61% and 6.06% of total assets in agricultural loans respectively, and urban-rural surviving banks and target banks held 2.03% and 7.52% of total assets in agricultural loans. This table also indicates that target banks evaluated at the mean are relatively more active in agricultural loans than surviving banks in all classes except for the rural-urban class. For example, rural-rural, urban-rural, and urban-urban surviving banks devoted 15.05%, 2.03% and 1.07% of total assets to agricultural loans respectively, in comparison to 15.50%, 7.52% and 1.40% for target banks. Another interesting point is that urban banks targeted by rural banks are more agriculturally related than are urban banks targeted by urban banks. Likewise, rural banks targeted by rural banks are more agriculturally related than rural banks targeted by urban banks.

Survivor and individual target banks are separated into four size categories based on bank assets on June 30 prior to merger. Table 3 indicates that small banks are seldom

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[2] If a bank is located in a MSA area, the bank is regarded as an urban bank, otherwise it is a rural bank.

survivor banks with only 6% (60 of 1,062) of total bank mergers having small sized surviving banks. Surviving banks are mostly huge sized banks, 54% (577 of 1,062), followed by large sized banks (31%, 329 of 1,062) and medium sized banks (9%, 96 of 1,062). Among target banks, large sized banks are most frequently targeted (36%, 382 of 1,062), followed by small sized banks (25%, 270 of 1,062), medium sized banks (21%, 227 of 1,062), and huge sized banks (17%, 183 of 1,062). It is reasonable that huge sized banks are less often targeted than small sized banks since there are fewer huge banks than small banks. Table 3 also indicates that huge sized banks are more likely to target large sized banks (45%, 262 of 577) and huge sized banks (31%, 176 of 577) and are less likely to target medium sized banks (17%, 98 of 577) and small sized banks (7%, 41 of 577). However, small, medium and large sized banks are more likely to target small sized banks than banks in the other size categories and they seldom target huge sized banks. For example, among all of the huge sized target banks, 96% (176 of 183) are acquired by huge sized banks, and only 4% (7 of 183) are acquired by other sized banks.

Target banks have more agricultural loans relative to total assets than their comparatively sized surviving banks when evaluated at the means, with the exception of small sized banks (Table 4). Medium, large and huge sized surviving banks held 5.16%, 3.18% and 0.57% of their assets in agricultural loans respectively, in comparison to 7.12%, 3.83% and 1.08% for medium, large and huged sized target banks respectively. Small sized surviving banks devoted 22.97% of their assets to agricultural loans compared with 18.86% for small sized target banks. According to this table, smaller banks tend to be more active in agricultural loans relative to other assets than larger banks. For example, small sized surviving banks held 22.97% of their assets in agricultural loans compared with 5.16%, 3.18% and 0.57% for medium, large and huge sized surviving banks respectively. Small sized target banks held 18.86% of their assets in agricultural loans compared with 7.12%, 3.83% and 1.08% for medium, large and huge sized target banks respectively.

Results
Regression Diagnostics
The effects of mergers on the proportions of assets invested in 1) total agricultural loans, 2) agricultural production loans and 3) agricultural loans secured by real estate are estimated by following the modeling process in equations (1) through (16). The results of Breusch-Pagan-Godfrey (B-P-G) test on the OLS ordinary least (OLS) estimates of equation (1) indicate a problem of heteroscedasticity. Therefore, equation (1) was re-estimated by weighted least squares as was done in Berger et al. In this study, the reciprocal of the square of GTA is used as the weight. The weighted least squares results of equation (1) may be found in Luo. The F statistics for the three regressions are significant at the 0.01 level. Many of the variables' coefficient estimates have the same sign and are statistically significant as was found for the estimates in Berger et al.

The coefficient estimates are statistically significant for most regressions (Luo). Therefore, although multicollinearity is present at a high level, it does not appear to be harmful in estimating the effects of M&As on the agricultural loan-to-asset ratios of banks.

Static, Restructuring and Direct Effect Estimates

Table 5 presents estimates of the static, restructuring and direct effects of mergers and the secular change for agricultural loan ratios. Of the 1,062 banks involved in mergers, 609 bank charters were terminated, leaving 453 banks. The static effect is estimated by taking the predicted agricultural loan ratio from equation (1) for the pro forma banks less the agricultural loan ratio predicted by equation (1) for the pre-merger banks. The model predicts the 1,062 pre-merging banks had a 0.0631 agricultural loan-to-asset ratio. Combining their balance sheets into 453 pro forma banks yields a statistically significant static effect of a 0.0277 reduction in the proportion of GTA invested in total agricultural loans. Furthermore, the estimated static effects for agricultural production loans and agricultural loans secured by real estate are –0.0184 and –0.0156 and statistically significant. Hence, the static effect substantially reduces the agricultural loan ratios of merged banks. Because pro forma banks result from simply adding together the pre-merger banks' balance sheets, the negative static effect is consistent with the previous literature that finds larger consolidated banks devote a lower proportion of their assets to agricultural lending. This also confirms that the proportion of agricultural lending is related to bank size as has been observed here and in previous literature. Berger et al. also found that the static effect has a considerable negative impact on the proportion of bank assets invested in small business lending.

The secular change to the agricultural loan-to-asset ratio, i.e., the change that results from factors unrelated to M&As such as macroeconomics conditions, is shown in Table 5. The secular change indicates that the pro forma banks would grow in GTA from $233.51 billion to $241.09 billion and would decrease their proportions of total agricultural loans, agricultural production loans and agricultural loans secured by real estate in the absence of dynamic effects of mergers. The secular changes for the above three categories of agricultural loans are -0.0025, -0.0023, and -0.0011, respectively, and are statistically significant with the exception of agricultural loans secured by real estate. Since secular change applies equally to banks involved in mergers and those not involved in mergers, the negative secular change suggests an overall decline in the proportion of bank assets invested in agriculture during this time period, independent of bank mergers. Berger et al. also found a statistically significant negative secular change for the proportion of bank assets invested in small business loans.

The restructuring effect measures the change in lending focus that results from a bank changing its size, financial condition, or competitive position after consummating a merger. As can be seen in Table 5, the estimate of the restructuring effect yields an $8.83 billion reduction in GTA. The estimated restructuring effect has a slightly positive impact on agricultural loan proportions with increases in the total agricultural loans and agricultural loans secured by real estate proportions of 0.0007 and 0.0011, respectively. However, there is almost no impact on the proportion of bank assets invested in agricultural production loans. The only statistically significant restructuring effect is on the proportion of assets invested in agricultural loans secured by real estate. The restructuring effect is very small in magnitude relative to the static effect and not very important for agricultural lending.

The direct effect is the change in agricultural loan-to-asset ratio attributable to a direct adjusting of attention toward or away from agricultural loans or other assets as a result of the merger. The direct effect is used to measure the difference between a bank's

agricultural lending after consolidation and the agricultural lending of another bank of the same size, same financial condition and same competitive position that has not been involved in a merger. The direct effect estimates reported in Table 5 for total agricultural loans, agricultural production loans and agricultural loans secured by real estate are negative (-0.0001, -0.0021 and -0.0025), but they are not large in magnitude and only statistically significant for agricultural loans secured by real estate. Thus, the direct effects decrease the proportion of GTA devoted to total agricultural loans, agricultural production loans, and agricultural loans secured by real estate by only small amounts.

The sums of static, restructuring and direct effects of mergers on the proportions of GTA invested in agriculture are -0.0271, -0.0205, and -0.0167 for total agricultural loans, agricultural production loans, and agricultural loans secured by real estate and all are statistically significant (Table 5). The negative static and direct effects are only slightly offset by the positive restructuring effect. The effects are consistent among the three categories of agricultural loans suggesting banks have the same policy for different categories of agricultural loans, i.e., the proportions of GTA invested in both categories of agricultural lending, production and real estate, are reduced as a result of mergers. This result is not consistent with Featherstone's findings. He found that banks acquired by a bank holding company generally did not decrease their agricultural lending after acquisition. However, an important difference is that Featherstone considered banks that continued to exist but as part of a new or different bank holding company and this study considered banks that were merged into other banks.

Effects by Type and Size of Merger

The results presented in Table 5 should be viewed as weighted average effects over the different types of mergers, where the weight is the size of bank, GTA. By considering the dummy variables for 'mergers of equals', 'family mergers,' and 'size of merger', it is possible to estimate if different types (Table 6) and sizes (Table 7) of mergers have different effects on the proportion of assets invested in agricultural loans.

The totals of the static, restructuring and direct effects on agricultural loan ratios by type of merger are presented in Table 6. The results indicate that family mergers produce the largest significant effect (-0.0420) for the total agricultural loan ratio. This is important, since an increase in family mergers is allowed by the Riegle-Neal Interstate Banking and Branching Act. This result suggests that family mergers tend to reduce the total agricultural loan proportion by a larger amount and results in greater negative effects than all mergers in general. The results show that mergers of unequals and non-family mergers have relatively smaller negative effects on the total agricultural loan ratio, although they are statistically significant.

The results in Table 7 indicate that the total of the static, restructuring and direct effects on the total agricultural loan proportion is relatively small in magnitude when small and medium size banks merge with each other. It is reasonable to expect that these mergers would nearly double the size of the banks and allow the small and medium banks, which are now larger after merger, to increase their total loans as a whole. Also they might invest some assets in other types of loans and larger loans away from agriculture, since their legal lending limit has increased. However, since they are still relatively small banks, they cannot devote too many assets to large loans. Hence, the negative effect on agricultural loan proportions for smaller bank mergers is small relative

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to larger bank mergers. The results also suggest that mergers involving small and medium banks only represent a very small percent of the dollar value of assets merged, 2.6% ($6.11 billion of $233.51 billion). Thus, large and huge bank mergers involve most of the dollar value of assets merged. These two bank merger size categories contribute the most to the negative total effect on the total agricultural loan-to-asset ratio.

External Effect Estimates

As noted earlier, the external effect is primarily treated as a qualitative effect. The external effect measures the reactions of other bank lenders in the local market to the change in competitive conditions created by M&As. The external effect is estimated by taking the proportion of GTA invested in agricultural loan categories assuming no M&As in the local market, that is, by taking the predicted values from equation (1) with the MARKET PAST M&A variables set to zero. Then the predicted values from equation (1) with the MARKET PAST M&A variables set to their actual values are subtracted to estimate the external effect. Although small in magnitude, the external effects of other local banks are significantly negative (Table 5). The results are surprising (Table 5). Anecdotally, banks not involved in mergers indicate that it is often a perfect time to enhance their portfolio when a competing bank is merged into another bank, particularly if the other bank is from a distant market. Customers and loan officers of the merged bank may become dissatisfied with changes that are implemented and decide to switch to the local, competing bank. Although the qualitative effect is interesting, it is difficult to compare the magnitudes of the static, restructuring and direct effects with the external effect, because the static, restructuring and direct effects are expressed in terms of the assets of the merging banks, while the external effect is expressed in terms of the assets of all the banks in the nation. Berger et al. found different results. They found that other banks in the local market tend to increase their small business loan ratios, in fact, by perhaps a large enough amount to offset the decline in the small business loan-to-asset ratio of merging banks.

Concluding Comments

Given the large drop in the number of commercial banks and all the bank consolidation activity, this study addresses an issue that has been the subject of considerable debate and concern for policy makers, financial institutions and their clients—what effect does the consolidation of banks have on agricultural lending by commercial banks? Regression analysis, based on a model from Berger et al., is used to explain the variation in commercial bank agricultural loan-to-asset ratios as a function of bank and organization size, financials and competitive position, organizational complexity, the bank's previous merger activity, the previous merger activity of banks in the local market, time and environmental variables. Separate regression models are specified to estimate the static and dynamic effects of mergers on bank total agricultural loan, agricultural production loan, and agricultural loans secured by real estate ratios to detect if portions of the agricultural loan portfolio are affected differently following mergers occurring from 1994 to 2001.

The results indicate that commercial bank mergers have a negative effect on commercial bank proportions of assets invested in total agricultural loans, agricultural production loans, and agricultural loans secured by real estate. The results also indicate

that the static aggregation of commercial banks following mergers is associated with a considerable negative effect on their agricultural loan-to-asset ratios. The dynamic effects measured as a whole (restructuring, direct and external) have a slight negative impact on bank agricultural loan-to-asset ratios. However, the dynamic effects estimated for a three-year period of adjustment are not consistently statistically significant, and they are relatively weak in economic significance. Among the dynamic effects, only the restructuring effect is positive, but the magnitude is very small in all cases and is only statistically significant for the agricultural loans secured by real estate case, so the negative static effect of mergers on agricultural loan-to-asset ratios is only slightly offset by the dynamic restructuring effect. The dynamic direct effect of mergers on commercial bank agricultural loan ratios following mergers is negative in all cases, but small in magnitude and statistically significant in only the agricultural loans secured by real estate case. Finally, the external effect is significantly negative in all cases, but small in magnitude. When the four effects are evaluated together, the impact of mergers on bank agricultural loan-to-asset ratios is significantly negative and the magnitude is dominated by the static effect.

The effects of mergers on agricultural loan ratios may differ by size of merger participants. The results indicate that small (less than $50 million) and medium ($50 to $100 million) size bank mergers are associated with a much smaller negative effect on agricultural loan-to-asset ratios than large ($100 to $500 million) and huge ($500 million or more) size bank mergers. The type of merger is found to be important. Family mergers, i.e., mergers between banks affiliated with the same bank holding company, tend to have larger negative effects on agricultural loan ratios than other types of mergers. Such family mergers are of particular concern because of the relaxation of the interstate branching regulations as a result of the Riegle-Neal Interstate Banking and Branching Act.

A negative effect of mergers on bank agricultural loan ratios is found in this study. Therefore, there may be concern for the availability of commercial bank agricultural credit in areas experiencing merger activity. However, this does not necessarily mean that an agricultural credit gap has formed in these areas. Other credit providers, such as Farm Credit Services, Farm Service Agency and non-traditional lenders, have likely increased their presence in areas experiencing merger activity. Also, merged banks may not be decreasing their agricultural loans, but instead they may be increasing their assets in other areas, which would result in a decreasing agricultural loan-to-asset ratio. The now larger bank may be better able to serve the entire credit needs of the community, including agricultural loans, from its increased capacity. However, that analysis is beyond the scope of this study.

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Table 1. Dependent and Independent Variable Definitions
Dependent Variables:
*Loan Proportio*ns
P_1 Proportion of gross total assets invested in total agricultural loans
P_2 Proportion of gross total assets invested in agricultural production loans
P_3 Proportion of gross total assets invested in real estate loans secured by farmland

Independent Variables:
Bank and Organization Size Variables

LNGTA   Log of bank gross total assets (GTA). A second order term for this variable is also included, $\frac{1}{2}(LNGTA)^2$. In addition, this variable interacts with MERGEDk variables defined below.

SMALLBANK   Dummy variable, equals one if bank has GTA less than \$50 million. This variable is excluded from the regression as the base case; equals zero otherwise.

MEDBANK   Dummy variable, equals one if bank has GTA from \$50 million to \$100 million; equals zero otherwise.

LARGEBANK   Dummy variable, equals one if bank has GTA from \$100 million to \$500 million; equals zero otherwise.

HUGEBANK   Dummy variable, equals one if bank has GTA of \$500 million or more; equals zero otherwise.

LNORGGTA   Same as LNGTA variable, except defined over all the banking GTA in the high holding company organization. Also included as second order term. Interacts with ACQUIRED variables defined below.

SMALLORG, MEDORG, LARGEORG, HUGEORG
     Same as bank level dummy variables, except they are based on all banking GTA in the organization. If bank is an independent bank or a single bank holding company, BANK SIZE and ORG SIZE are identical.

Bank and Organization Financial Variables

EQRAT   Bank equity to GTA ratio. Also included as second-order term, $\frac{1}{2}(EQRAT)^2$.

LLRRAT   Bank loan loss reserve to total loans ratio. Also included as second-order term, $\frac{1}{2}(LLRRAT)^2$.

NPFRAT   Bank non-performing (past due 90 or more days and still accruing, plus nonaccrual) loans to total loans ratio. Also included as second-order term, $\frac{1}{2}(NPFRAT)^2$.

ORGEQRAT, $\frac{1}{2}(ORGEQRAT)^2$, ORGLLRRAT, $\frac{1}{2}(ORGLLRRAT)^2$, ORGNPFRAT, $\frac{1}{2}(ORGNPFRAT)^2$. These variables are the same as the bank level financial variables, except that they are based on all the banking assets in the organization.

Local Market Competitive Position Variables

BANKSHARE   Bank's share of deposits in the local market (MSA or non-MSA county), weighted by the proportion of the bank's deposits in each of its different markets.

BANKHERF   Herfindahl index for market concentration, using the same weight as defined for BANKSHARE. For a given market, the Herfindahl index is the sum of market shares squared for all banks with a branch office in the market.

ORGSHARE   Same as BANKSHARE, except based on all banking deposits in the organization.

ORGHERF   Same as BANKHERF, except based on all banking deposits in the organization.

Organizational Complexity Variables

BHCOWNED   Dummy variable, equals one if bank is affiliated with a high holder company; equals zero otherwise.

MULTILEVELBHC   Dummy variable, equals one if there are at least two levels of bank holding company, that is, the bank's direct holder is different from the high holder; equals zero otherwise.

OUT-OF-STATE   Dummy variable, equals one if bank's high holder company is located in another state, i.e., that bank's physical state is different from the bank holding company's physical state; equals zero otherwise.

Past Merger and Acquisition (Past M&A) Variables

MERGEDk   Dummy variable, equals one if bank survived one or more mergers k years ago, i.e., the bank's charter survives and absorbs the assets one or more banks' whose charters do not survive, k = 1,2,3; Also interacts with LNGTA.

MERGEDk-EQ   Dummy variable, equals one if bank survived 'merger of equals' k years ago, where 'merger of equals' means the survived bank had GTA between 1/3 and 2/3 of the GTA of the pro forma bank, k=1,2,3. Also interacts with LNGTA.

MERGEDK-FAM   Dummy variable, equals one if bank survived one or more 'family mergers', where 'family merger' means survived bank and non-survived bank had same high holder company k years ago, k = 1,2,3; equals zero otherwise. Also interacts with LNGTA.

ACQUIREDk   Dummy variable, equals one if bank was acquired k years ago, i.e., the bank had a new high holder company, k = 1,2,3; equals zero otherwise. Also interacts with LNORGGTA.

ACQUIREDk-OUT   Dummy variable, equals one if bank was acquired by a high holder company that is located in another state, i.e., the acquired bank's physical state code is different from the acquiring bank holding company's physical state code, k = 1,2,3; equals zero otherwise. Also interacts with LNORGGTA.

Market Past Merger and Acquisition (Mar Past M&A) Variables
MAR-MERGEDk, MAR-MERGEDk-EQ, MAR-MERGEDk-FAM, MAR-
ACQUIREDk, MAR-ACQRUIEDk-OUT

> All of the above variables are derived from PAST M&A variables.
> This means that MAR PAST M&A variables for banks are
> calculated as a double weighted average of PAST M&A variables,
> where the PAST M&As for banks in a given market are first
> weighted by banks' shares of deposits in that market area and then
> these market weighted averages are weighted a second time by the
> bank's shares of its total deposits across the various markets it has
> presence (market MSA or non-MSA county). Also MAR-
> MERGEDk, MAR-MERGEDk-EQ, and MAR-MERGEDk-FAM
> interact with LNGTA; Also MAR-ACQUIREDk and MAR-
> ACQUIREDk-OUT interact with LNORGGTA.

Time Variables
YEARt

> Dummy variable, equals one if the lending occurs in year t, t =
> 1997, 1998; equals zero otherwise. All year dummies are included,
> so no intercept is included in the equation.

Environmental Variables
INMSA

> Dummy variable, equals one if bank is located in a Metropolitan
> Statistical Area (MSA); equals zero otherwise.

STATEn

> Dummy variable, equals one if bank is located in State n, n =
> 1,2,3,4, ……,50 to include all U.S. states and the District of
> Columbia, except for California, which is excluded as the base
> case.

Table 2. Bank Merger and Acquisition, 1994-2000[a]

Years	Industry Banks[b]	GTA[c]	All Mergers Banks[d]	GTA	Mergers of Equals Banks[e]	GTA	Family Mergers Banks[f]	GTA	All Acquisitions Banks[g]	GTA	Out-of-State Acquisitions Banks[h]	GTA
1994	11,146	$4,246	351	$704	93	$46	134	$368	296	$72	107	$48
1995	10,599	$4,446	363	$1,066	106	$200	171	$722	221	$360	93	$145
1996	10,100	$4,600	298	$1,325	85	$382	153	$1,159	235	$51	90	$27
1997	9,726	$4,869	292	$1,311	68	$158	139	$1,012	224	$115	74	$95
1998	9,370	$5,202	299	$1,002	75	$71	142	$660	212	$493	81	$469
1999	9,058	$5,413	232	$1,237	55	$492	108	$803	157	$126	56	$47
2000	8,856	$5,754	250	$1,409	71	$34	136	$1,083	104	$298	30	$115
Total			2,085	$8,053	553	$1,382	983	$5,806	1,449	$1,515	531	$947

[a] The mergers occurred between July 1, 1994 and June 30, 2001. If a merger occurred in a certain year, the consolidated bank was valued at the end of the previous year. For example, a merger occurring between July 1, 1998 and June 30, 1999 is valued as of June 30, 1998 and appears in the 1998 row.
[b] Number of banks in Call Report data set.
[c] Gross total assets (GTA) are in billions of 1996 dollars using the GDP implicit price deflator.
[d] Number of banks having survived a merger during the year.
[e] Number of banks having survived a merger where the GTA of the surviving bank was between 1/3 and 2/3 of the consolidated pro forma bank.
[f] Number of banks having survived a merger where the surviving bank and non-surviving banks have the same high holder company.
[g] Number of banks who switched to another high holder company during the year.
[h] Number of banks who switched to an out-of- state high holder company during the year.

Table 3. Number of Survivor and Individual Target Banks Involved in Mergers by MSA Class and Size

Survivor MSA Class	Target MSA Class			Total
	Rural	Urban		
Rural	186	51		237
Urban	254	571		825
Total	440	622		1062

Survivor Size[a]	Target Size				Total
	0 - 50	50 - 100	100 - 500	500 or more	
0-50	50	6	4	0	60
50-100	67	13	15	1	96
100-500	112	110	101	6	329
500 or more	41	98	262	176	577
Total	270	227	382	183	1062

[a] Pre-merger bank assets measured in millions of 1996 dollars (GDP implicit deflator).
Note: Mergers occurred from July 1, 1997 through June 30, 1999.

Table 4. The Pre-Merger Percentage of Agricultural Loans to Total Assets for Survivor and Individual Target Banks by MSA Class and Size

| | Survivor Bank | | Target Bank | |
	Mean	Median	Mean	Median
Bank MSA Class				
Rural-Rural[a] (N = 186)	15.05	11.00	15.50	10.91
Rural-Urban (N = 51)	8.61	2.63	6.06	1.10
Urban-Rural (N = 254)	2.03	0.51	7.52	3.40
Urban-Urban (N = 571)	1.07	0.31	1.40	0.13
Bank Size				
0-50[b] (N = 60)[c]	22.97	23.78	18.86	18.42
50-100 (N = 96)	5.16	5.71	7.12	0.92
100-500 (N = 329)	3.18	1.08	3.83	0.45
500 or more (N = 577)	0.57	0.41	1.08	0.14

N = 1062

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

[b] Bank assets measured in millions of 1996 dollars (GDP implicit deflator).

[c] Number of survivors.

Note: Mergers occurred from July 1, 1997 through June 30, 1999.

Table 5. Effects of Mergers on Agricultural Loan Proportions

	Pre-merger	Static effect	Secular change	Restructuring effect	Direct effect	Total static, restructuring, and direct effects	External effect[b]
Number of banks	1,062	-609	NA	NA	NA	-609	NA
Gross total assets[a]	233.51	NA	7.58	-8.83	NA	-1.25	NA
Proportions of assets in:							
Total agricultural loans	0.0631	-0.0277*	-0.0025*	0.0007	-0.0001	-0.0271*	-0.0006**
Production loans	0.0471	-0.0184*	-0.0023*	0.0000	-0.0021	-0.0205**	-0.0004**
Loans secured by farmland	0.0352	-0.0156**	-0.0011	0.0011*	-0.0025*	-0.0167*	-0.0002**

NA: Not all of the effects change the number of banks or their gross total assets.

[a] Billions of 1996 dollars (GDP implicit price deflator).

[b] The magnitudes of the external effect estimates are not comparable to other estimates in the table, since the external effect estimates are based on the assets of all the banks in the nation, whereas, the other estimates are based on assets of the merged banks.

* Significantly different from zero at the 0.05 level.

** Significantly different from zero at the 0.01 level.

Table 6. Effects of Bank Mergers on Agricultural Loan Proportions by Type of Merger

	All Mergers	Mergers of Equals	Family Mergers	Mergers of Unequals	Non-family Mergers
Number of pro forma banks	453	105	209	348	244
Gross total assets[a]	233.51	27.82	175.66	205.69	58.85
Total Static, Restructuring, and Direct Effects					
Total agricultural loans	-0.0271[**]	-0.0383	-0.0420[*]	-0.0227[**]	-0.0173[**]
Production loans	-0.0205[**]	-0.0331	-0.0259	-0.0169[*]	-0.0155[*]
Loans secured by farmland	-0.0167[**]	-0.0210	-0.0222[*]	-0.0159[**]	-0.0127[**]

[a] Billions of 1996 dollars (GDP implicit price deflator).
[*] Significantly different from zero at the 0.05 level.
[**] Significantly different from zero at the 0.01 level.

Table 7. Effects of Bank Mergers on Agricultural Loan Proportions by Size of Participants

	Size of Target[a]			
	Small	Medium	Large	Huge
Size of Survivor	Less than 50	50 to 100	100 to 500	500 or more
Small (less than 50)				
Number of pro forma banks	28	5	2	0
Gross total assets[b]	0.72	0.46	0.39	
Total static, restr. and direct effects	-0.004*	-0.010	-0.011	
Medium (50 to 100)				
Number of pro forma banks	42	12	4	1
Gross total assets[b]	2.88	2.05	0.97	0.66
Total static, restr. and direct effects	-0.024*	-0.016*	-0.039	-0.033
Large (100 to 500)				
Number of pro forma banks	64	51	51	9
Gross total assets[b]	9.31	11.58	16.23	8.97
Total static, restr. and direct effects	-0.034**	-0.040	-0.064	-0.068
Huge (500 or more)				
Number of pro forma banks	19	22	78	65
Gross total asssets[b]	10.11	15.25	57.33	96.52
Total static, restr. and direct effects	-0.033*	-0.080	-0.052	-0.031*

[a] Bank assets measured in millions of 1996 dollars (GDP implicit price deflator).
[b] Bank assets measured in billions of 1996 dollars (GDP implicit price deflator).
* Significantly different from zero at the 0.05 level.
** Significantly different from zero at the 0.01 level.