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Geographic Deregulation and Commercial Bank Performance in US State Banking Markets

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Abstract

This paper examines the effects of geographical deregulation on commercial bank performance across states. We reach some general conclusions. First, the process of deregulation on an intrastate and interstate basis generally improves bank profitability and performance. Second, the macroeconomic variables – the unemployment rate and real personal income per capita – and the average interest rate affect bank performance as much, or more, than the process of deregulation. Finally, while deregulation toward full interstate banking and branching may produce more efficient banks and a healthier banking system, we find mixed results on this issue.

Journal of Economic Literature Classification: E5, G2

Keywords: commercial banks, geographic deregulation, bank performance

Geographic Deregulation and Commercial Bank Performance in US State Banking Markets

1. Introduction

This paper examines the effects of geographical deregulation of banking and branching activity on commercial bank performance across states. The lifting of geographic restrictions on bank operations led to the passage of the Riegle-Neal Interstate Banking and Branching Efficiency (IBBEA) of 1994, allowing nationwide branching in the United States and facilitating bank consolidation. The long process of geographic deregulation that culminated in the passage of the IBBEA overturned the prohibitions of interstate banking of the 1927 McFadden Act and 1956 Douglas Amendment. The emergence of interstate banking and branching generated a significant increase in mergers and acquisitions. Conventional wisdom suggests that these mergers and acquisitions would improve bank performance and increase bank efficiency.[1]

Market pressures led banks to seek ways around geographic restrictions on bank operations prior to passage of IBBEA. For example, technological innovations such as the automated teller machine loosened regulatory constraints. In addition, two types of deregulation occurred at the state level prior to IBBEA. First, multibank holding companies (MBHCs) received permission to own separate banks within some states (e.g., Texas), whereas bank branching faced different regulatory obligations. Thus, a network of banks within a MBHC achieved something similar to a branch network, although the state restricted branch banking. Second, some states allowed MBHCs from other states to operate within their borders with reciprocity. Reciprocity arrangements at times covered a regional group of states and at other times the whole nation. Other states did not require reciprocity at all.

[1] For example, Jayaratne and Strahan (1997) show that bank loan losses and operating costs fell sharply when states allowed interstate branching between 1978 and 1992. But these state-enacted deregulations could not exploit economies of scale and scope to the full extents allowed by IBBEA.

State restrictions on bank branch location, partly intended to prevent freewheeling banks from choosing inaccessible sites to deter customers from redeeming their circulating banknotes (Kane 1996, p.142), began in the nineteenth century. The McFadden Act of 1927 and the later Douglas Amendment of 1956 effectively prohibited banks from branching across state lines and forced all national banks to conform to the branching regulation in the state of their location, thus, placing national banks and state banks on equal footing. The large number of commercial banks in the United States reflects these restrictions on bank branching. Moreover, the Great Depression and financial panic left the American public with a hostile attitude toward large banks. The U.S. government enacted heavy regulation on the financial industry. In 1933, the Glass-Steagall Act prohibited commercial banks from dealing in corporate securities and prohibited investment banks from engaging in commercial banking activities. To rebuild financial credibility, the Federal Deposit Insurance Corporation (FDIC) was established in 1934, providing federal insurance on bank deposits and FDIC oversight of insured institutions.

In recent decades, the U.S. commercial banking industry has experienced a dramatic regulatory change. With the passage in 1994 of the Riegle-Neal IBBEA, bank holding companies could acquire banks in any state after September 30, 1995. The laws of some states that allowed interstate banking only on a regional or reciprocal basis became irrelevant. With the possibilities of economies of scale and scope, banking analysts anticipated that mergers and acquisitions within the banking industry would increase substantially and the number of commercial banks would decline.

In this paper, we test whether Riegle-Neal and the process of deregulation that proceeded its passage allowed banks to achieve greater efficiency and profitability. We examine the profitability of the U.S. commercial banking industry before and after Riegle-Neal on a state-by-

state basis. As noted above, many states already allowed interstate banking on regional or national, reciprocal or non-reciprocal bases before the passage of IBBEA. The IBBEA, thus, culminated a process of deregulation in the U.S. banking industry. We examine the effects of deregulation on a state-by-state basis, controlling for the effect of state economic conditions and interest rate variation on bank performance and profitability. We use Call Report data, posted on the website of the Federal Reserve of Chicago as the Report of Condition of Income.[2] The rest of the paper is organized follows. Section 2 provides a literature review. Section 3 describes the data and methodology. Section 4 reports the mean values for the performance measures in the pre- and post-IBBEA periods and discusses differences. Section 5 presents and discusses regression results. Section 7 concludes.

2. Literature Review

During the past thirty years, competition in banking and attempts to expand market reach by large institutions exerted much pressure for deregulation. The enactment of Riegle-Neal IBBEA in 1994 encouraged structural changes in the banking industry through bank mergers and acquisitions. This section surveys a selection of the academic research on pre- and post-IBBEA structure and performance of the banking industry.

The 1980s and early 1990s saw severe financial turbulence – the savings and loan debacle followed by the crisis in the commercial banking industry. These crises led to failure rates among financial institutions not seen since the Great Depression and triggered many of the regulatory changes that occurred in the 1980s and 1990s.[3] Conventional wisdom suggests that the lifting of restrictions on interstate banking and branching in these years generated a significant increase in

[2] The data, posted at the Federal Reserve Bank of Chicago, appear under Economic Research & Data at the following address: http://www.chicagofed.org/economic_research_and_data/commercial_bank_data.cfm.

[3] Jeon and Miller (2007a) evaluate the causes of those failure rates, as well as merger and new-charter rates, during this turbulent period.

mergers and acquisitions (Rhoades 2000, and Jeon and Miller 2003). One view of the consolidation process is that it, by and large, produced positive effects -- banks became more efficient (Jayaratne and Strahan, 1997, 1998). Another view sees a possible negative effect of consolidation on the availability of loans to small businesses (Ely and Robinson, 2001).

Table 1 reports the steady decline in number of banks from 1976 to 2007. In 2007, forty-seven percent of banks held total assets less than 100 million dollars, another forty-seven percent held assets between 100 million dollars and 1 billion dollars, five percent held assets between 1 billion dollars and 10 billion dollars and one percent held assets of more than 10 billion dollars. In addition, the ten biggest banks in terms of assets owned approximately fifty percent of all commercial bank assets.

One strand of the literature on the changing structure of the banking industry focuses on the effects of bank mergers on bank performance. Berger (1995) tests the market-power and efficient-structure hypotheses in the banking industry. The market-power hypothesis argues that mergers reflect a desire to set prices that are less favorable to consumers. The efficient-structure hypothesis argues that mergers reflect efficiency considerations that lower prices, making consumers better off. Berger (1995) concludes that the data do not support the scale-efficiency version of the efficient-structure hypothesis. Scale does not positively relate to either profits or market concentration. The data also do not support the traditional structure-conduct-performance hypothesis version of the market power hypothesis. Controlling for other effects, concentration usually relates negatively, not positively, to profitability. The profit-concentration relationship is spurious, tracing to correlations with other variables, particularly market share.

Like Berger (1995), Jeon and Miller (2007b) examine market-power versus efficient-structure explanations of the positive correlation between bank consolidation and performance.

Defining the "relevant" market at the state level, rather than at the MSA and non-MSA county levels, as is common in the literature, they test whether consolidation in the banking industry improves profitability and performance by lowering costs or increasing market power. They perform two different tests of this issue. First, they consider the relationship between several measures of bank concentration and one measure of bank efficiency at the state level and the performance of the average bank within that state. They find a robust and significant positive correlation between bank concentration in a state and the return on equity of the average bank in that state and a significant negative correlation between bank efficiency in a state and the return on equity of the average bank in that state. This last effect proves significant, however, only when they exclude the unemployment rate. Second, they perform Granger temporal causality tests between bank performance and market power, finding that market power temporally leads bank performance. This finding supports the market power over the efficient structure hypotheses of improved bank performance. Based on their two different tests, they conclude that the market-power rather than the efficient-structure theory receives more support.

Berger and Mester (2003) and Berger, Demsetz, and Strahan (1999) report evidence on this issue as well. They argue that rising profitability during the 1990s primarily reflects higher revenue, since costs also rise. Moreover, they attribute this rising profitability to merger activity. They contend that the initial providers of better service provision capture short-run profits, which the industry competes away in the long run. A continual process of innovation sustained the rising profitability during the 1990s. They dismiss the market-power explanation of rising profitability, however, since concentration at the MSA and non-MSA level remained unchanged during the 1990s. Stiroh and Strahan (2003) argue that lifting of geographic restrictions on banking shifted banking assets away from low- profit to high-profit banks, increasing the average profitability of

the banking industry. In other words, the competitive dynamics of the industry reshuffled the banking business toward more profitable banks.

Pilloff and Rhoades (2002) also study structure and profitability in banking markets. They use the structure-conduct-performance model and regression analysis to investigate a number of analytical issues that arise in evaluating competition and bank mergers. Their most consistent and strongest finding shows that the local market Herfindahl-Hirschman Index of concentration (HHI) positively and significantly relates to profitability in the banking industry, as it generally does in other industries. They also find that the number of organizations and the level of recent deposit growth may provide additional information on the level of competition. Finally, several variables including market size, the number of large banking firms, deposits per office, and resident migration rates exhibit similar relationships to profitability in bivariate analyses, suggesting additional characteristics which may prove important for competition.

Jayaratne and Strahan (1997, 1998) in companion studies consider various aspects of banking industry structure and bank performance. In the first paper, they find that bank efficiency improved greatly after the relaxation of branching restrictions by states. Loan losses and operating costs fell sharply, and the reduction in banks' costs led to lower loan interest rates to bank borrowers. Moreover, the relaxation of state limits on interstate banking also led to improvements in bank performance. These gains were smaller, however, and any causal relationship proved less robust. They suggest that much of the efficiency improvement brought about by banking and branching deregulation reflected a selection process, whereby better performing banks expanded at the expense of poorer performers. They also report that loan losses and operating costs fell sharply with deregulation and that the reduction in banks' costs led to lower loan interest rates to bank borrowers. While improvements to the banking system helped bank customers directly, they also

find important benefits to the rest of the economy. In particular, state economies grew significantly faster after banking and branching deregulation occurred.

In the second paper, Jayaratne and Strahan (1998) consider entry restriction, industry evolution, and dynamic efficiency in commercial banking. They again show that bank performance improves significantly after the lifting of restrictions on bank expansion. They find that operating costs and loan losses decrease sharply after states permit statewide banking and branching and, to a lesser extent, after states allow interstate banking and branching. They again argue that the improvement following banking and branching deregulation occurs because better banks grow at the expense of their less efficient rivals. By retarding the "natural" evolution of the industry, banking and branching restrictions reduce the performance of the average banking asset. They also find that banks pass on most of the reductions in banks' costs to bank borrowers in the form of lower loan rates.

Dick (2006) considers how nationwide banking and branching affected banking industry market structure, service quality, operating costs, loan portfolio quality, service prices, and rates of return. She differs from Jayaratne and Strahan (1997) in several ways. First, she focuses on the latter stage of deregulation. Second, she analyzes not only the effects of deregulation on bank performance measures but also the effect of deregulation on market structure and service quality. Her results suggest that deregulation left the relevant geographic banking markets virtually intact, with urban markets having two or three dominant banks in 1999 just as they did in 1993, with no or little change in local concentration. Moreover, service quality improved, along with higher operating costs and service fees. When service costs rise, she finds, customers experience more value per dollar.

Our analysis directly extends a part of the analysis contained in Jayaratne and Strahan (1998). In that paper, they consider the effects of intrastate and interstate deregulation of banking and branching activity on bank performance. They examine six weighted average measures of bank performance by state: return on assets, return on equity, the natural logarithm of non-interest expenses, the ratios of non-performing loans, net charge-offs, and loan-loss provisions to total loans. Their intrastate and interstate banking and branching dummy variables are defined as follows. The intrastate dummy variable equals one for states that do not impose restrictions on branching through merger and acquisition; zero otherwise. The interstate banking dummy variable equals one for states with interstate banking agreements; zero otherwise. They employ panel data estimation across various samples, the longest of which runs from 1975 to 1992.

Our analysis expands and improves on Jayaratne and Strahan (1998) by extending the sample through 2004, which includes the passage of the IBBEA. As such, we can control for much further movement toward interstate banking and branching activity than they could with their sample ending in 1992. In addition, we also consider the effect of deregulation of geographic restrictions on banking and branching activity across different asset-size classes, ranging from small community banks through regional powers up to major international banks

Nippani and Green (2002) provide further background for our analysis. They examine the effect of IBBEA on the performance of the banking industry by comparing pre- and post-IBBEA performance measures. They adopt each of the performance measures of Jayaratne and Strahan (1998), except the natural logarithm of non-interest expenses. Instead, they add net interest margin to complete their set of six measures. They find that performance generally improved in the post-IBBEA period. When they control for general economic conditions, however, the effect of IBBEA

on bank performance generally becomes insignificant. They conclude that macroeconomic control variables affected bank performance more than the enactment of the IBBEA.

Several factors in the Nippani and Green (2002) method limit their analysis. First, they only consider pre- and post-IBBEA performance. The IBBEA reflected the culmination of a process of deregulation in the U.S. banking industry. Through their regulation of the ability of out-of-state multibank holding companies to operate within their borders, states actually allowed interstate banking in one form or another prior to IBBEA. For example, even though Jayaratne and Strahan's (1998) sample period pre-dates the passage of the IBBEA, they still used an interstate banking indicator variable. Since Nippani and Green (2002) only consider the effects of IBBEA on bank performance and ignore all the other regulatory changes that affected the geographic operation of banks prior to the enactment of IBBEA, Nippani and Green (2002) misspecify their model. We correct the misspecification in our paper by including more regulatory change variables to capture the process of deregulation leading up to IBBEA. Furthermore, Nappini and Green's (2002) paper only considers national averages and excludes any information about differences in bank performance across states, each of which faced different regulatory structure and change. Once again, Jayaratne and Strahan (1998) considered the possible effects of interstate banking and branching activity on a state-by-state basis. We follow Jayaratne and Strahan's approach. Since different states enacted different branching laws as well as different regimes for in-state and out-of-state bank holding company activities, analysis of the effects of regulatory change on bank performance should occur at the state, not the national, level.

The enactment of Riegle-Neal IBBEA allowed banks to improve their efficiencies and profitabilities through merger and acquisition across state borders. In a related paper, Nippani and Washer (2005) show that large banks did improve efficiency and profitability after the enactment

of IBBEA. They examine the effect of IBBEA on the performance of banks across different bank asset size classes, albeit with national average performance measures. They find the return on assets of small banks fell significantly below that of larger banks in the post-IBBEA period. This result contrasts with the pre-IBBEA period when small banks successfully competed with and in some cases outperformed larger banks. They conclude that the enactment of IBBEA placed small banks at a competitive disadvantage, which could eventually lead to their demise – failure and/or acquisition. We, too, investigate differential effects of IBBEA by size class of bank, but on a state, not a national, level.

In sum, we employ a panel data across states to consider the effect of intrastate and interstate deregulation of banking and branching activity on the performance of banks. We combine the performance measures of Jayaratne and Strahan (1998) and Nippani and Green (2002) to consider seven measures: return on assets, return on equity, the net interest margin, the ratio of non-interest expense to total assets, and the rations of non-performing loans, net charge-offs, and loan-loss provisions to total loans. And we also measure the effects on five distinct size classes off banks as well as on the banking industry as a whole.

3. Data and Methodology

We use data from three sources to examine bank profitability and performance before and after the passage of IBBEA in 1994 We collect 1984 to 2004 end-of-year panel data on assets, operating income, operating expense, equity capital, non interest income, non interest expense, loans, loans 90 days or more past due, nonaccrual loans, loan charge-offs, loan recoveries, and loan-loss provision/reserves from the Federal Reserve Bank of Chicago Report of Condition and Income

(Call Report) and merger data.[4] We separate the merged data file into five different categories by total asset size – banks with total assets less than $100 million, between $100 million and $300 million, between $300 million and $1 billion, between $1 billion and $15 billion, and over $15 billion, as well as all U.S. commercial banks combined -- and calculate totals by state and year. We convert Bureau of Economic Analysis data on nominal personal income per capita by state into real values, deflating with the consumer price index (CPI).[5] Finally, we collect data on the unemployment rate by state from the Bureau of Labor Statistics.[6] In our regression analyses of the effects of deregulation on bank performance, the natural logarithms of each state's unemployment rate (*lnunem*) and real personal income per capita (*lnrpipc*) control for general economic conditions while the natural logarithm of the average interest rate earned by banks by state, year, and size class (*lnaveint*) controls for interest rate variation.[7]

We compute six weighted-average performance measures for each size class of banks by state and year. These natural logarithm measures include i) the gross return on assets [*lnroa=ln(1+roa)*]; ii) the gross return on equity [*lnroe=ln(1+roe)*]; iii) the net interest margin [*lnnim*]; iv) the ratio of non-interest expenses to assets [*lnnie/tl*]; v) the ratio of non-performing loans to total loans [*lnnp/tl*]; vi) the ratio of loan losses to total loans [*lnls/tl=ln(1+ls/tl)*]; and vii)

[4] The data appear at http://www.chicagofed.org/economic_research_and_data/commercial_bank_data.cfm. We could not use data over a longer period because information did not exist for total loans 90 days or more past due, total nonaccrual loans, total non interest income, and total non interest expense in the Call Reports until 1984.

[5] Nominal income data appear at http://www.bea.gov/regional/index.htm#state; CPI data come from the Federal Reserve Bank of St. Louis FRED source, http://research.stlouisfed.org/fred2/. Since available data are monthly observations, we compute annual values as monthly averages.

[6] The data appear at http://stats.bls.gov/sae/home.htm. Once agin, annual unemployment rates equal monthly averages.

[7] That is, in each state, year, and asset class size, we computed the average interest rate. Thus, this variable adjusts across state, year, and asset class size.

the ratio of loan loss reserves to total loans [*lnllr/tl=ln(1+llr/tl*]. Our interest rate control variable [*lnaveint*] equals the ratio of interest income to bank assets.[8]

We construct three dummy variables to capture the process of interstate deregulation of banking and branching restrictions prior to the IBBEA. First, the dummy variable *non* equals one after the adoption of full interstate banking and branching (i.e., IBBEA) and before IBBEA in those states that allowed bank holding companies to enter their states from anywhere in the whole country without requiring reciprocity. Second, the dummy variable *nation* equals one in those states that allowed bank holding companies from anywhere in the nation to operate within their states, but only with reciprocity. Third, the dummy variable *reg-non* takes a value of one before IBBEA in those states that allowed out-of-state bank holding companies from a proscribed region to operate within its boundaries -- either with or without reciprocity. The *nation* and *reg-non* dummy variables equal zero after the adoption of IBBEA. Finally, the variable *lnbch-bn* measures the natural logarithm of the number of branches per bank in a state. This variable captures the degree of intrastate regulation of branching activity within the state.

To see how much of the variation in performance variables (*lnroa, lnroe, lnnim, lnnie/tl, lnnp/tl, lnls/tl, lnllr/tl*) reflect changes in the independent variables of *non*, *reg-non*, *nation*, *lnbch-bn*, *lnrpipc*, *lnaveint*, and *lnunem*, we estimate the fixed- and random-effects panel regressions of the following form, where *lnperf* stands for each of the performance variables::

$$\begin{aligned}\ln pref = \alpha + \beta_1^{roa} \ln bch\text{-}bn + \beta_2^{roa} non + \beta_3^{roa} reg\text{-}non + \beta_4^{roa} nation \\ + \beta_5^{roa} \ln rpipc + \beta_6^{roa} \ln ave\text{int} + \beta_7^{roa} \ln unem + \varepsilon^{roa}.\end{aligned}$$

The intercept term in each regression is modified when any of the dummy variables –*non*, *nation*, or *reg-non* – equal one. For example, β_2 adds to the intercept when the dummy variable

[8] We will provide details of our calculations on request.

non takes a value of 1. Similarly, β_3 and β_4 add to the intercept term when *reg-non* and *nation* take a value of 1. Finally, $\beta_1, \beta_5, \beta_6$, and β_7 measure the marginal effects of changes in *lnbcn-bn, lnrpipc, lnaveint,* and *lnunem* on the dependent variable.

4. Preliminary Tests and Discussion

Nippani and Green (2002) report preliminary tests for differences between the bank performance measures per- and post-IBBEA. They divide their samples as follows: 1990:1 to 1995:4 for pre-IBBEA and 1995:4 to 2000:1 for post-IBBEA. We provide similar evidence using our state-by-state information for the following samples: 1984 to 1995 for pre-IBBEA and 1996 to 2004 for post-IBBEA. Thus, our samples begin earlier and end later than those in Nappani and Green. Additionally, while Nippani and Green use information only at the national level, we use state-by-state information. This exercise allows the careful comparison of the general characteristics of our database with their database.

Table 2 reports the findings. Our performance measures both pre- and post-IBBEA generally possess similar magnitudes to those in Nippani and Green (2002, Table 1, 904-905), where they do not consider the ratio of non-interest expenses to assets. The notable exception occurs for loan loss reserves to total loans, where our means fall much lower. For example, considering Panel F for all banks, we find ratios of 1.10 and 0.78 for pre- and post-IBBEA, whereas Nippani and Green report 2.51 and 1.85. In other words, the inclusion of data for 1984 to 1989 and 2000 to 2004 leads to much lower values for loan loss reserves to total loans. We also note that across asset size classes and different performance measures, the differences and significance between the pre- and post-IBBEA periods in our Table 2 generally match those reported in Nippani and Green.

Panel F in Table 2 reports the findings for all banks. Here, we see that the return on assets, return on equity, and the net interest margin all significantly increase in the post-IBBEA period. Further, nonperforming loans to total loans, net loan losses to total loans, and loan loss reserves to total loans significantly decrease in the post-IBBEA period. Finally, the non-interest expense ratio does not alter significantly between the two periods. In sum, all bank performance measures, except the non-interest expense ratio, improve in the post-IBBEA period. Nippani and Green (2002) differ only in that for all banks, they report a significant decrease in the net interest margin.

We report similar patterns for the changes in the performance measures across the different asset size classes as those for all banks. For banks with assets between $1 and $15 billion, the findings match those for all banks exactly. For banks with assets between $100 and $300 million and between $300 million and $1 billion, the findings prove identical to those for all banks with one exception – although the net interest margin does increase in both cases, the increases are not statistically significant. For the smallest banks (i.e., assets below $100 million), the net interest margin proves significantly smaller in the post-IBBEA period, while the non-interest expense ratio proves significantly larger. Moreover, no significant differences exist for the return on assets or the return on equity pre- and post-IBBEA. For the largest banks (i.e., over $15 billion), no significant differences exist for net loan losses to total loans and loan loss reserves to total loans, while the non-interest expense ratio significantly increases in the post-IBBEA period.

Another way to view the information in Table 2 considers the best performances across the seven performance measures across asset size classes in the pre- and post-IBBEA periods. For the pre-IBBEA period, banks between $100 and $300 million in assets achieved the highest return on assets and the lowest nonperforming loans to total loans, net loan losses to total loans, and loan loss reserves to total loans. Banks between $1 and $15 billion in assets recorded the highest return

on equity, whereas banks with assets below $100 million earned the highest net interest margin. Banks over $15 billion in assets achieved the lowest non-interest expense ratio. Thus, banks between $100 and $300 million in assets scored best on four of the seven performance measures.

The story alters somewhat in the post-IBBEA period. Now, banks between $100 and $300 million in assets earned the highest net interest margin, experienced the lowest net loan losses to total loans and held the lowest loan loss reserves to total loans. Banks over $15 million in assets earned the highest return on assets and highest return on equity. Finally, banks between $300 million and $1 billion in assets recorded the lowest non-interest expense and nonperforming loan ratios. Once again, banks between $100 and $300 million in assets scored best, but now only on three of the seven performance measures.

We also observe a consistent pattern that across asset size classes, bank performance generally improved between the pre- and post-IBBEA periods. Return on assets and return on equity rose while the non-performing loan, loan loss and loan loss reserve ratios fell. Two different conjectures may explain this observation. First, the severe financial problems faced by the banking industry during the early 1990s, when bank failures reached levels not seen since the Great Depression, may have blunted average performance across asset size classes, which reversed itself during the more financial friendly period in the post-IBBEA period. Second, as Stiroh and Strahan (2003) argue, increased competition in the banking industry as a result of the banking deregulation may have spurred a dynamic evolution that shifted bank resources to better performing banks. In addition, the increase in the number of troubled banks during the early 1990s and the reallocation of their resources may have aided and abetted this dynamic evolution.[9]

[9] To the extent that resource reallocation to better performing banks also led to better banks increasing their size, then these banks in one asset class size in the pre-IBBEA period may move to a higher asset class size in the post-IBBEA period.

In addition, Table 2 shows that the non-interest expense ratio did not alter significantly for banks between $100 million and $15 billion in assets. This ratio rose significantly, however, for the smallest and largest banks. Also, in the post-IBBEA period, the return on assets and the return on equity monotonically increase from the smallest to the largest banks. That is, the rich got relatively richer. The largest banks experienced the largest bump in profitability in the post-IBBEA period and now lead all asset size classes in return on asserts and return on equity.

5. Regression Results and Interpretations

In this section, we test whether the process of deregulation of banking and branching activity within and between states improves bank performance. We estimate random- and fixed-effect specifications for bank performance, including regulatory change variables as well as control variables for the condition of the state economy. In order to choose between the fixed- and random-effect specifications, we run Hausman specification tests. In all cases, we reject the null hypothesis of the random-effect specification. Thus, we only report fixed-effect results, which appear in Table 3. Several consistent findings deserve mention. We discuss, in turn, the effects of regulatory variables and then the effects of economic control variables.

Effects of Regulatory Variables

First, the number of branches per bank (*lnbch-bn*) generally exerts significant positive effects on the return on assets (*lnroa*), the return on equity (*lnroe*), and the net interest margin (*lnnim*) and significant negative effects on the non-performing loan ratio (*lnnp/tl*), the net loan loss ratio (*lnls/tl*), and the loan-loss reserve ratio (*lnllr/tl*) across all sizes of banks. That is, increases in the number of branches per bank increase the banks' profitability and performance and lessens the importance of problem loans. Two conjectures may explain these findings. Banks with large branching networks may exert more market power, improving bank performance and net interest

margin; and banks with more branches may be better able to diversify their portfolios and reduce average risk.

The effect of the number of branches per bank paints a different picture for the non-interest expense ratio. Here, a negative effect occurs for all asset size classes, except for banks over $15 billion in assets, where a significant positive effect emerges. In addition, the negative effects prove insignificant except for the smallest banks (under $100 million). That is, expanding the branching network significantly reduces the non-interest expense ratio for the smallest banks, but significantly increases this ratio for the largest banks. We conjecture that the relaxation of regulations limiting intrastate banking led to more competition for the smallest banks, forcing them to economize relatively on non-interest expenses. The largest banks, on the other hand, must shoulder relatively higher non-interest expenses to maintain and expand their market shares. Alternatively, we can conjecture that the largest banks faced less competition and did not control their costs as carefully.

Second, only the net-interest-margin (*lnnim*) models exhibit significant coefficients for all deregulation dummy variables across all bank size classes. That is, more deregulation of banking and branching activity uniformly leads to a higher net interest margin. Here, too, we can conjecture that reducing geographic regulatory restrictions may enhance the market power of banks, facilitating an increase in net interest margins.

Finally, focusing on the interstate banking dummy variables, either regional or national (*reg-non*, *nation*, and *non*), we find that banks between $300 million and $15 billion in assets (panels C and D) experience many more significant effects of interstate banking deregulation than small banks under $300 million in assets (panels A and B) and large banks over $15 billion in

assets (panel E). F-tests for the joint significance of the interstate banking dummy variables[10] show that these dummies prove jointly significant in all seven equations for banks between $1 and $15 billion in assets, but only in five equations for banks between $300 million and $1 billion in assets (joint insignificance in the return on assets and return on equity equations) and banks over $15 billion in assets (joint insignificance in the return on equity and loan-loss reserve equations). Banks under $300 million experience the weakest response to interstate banking adjustments, where the interstate banking dummy variables prove jointly significant in four equations for banks between $100 and $300 million in assets (joint significance in the net interest margin, non-interest expense, loan loss, and loan loss reserve equations) and in two equations for banks under $100 million in assets (joint significance in the net interest margin and non-interest expense equations).

Across all asset size classes, interstate banking deregulation significantly increases the non-interest expense ratio with one significant effect for the smallest banks, two significant effects for banks between $100 million and $1 billion in assets, and three significant effects for banks over $1 billion in assets. In other words, the emergence of interstate banking and branching activities caused banks to spend relatively more money on non-interest expenses, where the effect becomes more pervasive for the larger banks.

For banks between $300 million and $15 billion in assets, geographic deregulation increases the riskiness of these banks (i.e., higher values for *lnnp/tl*, *lnls/tl*, and *lnllr/tl*), increases their net interest margins, and sometimes lowers their returns on equity. What do these results imply? We conjecture that many of these banks exerted local market power as large regional banks. As these regional players took advantage of interstate banking, they acquired more risk but offset this risk to some extent with higher equity to asset ratios and net interest margins. That is, if their

[10] The joint significance levels are indicated by asterisks next to the dependent variables in column one of Table 3.

returns on assets did not change and their returns on equity declined, then the equity to asset ratio must have risen. Finally, their increased net interest margins may trace to enhanced market power.

The interstate banking dummy variables (*reg-non*, *nation*, and *non*) generally do not affect return on assets. As the exception, they do significantly and positively affect return on assets for banks with assets in excess of $15 billion. We also note in this connection that the interstate banking dummy variables produce a negative effect on return on equity for the very largest banks, although the complete set of interstate banking dummy variables proves insignificant in this regard. These two results occur only if the equity to asset ratio falls with interstate banking activity for the largest banks, just the opposite of the effect of geographic deregulation on banks in the $300 million to $15 billion asset size class.

Effects of Economic Variables

First, the average interest rate (*lnaveint*) generates significant positive effects on the net interest margin, the non-interest expense ratio, the non-performing loans ratio, the net loan loss ratio, and the loan loss reserves ratio across all bank sizes. What conclusion can we draw from these findings? We conjecture that lending rates respond more vigorously than deposit rates to interest rate increases, leading to a higher net interest margin as the average interest rate rises. Moreover, a higher average interest rate may lead to self-selection of borrowers, implying a riskier pool of borrowers, on average (Stiglitz and Weiss 1981). As a result, banks expend more resources on underwriting activity, because of the higher average risk level.

Second, higher real personal income per capita (*lnrpipc*) generally produces significantly higher net interest margin, non-interest expense ratio, non-performing loan ratio, net loan loss ratio, and loan loss reserve ratio across all bank sizes. We conjecture that higher real percapita personal income encourages banks to take on more risk, reflected by a higher net interest margin, non-

interest expense ratio, non-performing loan ratio, net loan loss ratio, and loan loss reserves ratio. But, small banks (under $1 million in assets) expaned their equity, reducing return on equity. The largest banks (over $15 billion in assets) also managed to increase their return on assets, while not altering their return on equity, implying that equity rose. Finally, a higher state unemployment rate (*lnunem*) consistently worsens bank performance. That is, return on assets and return on equity significantly decrease with a higher unemployment rate (except for return on assets for smaller banks in panel A and for return on equity for larger banks in panel E) while the non-performing loans ratio, the net loan losses ratio, and the loan losses ratio significantly increase with a higher unemployment rate across all bank sizes.

6. Conclusions

The Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 permitted branching activity across states. Prior to IBBEA, many states enacted legislation to allow out-of-state bank holding companies from a proscribed region to operate within their boundaries, either with or without reciprocity from the home state of that bank holding company. Using state-level data, we investigate the effect on average bank performance of deregulation toward complete interstate banking and branching activity across states using the Report on Condition and Income (Call Report) posted on the website of Federal Reserve of Chicago.

We reach some general conclusions. First, the process of deregulation on an intrastate and interstate basis generally improves bank profitability and performance. The deregulation variables significantly increased net interest margins across all bank sizes, as well as return on assets and return on equity for large banks.

Second, we find that the macroeconomic variables -- the unemployment rate and real personal income per capita – and the average interest rate significantly affected bank performance

as much, if not more, frequently than the process of deregulation. Within the set of bank deregulation variables, interstate branching regulation affected bank performance in each and every equation reported, except for the non-interest expense ratio for banks between $100 million and $15 billion in assets. The effects of interstate banking proved most important for banks between $1 and $15 billion in assets and least important for banks under $100 million in assets. In other words, intrastate banking deregulation affects banks of all sizes, but interstate banking deregulation affects larger banks more than smaller banks.

Finally, some economists argued that deregulation toward full interstate banking and branching activity would produce more efficient banks and a healthier banking system. That is, the consolidation of the banking system allows banks to take advantage of economies of scale and scope. Moreover, increasing bank loan portfolio diversification can reduce risk and lower the probability of credit crises. Our results provide mixed evidence on this notion. To wit, more deregulation of banking and branching activity leads to a lower non-performing loan ratio for banks in excess of $15 billion in assets, but a higher net loan loss and loan loss reserve ratios largely for banks between $300 million and $15 billion in assets.

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Table 1: Number of Banks by Year, 1976 to 2007

Years	Number of Banks	Years	Number of Banks
1976	15,265	**1992**	12,690
1977	15,295	**1993**	12,239
1978	15,419	**1994**	11,699
1979	15,418	**1995**	11,154
1980	15,850	**1996**	10,804
1981	15,957	**1997**	10,269
1982	16,063	**1998**	9,842
1983	15,003	**1999**	9,575
1984	14,750	**2000**	9,262
1985	14,665	**2001**	8,999
1986	14,146	**2002**	8,751
1987	13,659	**2003**	8,610
1988	14,281	**2004**	8,433
1989	13,888	**2005**	8,303
1990	13,519	**2006**	8,154
1991	13,095	**2007**	8,210

Note: The number of banks data comes from the Federal Reserve Bank of Chicago website Call Report data 1976-2007 (annually data) 1976-2006 (annually data)

Table 2: Tests of Difference in Means: 1984-1995 and 1996-2004

Variable Name	Pre-IBBEA Mean	Post-IBBEA Mean	t-test
Panel A: Banks with Assets less than $100 million			
roa	0.75	0.88	1.69
roe	7.69	7.53	-0.29
nim	4.29	3.92	-4.79***
nie/tl	3.73	4.33	2.85***
np/tl	2.18	1.07	-14.31***
ls/tl	0.77	0.38	-6.16***
llr/tl	0.94	0.55	-5.66***
Panel B: Banks with Assets between $100 Million and $300 Million			
roa	0.91	1.23	9.52***
roe	10.39	11.96	4.86***
nim	4.12	4.14	0.39
nie/tl	3.58	3.57	-0.13
np/tl	1.95	0.91	-16.08***
ls/tl	0.67	0.37	-7.79***
llr/tl	0.85	0.53	-6.49***
Panel C: Banks with Assets between $300 Million and $1 Billion			
roa	0.80	1.31	9.53***
roe	9.43	13.32	5.30***
nim	3.99	4.01	0.31
nie/tl	3.55	3.51	-0.39
np/tl	2.02	0.85	-13.80***
ls/tl	0.86	0.50	-4.96***
llr/tl	1.02	0.62	-4.94***
Panel D: Banks with Assets between $1 Billion and $15 Billion			
roa	0.87	1.39	10.71***
roe	11.62	14.69	4.95***
nim	3.74	3.88	2.35**
nie/tl	3.63	3.64	0.06
np/tl	2.14	0.91	-15.87***
ls/tl	0.96	0.84	-1.59
llr/tl	1.15	0.88	-3.54***
Panel E: Banks with Assets over $15 Billion			
roa	0.72	1.47	8.85***
roe	9.98	16.46	4.31***
nim	2.99	3.65	4.51***
nie/tl	3.19	3.79	3.19***
np/tl	2.62	1.08	-7.75***
ls/tl	0.88	0.93	0.47
llr/tl	0.95	1.06	0.72

Table 2: Tests of Difference in Means: 1984-1995 and 1996-2004 (continued)

Variable Name	Pre-IBBEA Mean	Post-IBBEA Mean	t-test
Panel F: All U.S. Banks			
roa	0.84	1.32	12.74***
roe	10.62	13.20	6.14***
nim	3.85	3.96	2.14**
nie/tl	3.48	3.52	0.65
np/tl	2.25	0.92	-19.05***
ls/tl	0.93	0.70	-3.49***
llr/tl	1.10	0.78	-4.91***

Note: The variables include the return on assets (*roa*), the return on equity (*roe*), the net interest margin (*nim*), non-interest expense to total assets (*nie*), non-performing loans to total loans (*np/tl*), net loan losses to total loans (*ls/tl*), and loan loss reserves to total loans (*llr/tl*). We calculate all variables at the state level. The number of observations in the pre- and post-IBBEA periods for the various samples equal the following: Banks with less than $100 million in assets, n_{pre} = 612 and n_{post} = 455; Banks with assets between $100 and $300 million, n_{pre} = 611 and n_{post} = 449; Banks with assets between $300 million and $1 billion, n_{pre} = 599 and n_{post} = 450; Banks with assets between $1 and $15 billion, n_{pre} = 574 and n_{post} = 437; and Banks with assets over $15 billion, n_{pre} = 119 and n_{post} = 208; and All banks, n_{pre} = 612 and n_{post} = 459.

*** significant at the 1-percent level.

** significant at the 5-percent level.

* significant at the 10-percent level.

Table 3: Fixed-Effect Models

Dependent Variable	Independent Variable Coefficients							
	Intercept	*lnbch-bn*	*reg-non*	*nation*	*non*	*lnrpipc*	*lnaveint*	*lnunem*
Panel A: Banks with Assets less than $100 million								
lnroa	0.0901**	0.0045***	0.0012	0.0007	0.0008	0.0098	0.0170***	-0.0032
lnroe*	-0.2489	0.0423***	0.0014	-0.0068	-0.0173*	-0.1091**	0.0495***	-0.0453***
lnnim	0.2335	0.0777***	0.0614***	0.1099***	0.0811***	0.4289***	0.7450***	0.0534***
lnnie/tl**	-0.0073	-0.0845***	0.0260	0.0265	0.1049***	0.6521***	0.1920***	0.0178
lnnp/tl	-2.7760**	-0.2027***	-0.0525	0.0010	0.0136	0.0603	1.0213***	1.0267***
lnls/tl	0.2156***	-0.0037***	0.0004	0.0002	0.0021*	0.0404***	0.0209***	0.0119***
lnllr/tl	0.2664***	-0.0046***	-0.0002	-0.0008	0.0011	0.0505***	0.0224***	0.0118***
Panel B: Banks with Assets between $100 Million and $300 Million								
lnroa	0.0103	0.0036***	-0.0004	-0.0006	-0.0006	-0.0009	0.0013	-0.0037***
lnroe	-0.5263***	0.0342***	-0.0014	-0.0106	-0.0143*	-0.1510***	-0.0188	-0.0635***
lnnim*	-1.0068***	0.0414***	0.0542***	0.0892***	0.0382***	0.3343***	0.3413***	-0.0123
lnnie/tl**	0.8026	-00228	0.0404*	0.0735***	0.0270	0.8494***	0.3464***	0.1755***
lnnp/tl	6.3174***	-0.3077***	0.0543	0.0878	0.0483	1.9490***	1.6173***	1.2641***
lnls/tl*	0.1656***	-0.0043***	0.0008	0.0018***	0.0020***	0.0316***	0.0144***	0.0098***
lnllr/tl**	0.2136***	-0.0048***	0.0004	0.0015*	0.0017**	0.0398***	0.0187***	0.0100***
Panel C: Banks with Assets between $300 Million and $1 Billion								
lnroa	0.0356	0.0036***	-0.0015	-0.0005	-0.0003	0.0054	0.0015	-0.0029**
lnroe	-0.4697	0.0479***	-0.0233*	-0.0127	-0.0182	-0.1405**	-0.0073	-0.0641***
lnnim*	0.7131	0.0896***	0.0527***	0.0914***	0.0489**	0.6613***	0.5988***	0.1103***
lnnie/tl**	-2.2272***	-0.0131	0.0688***	0.0467	0.1038***	0.1026	0.3849***	0.1275***
lnnp/tl*	4.5487***	-0.2804***	0.1672***	0.1439**	0.0167	1.6266***	1.5214***	1.3188***
lnls/tl*	0.2228***	-0.0046***	0.0035***	0.0033***	0.0058***	0.0419***	0.0227***	0.0143***
lnllr/tl**	0.2960***	-0.0055***	0.0023*	0.0023*	0.0040***	0.0548***	0.0279***	0.0138***
Panel D: Banks with Assets between $1 Billion and $15 Billion								
lnroa**	0.0232	0.0031***	-0.0018**	0.0007	-0.0003	0.0036	-0.0016	-0.0040***
lnroe*	-0.7737	0.1135***	-0.0612***	-0.0538**	-0.1156***	-0.1899	-0.0540	-0.1083***
lnnim*	-1.2200***	0.1610***	0.0730***	0.1351***	0.0741***	0.2896***	0.4959***	0.0527**
lnnie/tl*	-2.6758***	-0.0217	0.1307***	0.2416***	0.2053***	0.0321	0.2854***	0.0423
lnnp/tl**	-0.7456	-0.1944***	0.1451**	0.1489**	0.0349	0.4840	1.2167***	1.1230***
lnls/tl*	0.2667***	-0.0037***	0.0033***	0.0044***	0.0034**	0.0528***	0.0203***	0.0132***
lnllr/tl**	0.2862***	-0.0049***	0.0034***	0.0035***	0.0031**	0.0541***	0.0235***	0.0119***
Panel E: Banks with Assets over $15 Billion								
lnroa**	0.0809**	0.0069***	0.0033*	0.0050**	0.0046**	0.0196**	0.0051***	0.0049**
lnroe	-0.9043	0.3476***	-0.0266	-0.0356	-0.1544*	-0.1226	0.0273	-0.0478
lnnim**	-0.9585	0.3674***	0.1202**	0.1757***	0.1073	0.5176*	0.6383***	0.2812***
lnnie/tl*	-2.2688	0.2922***	0.1564**	0.3085***	0.1585**	0.2634	0.4273***	0.1018
lnnp/tl*	9.4290***	-0.4367***	0.0152	-0.1322	-0.5014***	2.7130***	0.9987***	0.8520***
lnls/tl**	0.3156***	-0.0031**	0.0041**	0.0011	-0.0004	0.0670***	0.0169***	0.0136***
lnllr/tl	0.3163***	-0.0049***	0.0012	-0.0033	-0.0024	0.0668***	0.0183***	0.0134***

Table 3: Fixed-Effect Models (continued)

Dependent Variable	Independent Variable Coefficients							
	Intercept	***lnbch-bn***	***reg-non***	***nation***	***non***	***lnrpipc***	***lnaveint***	***lnunem***
Panel F: All U.S. Banks								
lnroa*	0.0047	0.0030***	-0.0008	0.0009	0.0001	-0.0003	-0.0025**	-0.0044**
lnroe*	-0.7174***	0.0485***	-0.0148*	-0.0089	-0.0307***	-0.1831***	-0.0440***	-0.0757***
lnnim*	-0.8013**	0.0613***	0.0481***	0.1043***	0.0648***	0.3959***	0.3913***	0.0382***
lnnie/tl*	-2.0362***	-0.0378***	0.0815***	0.1665***	0.1564***	0.2152**	0.2316***	0.0663***
lnnp/tl*	2.2342*	-0.3038***	0.1224**	0.1191**	0.0222	1.0722***	1.3397***	1.1555***
lnls/tl*	0.2432***	-0.0040***	0.0025***	0.0031***	0.0037***	0.0477***	0.0202***	0.0139***
lnllr/tl**	0.2916***	-0.0044***	0.0020**	0.0020**	0.0027***	0.0548***	0.0256***	0.0128***

Note: The variables include the natural logarithms of one plus the return on assets (*lnroa*), one plus the return on equity (*lnroe*), the net interest margin (*lnnim*), non-performing loans to total loans (*lnnp/tl*), one plus net loan losses (*lnls/tl*), and one plus loan loss reserves to total loans (*lnllr/tl*). The significance level of the F-test for the joint significance of *reg-non*, *nation*, and *non* appears immediately after the dependent variables in column one. We calculate all variables at the state level. The independent variables in the regression include the *reg-non*, *nation*, and *non* dummy variables that takes a value of 1 for the post- *reg-non*, *nation*, and *non* periods and 0 for the pre- *reg-non*, *nation*, and *non* periods and control variables for *lnbch-bn* (the natural logarithm of the number of branches per bank), *lnrpipc* (the natural logarithm of real personal income per capita), *lnaveint* (the natural logarithm of interest income to assets) and *lnunem* (the natural logarithm of the unemployment rate). We calculate all independent variables at the state level.

*** significant at the 1-percent level.

** significant at the 5-percent level.

* significant at the 10-percent level.