The Valuation Effects of the Geographic Diversification of U.S. Banks

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October 2012

Abstract: This paper assesses the impact of the geographic diversification of bank holding company (BHC) assets across the United States on their market valuations. Using two new identification strategies based on the dynamic process of interstate bank deregulation, we find that exogenous increases in geographic diversity reduce BHC valuations. We also provide some evidence that the reduction in BHC valuations is associated with an increase in insider lending and a reduction in loan quality. Taken together, these findings are consistent with theories predicting that geographic diversity intensifies agency problems, reducing valuations.

JEL Classifications: G34, L22, G21, G24

Keywords: Corporate diversification; Agency problems; Economies of scope; Corporate insiders; Corporate valuation

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1. Introduction

Does the geographic diversification of bank holding company (BHC) assets increase or decrease their corporate valuations? Geographic diversity could exert a valuation-enhancing effect by boosting economies of scale (Chandler, 1977; Gertner, Scharfstein, and Stein, 1994; Houston, James, and Marcus, 1997; and Berger, Demsetz, and Strahan, 1999) or reducing exposure to idiosyncratic local shocks (Diamond, 1984). On the other hand, theories of corporate governance by Jensen (1986), Jensen and Meckling (1986), Jensen and Murphy (1990), and Scharfstein and Stein (2000) suggest that corporate insiders will have greater latitude to extract private benefits from geographically diversified corporations when small shareholders find it difficult to monitor and govern such physically dispersed entities. Thus, even if diversification has valuation-reducing effects, insiders might still seek geographic diversification if their additional private benefits are greater than their own losses from the corporation's lower value.

Empirically, it has proven extraordinarily difficult (1) to identify the causal impact of diversity on the valuation of corporations in general—and banks in particular—and (2) to measure directly the potential roles of scale economies, agency problems, and other factors underlying changes in market valuations (Berger and Humphrey, 1997, Laeven and Levine, 2007, and Calomiris and Nissim, 2007). Although research finds that nonfinancial and financial firms that diversify across different *activities* tend to have lower valuations (e.g., Lang and Stulz (1994), Berger and Ofek (1995), Servaes (1996), Denis, Denis, and Sarin (1997), and Laeven and Levine (2007)),[1] many question whether diversification

[1] Most of these papers determine the valuation effects of diversification using the so-called "chop-shop" approach as proposed by Lang and Stulz (1994) that compares the valuation of stand-alone firms with that of diversified entities.

causes these valuation effects (e.g., Maksimovic and Phillips (2002), Campa and Kedia (2002), Graham, Lemmon, and Wolf (2002), and Villalonga (2004)). Similar concerns apply to research on *geographic* diversification. Denis, Denis, and Yost (2002) find a diversification discount for nonfinancial firms that diversity globally, while Deng and Elyasiani (2008) find a diversification premium for banks diversifying across the U.S. states. But, again, it is difficult to draw strong causal inferences.

In this paper, we develop and implement two new approaches for identifying the causal impact of the geographic diversification of BHC assets on their market valuations. Although we provide some evidence about the factors underlying observed changes in market valuations, our major contribution is in improving identification, not in constructing better measures of scale economies, agency problems, or other factors associated with market valuations. Furthermore, although we primarily use both identification strategies to evaluate the net effect of geographic diversification on BHC valuations, they can be employed to assess an array of questions about bank behavior.

At the core of both identification strategies, we exploit the cross-state, cross-time variation in the removal of interstate bank branching prohibitions to identify an exogenous increase in geographic diversity. From the 1970s through the 1990s, individual states of the United States removed restrictions on the entry of out-of-state banks. Not only did states start deregulating in different years, states also signed bilateral and multilateral reciprocal interstate banking agreements in a somewhat chaotic manner over time. There is enormous cross-state variation in the twenty-year *process* of interstate bank deregulation, which culminated in the Riegle-Neal Interstate Banking Act of 1995.

There are good economic and statistical reasons for treating the process of interstate bank deregulation as exogenous to bank valuations. Restrictions on interstate banking protected banks from competition for much of the 20th century. During the last quarter of the century, technological and financial innovations eroded the value of these restrictions. For example, Kroszner and Strahan (1999) find that checkable money market mutual funds facilitated banking by mail and phone, and improvements in data processing, telecommunications, and credit scoring weakened the advantages of local banks. They hold that these innovations reduced the willingness of banks to fight for the maintenance of protective regulations, triggering deregulation. Furthermore, we find no empirical evidence that valuations or changes in valuations affected the timing of deregulation. And, there is no evidence that states signed bilateral and multilateral interstate banking arrangements based on BHC valuations or their distance from other states. Thus, the process of interstate bank deregulation appears to be a fairly chaotic process that provides a useful laboratory for evaluating the impact of BHC diversification on valuations.

The first identification strategy uses the state-time variation in the dynamic process of interstate bank deregulation as an instrument for the geographic diversity of BHCs. While past researchers have treated interstate bank deregulation as a single, discrete event, typically dating deregulation as the year in which a state first allows banks from any other state to enter, (e.g., Klein and Saidenberg (2010)), we believe that we are the first to exploit the state-specific process of deregulation. In this first strategy, we only provide information on the dynamic impact of diversity of a state's "average" BHC, because our instrument does not have a BHC-specific component.

The second identification strategy embeds the state-time variation in the dynamic process of interstate bank deregulation into a gravity model of individual BHC investments in "foreign" states to develop a BHC-specific instrumental variable of diversification. Inspired by Frankel and Romer's (1999) study of international trade, we construct a BHC-specific instrument for geographic diversity in the following manner. First, for each BHC in each period, we use a gravity model to estimate the share of assets it will hold in each "foreign" state, conditional on there being no regulatory prohibitions on establishing a subsidiary in that state. Second, based on this estimate—and imposing a zero when there are regulatory prohibitions on interstate banking—we compute the projected geographic diversity of each BHC in each period. This *gravity-deregulation* model produces the instrumental variable that we employ to identify the causal impact of geographic diversity on Tobin's *q at the BHC level*, i.e., this identification strategy differentiates among banks within the same state. We believe that we are the first to extend the gravity model to examine the cross-state expansion and investment decisions of individual banks.

Both identification strategies indicate that increases in geographic diversity reduce BHC valuations. This finding holds after controlling for BHC fixed effects, state-quarter fixed effects, and a wide-array of time-varying BHC characteristics, such as size, growth, profitability, and the capital-asset ratio that also exert an influence on valuations. Even when conditioning on the degree to which the BHC engages in a diversity of activities, the median *q* of other banks in the state, and the concentration of the local banking market, there is still a significant, negative impact of geographic diversity on *q*. Furthermore, we find no evidence that changes in the accounting value of assets around the time of mergers and acquisitions or changes in the debts of banks drive the results. These findings indicate

that the valuation-reducing effects of diversification, such as those potentially arising from an intensification of agency problems, outweigh the valuation-increasing effects of diversification, such as those potentially produced by scale economies.

Although our major contribution is showing that diversification lowers BHC valuations, we also examine several potential explanations of this finding. First, the results do not seem to be driven simply by competition, where interstate bank deregulation triggers an intensification of competition within a state that lowers expected profits and valuations. Rather, the results hold when controlling for each bank's profitability and the degree of competition within it local banking market. Moreover, we instrument for *each* BHC's level of diversification, so that we distinguish among banks within the same state and include a set of time-varying state fixed effects which account for unobservable effects, such as banking competition, at the state level. Thus, we identify the impact of an increase in the diversification of a BHC on its market valuation, not the effects of interstate deregulation on overall bank competition at the state level.

Second, we provide some evidence that the drop in BHC valuations is associated with an increase in the benefits flowing to corporate insiders and a reduction in loan quality, consistent with an intensification of agency problems within BHCs. Specifically, diversification (a) increases the incidence and magnitude of loans extended to the executives of its subsidiary banks and (b) increases the proportion of nonperforming loans in a BHC's subsidiaries. Although the totality of the findings in this paper are consistent with the view that diversification intensifies agency problems within BHCs, future research will need to develop and examine more precise measures of agency problems before one

can draw sharper inferences about the precise mechanisms through which geographic diversity lowers BHC valuations.

This paper relates to several strands of research. First, Goldberg (2009), Jayaratne and Strahan (1996), and Morgan, Rime, and Strahan (2004) find that cross-economy banking boosts efficiency and growth while reducing economy volatility. Our results simply suggest that the valuation-reducing effects of diversification dominate any such valuation-enhancing effects. Second, Liberti and Mian (2009), Deng and Elyasiani (2008), Mian (2008), Degryse and Ongena (2005), and Brickley et al. (2003) argue that the effectiveness of banking deteriorates with the distance between bank and borrower.[2] This is consistent with the view that diversification triggers a reduction in market valuations. Third, another line of research estimates the cost functions of banks with different industrial organizations (Berger and Humphrey, 1991; Berger, Hanweck, Humphrey, 1987; Ferrier et al, 1993). Rather than attempting to measure directly changes in the costs, risks, and agency frictions underlying changes in BHC valuations, we focus on better identifying and estimating the net effect of diversification on BHC valuations.

Examining the geographic diversity of U.S. BHCs in the 1980s and 1990s offers insights about current policy debates, including debates about international and cross-border banking. We examine an exceptionally simple form of diversity: geographic diversity within a single country and industry. If the adverse valuation effects of diversifying across U.S. states dominate the positive effects from economies of scale and enhanced risk diversification even for this simple form of geographic diversification, then this advertises the importance of agency problems within banks more generally.

[2] Demsetz and Strahan (1997) find that diversification tends to increase bank risk.

2. Data and interstate bank deregulation

2.1. Sources

We use balance sheet information on BHCs and their chartered subsidiary banks. For BHCs, data are collected on a quarterly basis by the Federal Reserve and published in the Financial Statements for Bank Holding Companies. Consolidated balance sheet, income statement, and detailed supporting schedules for domestic BHCs are publicly available since June 1986.[3] Furthermore, all banking institutions regulated by the Federal Deposit Insurance Corporation, the Federal Reserve, or the Office of the Comptroller of the Currency file Reports of Condition and Income, known as Call Reports, which include balance sheet and income data on a quarterly basis. Call Reports also report the identity of the entity that holds at least 50% of a banking institution's equity stake (RSSD9364), which we use to link banking subsidiaries to their parent BHCs. We obtain qualitatively similar results when performing the analysis using Federal Deposit Insurance Corporation data on bank branches rather than subsidiaries, and constructing a measure of diversification based on branches. The drawback of using information on branches is that such information is available only on an annual basis and limited to commercial banks, while data on subsidiaries is available at a quarterly level and for a broader set of financial institutions that includes commercial banks, state-chartered savings banks, and cooperative banks.[4]

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[3] The corresponding reporting form is called FR Y-9C. More information is available at: http://www.federalreserve.gov/reportforms/ReportDetail.cfm?WhichFormId=FRY-9C.

[4] We exclude subsidiaries that exclusively engage in foreign activities (e.g. Edge corporations) when we determine a BHC's geographic diversification since they do not contribute to domestic diversification, which

Information on Market Capitalization of publicly traded BHCs is obtained from the Center of Research in Security Prices (CRSP), where we use the end of quarter market capitalization for all registered BHCs in the United States. The Bureau of Economic Analysis provides state level data on social and economic demographics.

For interstate deregulation, Amel (1993) and our own updates provide information on changes in state laws that affect the ability of commercial banks to expand across state borders. Commercial banks in the U.S. were prohibited from entering other states due to regulations on interstate banking. Over the period from 1978 through 1994, states removed these restrictions by either (1) unilaterally opening their state borders and allowing out-of-state banks to enter or (2) signing reciprocal bilateral and multilateral branching agreements with other states and thereby allowing out-of-state banks to enter. The Riegle-Neal Act of 1994 repealed the prohibition on BHCs headquartered in one state from acquiring banks in other states at the federal level. Amel (1993) reports for each state and year, the states in which a state's BHC can open subsidiary banks. We confirmed the dating of the state-by-state relaxation of interstate banking restrictions in Amel (1993) and extended the data for the full sample period using information from each state's bank regulatory authority.

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is the focus of our study. A BHC's exposure to foreign activities might still have an influence on its valuation. In our analysis we therefore account for this by including a variable that captures a BHC's foreign activity.

2.2. Geographic diversification

For each BHC, in each quarter, we determine the cross-state distribution of its bank subsidiaries, typically weighting the subsidiaries by their assets. We use the location of the BHC's subsidiaries as reported in the Call Reports and define BHC diversity in terms of the location of its bank network, not the physical location of those receiving loans. This is appropriate for gauging the effect of geographic diversity on agency problems within BHCs.[5]

We use four variables to capture the extent of a BHC's geographic diversification. First, we use a dummy variable that takes on the value of one if a BHC has subsidiaries in more than one state, and zero otherwise. Additionally, we compute the share of a holding company's assets that are held in out-of-state affiliates, i.e., subsidiaries not located in the same state as the BHC. Our third measure of geographic diversification is a BHC's concentration of assets across states. We measure this by calculating the Herfindahl-Hirschman Index of a BHC's assets in each state in which it is active. To construct a measure that is increasing in the degree of geographic diversification, we subtract the value of this Herfindahl Index from one, and use this as our third measure of geographic diversification. Our final measure of geographic diversification is the average distance (in miles) between the BHC's headquarters and its affiliated subsidiaries. We compute this distance measure

[5] Conceptually, an alternative approach to determine the effect of geographic diversification on firm value would be to compare the valuation of geographically diversified banks with the valuation of single-state banks, as in the "chop-shop" approach used in Lang and Stulz (1994) and Laeven and Levine (2007). However, such an approach faces serious data limitations. Over our sample period, the fraction of US states without a single-state BHC ranges from about one third in 1986 to about one quarter in 2007. Moreover, on average less than two thirds of US states have less than five single-state BHCs over the sample period. Therefore, the chop-shop methodology would be limited to only a small subset of US states with a sufficiently large number of single-state BHCs. Our instrumental variables approach circumvents these data limitations and exploits exogenous variation in diversification.

using information on the address of the BHC's headquarters and the counties in which its subsidiaries are located.

2.3. Activity diversity

In our analyses, we account for differences in the diversity of BHCs' financial activities in order to focus on the independent impact of geographic diversity on BHC behavior. Laeven and Levine (2007) show that financial institutions that combine lending activities and non-lending activities (such as underwriting) have lower market values. We use their empirical proxies of activity diversity to control for diversification across different financial activities. We use both their index of income diversity (Income Diversity) and their index of diversity based on the allocation of BHC assets across lending and non-lending activities (Asset Diversity). The indexes take on values between zero and one, where larger values imply that the BHC's income and assets are more diversified across lending and non-lending activities.[6]

[6] Income Diversity is computed as follows:

$$\text{Income Diversity} = 1 - \left| \frac{\text{Net Interest Income} - \text{Total Noninterest Income}}{\text{Total Operating Income}} \right|.$$

Net interest income is Total interest income minus Total interest expenses. Other operating income includes net fee income, net commission income, and net trading income. In turn, Asset Diversity is computed as:

$$\text{Asset Diversity} = 1 - \left| \frac{\text{Net Loans} - \text{Other Earning Assets}}{\text{Total Earning Assets}} \right|.$$

Net loans is Total loans net of loan loss provisions, and Other earning assets include all earning assets other than loans (such as Treasuries and other fixed income securities, including mortgage-backed securities).

2.4. Other factors

To account for other influences, we control for several bank-specific as well as state-specific characteristics (cf., Avraham, Selvaggi, and Vickery, 2012). To capture differences in the size of BHCs, we include the natural log of total assets, the natural log of operating income, as well as the growth rate of these two variables. In further robustness tests, we also include the ratio of bank capital to total assets and its return on equity. To control for time-varying, state-specific characteristics, we include the median state-level q, the concentration of banking assets within a state, and the real growth rate of state personal income in our regression models. Other than including time and BHC fixed effects, we do not directly control for the role of information, such as the increasing use of "hard" information especially by large banks in their loan making process (Petersen and Rajan, 2002). However, if banks that diversify geographically rely more on hard information (Berger et al., 2005), this should lower the cost of delegated monitoring for these banks (Diamond 1984) and thus boost their valuations. Therefore, not controlling for the use of hard information should bias the results in favor of finding a positive effect of diversification on valuations.

2.5. Sample construction

Our sample of BHCs is constructed as follows. We first match subsidiaries of BHCs to their ultimate parent company using information from the Call Reports. Specifically, each subsidiary reports its unique parent company, and there can be several layers of subsidiaries and parent companies before the ultimate parent company is reached. We assign a subsidiary to the parent BHC that owns at least 50% of the subsidiary's equity. We

only focus on BHCs located in the U.S. and therefore drop holding companies chartered in Puerto Rico. Furthermore, we eliminate BHCs that change the location of their headquarters across states during the sample period. This is an exceeding small number of institutions, and the results hold when including them.

Next, we merge this data with information on stock prices of traded BHCs from CRSP to compute Tobin's *q*.[7] Three BHCs report two different stock prices for different classes of shares for about 13 quarters and therefore report two values of market capitalization. We sum the reported amounts of capitalization for each share class whenever two different classes of shares are traded in a quarter. Using data on stock market capitalization of a bank's equity, we compute each bank's Tobin's *q* as the ratio of stock market capitalization of equity plus book value of total liabilities, minority interest, and perpetual preferred stock divided by the book value of total assets.

We further exclude observations below the 1st and above the 99th percentile of *q* to mitigate the influence of outliers. Our final sample contains 28,359 BHC-quarter observations of 756 BHCs. The time period of our sample ranges from the second quarter of 1986 to the last quarter of 2007 and includes all publicly traded BHCs, headquartered in one of the 50 states of the U.S. and the District of Columbia. Although interstate banking deregulation started in 1978, only 10 percent of all state-pairs signed (bilateral) interstate banking agreements prior to 1987, which is the start of our sample period. Thus, most of the deregulation activity takes place during our sample period.

Table 1 reports descriptive statistics of the main variables, with the sample of 756

[7] A data set matching Call Report and CRSP identifiers is available on the website of the Federal Reserve Bank of New York, see http://www.newyorkfed.org/research/banking_research/datasets.html.

BHCs split into diversified and nondiversified BHC-quarter observations. Since BHCs diversify during our sample period, the same entity can appear in both columns of Table 1, being categorized as a nondiversified BHC in the quarters before it diversifies and a diversified BHC afterwards. About one quarter of our sample consists of BHCs with subsidiaries in more than one state. Also, more than half of all geographically diversified BHCs have at least five subsidiaries located in at least three different states. The majority of nondiversified BHCs, on the other hand, operate only one subsidiary. As shown, diversified banks tend to (1) have higher Tobin's *q*, (2) be more profitable as measured by the return on equity, (3) be much larger, and (4) be more diverse in their activities, as measured by Income Diversity and Asset Diversity, where all of these differences are significant at the 1% level.

3. Geographic diversity of BHC assets and Tobin's *q*: OLS results

3.1. Preliminary results

As a preliminary assessment of the relationship between the market valuation of a BHC and its geographic diversification, we first estimate OLS regressions. The reduced form model is specified as follows:

$$q_{ist} = \beta D_{ist} + \boldsymbol{X}'_{ist}\rho + \delta_i + \delta_{st} + \varepsilon_{ist} \quad (1)$$

where q_{ist} denotes the Tobin's q of BHC i in state s during quarter t, D_{ist} denotes alternative measures of a BHC's geographic diversification, $\boldsymbol{X}'_{ist}$ is a matrix of conditioning information, and δ's are fixed effects, where we use BHC, state, quarter, and state-quarter fixed effects in various specifications.

Throughout the paper, the reported standard errors are heteroskedasticity robust and adjusted for clustering at the state-quarter level, thereby controlling for potential error correlation within a state and quarter. Standard errors are clustered at this level because the process of deregulation took place over time at the state level, affecting all BHCs within a state. The BHC fixed effects account for unobserved, time-invariant differences across BHCs and focuses the analysis on how the valuation of a BHC changes after diversification changes. State-quarter fixed effects account for time-varying, state-specific traits, including economic activity, changes in fiscal, labor, tax, and other economic policies at the state level. In alternative specifications, we also consider different combinations of fixed effects, including time-varying state fixed effects for the states in which a BHC has subsidiaries.

In Table 2, we consider four measures of the cross-state diversity of BHC assets: (1) a dummy variable that takes a value of one if the BHC has bank subsidiaries in more than one state, and zero otherwise, (2) the fraction of the BHC's total assets held in out of state subsidiaries, (3) one minus the Herfindahl index of the distribution of the BHC's assets across states, and (4) the average distance (in miles) between the location of a BHC's headquarters and its subsidiaries (including subsidiaries within its home state). In the first four regressions, we simply condition on state and quarter fixed effects. In the next four regressions, we also control for BHC fixed effects.

The relationship between geographic diversity and q depends on whether the regression excludes or includes BHC fixed effects. Without BHC fixed effects, there is a positive association between each of the four diversity measures and q, which confirms the results in Deng and Elyasiani (2008). But, with BHC fixed effects, there is a strong negative relationship between diversity and q, although only three of the four measures of

diversification—the fraction of assets held by out-of-state banks being the exception—enter significantly.[8] The association between diversification and *q* also holds when using state-quarter fixed effects. These results are consistent with the view that more highly valued BHCs diversify but valuations fall after BHCs diversify geographically.[9]

Without addressing causality, the economic magnitudes are small. For example, the estimated coefficient in column 7 indicates that if the median nondiversified BHC switched to the median level of diversity, this would be associated with a drop in *q* of about 0.4, i.e., about 0.4%. This drop translates into a drop in market capitalization of the average bank of about $15 million. Aggregating across all banks in our sample, the coefficient estimates suggest a drop of bank capitalization in the neighborhood of $20 billion associated with geographic diversification. While relatively small, the coefficients from Table 2 reflect a net result that also incorporates the positive ramifications of diversification.

Of course, reverse causality is likely to attenuate the OLS coefficient if high valuations encourage geographic diversification. Thus, using instruments that isolate the causal impact of diversification on valuations might yield larger effects, which is indeed what we find below.

One concern about the results in Table 2 is that there might be trends in BHC valuations that start *before* the BHC diversifies. Specifically, we want to know whether there is a break in the evolution of *q* once a BHC diversifies. If values were falling before a BHC diversifies and there is no downward break in this trend around diversification, then

[8] All four measures of diversification enter negative and significantly if we limit the sample to bank holding companies without international activities.

[9] Deng and Elyasiani (2008) distinguish between diversification and distance. As a robustness test, we control for distance and obtain the same results on diversification.

the regressions in Table 2 would still indicate that q fell after diversification. However, it would not imply that diversification was associated with this fall since there was no break in the evolution of q following diversification.

To address this concern, we trace out the dynamics between diversification and BHC valuations to assess whether there are pre-diversification trends in q using the following regression:

$$q_{it} = \alpha + \beta_{-10}D_{-10t} + \beta_{-9}D_{-9t} + \ldots + \beta_{10}D_{10t} + \delta_i + \delta_{it} + \varepsilon_{it}, \quad (2)$$

where D_{-j} equals one for BHCs in the *j*th quarter before the BHC first diversifies into another state, D_{+j} equals one for BHCs in the *j*th quarter after the BHC first diversifies into another state, and β_{-j} and β_{+j} are the corresponding coefficient estimates on these dummy variables. We do this while controlling for BHC and state-quarter fixed effects.

We consider a window of 20 quarters, spanning from 10 quarters before the BHC first diversifies until 10 quarters afterwards. We estimate this relationship only for BHCs that expanded geographically during the sample period. Figure 1 plots the estimated coefficients from the regression: the solid line is the estimated coefficients (β_{-10}, β_{-9}, etc.), while the dashed lines represent the 95% confidence interval.

As shown in Figure 1, there is a noticeable drop in BHC q after banks first diversify across state boundaries. The drop in q grows for a few quarters afterwards as well. There are no signs of a change in q, or trends in q, prior to deregulation.

3.2 Additional Robustness tests

In Table 3, we assess the robustness of the relationship between the cross-state diversity of BHC assets and a BHC's q by controlling for many additional BHC-specific and

state-specific factors, and by considering alternative combinations of fixed effects, including dummy variables to control for the states where a BHC has subsidiaries. The regressions in Table 3 use our broadest measure of geographic diversity, i.e., 1 – the Herfindahl index of BHC assets across states.

We find that the negative association between BHC diversity and q is quite robust. First, the results hold when controlling for BHC-specific factors, including the median q of all BHCs in the state, the degree of market concentration in the BHC's home state, the growth of total assets and operating income, the return on equity, the capital-to-asset ratio, BHC asset size and operating income, the degree to which the BHC receives income from diverse financial activities and invests its assets in diverse activities, a dummy variable that denotes whether the BHC has a subsidiary with international activity, and the share of assets acquired or sold during the quarter, and after we control for time-varying, state-specific factors, such as the growth of personal income. While the diversity of BHC activities, as measured by the degree to which the BHC receives income from non-interest earning assets and invests in assets beyond loans, is negatively associated with q, (consistent with the findings in Laeven and Levine, 2007), the regression still indicates an independent, negative association between cross-state asset diversity and BHC q.

Second, the results are robust to controlling for the location of a BHC's subsidiaries. For example, two BHCs chartered in Rhode Island could each have a single subsidiary, one in Massachusetts and the other in Connecticut. Thus, in Table 3, we incorporate a set of state dummy variables for each BHC, where the value of each dummy equals one if the BHC has a subsidiary in that state and quarter, and zero if the BHC does not have a subsidiary in that state and quarter (column 4). Moreover, we allow the effect of diversifying into each

particular state to vary over time (column 6). Again, we find a robust negative relation between the cross-state diversity of BHC assets and market valuations after controlling in this manner for the state-specific location of a BHC's subsidiaries.

The OLS estimates presented thus far do not permit a causal interpretation. In particular, OLS estimates might be biased because BHC valuations could shape the decision of BHCs to expand geographically and because some third factor, such as state-specific shocks or differences in BHC management, could affect both diversification and q. To address this concern we employ two instrumental variable approaches.

4. Instrumental variables: state-time instruments

To obtain a consistent estimate of the impact of BHC diversity on q, we need an instrumental variable that is correlated with the cross-state diversity of BHC assets but not independently correlated with q through other channels. We employ two instrumental variable strategies, where our first strategy employs time-varying, state-level instruments. The next section develops an instrumental variable strategy to identify diversity at the BHC-level. Consistent with earlier research on the liberalization of branching restrictions (e.g., Jayaratne and Strahan, 1996), we exclude the states of Delaware and South Dakota from these analyses. Both states removed usury limits in 1980, shortly before removing branching restrictions, making it difficult to isolate the independent effect of branching deregulation on BHC diversification.

4.1. The time-varying, state-level instruments

We use the state-specific process of interstate bank deregulation to identify exogenous increases in the cross-state diversity of BHC assets. The idea is that as one state, say Massachusetts, signed bilateral and multilateral reciprocal interstate banking agreements with other states over the years, and as other states made unilateral decisions allowing the entry of BHC subsidiaries from Massachusetts, BHCs from Massachusetts had greater opportunities to open subsidiaries in other states. As emphasized, there are enormous cross-state differences in the evolution of interstate bank deregulation. For each state, this was a dynamic process, not a single event.

We consider nine sets of time-varying, state-level instruments. The first three do not explicitly account for the evolution of deregulation. First, we simply use the number of years since a state first started liberalizing its interstate banking restrictions (Years since interstate bank deregulation), thereby allowing BHCs from other states to enter. Second, we use this variable, Years since interstate bank deregulation, and its square to allow for a quadratic relationship between the timing of interstate deregulation and the cross-state diversification of BHC assets. Third, we consider a nonparametric specification that includes independent dummy variables for each year since the state started liberalizing interstate banking restrictions, taking a value of one all the way through the first ten years after deregulation, and zero otherwise.

The remaining six instrument sets explicitly account for state differences in the evolution of deregulation. The fourth instrument set equals the logarithm of the number of states in which a BHC can open subsidiaries, including its home state. This is a simple measure of the number of states in which a BHC can potentially operate, and we refer to

this variable as Ln (Number of accessible states). Fifth, we weight the number of accessible states by the inverse of their distance from the home state, since it might be less costly for a bank in California to open a subsidiary in a close state, say, Nevada than in a distant state, say, New Hampshire (Number of accessible states – weighted).[10]

For the sixth and seventh instrument sets, we use a measure of the potential interstate market available to BHCs by including the natural logarithm of the total population of the states in which the BHC could potentially operate, excluding the BHC's home state. We refer to this variable as Ln (Market Population). Thus, rather than simply counting the number of accessible states, as done in Ln (Number of accessible states), Ln (Market Population) also captures information on the potential market available to the BHC from the opening of subsidiaries elsewhere. For the seventh instrument, we weight the sixth measure of the potential population available to BHCs by the relative distance of the market from the BHCs home state, and refer to this variable as Ln(Market Population – Weighted), where we use the aforementioned weighting scheme.

Finally, the eighth and ninth instruments are based on Market Potential, which equals Market Population divided by the population of BHC's home state. This variable captures the possibility that the desirability of opening a subsidiary in another state is positively associated with the additional market made available by that state. Thus, a BHC in California and a BHC in Nevada might view the appeal of opening a subsidiary in, say, Oregon differently. The ninth instrument uses the weighted version of this instrument.

[10] The closest state receives a weight of one and the farthest state a weight of zero. The relative distance between home state *i* and state *j*, is then computed by dividing the distance between *i* and *j* by the distance between *i* and the farthest state.

4.2. First-stage regression results and instrument validity

The first-stage regressions are presented in Panel B of Table 4. As shown in columns one through nine, we find that interstate deregulation increased the degree of cross-state diversity of BHC assets. The positive impact of deregulation on BHC diversity holds across the different indicators of interstate bank deregulation. When considering the time-varying evolution of interstate restrictions (column (4) to (9)), we find the link between diversification and deregulation to be statistically weakest when focusing only on the number of states in which a BHC can potentially open a subsidiary. The explanatory power of our measure of deregulation in explaining BHC diversification increases when we also incorporate the size and distance of potential markets into our instrument. This suggests that the distance and population of potential markets shape BHC ("foreign-state") investment decisions.

The significant impact of deregulation on BHC diversity holds when conditioning on a full set of BHC-specific, and state-specific factors as well as state and quarter fixed effects. Since the treatment is occurring at the state-time level, we do not employ BHC fixed effects in these first set of instrumental variable results. However, we do include BHC fixed effects later when we develop a BHC-level treatment.

Several pieces of evidence support the validity of the instrumental variables. First, the *F*-test results show that interstate deregulation explains BHC diversity after controlling for many potential influences. For seven out of the nine sets of instrumental variables, the *F*-test is above ten and sometimes exceeds 30. For these sets of instrumental variables, there is a strong statistical link between deregulation and BHC diversity.

Second, for those specifications where we have more than one instrument (i.e., regressions in columns (2) and (3)), Hansen *J*-test results (not reported) indicate that we cannot reject the null hypothesis of the validity of the instruments. Thus, there is no evidence that these instruments explain BHC valuations beyond their ability to account for variation in the cross-state diversity of BHC assets.

Third, we could find no evidence—either in the historical evidence on how states formed bilateral and multilateral interstate banking agreements or in the data—that states selected other states based on BHC valuations. As suggested by Amel (1993), the state-specific process of forming a series of interstate banking agreements with other states evolved in a relatively chaotic manner. The randomness in the deregulation process is evident from Figure 2, which displays the process of interstate banking liberalization from the viewpoint of BHCs located in Massachusetts, with lighter colors denoting states that removed their entry barriers for BHCs from Massachusetts earlier than other states.

Nevertheless, it might still be the case that the pattern of state-pair specific banking agreements is associated with differences in q between states. For instance, states with relatively high-q BHCs may be more prone to engage in interstate banking agreements with states that have relatively low-q BHCs (or vice versa).

However, when examining all state-pair bank deregulation agreements, we find no evidence that differences the valuation of banks between two states affected the timing of state-pair agreements. In particular, Figure 3 plots the average q in each state against the average q of each other state before the state-pair removes their (bilateral) entry restrictions. The figure suggests that there is essentially no relationship between the valuations of BHCs in states and the timing of their interstate agreements.

Finally, we find no evidence that states are more likely to sign reciprocal agreements with neighboring states than with distant states, which would invalidate our instrument for geographical diversification. We examine whether the timing of interstate banking deregulation between two states is associated with the geographical distance between these states. Figure 4 presents this relationship graphically by plotting the within-year of interstate deregulation for a given state-pair against the distance between these two states. This figure suggests that there is no relationship between the distance between two states and the (bilateral) removal of interstate banking restrictions.

4.3. Second-stage regression results with time-varying, state-level instruments

Panel A of Table 4 presents the two-stage least squares (2SLS) regressions of BHC *q* on BHC diversity for the nine different sets of instrumental variables. As already mentioned, the associated first-stage results are reported in Panel B of Table 4.

The second-stage results indicate that the cross-state diversity of BHC assets lowers *q*. In particular, the projected value of BHC asset diversification is associated with a significant reduction in BHC *q*. The only exception is when using the instrumental variable Ln (Number of accessible states). As noted, this is also the only instrumental variable that has weak explanatory power in explaining the cross-state diversity of BHC assets in the first-stage. However, when we weight by the size of the accessible states or the distance of the accessible states from the BHC, this (1) improves the fit of the first-stage regression and (2) yields a second-stage result in which the exogenous component of BHC diversity is negatively, and statistically significantly, linked to BHC *q*.

The economic size of the estimated impact of cross-state asset diversity on market valuation of a BHC is large. For example, a one standard deviation increase in the asset diversity index (1 – Herfindahl Index of assets across states) implies a decrease in q of about 30 percent of its standard deviation when using regressions (4) or (5), a reduction of over 40 percent of its standard deviation when using regressions (6) or (7), and a reduction of about 12 percent of its standard deviation when using the other regressions. As another example, consider New Jersey and the regression estimates in regression (7) of Table 4. The results suggest that if New Jersey were to change from a situation in which its BHCs were prohibited from diversifying into any state to a situation in which all states allowed New Jersey BHCs to enter that the average q of BHCs in New Jersey would fall by almost 5 percent. This is substantial. Aggregating across the U.S. banking system, it would involve a drop in market capitalization of about $225 billion.

The 2SLS estimates are between 10 and 20 times larger than the OLS estimates in absolute value terms. One explanation for this result is that higher-valued BHCs are more likely to diversify than lower-valued BHCs, biasing the OLS estimate toward zero. The 2SLS estimates identify the "true," larger impact of BHC diversity on q.

5. Instrumental variables: gravity-deregulation model

One shortcoming with the analyses thus far is that we have examined the impact of diversity on valuations for the average BHC in a state: We have not yet developed and employed a BHC-level instrumental variable. We would like, however, to distinguish among BHCs within the same state and identify the impact of an exogenous increase in diversity on BHC valuations for individual financial institutions.

In this section, we design a strategy to identify the impact of diversity on *q* at the BHC-level. We do this by simultaneously (a) using the dynamic process of interstate bank deregulation discussed above to differentiate across states and time and (b) using the distance of each BHC's headquarters to the state capitals of its own state and of other states to differentiate across BHCs within the same state.

5.1. Gravity-deregulation model: strategy

We use a gravity model to construct a time-varying, BHC-specific instrumental variable for diversification, which we then use in our two-stage least squares evaluation of the impact of diversity on *q*. Frankel and Romer (1999) developed this approach to study whether international trade causes economic growth. They first use a gravity model of international trade to estimate bilateral trade volumes between countries. Based on the projected bilateral trade volumes, they construct the projected aggregate trade volume of each country. Using this projected trade share as their instrument for actual trade in their first stage regression, they assess the causal impact of trade on growth.

Based on the gravity model, we hypothesize that BHCs will invest more in geographically close states than in far states. BHCs that are close to another state might have greater familiarity with its economic conditions and face lower costs to establishing and maintaining subsidiaries than farther states. From this perspective, a BHC in the southern part of California will tend to invest more in Arizona than Oregon and a BHC in the northern part of California might find it correspondingly more appealing to open a subsidiary in Oregon. To measure closeness to other states, we compute the distance (in

100s of miles) of each BHC's headquarters to each state's capital, which we call ("Distance in 100 miles.").

We further hypothesize that BHCs will be more attracted to comparatively larger markets than smaller markets. Thus, holding other things constant, BHCs in Colorado will invest more in California than in Wyoming. To measure relative market size, we compute the logarithm of the population of the BHC's home state (in period t) divided by the population of a foreign state (in period t): Ln(Population-ratio).

5.2. The gravity-deregulation model: two-step process

In the first step ("zero stage") of the gravity-deregulation model, we estimate the following model:

$$\text{Share}_{bijt} = \alpha \text{Distance}_{bij} + \beta \text{Ln}(\text{pop}_{it}/\text{pop}_{jt}) + \delta_b + \delta_{ij} + \delta_{it} + \varepsilon_{bijt} \quad (3)$$

where $\text{Share}_{b,i,j,t}$ is the percentage of assets of BHC b, headquartered in state i, held in its subsidiaries in state j in quarter t; $\text{Distance}_{b,i,j}$ is the distance in 100s of miles between BHC b's headquarters and state j's capital; and $\text{Ln}(\text{pop}_{i,t}/\text{pop}_{j,t})$ is the Ln(Population-ratio) defined above.

Furthermore, we condition on many possible fixed effects. In the specifications, we control for various combinations of BHC fixed effects (δ_b), separate fixed effects for each state ($\delta_i + \delta_j$), state-pair fixed effects ($\delta_{i,j}$), quarter fixed effects (δ_t), and state-quarter fixed effects ($\delta_{s,t}$). In this first step, we only include observations in which it is legally feasible for BHC b with headquarters in state i to open a subsidiary in state j during quarter t.[11] We also

[11] In this first step of the gravity-deregulation model, we tried several variations. Since many BHCs do not diversify, the dependent variable has many zeros. We also estimated a Tobit rather than a linear OLS model (unreported). This yields stronger though qualitatively similar results compared to those reported below.

exclude Alaska and Hawaii from the analysis and thus focus on the diversification of BHCs across the 48 contiguous states.

As reported in Table 5, the gravity model can explain BHC investment in "foreign-states." First and foremost, across the various specifications, there is a negative relationship between a BHC's investment in a state and the distance between the BHC's headquarters and that state. Thus, there are good reasons for believing that interstate bank deregulation between state *i* and state *j* will differentially affect BHCs in state *i*, depending on their distance to state *j*. Second, the size of the foreign market matters for the foreign state investment decisions of a BHC. As shown, BHCs are less likely to diversify into comparatively small states.

In the second step of the gravity-deregulation model, we construct a projected aggregate diversity measure for each BHC in each quarter, where the aggregation is done across all possible states into which the BHC can legally diversify. For observations in which a BHC is legally permitted to open a subsidiary in a particular state, we use the projection share from the estimated gravity models given in Table 5. For observations in which regulations prohibit a BHC from opening a subsidiary in a state, we set the projected share equal to zero. Then, we use these projected shares to compute the diversity index—the projected Herfindahl index of each BHC assets across states. We use this predicted diversity index from the gravity-deregulation model as the instrument for actual diversity in our first stage regression to assess the impact of diversity on *q*. We use the various specifications from the "zero stage" equations from Table 5 to construct the first-stage instruments.

5.3. Results using BHC instruments based on the gravity-deregulation model

The first-stage results in Table 6 suggest that the instrumental variable is very useful in explaining BHC diversity as the *F*-test of the excluded instruments is above ten. In this table, we use regression (4) of Table 5, but the results hold for the other gravity models provided in Table 5.

As shown in Panel A of Table 6, the second-stage results indicate that geographic diversity reduces Tobin's *q*. By using time-varying, BHC-specific instrumental variables, this gravity-deregulation strategy differentiates among BHCs within the same state and quarter. It identifies the impact of BHC's diversity on *q*, so we can condition on BHC and state-time fixed effects throughout. Indeed, following Frankel and Romer (1999), all of the fixed-effects included in the zero stage are also included in the first and second stages.

The size of the estimated coefficient is similar to the one obtained from earlier 2SLS estimation (Table 4). In addition to the earlier 2SLS analysis, however, we include BHC fixed effects, and thus the coefficient in Table 6 represents the drop in valuation after a BHC changes its geographic diversity. Moreover, by including state-time dummies our analysis accounts for unobservable time-varying changes at the state-level, such as competition, which also exert an influence on *q*. Hence, the coefficients in Table 6 reflect the change in *q* when a BHC changes its geographic diversification beyond state-specific unobservable effects.

In columns (2) and (3), we examine two components of Tobin's *q*: the market capitalization ratio and the ratio of the bank's total debt plus perpetual preferred stock to total assets. The regressions show that diversification reduces both components. The drop in *q* does not simply reflect a reduction in the value of bank debt as a share of total assets

(leverage); rather, the market capitalization ratio also falls materially. In fact, the market capitalization effect tends to dominate.

Next, we provide some exploratory evidence about the relationship between geographic diversification and agency problems within BHCs. Specifically, we assess whether diversification increases (a) the incidence and magnitude of loans extended to the executives of its subsidiary banks and (b) the proportion of nonperforming loans in a BHC's subsidiaries. In terms of insider lending, we use two variables: **Lending indicator** is a dummy variable that equals one if the subsidiary bank extends a loan to an officer of the bank in that quarter and zero otherwise, and **Ln (Average Loan Size per Officer)** is the natural logarithm of the average loan size made by a bank to its executives. In terms of loan quality, we examine the share of nonperforming loans, which can provide suggestive information about monitoring effort across banks (after properly accounting for regional differences and other factors influencing credit quality).

Information on lending to officers and nonperforming loans is provided at the subsidiary level, which influences our econometric methods. Thus, we examine how lending at affiliated subsidiaries changes once a BHC becomes more geographically diversified. Since our instrument varies at the BHC level, we apply a split-sample IV technique (as in Angrist and Krueger (1994) and Angrist and Pischke (2009)), where we first use the instrument obtained from the gravity-deregulation model to estimate the exogenous component of a BHC's geographic diversification, and then use this in an OLS regression at the subsidiary level. Following Björklund and Jäntti (1997) we estimate standard errors for this estimator via bootstrapping.

The results in Panel B of Table 6 indicate that as BHCs become more geographically diversified, subsidiary banks increase the frequency with which they make loans to officers, boost the average size of those insider loans, and experience an increase in the share of nonperforming loans on their books. From the coefficient estimates reported in column 4, an increase in the BHC's geographic diversification of one standard deviation raises the probability of extending a loan to an officer by approximately five percentage points.[12] Since about 27% of all banks in our sample extend a loan to an officer, this five-percentage point increase implies that officers at subsidiaries have a 20% higher chance of receiving a loan when the parent BHC increases its geographic diversification by one standard deviation. The loan size results yield an effect of comparable magnitude: the coefficient estimates imply that a one standard deviation increase in diversification would result in a 20% increase in average insider loan size. Similarly, we find that the share of nonperforming loans at subsidiaries increases significantly when BHCs increase their degree of geographic diversification. These findings are consistent with the view that diversification intensifies agency problems within BHCs, but they do not rule out the possibility that other mechanisms account for the negative impact of geographic diversity on BHC valuations.

5.4. Extensions and robustness tests

In Table 7, we extend the analyses along two dimensions. First, the agency view of diversification suggests that diversification across geographical dispersed bank subsidiaries

[12] Since the Lending indicator variable is a dummy variable, the regression coefficient can be interpreted as a change in the likelihood of lending.

lowers valuations by facilitating rent-seeking and by increasing organizational complexity more generally (e.g. Scharfstein and Stein, 2000). This view suggests that BHC acquisitions of subsidiaries will tend to lower valuations, sales of subsidiaries will tend to increase valuations, and these valuation effects will be larger if the subsidiary is in a different state from the BHC's parent corporation. We examine these possibilities by including into the regression model a dummy variable Acquisition (Sale) that denotes whether the BHC acquires (sells) another bank subsidiary, together with an interaction term between this variable and an indicator variable for whether or not the subsidiary is located in the same state as the BHC. The results are presented in columns (1) and (2) of Table 7.

Second, we were concerned that BHC M&As might trigger short-run valuation effects (Graham, Lemmon, and Wolf (2002); Custodio (2010)). This might occur, for example, because BHCs acquire already discounted banks when they expand geographically. So, in regressions (3) and (4) of Table 7, we eliminate the period around M&As from the sample. In regression (3), we eliminate the quarter of the M&A and in regression (4), we eliminate the year after the BHC diversifies. These regressions complement those in columns (1) and (2), where we directly distinguish between acquisitions, sales, and geographic proximity.

The results from Table 7 confirm and strengthen the earlier results and interpretations. The regression analyses show that our main results are not driven by M&As. Whether we directly control for M&As, or simply drop observations around the time of M&As from the sample, we find a strong, negative relationship between geographic diversification and the valuation of BHCs. In fact, the coefficient estimate on the diversification variable is similar in magnitude using either approach (cf. the regression

results in columns (2) and (4)). Furthermore, the results in columns (1) and (2), where we directly control for, and differentiate between, the effects of acquisitions and sales, show that BHCs tend to experience a boost in valuations when they sell subsidiaries, especially when these subsidiaries are located in states other than the BHC's parent. Indeed, the results on the disposal of out-of-state subsidiaries suggest that shareholders value geographic focus.

5.5. Advantages of the gravity-deregulation model and economic effects

The BHC-level instrumental variable results in Tables 6 and 7 have two particularly valuable properties relative to the results based on state-level instruments (Table 4). First, the BHC-level instruments differentiate among BHCs within the *same* state and quarter. Although we control for state-quarter characteristics in the earlier analyses (including the time-varying level of competition within each state), the state-time level instrumental variable results only provide information on the "average" BHC in a state. But, the BHC-level instrumental variable specification provides specific information on each BHC. This allows us to draw sharper inferences about the impact of BHC diversity on valuations.

Second, the BHC-level instrumental variable results suggest that diversification per se—not an intensification of bank competition triggered by interstate deregulation—is driving the results. In particular, we were concerned that if state A signs an interstate banking agreement with state B, then valuations of state A's BHCs might fall because of greater competition coming from state B's banks, not because of an intensification of agency problems caused by some of state A's BHCs diversifying into state B.

The BHC-level analyses reduce concerns that results are driven by an intensification of competition in two ways. First, we account for statewide, unobservable time-varying changes, such as changes in competition within a state, by introducing state-quarter fixed effects into the analyses. Second, the gravity-deregulation model distinguishes among BHCs within the same state. This differentiation helps identifying the impact of diversity on valuations beyond the impact of competition on *q* by controlling for changes in statewide bank competition resulting from the signing of interstate banking agreements. To see this, consider state A, which is closed to "foreign" banks. Banks within state A compete with one another. When state A deregulates with state B, competition within state A intensifies. The interstate banking agreement thus affects state A's entire banking market since banks within state A compete with one another. By differentiating among BHCs within state A, we show that "treated" BHCs within state A—those BHCs close to state B—have a significantly greater probability of diversifying into state B and experiencing a drop in *q*. Because we differentiate by BHC within the same state, this drop in *q* cannot be due to a state-level effect. Under the assumption that a state is the relevant banking market, therefore, these results suggest that geographic diversification lowered BHC valuations.

Finally, we further confirm the findings when controlling for bank competition within each BHC's local market. Specifically, the results hold when we control directly for competition using the Hirschman-Herfindahl index of deposits at the Metropolitan Statistical Area (MSA) level as a measure of local bank competition.

Economically, the BHC-level instrumental variable results—based on the gravity-deregulation model—are similar in economic magnitude to those based on state-level instruments. Regulatory induced changes in diversity that affect BHCs differently

depending on their location have large economic effects on valuations, reducing Tobin's *q* by between five and ten percent when a state goes from completely closed to completely open.

6. Conclusions

This paper examines how an exogenous increase in the geographic diversity of a BHC's assets affects the market's valuation of the BHC. We first use the state-specific, time-series pattern of interstate bank deregulation to identify the exogenous component of the geographic diversity of BHC assets. We then also incorporate a gravity model of BHC investments across states to differentiate among BHCs within the same state. These new identification strategies allow us to draw more precise inferences about the causal impact of diversification on the valuation of firms than previous research.

We find that increases in geographic diversity due to interstate bank deregulation reduced BHC valuations. The findings do not seem to be driven by accounting oddities around BHC mergers and acquisition or an intensification of competition following bank deregulation. Moreover, the drop in valuations is accompanied by more lending by BHC to the executives of subsidiary banks and an increase in nonperforming loans. Though further research is needed to pin down the precise mechanisms, the results presented in this paper are consistent with the view that an exogenous increase in geographical complexity intensified agency problems—by making it more difficult for outside investors to monitor the BHC and exert effective corporate control—with adverse implications on BHC value.

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Table 1: Summary Statistics

	Nondiversified bank holding companies						Diversified bank holding companies					
	N	Mean	Std.Dev.	Min.	Max.	Median	N	Mean	Std.Dev.	Min.	Max.	Median
Tobin's Q	21,861	105.75	5.70	94.94	130.52	104.84	6,498	106.17	6.16	95.00	130.59	104.82
Fraction of assets held by out-of-state-banks	21,857	0	0	0	0	0	6,495	0.19	0.17	0	0.90	0.14
1 - Herfindahl Index of assets across states	21,857	0	0	0	0	0	6,485	0.43	0.26	0	1	0.40
Number of states	21,861	1	0	1	1	1	6,498	3.20	1.86	2	14.00	3.00
Number of subsidiaries	21,861	1.99	2.62	1	38	1	6,498	8.41	9.62	2	72.00	5.00
Income Diversity	21,292	0.64	0.12	0.02	1	0.63	6,441	0.74	0.12	0.06	1	0.73
Asset Diversity	21,730	0.77	0.17	0	1.00	0.80	6,393	0.81	0.14	0	1	0.84
=1 if BHC has subsidiary with international activity	21,861	0.03	0.16	0	1	0	6,498	0.24	0.42	0	1	0.00
Share of assets in Acquisitions/ Sales in quarter	21,858	6.12	21.78	0	96.68	0	6,498	10.51	23.41	0	93.80	0.00
Equity (in million $)	21,861	227.33	837.39	1.72	20,700	67.80	6,498	3,188	11,600	11.63	147,000	575.57
Total Assets (in million $)	21,861	2,794	11,100	77.28	299,000	793.28	6,498	42,100	152,000	150.62	2,360,000	7146.60
Net Interest Income (in 1,000,000 $)	21,301	23.04	65.50	-77.538	1,195	7.90	6,442	308.72	979.71	-1.57	12,900	64.97
Total Operating income (in 1,000,000 $)	21,301	57.30	218.92	1.69	5,288	16.09	6,442	927.93	3113.07	-685.44	45,700	155.00
Return on Equity	20,917	3.00	1.58	-9.61	6.81	3.18	6,337	3.31	1.58	-9.55	6.81	3.53
Average Distance between HQ and subsidiaries	21,814	7.10	12.09	0.06	901.83	3.20	6,498	91.94	125.45	1.32	808.24	47.18
Capital-Asset-Ratio	21,861	8.68	2.32	0.48	40.87	8.43	6,498	8.03	1.81	3.01	17.76	7.95
Growth of Total Assets	20,821	0.03	0.05	-0.08	0.40	0.02	6,315	0.03	0.06	-0.08	0.40	0.02
Growth of Total Operating Income	20,274	0.03	0.08	-0.26	0.59	0.02	6,206	0.03	0.08	-0.26	0.59	0.02

This table shows summary statistics for the used samples. Banks are 'nondiversified' if they have subsidiaries in only one state. 'Diversified' banks have subsidiaries in at least two states. The sample ranges from the second quarter of 1986 to the last quarter of 2007.

Table 2: Geographic Diversification and Bank Holding Company Value

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Diversification Dummy	1.161***				-0.207**			
	(0.071)				(0.096)			
Fraction of assets held by out-of-state-banks		3.231***				-0.256		
		(0.267)				(0.312)		
1 - Herfindahl Index of assets across states			1.549***				-0.388**	
			(0.128)				(0.161)	
ln(Average distance between HQ and subsidiaries)				0.327***				-0.123***
				(0.024)				(0.033)
Quarter fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
State fixed effects	✓	✓	✓	✓				
Bank Holding Company fixed effects					✓	✓	✓	✓
Observations	28,338	28,331	28,321	28,291	28,338	28,331	28,321	28,291

This table reports regression results from a state-quarter fixed effects OLS analysis. The dependent variable is Tobin's q and given as (Capitalization + Perpetual Preferred Stock + Total Liabilities and Minority Interest)/(Total Assets). For expositional purposes Tobin's q is multiplied by 100. Diversification dummy is a dummy variable that takes on the value of one if a bank holding company has subsidiaries in another state, and zero otherwise. 'Fraction of assets held in out of state subsidiaries' is the fraction of assets that are in affiliated subsidiaries of a holding company that are not located in the same state as the bank holding company. '1-Herfindahl index of assets across states' is 1 - the sum of squared share of assets held in different states. ln(Average Distance between HQ and subsidiaries) is the log of the average distance in miles between a bank holding company headquarter's county and the county of its affiliated subsidiary banks.
State and time dummies for each quarter are used. Standard errors are robust, clustered at the state-quarter level and reported in parentheses below. Significance stars are: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Geographic Diversification and Bank Holding Company Value - Controls

	(1)	(2)	(3)	(4)	(5)	(6)
1 - Herfindahl Index of assets across states	-0.919***	-0.773***	-0.459***	-1.242***	-0.388**	-2.187***
	(0.133)	(0.128)	(0.139)	(0.193)	(0.181)	(0.304)
Median q in state and quarter	0.839***	0.617***	0.644***	0.656***		
	(0.009)	(0.011)	(0.011)	(0.011)		
Market Concentration (HHI)	-1.485***	-0.977***	-0.951***	-0.975***		
	(0.239)	(0.267)	(0.335)	(0.336)		
Growth of Total Assets		3.920***	2.986***	2.993***	2.814***	-0.612
		(0.594)	(0.473)	(0.470)	(0.555)	(0.600)
Return on Equity		0.989***	0.436***	0.421***	0.470***	0.590***
		(0.035)	(0.021)	(0.021)	(0.026)	(0.029)
Capital-Asset-Ratio		0.268***	-0.027	-0.037*	-0.013	0.119***
		(0.021)	(0.019)	(0.019)	(0.023)	(0.024)
Growth of Total Operating Income		-4.952***	-3.896***	-4.013***	-4.364***	-1.097***
		(0.439)	(0.328)	(0.329)	(0.398)	(0.422)
ln(Total Operating Income)		6.829***	7.279***	7.441***	7.780***	0.974**
		(0.312)	(0.349)	(0.349)	(0.424)	(0.386)
Income Diversity		-6.928***	-5.939***	-5.771***	-6.020***	-5.473***
		(0.324)	(0.368)	(0.367)	(0.432)	(0.455)
Asset Diversity		-1.137***	-0.391**	-0.357**	-0.197	-1.226***
		(0.191)	(0.182)	(0.182)	(0.222)	(0.231)
=1 if BHC has subsidiary with international activity		-0.757***	-0.437***	0.011	-0.413**	-0.232
		(0.125)	(0.151)	(0.161)	(0.200)	(0.252)
Share of assets in Acquistision/ Sales in quarter		0.004***	0.004***	0.004***	0.005***	0.004***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ln(Total Assets)	0.716***	-5.984***	-7.439***	-7.627***	-8.059***	0.226
	(0.029)	(0.312)	(0.360)	(0.358)	(0.437)	(0.361)
Growth of State Personal Income	4.308	-1.458	2.844	2.663		
	(2.687)	(2.835)	(2.658)	(2.631)		
Growth of State Personal Income (lag)	7.278***	-2.260	4.165	4.154		
	(2.675)	(3.015)	(2.827)	(2.811)		
State fixed effects	✓	✓				
Subsidiary state fixed effects				✓		
Quarter fixed effects	✓	✓	✓	✓		
Bank Holding Company fixed effects			✓	✓	✓	✓
State-quarter fixed effects					✓	
Subsidiary state quarter fixed effects						✓
Observations	28,321	25,506	25,506	25,506	25,506	25,506

This table reports regression results from a fixed effects OLS analysis.The dependent variable is Tobin's q and given as (Capitalization + Perpetual Preferred Stock + Total Liabilities and Minority Interest)/(Total Assets). For expositional purposes Tobin's q is multiplied by 100. 'Fraction of assets held in out of state subsidiaries' is the fraction of assets that are in a holding company's affiliated banks which are not located in the same state as the holding company. 'Median q in state and quarter' is the median value of Tobin's q in a state in that quarter. 'Market Concentration (HHI)' is a Herfindahl Index of banking asset concentration in a holding company's market. 'Income Diversity' is given as 1 - |(Net Interest Income - Total Noninterest Income)/(Total Operating Income)|, 'Asset Diversity' is defined as 1 - |(Net Loans - Other Earning Assets)/(Total Earning Assets) |. 'Capital-Asset-Ratio' is the fraction of bank equity over total assets, 'Return on Equity' is defined as Netincome / Equity.

The used fixed effects model is indicated in the table: 'State fixed effects' account for the location of the holding company headquarter by including dummy variables, that take on the value of one if a holding company is headquartered in that state, and zero otherwise. The regression models labeled 'Subsidiary-state fixed effects' include a set of dummy variables that take on the value of one for each state a bank holding company has subsidiaries in. Standard errors are robust, clustered at the state-quarter level and reported in parentheses below. Significance stars are: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 4: The impact of Geographic Diversification on Bank Holding Company Value - State Instrumental Variables based on Interstate Branching Deregulation

Panel A: Second Stage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1 - Herfindahl Index of assets across states	-2.064	-1.840	-3.320***	-13.999*	-11.107***	-22.320**	-17.191***	-12.559***	-11.634***
	(2.644)	(1.163)	(1.030)	(7.500)	(3.840)	(10.397)	(5.136)	(4.841)	(3.182)
Bank and Macro Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
State fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Quarter fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	25,432	25,432	25,432	25,432	25,432	25,432	25,432	25,432	25,432
F Test of instruments' joint significance	32.09	67.22	15.93	6.804	23.26	6.298	19.82	16.50	36.64
Excluded Instrument:									
Years since interstate branching deregulation	✓	✓							
(Years since interstate branching deregulation)^2		✓							
Years since interstate branching deregulation [nonparametric]			✓						
ln(Number of accessible states)				✓					
ln(Number of accessible states - weighted)					✓				
ln(Market Population)						✓			
ln(Market Population - weighted)							✓		
ln(Market Potential)								✓	
ln(Market Potential - weighted)									✓

This panel reports 2nd stage regression results from 2SLS analysis. The dependent variable is Tobin's q and given as (Capitalization + Perpetual Preferred Stock + Total Liabilities and Minority Interest)/(Total Assets). For expositional purposes Tobin's q is multiplied by 100. The endogenous variable '1-Herfindahl index of assets across states' is 1 - the sum of squared share of assets held in different states by the parent bank holding company.The excluded instruments are given in the rows titled 'Instruments': 'Years since interstate branching deregulation' is the number of years since the liberalization of interstate branching restrictions. 'Number of accessible states' is the number of states a bank holding company can enter because of bilateral or unilateral branching agreements. It is zero if a bank holding company is not allowed to branch into any other state apart from the state where it is headquartered in. 'Market Population' is the total population, excluding the holding company's headquarter state's population, a bank holding company can access due to bilateral or unilateral branching agreements. 'Market Potential' is 'Market Population' divided by the population of a holding company's headquarter state. As indicated, these variables are weighted by the relative distance of each state to every other state whereas the closest state receives a weight of one and the farthest state receives a weight of zero.
State and time dummies for each quarter are used. Standard errors are robust, clustered at the state-quarter level and reported in parentheses below. Significance stars are: * p<0.10, ** p<0.05, *** p<0.01.

Panel B: First Stage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Years since interstate branching deregulation	0.008***	0.037***							
	(0.001)	(0.003)							
(Years since interstate branching deregulation)^2		-0.003***							
		(0.000)							
ln(Number of accessible states)			0.079***						
			(0.012)						
ln(Number of accessible states - weighted)			0.115***						
			(0.013)						
ln(Market Population)			0.129***						
			(0.013)						
ln(Market Population - weighted)			0.134***						
			(0.013)						
ln(Market Potential)			0.145***						
			(0.014)						
ln(Market Potential - weighted)			0.143***						
			(0.014)						
			0.154***						
=1 if one year after interstate branching deregulation, 0 otherwise			(0.015)						
			0.161***						
=1 if two years after interstate branching deregulation, 0 otherwise			(0.016)						
			0.160***						
=1 if three years after interstate branching deregulation, 0 otherwise			(0.016)						
			0.145***						
=1 if four years after interstate branching deregulation, 0 otherwise			(0.017)						
				0.018***					
=1 if five years after interstate branching deregulation, 0 otherwise				(0.007)					
					0.035***				
=1 if six years after interstate branching deregulation, 0 otherwise					(0.007)				
						0.011**			
=1 if seven years after interstate branching deregulation, 0 otherwise						(0.004)			
							0.020***		
=1 if eight years after interstate branching deregulation, 0 otherwise							(0.004)		
								0.018***	
=1 if nine years after interstate branching deregulation, 0 otherwise								(0.004)	
=1 if more than 10 years after interstate branching deregulation, 0 otherwise									0.028***
									(0.005)
Bank and Macro Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
State fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Quarter fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
F Test of joint significance	32.09	67.22	15.93	6.804	23.26	6.298	19.82	16.50	36.64
Observations	25,432	25,432	25,432	25,432	25,432	25,432	25,432	25,432	25,432

Table 5: The relationship between population, distance and BHC asset holdings: Zero-Stage

	(1)	(3)	(4)	(5)
Distance (in 100 miles)	-1.056***	-1.798***	-0.236***	-1.823***
	(0.006)	(0.012)	(0.017)	(0.012)
ln(Population-ratio)	-0.870***	-3.631***	-0.004	-5.960***
	(0.006)	(0.125)	(0.041)	(0.248)
State fixed effects		✓		
Quarter fixed effects		✓	✓	
Bank Holding Company fixed effects			✓	✓
State-Pair fixed effects			✓	
State-Quarter fixed effects				✓
Observations	1,125,775	1,125,775	1,125,775	1,125,775

This table reports regression results from a state-quarter fixed effects OLS analysis. The dependent variable is the share of assets (in %) a BHC holds in a state. 'Population ratio' is the total population in a BHC's home state divided by the population in state A; 'Distance in 100 miles' is the distance between a BHC's headquarters and the capital of state A (in 100 miles).
Standard errors are robust and reported in parentheses. Significance stars are: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 6: The impact of Geographic Diversification on Bank Holding Company Value and Subsidiary Activity - BHC Instrumental Variables based on a Gravity-Deregulation Model

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Bank Holding Company Level			Panel B: Subsidiary Level		
	Tobin's q	Market Capitalization / Total Assets	(Total Liabilities + Perpetual Preferred Stock)/ Total Assets	Lending Indicator	ln(Average Loan Size per Officer)	Share of nonperforming loans
1 - Herfindahl Index of assets across states	-16.074***	-12.673**	-2.262***	0.176***	1.652**	0.510**
	(6.070)	(5.621)	(0.707)	(0.073)	(0.844)	(0.254)
Bank and Macro Controls	✓	✓	✓	✓	✓	✓
Bank Holding Company fixed effects	✓	✓	✓	✓	✓	✓
State-Quarter fixed effects	✓	✓	✓	✓	✓	✓
Observations	24,526	24,443	24,526	59,322	58,569	75,459
Fixed effects in gravity model:						
Bank Holding Company fixed effects	✓	✓	✓	✓	✓	✓
State-Quarter fixed effects	✓	✓	✓	✓	✓	✓

This panel reports 2nd stage regression results from 2SLS analysis. The dependent variable is given in the column header. Tobin's Q is given as (Capitalization + Perpetual Preferred Stock + Total Liabilities and Minority Interest)/(Total Assets). For expositional purposes Tobin's q is multiplied by 100. Lending Indicator is a dummy variable that equals one if a subsidiary banks extends a loan to an officer in that quarter; ln(Average Loan Size per Officer) is the natural logarithm of the subsidiary's average loan size to officers in that quarter; Share of nonperforming loans is the share of nonperforming loans in the subsidiary's total loan portfolio. The endogenous variable '1-Herfindahl index of assets across states' is 1 - the sum of squared share of assets held in different states by the parent bank holding company. The excluded instrument is 1 - Herfindahl Index of assets across states (Predicted), which is computed as follows: Using a gravity-deregulation model, we estimate how (a) the distance between a BHC's location and the capital of state A and (b) the difference in population between a BHC's home state and state A are related to the share of assets a BHC holds in state A using a OLS regression. Using coefficient from this regression, we predict the share of assets a BHC holds in a state and quarter, where we impose that BHC's projected holdings of assets are zero in states that they cannot enter because of interstate bank regulations. Finally, we aggregate the information for each BHC at the BHC-quarter level and compute the predicted Herfindahl Index of assets across state (Predicted). Standard errors are robust and reported in parentheses below. Significance stars are: * p<0.10, ** p<0.05, *** p<0.01.

Table 7: The impact of Geographic Diversification on Bank Holding Company Value - BHC Instrumental Variables based on a Gravity-Deregulation Model – Acquisitions and Sales

	(1)	(2)	(3)	(4)
Sample Selection:	Full sample - no exclusion		Exclude BHC-quarter observations if the BHC…	
			...acquires or sells a subsidiary …	
			a subsidiary in that quarter	… up to four quarters after acquisition/ sale.
1 - Herfindahl Index of assets across states	-14.952***	-14.435***	-10.188**	-14.218**
	(5.134)	(4.967)	(4.042)	(5.699)
Acquisition	0.578	0.490		
	(0.499)	(0.470)		
Acquisition * (Subsidiary in same state as BHC)		-0.089		
		(0.204)		
Sale	1.572***	1.788***		
	(0.429)	(0.462)		
Sale * (Subsidiary in same state as BHC)		-1.339***		
		(0.327)		
Bank and Macro Controls	✓	✓	✓	✓
Bank Holding Company fixed effects	✓	✓	✓	✓
State-Quarter fixed effects	✓	✓	✓	✓
Observations	24,526	24,526	20,811	16,370
Fixed effects in gravity model:				
Bank Holding Company fixed effects	✓	✓	✓	✓
State-Quarter fixed effects	✓	✓	✓	✓

This panel reports 2nd stage regression results from 2SLS analysis using different subsamples. Observations are excluded according to the row labeled 'Sample Selection'. Tobin's Q is given as (Capitalization + Perpetual Preferred Stock + Total Liabilities and Minority Interest)/(Total Assets). For expositional purposes Tobin's q is multiplied by 100. The endogenous variable '1-Herfindahl index of assets across states' is 1 - the sum of squared share of assets held in different states by the parent bank holding company. The excluded instrument is 1 - Herfindahl Index of assets across states (Predicted), which is computed as follows: Using a gravity-deregulation model, we estimate how (a) the distance between a BHC's location and the capital of state A and (b) the difference in population between a BHC's home state and state A are related to the share of assets a BHC holds in state A using a OLS regression. Using coefficient from this regression, we predict the share of assets a BHC holds in a state and quarter, where we impose that BHC's projected holdings of assets are zero in states that they cannot enter because of interstate bank regulations. Finally, we aggregate the information for each BHC at the BHC-quarter level and compute the predicted Herfindahl Index of assets across state (Predicted). 'Acquisition' is a dummy variable taking on the value of one whether a BHC acquired a subsidiary in the quarter, or zero otherwise; 'Sale' is a dummy variable taking on the value of one whether a BHC sold a subsidiary in that quarter, or zero otherwise. 'Subsidiary in the same state as BHC' is a dummy variable taking on the value of one whether the acquired/sold subsidiary is in the same state as the BHC headquarter, or zero otherwise.
Standard errors are robust and reported in parentheses below. Significance stars are: * p<0.10, ** p<0.05, *** p<0.01. The dependent variable is Tobin's q and given as (Capitalization + Perpetual Preferred Stock + Total Liabilities and Minority Interest)/(Total Assets). For expositional purposes Tobin's q is multiplied by 100. 'Acquisition/ Sale Dummy' is a dummy variable that takes on the value of one if the bank holding company acquires/ sells another bank, and zero otherwise. Standard errors are robust, clustered at the state-quarter level and reported in parentheses below. Significance stars are: * p<0.10, ** p<0.05, *** p<0.01.

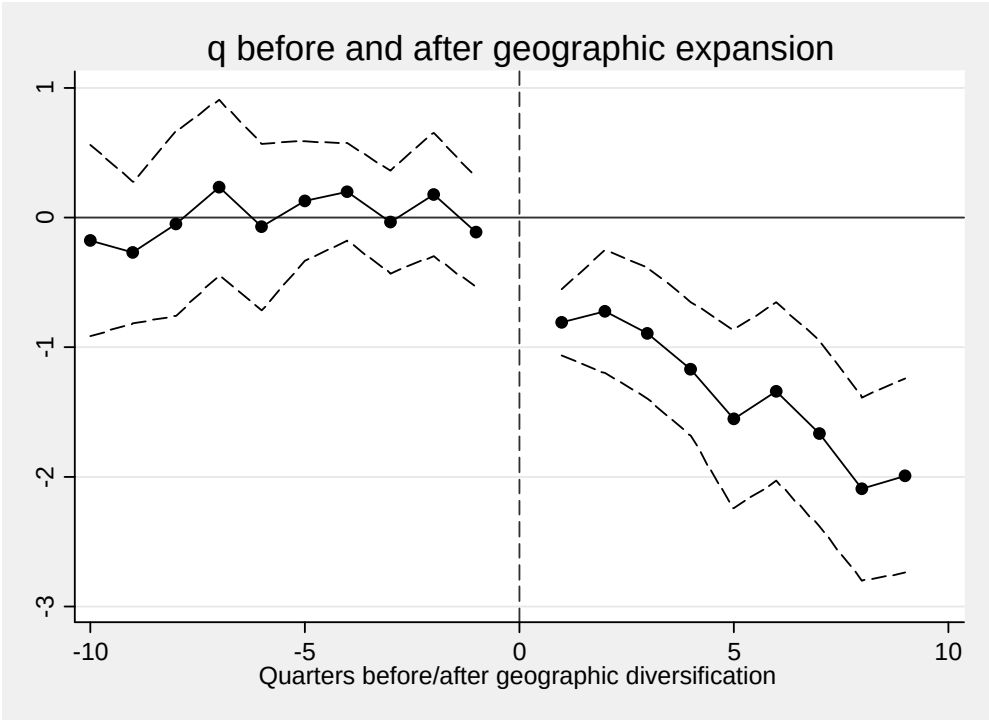

Figure 1. The Dynamic Impact of Geographic Expansion on *q*. This figure plots the impact of a geographic expansion on BHC's q. We consider a window of 20 quarters, spanning from 10 quarters before diversification until 10 quarters after geographic expansion. We report estimated coefficients from the following regression:
$q_{it} = \alpha_t + \alpha_s + \beta_{-10} D_{-10t} + \beta_{-9} D_{-9t} + \ldots + \beta_{10} D_{10t} + \varepsilon_{it}$, where D_{-j} equals one for banks in the jth quarter before expansion, D_{+j} equals one for banks in the jth quarter after expansion, α_t/α_s are time/state fixed effects. Our coefficients are centered on the quarter of expansion. The solid line denotes the estimated coefficients (β_{-10}, β_{-9} ...), while the dashed lines represent the 95% confidence interval.

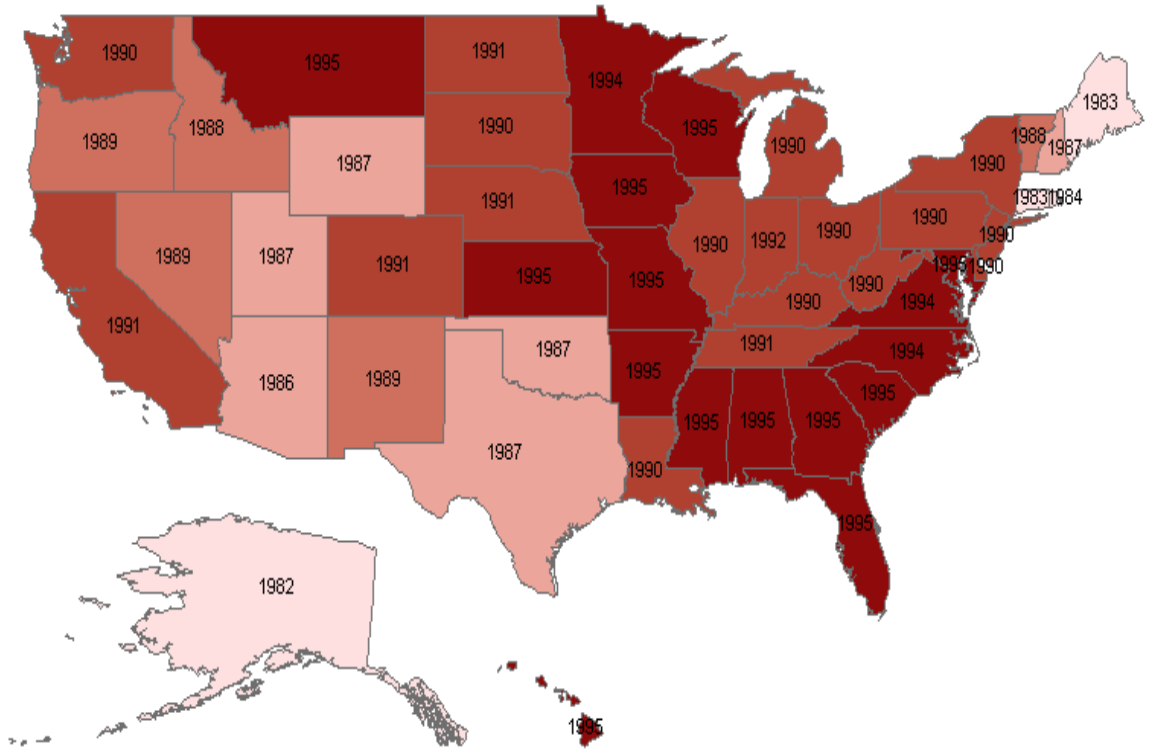

Figure 2. Pattern of Interstate Banking Deregulation: The Case of the State of Massachusetts. This map presents the geographic evolution of interstate banking deregulation for the state of Massachusetts and other states. For each state, this figure displays the year when BHCs located in Massachusetts were allowed to enter that state.

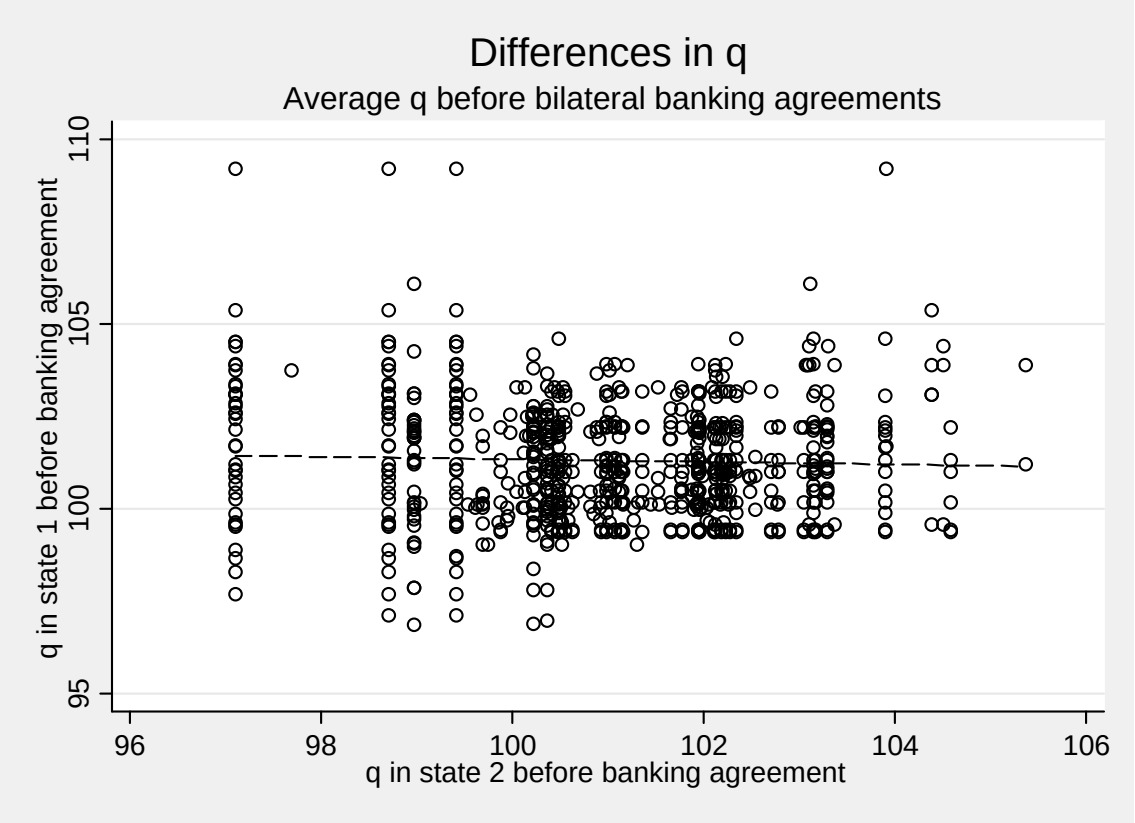

Figure 3. Differences in *q* Before (Bilateral) Interstate Banking Agreements. This figure plots the average q (in %) in state 1 against the average q (in %) in state 2 before both states remove their interstate banking. The dashed line represents the linear relationship, computed from an OLS regression.

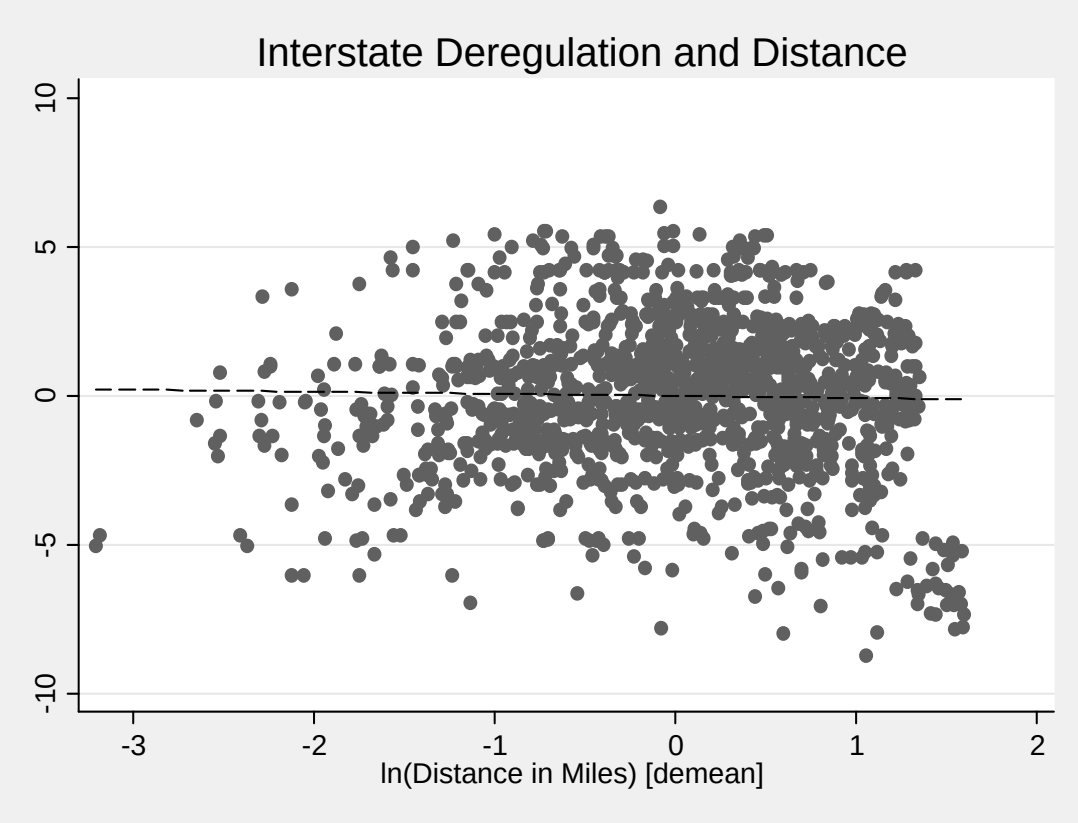

Figure 4. Within State Analysis: Year of Regulation with Another State and Distance. This figure plots the relationship between the year of interstate banking agreement and ln(distance) within a state, excluding all state-pairs that deregulate in 1995. For each state pair A-B, the y-axis measures the difference between the year of Interstate Deregulation between A and B and the average year of A's Interstate Banking Deregulation with all states (=within state); the x-axis measures the difference between ln(distance between A and B) and the average ln(distance) between A and all other states (i.e., the within state distance). Dots represent the demeaned year and ln(distance) for all state-pairs in the sample. The dashed line represents the linear relationship, computed from an OLS regression.