The Impact of Interstate Bank Branching Deregulations on the U.S. Agricultural Sector: From Better Access to Credit to Higher Farm Sales and Profits

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The Impact of Interstate Bank Branching Deregulations on the U.S. Agricultural Sector: From Better Access to Credit to Higher Farm Sales and Profits*

(PRELIMINARY)

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Abstract:

In this paper, we show that relaxing credit constraints and increasing access to finance by lifting state-level restrictions on interstate bank expansions from the 1970s through the early 1990s benefited the U.S. agricultural industry by increasing farm sales and profits. In our empirical analysis, we use historical county-level data from 1970 until 1994 for the entire U.S. and a difference-in-differences econometric framework that exploits only *within* state variation in bank deregulation to distinguish the effect of an increase in bank competition and reduction in credit constraints from potential confounding factors. Further, by including region-by-year fixed effects in our econometric equation, we estimate the impact of banking deregulations by comparing changes (in farm sales and expenditures) in states that lift restrictions on interstate banking to changes in states that do not lift such restrictions in the same (Census) region of the country. Finally, we also show that the empirical results are robust to comparing only counties along state borders, which have very similar climate, soil fertility, and access to transportation. Our estimates indicate that county-level farm sales increase by about 3.9 percent after the state deregulates its banking sector and allows interstate bank expansion. The results also show that county-level agricultural production expenditures in the state rise by 1.9 percent, which is less than the increase in sales, thus leading to higher farm profits. The positive impact on farm sales and expenditures is larger in metropolitan counties than in rural counties. Overall, our work demonstrates that government policies aimed at improving farmers' access to credit can lead to higher farm sales, both in urban and rural locations.

Keywords: Farm Sales; Farm Expenditure; Banking Deregulation; Credit Constraints
J.E.L. Codes: G18, G21, Q13, Q14

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1. Introduction

Establishing the existence and evaluating the impact of credit constraints on the U.S. agricultural sector is an important policy question. However, there are only a few studies that have considered this topic (e.g. Hartand and Lence (2004); Chaddad et al. (2005); Andreu et al. (2006); and Briggeman et al. (2009)) and (to our knowledge) only one previous study by Briggeman et al. (2009) has provided an estimate of the overall impact of credit constraints on output in the U.S. agricultural sector.[1] In this paper, we extend the existing literature by evaluating the overall impact of improved access to finance on U.S. farm sales, expenditures, and profits directly, taking advantage of a quasi-natural experiment. We show that relaxing credit constraints and increasing access to finance by lifting state-level restrictions on interstate bank expansions from the 1970s through the early 1990s benefited the U.S. agricultural industry by increasing farm sales, expenditures, and profits.

Using historical county-level data from 1970 until 1994 for the entire U.S., we estimate the effect of two policy innovations (allowing intrastate branching and interstate banking) that contributed to increased bank competition on farm sales and expenditures. Before the 1970s, most states either prohibited or severely restricted (interstate) bank branching (see Jayaratne and Strahan (1996) and Lence (1997)). Jayaratne and Strahan (1998) have shown that the two types of banking deregulations we consider have increased competition, reduced local monopolies, lowered borrowers' costs, and raised efficiency in the banking sector, thereby facilitating access to credit. Because the majority of non-real estate farm loans are obtained from commercial

[1] A number of other studies have estimated the impact of credit constraints on production, investment, and profits in the agricultural sector in other countries (with less developed financial markets) – see, for example, Petrick (2004) for Poland, Foltz (2004) for Tunisia, Feder et al. (1990) for China, Carter and Olinto (2003) for Paraguay, Blancard et al. (2006) for France.

banks (Cramer, Jensen, and Southgate, 2001; Butler and Cornaggia, 2011), such deregulations may have significant positive effects on the U.S. agricultural sector.[2] While a number of studies have examined the impacts of the two banking deregulations (and the accompanying reduction in credit constraints) on the financial and the manufacturing sectors of the U.S. economy, no work has been done yet to assess their overall effect on the agricultural sector. The current study attempts to fill this gap.

We employ annual county-level data from the Bureau of Economic Analysis (BEA) on farm sales and production expenditures (as well as sales of crops and livestock products separately) from 1970 through 1994. Sweeping changes in state-level banking regulations began in 1970 and this is also the year annual county-level data on farm sales and expenditures become available. Our sample ends in 1994 with the passage of a federal regulation – the 1994 Riegle-Neal Interstate Banking and Branching Efficiency Act – that ended (nationwide) state restrictions on bank expansions across local markets.

To estimate the impact of lifting state-level restrictions on bank expansions during the sample period, we specify a difference-in-differences econometric model with multiple time periods (fixed-effects panel model). Exploiting only *within* state variation in bank deregulation helps us to distinguish the effect of an increase in bank competition and reduction in credit constraints from potential confounding factors. Formally, we estimate a panel data model with county and year fixed effects. Furthermore, we estimate the impact of banking deregulations by comparing changes (in farm sales and expenditures) in states that lift restrictions on interstate banking to changes in states that do not lift such restrictions in the same region of the country by

[2] For a discussion of how credit constraints may affect farm operations and for a formal model with credit constraints, see, for example, Briggeman et al. (2009); Barry and Robison (2001); Barry et al. (2000); Bierlen and Featherstone (1998); Vasavada and Chambers (1996); Phimister (1995); or Hubbard and Kashyap (1992).

including region-by-year fixed effects. Intuitively, we compare the *within*-county changes in farm sales and expenditures in counties located in states that adopted a banking deregulation to changes in counties located in non-adopting states over the same time period. The results are robust to the inclusion of time-varying county-level covariates, such as income per capita and population density. They are also robust to the inclusion of state-specific time trends, which accommodate for any differences in trends in farm sales and expenditure across states and center identification on discontinuities surrounding the deregulation reforms.

Finally, note that sales depend on prices and quantities produced, which in turn depend on the local weather conditions (e.g. precipitation and temperature). Unfortunately, there is no weather data going back to our sample period. However, three points are in order. First, as we emphasized earlier, because we include region-by-year fixed effects in our difference-in-differences methodology, we effectively only compare counties with other counties in the same region, all of which likely have similar weather patterns (e.g. we compare counties in the Midwest with other Midwestern counties).[3] Second, it seems quite unlikely that these omitted variables (temperature and precipitation) are correlated with bank branching deregulations, so our coefficient estimates likely do not suffer from any severe biases. Last, we check directly that climate and geography (soil quality) do not affect our estimates much by comparing only counties along state borders. For such geographically proximate units, climate (average temperature and precipitation), soil fertility, and access to transportation (many state borders are

[3] Note that even if temperature and precipitation information were available, it would not be available for every county – for example, in the Midwest, weather stations are distributed sporadically across counties, with some counties with one or more stations, but most with none. Also, note that any potential longer-term climate changes that differ by states (or region) are captured by the state-specific time trends that we include in our model.

along navigable rivers) are quite similar, so such omitted variables are not likely to bias our estimates.

Our results suggest that the increase in bank competition and the accompanying reduction in credit constraints have indeed benefited the U.S. agricultural sector. In particular, our estimates indicate that county-level farm sales increase by 3.9 percent after the state deregulates its banking sector and allows interstate bank expansion. This increase can be due to a rise in the quantity produced or prices received by producers. With relaxed credit constraints, producers may choose to improve product quality, which may result in higher prices, or they can simply increase output. In either case, we would expect to see a concurrent increase in farm expenditure, which is what we find. Our estimates show that following interstate banking deregulation, county-level agricultural production expenditures in the state rise by 1.9 percent, which is less than the increase in sales, thus leading to higher farm profits.

We also show that the positive impact on farm sales and expenditures is larger in metropolitan counties than in rural counties (those adjacent and those nonadjacent to metropolitan counties). The positive impact from the interstate banking deregulation on farm sales in metropolitan counties is 6.3 percent, compared to 4.1 percent in rural adjacent counties and 3.3 percent in rural nonadjacent counties. Interestingly, livestock sales follow this overall urban-rural continuum pattern – metropolitan counties in states adopting the interstate banking deregulation experience a larger increase (8.4 percent) than nonmetropolitan counties (0.8 percent); but crop sales behave exactly the opposite – sales in rural counties rise more (5.8 percent) than sales in metropolitan counties (2.7 percent) as a result of better access to finance. Overall, our work demonstrates that government policies aimed at improving farmers' access to credit can lead to higher farm sales, both in urban and rural locations.

Our work is similar in spirit to that of Briggeman et al. (2009), who use 2005 data from the Agricultural Resource Management Survey (ARMS) and propensity score matching techniques to find that credit constraints reduce the value of production for farm sole proprietorships by $39,658. They aggregate this estimate the national level to conclude that credit constraints reduce the value of farm output in the U.S. by 3 percent. Despite the fact that we use a different data set from a different time period and a different econometric technique (to evaluate the impact of credit constraints on U.S. farm output) compared to Briggeman et al. (2009), the final results are very similar – our overall estimate of the increase in the value of farm output as a result of lifting credit constraints (banking deregulation) is 3.9 percent, which is only 0.9 percentage points higher than the aggregated impact of 3 percent computed by Briggeman et al. (2009).

2. Banking Deregulation across U.S. States

In the 1950s, 60s, and early 70s, banks in the United States were severely restricted by state statues in their ability to expand across state borders or to even branch within a state. The 1956 Douglas Amendment to the Bank Holding Company Act banned bank holding companies from acquiring banks in other states unless state regulations permitted such transactions. This Amendment effectively prohibited interstate bank mergers and acquisitions as no state allowed such cross-state transactions. From the late 1970s, individual states started adopting legislation that would allow bank holding companies that are headquartered in other states, with which they had reciprocal agreements, to acquire local banks. While the Garn-St. Germain Act of 1982 amended the Bank Holding Company Act to permit any bank holding company, regardless of the location of its headquarters, to acquire failed banks (see Jayaratne and Strahan 1996), it was the

Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 that effectively deregulated interstate banking nationwide.[4] This Act superseded prior agreements between states and put out-of-state banks on equal footing with local institutions.

Similarly, only a few states allowed unrestricted bank branching before the 1970s. In most states, there was either a ban or some form of (severe) restriction on branching activity, although banks could circumvent such restrictions by reorganizing as a multi-bank holding company (Jayaratne and Strahan 1996). In the 1970s and 80s, many states adopted deregulations that allowed banks to set up multiple branches within a state through mergers and acquisitions (M&A) and through de novo branching (establishing a brand new branch). For the majority of states, branching through M&A was allowed first, and de novo branching was permitted later. In our empirical work, we use the timing for deregulating branching through M&A (as opposed to de novo branching) since the former marks the leading edge of state branching deregulation reform (Cetorelli & Strahan 2006; Demyanyk *et al.* 2007).

3. Data

To evaluate the impact of interstate banking and intrastate branching regulations on the economic performance of the U.S. agricultural sector, we use county-level data on farm sales and expenditures from the BEA. These are annual data from 1970 until 1994. Sweeping changes in state-level banking regulations began in 1970, and this is also the year annual county-level data on farm sales and expenditures become available. Our sample ends in 1994 with the passage of a federal regulation – the 1994 Riegle-Neal Interstate Banking and Branching Efficiency Act – that ended (nationwide) state restrictions on bank expansions across local markets.

[4] Individual states could opt out of the interstate banking provisions of the Riegle-Neal Act before they went into effect in 1997, but only two states, Texas and Montana, passed legislation to do so (Kroszner and Strahan 1999).

The data are compiled and distributed by the BEA and include information on total farm sales and production expenditures as well as sales of crops and livestock (products) separately. Using annual data (instead of data with lower frequency from the Census of Agriculture, which is only available every five years) enables us to take advantage of all state-level variation in banking deregulations – for example, during the 1980s there is at least one state that adopts a bank deregulation in any given year. While data on farm profits is not available, we compute a proxy measure of profits by subtracting expenditures from sales.

Additionally, we use data on county population and personal income, also sourced from the BEA. To compute population density we employ data on county area from the 1980 Census. We divide counties into 3 categories – metropolitan, rural adjacent to metropolitan, and rural non-adjacent based on the rural-urban continuum spectrum defined by the Economic Research Service (ERS) at the United States Department of Agriculture (USDA).

4. Econometric Strategy

To estimate the impact of the two bank branching deregulations (allowing intrastate branching and interstate banking) on the U.S. agricultural sector, we specify the following generalized difference-in-differences econometric model:

$$(1)\quad \ln \psi_{cst} = \gamma_1 \text{Intrastate\_Branching}_{st} + \gamma_2 \text{Interstate\_Banking}_{st} + \mathbf{X_{cst-1}}\beta + \mu_c + \tau_t + \text{Region}_r * \tau_t + \varepsilon_{cst},$$

where $\ln \psi_{cst}$ is the natural logarithm of the outcome of interest (e.g. total farm sales or expenditures) in county *c*, state *s*, and year *t*. In a number of specifications, we do not use the logarithm of the outcome as a dependent variable, but rather the level of the variable of interest, because the outcome can be either zero or negative (e.g. profits, which we measure as the

difference between sales and expenditure and can be negative, as well as crop sales and livestock sales, one of which can be equal to zero for some county-year observations with positive total farm sales).

The indicator variables $\text{Intrastate\_Branching}_{st}$ and $\text{Interstate\_Banking}_{st}$ are equal to one starting in the year of the intrastate branching deregulation and the interstate banking deregulation, respectively, and zero otherwise. To control for time-varying factors that may be correlated with the adoption of bank branching deregulations, we include a matrix of county-level covariates, $\mathbf{X}_{\mathbf{cst}-1}$. First, we include population density, which can directly affect farms sales (and expenditure) because counties with higher urbanization can be less suitable for agricultural production (due to, among other factors, poor air quality and limited availability of arable land). Second, we include income per capita to control for local economic conditions. Ideally, as discussed in the Data section, we would be able to control for the county-level unemployment rate; since this data is not available, we include county-level income per capita instead. One important consideration with both of these covariates is that they can be (causally) affected by the two banking deregulations, and not merely changing contemporaneously with and independently from them. In fact, Jayaratne and Strahan (1996) show that banking deregulation leads about one percent higher growth in per capita income. To address this potential concern, we use lagged values of the covariates included in $\mathbf{X}_{\mathbf{cst}-1}$.[5]

Next, we include a full set of county fixed effects, μ_c, which absorb all time-invariant county-specific characteristics that affect the outcomes of interest (e.g. farm sales, expenditures, profits) and may be correlated with the two bank branching deregulations. Hence, only *within*-

[5] Note that the estimated effects of the two bank branching deregulations do not change significantly when we add the lagged covariates, nor when we use contemporaneous values of the covariates.

county (*within*-state) variation in the two banking deregulations is used to identify the effects of an increase in bank competition and reduction in credit constraints on the outcome of interest. Year fixed effects are included to account for annual economy-wide shocks that affect all states (and counties). Also, to capture potential time-varying regional differences in the U.S. agricultural sector that may exist, we include (Census) region-by-year fixed effects, $\text{Region}_r * \tau_t$, in our econometric model.[6] This allows counties in different regions of the country to follow different trajectories and accounts for differential shocks by region over time. Hence, we estimate the impact of the two banking deregulations by comparing changes (in the outcome variable, e.g. farm sales and profits) in counties located in states that lift restrictions on interstate banking to changes in counties located in states that do not lift these restrictions in the same region of the country. Our econometric strategy, then, never compares (counties in) California to (counties in) New York, nor (counties in) Texas to (counties in) Minnesota, which clearly have very different agricultural sectors due to a number of factors such as geographic location within the U.S., which influences weather patterns (temperature and precipitation) and in turn irrigation decisions and soil quality. Also, in one of our robustness checks, we directly verify that climate and geography (soil quality) do not affect our estimates much. We do so by comparing only counties along state borders. For such geographically proximate units, climate (average temperature and precipitation), soil fertility, and access to transportation (many state borders are along navigable rivers) are quite similar, so such omitted variables are not likely to bias our estimates.

[6] The four Census regions are as follows: Region 1 (South) contains AL, AR, DC, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, and VA; Region 2 (Northeast) contains CT, MA, MD, ME, NH, NJ, NY, PA, RI, VT, and WV; Region 3 (Midwest) contains IA, IL, IN, KS, MI, MN, MO, NE, ND, OH, SD, and WI; Region 4 (West) contains the remaining states.

In some specifications, to check for robustness, in addition to all of the right-hand side controls discussed above, we include state-specific time trends, which accommodate for any differences in agricultural trends in the outcome of interest across states and center identification on discontinuities surrounding the deregulation reforms – to the extent that they exist, state-specific trends can capture differences in the growth rate of agricultural productivity across states. Finally, ε_{cst} is a standard error term.

Problems with heteroskedasticity and serial correlation arise naturally in a panel data setup as this one, but the consequences from potential serial correlation can be even more severe if the identification involves difference-in-differences with multiple time-periods where the main variables of interest, the two banking deregulations in our setup, vary by state and not by county. To solve this problem, we follows Bertrand et al. (2004) who recommend computing heteroskedasticity robust standard errors clustered by state, and not by state-year cell or by county. This estimator of the variance-covariance matrix is consistent in the presence of any correlation pattern within states over time.

5. Results

We start the empirical analysis by estimating regression equation (1) with the (natural logarithm) of farm sales as the dependent variable. The results are presented in Table 3. In column (1), we estimate our most basic specification that includes only the deregulation indicators along with a full set of state and year fixed effects. The estimated coefficient on interstate banking is negative and statistically significant at 0.036 (with a standard error of 0.018), suggesting that the farms sales increased by 3.7 percent ((=$e^{0.036}$-1)*100) following the

adoption of the interstate banking deregulation.[7] This evidence is consistent with prior work by Jayaratne and Strahan (1998), who find that interstate banking deregulation has led to increased competition, reduction in local monopolies, and it had raised efficiency in the banking sector, thereby facilitating access to credit. Because the majority of non-real estate farm loans are obtained from commercial banks (Cramer, Jensen, and Southgate, 2001; Butler and Cornaggia, 2011), it is not surprising the interstate banking deregulation has significant positive effects on farm sales. Relaxing farmers' credit constraints may lead to investment in new technology, increasing production efficiency, and expanding the customer base. This will result in higher sales, which is what we find happens following the adoption of the interstate banking deregulation in counties located in reform states vis-à-vis counties located in non-reform states. The magnitude of the estimated coefficient is economically meaningful, as well. Given the average county farm sales of nearly $51 million (1982 U.S. dollars) over the sample period, the estimated impact of the interstate banking deregulation is an increase of about $1.9 million.

Unlike the coefficient on the interstate banking indicator, the coefficient on intrastate branching is practically zero, although there is a fairly large standard error around it, and inferences are thus difficult to make. In fact, as we show later, if we estimate a linear, instead of the present log-linear model, the impact of intrastate branching is positive, of the same magnitude as the impact on interstate banking, and significant at the 10 percent level. The potential lack of a significant effect from intrastate bank branching deregulation resembles the findings in Kerr and Nanda (2009), who document that while interstate banking brought about significant growth in entrepreneurship (and business closures) across states, intrastate branching

[7] Because the dependent variable is expressed in logarithmic form and the indicator variable only changes discontinuously, the effect of the interstate banking deregulation is calculated as $(e^{-0.345}-1) = -0.292$. Note that for estimated coefficients that are small in magnitude, this procedure makes little difference.

had little effect. This can be a result of a smaller impact of intrastate branching on competition in the banking sector, or in the agricultural context, because multi-state banks may have the technology to serve farmers better than single-state banks. Additionally, national banks with experience across many states may have a comparative advantage relative to single-state banks in evaluating agricultural investment projects.

In the second column of Table 3, we present the estimates from the basic specification in column (1) augmented with region-by-year fixed effects. This model delivers very similar results – the impact of the interstate banking regulation is again positive and statistically significant, and at 0.039 (with a standard error of 0.18) is slightly larger than the estimate in column (1). There again appears to be no effect on the farm sales from intrastate branching reforms. In the third, column of Table 3, we further expand the baseline model to include two important time-varying, county-level covariates – population density and the (natural logarithm) of the per capita income. The estimated effect on interstate banking deregulation does not change much. Both population density and income per capita have the expected signs, but only the latter is statistically significant.

In the fourth column of Table 3, we additionally include state-specific trends, which accommodate for any differences in trends in farm sales and expenditure across states and center identification on discontinuities surrounding the deregulation reforms. The estimated impact of interstate banking declines to 0.021 (with a standard error of 0.010) but it is still economically and statistically significant, implying that increased access to local finance raises county farm sales 2.1 percent or $1.1 million (1983 U.S. dollars). The impact of the intrastate branching deregulation is virtually zero in this specification, as well.

In the fifth, sixth, and seventh columns of Table 3, we subdivide our sample into metro counties (column 5), rural counties adjacent to metro counties (column 6), and rural counties not adjacent to metro counties (column 7), as identified by the rural-urban continuum spectrum created by the ERS at the USDA. We estimate the same model as in column 2, with state, year, and region-by-year fixed effects. The magnitude of the effect of interstate banking is largest for metro counties at 0.063 (standard error 0.016), smaller for rural adjacent counties at 0.042 (standard error 0.014), and smallest and insignificant for the rural non-adjacent counties at 0.033 (0.026). Note that although the magnitudes of the effect of interstate banking differ across these different types of counties, the effects are not statistically significantly different from each other. The effect of intrastate banking remains insignificant when we subdivide the sample along the rural-urban continuum.

Next we consider the effect of banking deregulation on farm expenditures. Greater access to credit resulting from increased interstate and intrastate banking would make it easier for farmers to obtain loans for capital and supply purchases, and thus would tend to increase farm expenditures. This is what we find in Table 4, where we estimate the same series of specifications as in Table 3, looking at the log of farm expenditures as the dependent variable. The effect of interstate banking is positive, but generally statistically insignificant, except in the case of metro counties where the estimated coefficient is significant at the 5 percent level. The estimated coefficient in column (3), for example, suggests a 1.8 percent increase in farm expenditures following the interstate banking deregulation. In all cases, the impact of this deregulation on farm expenditures is smaller than the impact on farm sales, suggesting a positive impact on profits (which is roughly the difference between sales and expenditures). The effect of intrastate branching is, again, economically small and statistically insignificant.

In Table 5, we compute a measure of farm profits by subtracting farm expenditures from farm sales. Since profits can be positive or negative, we estimate a slightly different version of specification equation (1), using the level of county profits (in dollar amounts) instead of the logarithm. In columns (1) and (2), we re-estimate our model with sales and expenditures, but we use the level instead of the logarithm of the respective dependent variable. The results are similar to those in Tables 3 and 4, except for the effect of intrastate branching on farm sales, which is now larger. The estimated coefficient suggests that intrastate branching increased county farm sales by about $3.5 million. Columns (3) - (8) show that impact of the two financial deregulations on farm profits. For example, the model with covariates in column (4) suggests that county profits rose by $1.48 million following the passage of the interstate banking deregulation. The intrastate branching deregulation also appears to have raised profits by about $1.47 million. Both effects are statistically significant at the 5 percent level. The results along the rural urban continuum suggest that all 3 different types of counties (metro, rural adjacent, and rural non-adjacent) experienced an increase in farm profits following the adoption of the interstate banking deregulation. The passage of the intrastate branching deregulation, on the other hand, raised profits only in rural adjacent counties.

Table 6 presents the results from a robustness check where we estimate our empirical model using a restricted set of counties – those along state borders. At state borders, the determinants of agricultural output and productivity, such as climate, soil fertility, and access to transportation (many state borders are along navigable rivers) are quite similar on both sides of the border. State policies with respect to interstate banking and intrastate branching deregulations, however, differ as we cross the border. Hence, comparing only counties along state lines may deliver sharper and more reliable estimates of the impact of financial deregulations and improved access to local finance. Notice that from our main sample of 2,806

counties and 70,102 observations, we now have 1,018 counties and 25,447 observations. The estimates using the restricted set of counties along state borders are quite similar to those using all counties. In particular, in column (4) of Table 6, the impact of interstate banking on farm profits is estimated to be positive at $1.165 million (vs. $1.48 million in column (4) of Table 5), and it is statistically significant at the 5 percent level. The effect of intrastate branching, on the other hand, is still positive but it is no longer statistically significant. Also, in the rural-urban hierarchy, while it is positive for all 3 types of counties, the impact of interstate banking is significant only for rural non-adjacent counties.

In Table 7, we test for the presence of phase-in effects, i.e. we ask if the impacts of any of the two deregulations occur with lags. To this end, we augment our baseline specification (1) to include first, second, and third lags of the interstate banking and the intrastate branching deregulation. The results suggest that there are no lag effects from the interstate banking deregulation (on sale, expenditures, or profits) and there is some evidence that lag effects exist for the intrastate branching deregulation. In particular, the third lag of the intrastate branching indicator is significant for both sales and profits in a number of specifications.

Finally, in Table 8, we separate sales of crops from sales of livestock and estimate equation (1) with state, year, and region-by-year fixed effects for crop sales and for livestock sales. In all previous specifications, the sales and expenditures for crops and livestock were combined in the variable total sales.[8] In the first (fourth) column of Table 8, we estimate the effect of banking deregulation on crop (livestock) sales in all counties, while columns 2, 3, and 4 (6, 7, and 8) show the results for metro counties, rural counties adjacent to metro counties, and

[8] Note that unlike sales, the BEA does not divide farm expenditure into separate groups for crop and livestock expenditure.

rural non-adjacent counties. In general, the results show positive effects from the two financial deregulations on both crop and livestock sales, although the impacts on crop sales are somewhat more precisely estimated. The coefficients on the interstate banking deregulation in columns (1) and (5) are very similar implying that that following the passage of this deregulation, county sales of crops and livestock products rose about $1.5 million.

6. Conclusion

In this paper, we ask if increasing access to local finance benefits agricultural producers in the U.S. To address this question and identify the impact of relaxing credit constraints on farms sales, expenditure, and profits, we employ variation in the timing of adoption of state-level bank branching deregulations and annual county-level data from the BEA on farm sales and production expenditures from 1970 through 1994. To estimate the impact of lifting state-level restrictions on bank expansions during the sample period, we specify a difference-in-differences econometric model with multiple time periods. Exploiting only *within* state variation in bank deregulation helps us to distinguish the effect of an increase in bank competition and reduction in credit constraints from potential confounding factors. Furthermore, we estimate the impact of banking deregulation by comparing changes (in farm sales and expenditures) in states that lift restrictions on interstate banking to changes in states that do not lift such restrictions in the same region of the country.

Our results suggest that the increase in bank competition and the accompanying reduction in credit constraints have indeed benefited the U.S. agricultural sector. In particular, our estimates indicate that county-level farm sales increase by 3.9 percent after the state deregulates its banking sector and allows interstate bank expansion. This increase can be due to a rise in the

quantity produced or prices received by producers. With relaxed credit constraints, producers may choose to improve product quality, which may result in higher prices, or they can simply increase output. In either case, we would expect to see a concurrent increase in farm expenditure, which is what we find. Our estimates show that following interstate banking deregulation in a state, county-level agricultural production expenditures rise by 1.9 percent, which is less than the increase in sales, thus leading to higher farm profits.

The results are robust to the inclusion of time-varying county-level covariates, such as income per capita, and population density. They are also robust to the inclusion of state-specific time trends, which accommodate for any differences in trends in farm sales and expenditure across states and center identification on discontinuities surrounding the deregulation reforms. We also verify that climate and geography (soil quality) do not affect our estimates much by comparing only counties along state borders. For such geographically proximate units, climate (average temperature and precipitation), soil fertility, and access to transportation (many state borders are along navigable rivers) are quite similar, so such omitted variables are not likely to bias our estimates. Overall, our work demonstrates that government policies aimed at improving farmers' access to credit can lead to higher farm sales and profits, both in urban and rural locations.

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TABLES

Table 1. Banking Deregulation

State	Statewide Branching Permitted	Interstate Banking Permitted
Alabama	1981	1987
Alaska	Before 1970	1982
Arizona	Before 1970	1986
Arkansas	1994	1989
California	Before 1970	1987
Colorado	1991	1988
Connecticut	1980	1983
Delaware	Before 1970	1988
District of Columbia	Before 1970	1985
Florida	1988	1985
Georgia	1983	1985
Hawaii	1986	1995
Idaho	Before 1970	1985
Illinois	1988	1986
Indiana	1989	1986
Iowa	1997	1991
Kansas	1987	1992
Kentucky	1990	1984
Louisiana	1988	1987
Maine	1975	1978
Maryland	Before 1970	1985
Massachusetts	1984	1983
Michigan	1987	1986
Minnesota	1993	1986
Mississippi	1986	1988
Missouri	1990	1986
Montana	1990	1993
Nebraska	1985	1990
Nevada	Before 1970	1985
New Hampshire	1987	1987
New Jersey	1977	1986
New Mexico	1991	1989
New York	1976	1982
North Carolina	Before 1970	1985
North Dakota	1987	1991
Ohio	1979	1985
Oklahoma	1988	1987
Oregon	1985	1986
Pennsylvania	1982	1986
Rhode Island	Before 1970	1984
South Carolina	Before 1970	1986
South Dakota	Before 1970	1988
Tennessee	1985	1985
Texas	1988	1987
Utah	1981	1984
Vermont	1970	1988
Virginia	1978	1985
Washington	1985	1987
West Virginia	1987	1988
Wisconsin	1990	1987
Wyoming	1988	1987

Source. Amel (1993), Kroszner and Strahan (1999), and Demyanyk et al.(2007).

Table 2. Summary Statistics

Variable	Mean	St. Dev.	Min.	Median	Max
Total Sales (thousands of 1982 U.S. dollars)	50,891	80,881	46	31,869	2,146,522
Total Expenditure (thousands of 1982 U.S. dollars)	44,600	65,635	84	29,246	1,565,681
Crop Sales (thousands of 1982 U.S. dollars)	23,001	51,635	36	11,087	1,677,341
Livestock Sales (thousands of 1982 U.S. dollars)	27,802	44,521	38	15,608	1,485,459
Total Profit (Sales - Expenditure, thousands of 1982 U.S. dollars)	6,291	20,003	-49,675	2,032	680,345
Interstate Banking Deregulation Indicator	0.33	0.47	0.00	0.00	1.00
Intrastate Branching Deregulation Indicator	0.46	0.50	0.00	0.00	1.00
Population Density (persons per square mile)	104.54	277.19	0.21	35.67	5,765.21
Income per capita (1982 U.S. dollars)	9,744	2,420	2,741	9,566	35,409

Note. The total number of observations is 70,102. There are 2,806 counties considered in the analysis. The sample period is from 1970 to 1994.

Table 3. The Impact of Bank Branching Deregulations on Farm Sales, 1970-1994

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All Counties	All Counties	All Counties	All Counties	Metro	Rural Adj.	Rural Non-adj.
Interstate Banking	0.036**	0.039**	0.036**	0.021**	0.063***	0.042***	0.033
	(0.018)	(0.018)	(0.017)	(0.010)	(0.016)	(0.014)	(0.026)
Intrastate Branching	-0.009	-0.007	-0.004	0.008	-0.029	0.007	-0.007
	(0.024)	(0.021)	(0.020)	(0.013)	(0.020)	(0.016)	(0.034)
Population Density			-0.018	-0.037**			
			(0.016)	(0.018)			
Income per capita			0.283***	0.299***			
			(0.048)	(0.042)			
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-by-Year Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
State Trends	No	No	No	Yes	No	No	No
R^2	0.97	0.97	0.97	0.97	0.97	0.97	0.97
No. Obs.	70,102	70,102	70,102	70,102	17,724	22,776	29,602
No. Counties	2,806	2,806	2,806	2,806	709	912	1,185

Note. Robust standard errors clustered at the state level are reported in parenthesis. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 4. The Impact of Bank Branching Deregulations on Farm Expenditures, 1970-1994

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All Counties	All Counties	All Counties	All Counties	Metro	Rural Adj.	Rural Non-adj.
Interstate Banking	0.012	0.017	0.018	0.002	0.034**	0.028	0.013
	(0.015)	(0.017)	(0.017)	(0.010)	(0.014)	(0.018)	(0.022)
Intrastate Branching	-0.011	-0.001	-0.002	0.006	-0.013	0.005	0.003
	(0.022)	(0.022)	(0.022)	(0.012)	(0.022)	(0.022)	(0.031)
Population Density			-0.034*	-0.046**			
			(0.017)	(0.019)			
Income per capita			0.013	0.038			
			(0.033)	(0.029)			
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-by-Year Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
State Trends	No	No	No	Yes	No	No	No
R^2	0.98	0.98	0.98	0.98	0.98	0.98	0.98
No. Obs.	70,112	70,112	70,112	70,112	17,722	22,780	29,610
No. Counties	2,806	2,806	2,806	2,806	709	912	1,185

Note. Robust standard errors clustered at the state level are reported in parenthesis. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 5. The Impact of Bank Branching Deregulations on Farm Profits, 1970-1994

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Sales	Expenditures	Profits	Profits	Profits	Profits	Profits	Profits
	All counties	All counties	All counties	All counties	All counties	Metro	Rural Adj.	Rural Non-adj.
Interstate Banking	3,186**	1,514	1,671***	1,480**	979*	2,569***	1,148*	1,665***
	(1,556)	(1,368)	(613)	(570)	(590)	(917)	(602)	(587)
Intrastate Branching	3,533*	2,320	1,211*	1,469**	245	571	1,733***	1,118
	(1,928)	(1,706)	(683)	(638)	(679)	(677)	(575)	(961)
Population Density				-877	-698			
				(647)	(609)			
Income per capita				1.798***	1.749***			
				(0.192)	(0.198)			
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Trends	No	No	No	No	Yes	No	No	No
R^2	0.96	0.96	0.74	0.75	0.76	0.81	0.68	0.50
No. Obs.	70,102	70,102	70,102	70,102	70,102	17,724	22,776	29,602
No. Counties	2,806	2,806	2,806	2,806	2,806	709	912	1,185

Note. Robust standard errors clustered at the state level are reported in parenthesis. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 6. The Impact of Bank Branching Deregulations on Farm Profits, Border Counties Only, 1970-1994

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Sales	Expenditures	Profits	Profits	Profits	Profits	Profits	Profits
	All counties	All counties	All counties	All counties	All counties	Metro	Rural Adj.	Rural Non-adj.
Interstate Banking	2,996**	1,673	1,323**	1,165**	1,136*	1,240	1,167	1,608***
	(1,450)	(1,280)	(526)	(485)	(589)	(1,099)	(811)	(453)
Intrastate Branching	2,665	2,032	634	899	353	-1,009	1,375*	1,183
	(1,708)	(1,627)	(684)	(657)	(674)	(1,116)	(774)	(870)
Population Density				185	810			
				(1,098)	(1,289)			
Income per capita				1.712***	1.625***			
				(0.179)	(0.203)			
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Trends	No	No	No	No	Yes	No	No	No
R^2	0.23	0.17	0.26	0.28	0.32	0.17	0.31	0.34
No. Obs.	25,447	25,447	25,447	25,447	25,447	6,672	7,425	11,350
No. Counties	1,018	1,018	1,018	1,018	1,018	267	297	454

Note. Robust standard errors clustered at the state level are reported in parenthesis. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 7. The Impact of Bank Branching Deregulations on Farm Profits, Phase-in Effects, 1970-1994

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Sales	Expenditures	Profits	Profits	Profits	Profits
	All counties	All counties	All counties	Metro	Rural Adj.	Rural Non-adj.
Interstate Banking	2,665**	1,020	1,642***	2,558***	1,323**	1,144**
	(1,228)	(1,054)	(574)	(770)	(605)	(536)
Interstate Banking Lag 1	156	301	-141	-311	-515	505
	(550)	(382)	(527)	(793)	(544)	(510)
Interstate Banking Lag 2	248	485	-237	-375	63	14
	(600)	(461)	(464)	(536)	(463)	(565)
Interstate Banking Lag 3	1,425	1,755	-326	721	-572	-240
	(1,429)	(1,252)	(865)	(724)	(761)	(1,089)
Intrastate Branching	2,524	2,029	494	1,024	942*	21
	(1,683)	(1,381)	(608)	(839)	(508)	(829)
Intrastate Branching Lag 1	506	214	291	-44	602	-221
	(600)	(445)	(623)	(632)	(683)	(703)
Intrastate Branching Lag 2	374	280	94	-921	-356	1,179
	(746)	(292)	(852)	(762)	(815)	(1,124)
Intrastate Branching Lag 3	2,127**	778	1,349*	1,205*	1,305**	1,579
	(1,032)	(679)	(724)	(717)	(585)	(1,272)
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Region-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.96	0.96	0.76	0.83	0.68	0.50
No. Obs.	70,102	70,102	70,102	17,724	22,776	29,602
No. Counties	2,806	2,806	2,806	709	912	1,185

Note: Robust standard errors clustered at the state level are reported in parenthesis. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 8. The Impact of Bank Branching Deregulations on Crop and Livestock Sales, 1970-1994

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Crops	Crops	Crops	Crops	Livestock	Livestock	Livestock	Livestock
	All counties	Metro	Rural Adj.	Rural Non-adj.	All counties	Metro	Rural Adj.	Rural Non-adj.
Interstate Banking	1,465**	1,194	965	1,772**	1,432	3,807**	2,529*	1,119
	(638)	(854)	(738)	(702)	(1,425)	(1,439)	(1,401)	(1,547)
Intrastate Branching	1,305*	1,412	2,344***	357	2,296	1,094	1,028	3,847*
	(683)	(853)	(822)	(1,098)	(1,608)	(1,525)	(1,666)	(2,000)
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.96	0.97	0.92	0.90	0.94	0.95	0.93	0.92
No. Obs.	70,102	70,102	70,102	70,102	70,102	17,724	22,776	29,602
No. Counties	2,806	2,806	2,806	2,806	2,806	709	912	1,185

Note: Robust standard errors clustered at the state level are reported in parenthesis. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.