Identifying the Valuation Effects and Agency Costs of Corporate Diversification: Evidence from the Geographic Diversification of U.S. Banks

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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 reduced BHC valuations. We also find that the geographic diversification of BHC assets increased insider lending and reduced loan quality. Taken together, these findings are consistent with theories predicting that geographic diversity intensifies agency problems.

JEL Classifications: G34, L22, G21, G24

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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; and Berger, Demsetz, and Strahan, 1999), improving internal capital markets (Houston, James, and Marcus, 1997; Kuppuswamy and Villalonga, 2012), 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 *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

[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.

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 to examine the ability of banks in one state to diversify into other states. 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 its 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, additional evidence suggests that the drop in BHC valuations is associated with an increase in the benefits flowing to the BHC's 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 to corporate insiders (i.e., executive officers, directors, principal shareholders and their related interests) and (b) increases the proportion of nonperforming loans. 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 economic 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

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

enhanced risk diversification even for this simple form of geographic diversification, then this advertises the importance of agency problems within banks more generally.

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

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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.

institutions that includes commercial banks, state-chartered savings banks, and cooperative banks.[4]

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.

[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 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

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[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]

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

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[6] Income Diversity is computed as follows: Income Diversity $= 1 - \left|\frac{\text{Net Interest Income} - \text{Total Noninterest Income}}{\text{Total Operating Income}}\right|$. Net interest income equals 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: Asset Diversity $= 1 - \left|\frac{\text{Net Loans} - \text{Other Earning Assets}}{\text{Total Earning Assets}}\right|$. Net loans equals gross loans minus loan loss provisions. Other earning assets includes all earning assets other than loans (such as Treasuries, mortgage-backed securities, and other fixed income securities).

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] 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, 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 31,847 BHC-quarter observations of 964 BHCs. The time period of our sample ranges from the third 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 964 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 22 percent 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 four subsidiaries located in at least three different states. The majority

[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.

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. T-tests indicate that 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:

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

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 focus the analyses 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.* 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.[8]

Without addressing reverse causality, the economic magnitudes are small. For example, the estimated coefficient in column 7 indicates that a one standard deviation increase in diversity is associated with a drop in *q* of about eight basis points, which is 1.4%

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

of q's standard deviation. As an alternative illustration of the economic magnitude, the estimated coefficient 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 0.2, i.e., about 0.2%. This drop translates into a drop in market capitalization of the average bank of about $6.4 million. While relatively small, the coefficients from Table 2 reflect a net result that also incorporates the positive ramifications of diversification.

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 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:

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

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, the BHC's 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, the share of assets in other BHCs acquired or sold during the quarter, and 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 have been widely used in the literature on the effects of banking deregulation (e.g., Jayaratne and

Strahan, 1996). They are based on the timing of a state's removal of its entry restrictions to out-of-state BHCs and 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.

For our purposes of identifying exogenous sources of variation in a BHC's ability to diversify into other states, there are two shortcomings with these three traditional measures of interstate bank deregulation. First, and most fundamentally, they do not measure the ability of a BHC, headquartered in say state A, to enter other states. Rather, the traditional measures are indicators of the ability of BHCs in other states to enter state A. Thus, while correlated because of the bilateral nature of interstate bank deregulation, these traditional measures do not directly measure the ability of a BHC to diversify its assets into other states. Second, these traditional measures of interstate bank deregulation do not account for differences in the evolution of interstate bank deregulation across states over time. We want to capture differences in the dynamic relaxation of constraints on interstate diversification that BHCs experienced. Thus, we expect that these traditional measures of interstate bank deregulation will have less power when explaining the geographic diversification of BHCs over time than variables that (a) explicitly measure a BHCs ability to diversify into other states and (b) account for heterogeneous evolution of interstate banking regulations.

To explicitly account for state differences in the evolution of a BHC to diversify into other states, we introduce a set of six new instruments. The fourth instrument set equals the logarithm of the number of states in which a BHC can open subsidiaries. This is a simple measure of the number of states in which a BHC can potentially diversify, 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).[9]

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, including 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.

[9] 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.

Finally, the eighth and ninth instruments are based on Market Potential, which equals Market Population divided by the population of BHC's home state. Compared to ln(Market Population), this variable captures the possibility that the desirability of opening a subsidiary in another state is positively associated with the additional relative 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.

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 (columns (4) to (9)), we find the link between diversification and deregulation to be statistically weakest when focusing only on the number of other states in which a BHC can potentially open a subsidiary (column (4)). 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 in Table 4A show that interstate deregulation explains BHC diversity after controlling for many potential influences. For eight 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.[10]

Second, the second-stage regression results in Table 4B indicate that it is important to account for (a) restrictions on the ability of a BHC to enter other states and (b) the state-specific evolution of interstate banking liberalizations when identifying the exogenous component of diversification. This is reflected in weaker second-stage results when using instruments that capture only the removal of bank entry restrictions (first three columns of Table 4B) as opposed to instruments that capture the ability of BHCs to expand into other states and cross-state differences in the evolution of interstate bank deregulation (as in the remainder of Table 4B). Since, as we argued before, the questions addressed in this paper require instruments that explain the ability of a BHC to diversify into other states, there are conceptual advantages to the instruments employed in columns (4) to (9).

Third, we could find no evidence—either in the historical accounts 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

[10] Additionally, 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 at the 1 % level.

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 in 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 mean valuations of BHCs in states and the timing of 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 statistically 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 projected asset diversity index obtained from the first stage implies a decrease in q of about 30 percent of its standard deviation when using regressions (4) or (6), a reduction of over 20 percent of its standard deviation when using regressions (5) or (7), and a reduction of about 15 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, then the average q of BHCs in New Jersey would fall by about 80 basis points. This is substantial. It implies a drop of $113 million in the total market capitalization of BHCs in New Jersey compared to their valuation at the end of 2007.

The 2SLS estimates suggest that geographic diversification has a more sizable effect on *q* than the OLS estimates. Comparing economic magnitudes between OLS and 2SLS results indicates a sizeable effect of geographic diversification on Tobin's *q*. The net effect of geographic diversification, computed using the OLS coefficient estimate from Table 3, column (2) suggests that a one standard deviation increase in a BHC's diversification is associated with a drop in *q* of about 0.2% or about 3% of its sample standard deviation. The net effect of diversification, computed using the 2SLS coefficient estimate from Panel A of Table 4, column (7), suggests a drop in *q* of about 1.2% or about 21% of its sample standard deviation. Overall, the estimated effect of diversification on *q* based on 2SLS is between 4 and 9 times larger than the OLS estimates. Furthermore, when using a simple reduced form specification in which we regress *q* on the instrumental variables that measure the process of interstate bank deregulation, the economic magnitudes of the estimated coefficients are similar to those emerging from the 2SLS estimates. Table A.1 provides the reduced form results. These results confirm our earlier findings. Let's use New Jersey again as an example. The process of interstate banking deregulation increased the available market population for the BHCs located in New Jersey by a factor of three. Based on the reduced form coefficients in column (7), this increase in market population is associated with an average decrease in *q* of about 80 basis points for BHCs in New Jersey.

The larger absolute value of the 2SLS results are consistent with the reverse causality concerns mentioned above and hence with the need to use instrumental variables to identify the impact of geographic diversity on BHC valuations. In particular, higher-valued BHCs might be more likely to diversify than lower-valued BHCs. Thus, OLS might yield coefficient estimates of the impact of diversity on valuations that are biased 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, and Rubinstein (2011) enhanced the econometric design, 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:

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

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 a BHC's home state fixed effects (δ_h), fixed effects for each state (δ_j), state-pair fixed effects (δ_{ij}), and quarter fixed effects (δ_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*. We also exclude Alaska and Hawaii from the analysis and thus focus on the diversification of BHCs across the 48 contiguous states.

The share of assets that a BHC can have in a certain state is naturally bounded between zero and one, which shapes our zero-stage estimation strategy. Many BHCs are not diversified across states, and even the median diversified BHC has assets in only three states. Since the dependent variable is bounded between zero and one and we observe many observations with a value of zero, OLS estimation is inappropriate. Following the work of Papke and Wooldridge (1996 and 2008), we use a fractional logit model to estimate the relationship between distance, population and a BHC's shares in a state. We obtain similar results when estimating this relationship using fractional probit, OLS, or Tobit regressions.

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. Using a fractional logit model in the first step of the gravity-deregulation model to predict shares also ensures that these predicted shares are between zero and one. 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*.

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

The first-stage results in Panel B of Table 6 indicate that the instrumental variable is powerful in explaining BHC diversity. The predicted level of the geographic diversity of a BHC is positively and significantly associated with the actual level diversity. This indicates that the gravity-deregulation model explains diversification at the BHC level.

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.

The size of the estimated coefficient is similar to the one obtained from earlier 2SLS estimation (Table 4). To gauge the economic magnitude, we again calculate the effect of diversification on *q* 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 BHCs from New Jersey to enter. Using the coefficient from Panel A of Table 6, column (1) we compute that a BHC's *q* falls by about 4.5 percent. This translates into a reduction of about $34 million in market capitalization for the average BHC in New Jersey.[11]

Since the regressions in Table 6 include BHC fixed effects, the coefficient estimates represent the drop in valuation after a BHC changes its geographic diversity. Moreover, by including state-time dummies our analyses account for unobservable time-varying changes at the state-level, such as competition, which might influence *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

[11] Table 2 in the Appendix reports reduced-form OLS results on the relation between *q*, predicted diversification (obtained from the gravity-deregulation model), and our measures of insider lending or loan quality. As it can be seen, higher predicted diversification is associated with lower *q*, higher insider lending, and a higher share of nonperforming loans.

total assets. The regressions show that the market capitalization ratio also falls materially, indicating that the drop in q does not simply reflect a reduction in the value of bank debt as a share of total assets (leverage).

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 credit extensions to insiders and (b) the proportion of nonperforming loans. The Call Report data we use define insiders as executive officers, directors, principal shareholders and their related interests. Information on credit to insiders and nonperforming loans is provided at the subsidiary level. Following our earlier empirical strategy, we aggregate the information at the BHC level.[12] In terms of insider lending at the BHC level, we use two variables: Credit Extension to Insiders Indicator is a dummy variable that equals one when at least one of the BHC's subsidiaries extends credit to insiders in a given quarter, and zero otherwise; and (Credit Extension to Insiders/ Total Loans) is the BHC's aggregate amount of credit extension to insiders across all its subsidiaries divided by the total amount of loans extended by all its subsidiaries. By scaling insider credit by total loans we account for the observation that larger BHCs extend more credit to insiders than smaller BHCs on average. To measure loan quality, we compute the share of nonperforming loans in total loans at the BHC level by aggregating the total amount of nonperforming loans across all BHC subsidiaries divided by a BHC's total loan volume across all subsidiaries, where nonperforming loans are defined

[12] To mitigate the influence of missing observations when aggregating these variables at the BHC level, we restrict attention to BHC-quarters where subsidiaries have nonmissing values. Our results also hold, however, when we include BHC-quarters were some subsidiaries do not report insider credit extensions or nonperforming loans.

as loans that are at least 90 days past due or that have been placed on nonaccrual. This variable provides suggestive information about monitoring effort across banks (after properly accounting for regional differences and other factors influencing credit quality).

The results in columns (4) to (6) in Panel A of Table 6 indicate that as BHCs become more geographically diversified, BHCs increase the frequency with which they extend credit to insiders, boost the share of loans 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 exogenous component of geographic diversification of one standard deviation, obtained from using predicted values from the first stage, raises the probability of extending a loan to an officer by approximately four percentage points.[13] Examining the share of credit extended to insiders on a BHC's total loan book shows that that a one standard deviation increase in predicted diversification increases the share of loans to insiders by 46 basis points. This is about 40% of the sample standard deviation of the share of credit extension to insiders in a BHC's total loans.

Similarly, the share of nonperforming loans at subsidiaries increases by about 55 basis points (which is equivalent to 60% of its standard deviation) when BHCs increase their predicted degree of geographic diversification by one standard deviation. 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.

[13] Since the Credit Extension to Insiders indicator variable is a dummy variable, the regression coefficient can be interpreted as a change in the likelihood of lending.

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 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, whereas sales of subsidiaries will tend to increase valuations. We examine these possibilities by including into the regression model the share of assets of acquired from other BHCs and the share of assets sold to other BHCs in each quarter. The results are presented in column (1) 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 (2) to (4) of Table 7, we eliminate (a) the quarter where the acquisition or sale takes place, (b) up to one quarter before and after, or (c) up to two quarters before and after the M&A. In regression (5), we only restrict attention to quarters after a M&A and eliminate up to two quarters after the M&A and in regression (6), we eliminate the year after the BHC buys or sells subsidiaries. These regressions complement those in column (1), where we directly distinguish between acquisitions and sales.[14]

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

[14] Since we are concerned about short-run valuation effects affecting our results, the issue of timing within a quarter is relevant. We characterize BHC-quarters as being affected by acquisitions or sales if the most recent acquisition or sale occurs in the second half of the respective quarter.

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 (1) and (2)). Furthermore, the results in column (1), where we directly control for, and differentiate between, the effects of acquisitions and sales, show that BHCs tend to experience a significant reduction in valuations when they acquire larger subsidiaries, suggesting that shareholders value corporate 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 their 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.

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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	24,764	105.51	5.66	94.70	128.68	104.60	7,083	105.87	5.98	94.78	128.44	104.50
Fraction of assets held by out-of-state-banks	24,758	0	0	0	0	0	7,080	0.21	0.20	0.00	0.96	0.15
1 - Herfindahl Index of assets across states	24,758	0	0	0	0	0	7,080	0.44	0.26	0.00	1	0.41
Number of states	24,764	1	0	1	1	1	7,083	3.19	1.84	2	14	3
Number of subsidiaries	24,764	1.99	2.87	1	44	1	7,083	7.81	8.94	1	72	4
Income diversity	24,293	0.63	0.12	0.02	1	0.63	7,052	0.74	0.12	0.04	0.999563	0.73
Asset diversity	24,640	0.76	0.17	0	1.00	0.79	7,006	0.81	0.14	0	1.00	0.84
Subsidiary with international activity	24,764	0.02	0.15	0	1	0	7,083	0.24	0.43	0	1	0
Share of assets in acquisitions/sales	24,764	0.03	1.64	0	138.40	0	7,083	0.10	2.52	0	108.35	0.00
Equity (in US$ millions)	24,764	214	781	1	20,700	66	7,083	3,084	11,200	7	147,000	547
Total assets (in US$ millions)	24,764	2,639	10,500	97	299,000	764	7,083	41,200	148,000	73	2,360,000	6901
Net interest income (in US$ millions)	24,306	22	62	-78	1,195	7.45	7,054	304	956	-65	12,900	63
Total operating income (in US$ millions)	24,306	54	203	1	5,288	15	7,054	920	3052	-685	45,700	150
Return on equity	23,847	2.88	1.73	-12.17	6.79	3.10	6,923	3.18	1.86	-12.04	6.78	3.48
Average distance between HQ and subsidiaries	24,632	7.03	10.80	0.06	150.31	3.24	6,733	93.20	128.92	1.33	901.83	47.18
Capital-to-asset ratio	24,764	8.77	2.60	0.39	81.33	8.44	7,083	7.96	2.06	1.11	60.36	7.85
Growth in total assets	23,733	0.03	0.05	-0.09	0.36	0.02	6,891	0.03	0.06	-0.09	0.36	0.02
Growth in total operating income	23,101	0.02	0.07	-0.26	0.56	0.02	6,765	0.03	0.08	-0.26	0.56	0.02
Tobin's Q	24,764	105.51	5.66	94.70	128.68	104.60	7,083	105.87	5.98	94.78	128.44	104.50

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 third 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	1.174***				-0.200**			
	(0.067)				(0.090)			
Fraction of assets held by out-of-state-banks		2.026***				-0.595**		
		(0.231)				(0.258)		
1 - Herfindahl Index of assets across states			1.721***				-0.357**	
			(0.117)				(0.149)	
ln(Average distance between HQ and subsidiaries)				0.378***				-0.115***
				(0.024)				(0.031)
Quarter fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
State fixed effects	✓	✓	✓	✓				
Bank Holding Company fixed effects					✓	✓	✓	✓
Observations	31,847	31,838	31,838	31,365	31,847	31,838	31,838	31,365

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)/(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	-0.993***	-0.872***	-0.580***	-1.347***	-0.332**	-1.764***
	(0.121)	(0.121)	(0.128)	(0.178)	(0.153)	(0.274)
Median q in state and quarter	0.820***	0.627***	0.644***	0.652***		
	(0.008)	(0.011)	(0.011)	(0.011)		
Market concentration (HHI)	-1.183***	-0.863***	-0.777**	-0.781**		
	(0.224)	(0.264)	(0.334)	(0.337)		
Growth in Total Assets		3.136***	2.750***	2.748***	2.763***	-0.852
		(0.555)	(0.420)	(0.418)	(0.459)	(0.536)
Return on Equity		0.766***	0.323***	0.311***	0.336***	0.455***
		(0.029)	(0.016)	(0.016)	(0.019)	(0.023)
Capital-Asset-Ratio		0.096***	-0.074***	-0.078***	-0.068***	0.063***
		(0.019)	(0.017)	(0.017)	(0.019)	(0.022)
Growth of Total Operating Income		-4.378***	-3.475***	-3.522***	-4.006***	-0.731*
		(0.402)	(0.294)	(0.294)	(0.327)	(0.375)
ln(Total Operating Income)		6.703***	7.182***	7.285***	7.769***	0.453
		(0.302)	(0.319)	(0.318)	(0.349)	(0.350)
Income Diversity		-7.647***	-5.984***	-5.917***	-5.727***	-5.379***
		(0.288)	(0.332)	(0.333)	(0.363)	(0.416)
Asset Diversity		-0.738***	-0.420**	-0.394**	-0.049	-0.938***
		(0.174)	(0.167)	(0.166)	(0.186)	(0.210)
=1 if BHC has subsidiary with international		-0.819***	-0.464***	-0.066	-0.351**	-0.132
activity		(0.129)	(0.142)	(0.149)	(0.173)	(0.231)
Share of assets in Acquisitions/ Sales in quarter		-0.010	0.004	0.005	0.004	0.008
		(0.009)	(0.008)	(0.009)	(0.010)	(0.012)
ln(Total Assets)	0.753***	-5.804***	-7.176***	-7.313***	-7.947***	0.810**
	(0.027)	(0.301)	(0.330)	(0.328)	(0.363)	(0.327)
Growth of State Personal Income	7.931***	-0.015	3.016	3.030		
	(2.079)	(2.424)	(2.295)	(2.299)		
Growth of State Personal Income (lag)	7.687***	-1.350	3.569	3.745*		
	(2.055)	(2.403)	(2.229)	(2.226)		
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	31,838	28,810	28,810	28,810	28,810	28,810

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)/(Total Assets). For expositional purposes Tobin's q is multiplied by 100. '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. '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	-3.383	-2.642**	-3.686***	-14.179*	-9.887**	-13.953**	-9.843***	-7.674**	-5.877**
	(2.398)	(1.116)	(0.969)	(7.392)	(4.191)	(5.517)	(3.425)	(3.337)	(2.481)
Bank and Macro Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
State fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Quarter fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	28,735	28,735	28,735	28,735	28,735	28,735	28,735	28,735	28,735
F Test of instruments' joint significance	45.92	90.13	20.60	7.589	19.16	13.97	30.51	28.07	51.11
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)/(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 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	0.009***	0.038***							
	(0.001)	(0.003)							
(Years since interstate branching deregulation)^2		-0.003***							
		(0.000)							
=1 if one year after interstate branching deregulation, 0 otherwise			0.075***						
			(0.011)						
=1 if two years after interstate branching deregulation, 0 otherwise			0.114***						
			(0.012)						
=1 if three years after interstate branching deregulation, 0 otherwise			0.134***						
			(0.012)						
=1 if four years after interstate branching deregulation, 0 otherwise			0.140***						
			(0.012)						
=1 if five years after interstate branching deregulation, 0 otherwise			0.147***						
			(0.012)						
=1 if six years after interstate branching deregulation, 0 otherwise			0.146***						
			(0.013)						
=1 if seven years after interstate branching deregulation, 0 otherwise			0.155***						
			(0.014)						
=1 if eight years after interstate branching deregulation, 0 otherwise			0.165***						
			(0.014)						
=1 if nine years after interstate branching deregulation, 0 otherwise			0.159***						
			(0.015)						
=1 if more than 10 years after interstate branching deregulation, 0 otherwise			0.148***						
			(0.015)						
ln(Number of accessible states)				0.017***					
				(0.006)					
ln(Number of accessible states - weighted)					0.029***				
					(0.007)				
ln(Market population)						0.017***			
						(0.004)			
ln(Market population - weighted)							0.026***		
							(0.005)		
ln(Market potential)								0.025***	
								(0.005)	
ln(Market potential - weighted)									0.034***
									(0.005)
Bank and Macro Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
State fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Quarter fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
F Test of joint significance	28,735	28,735	28,735	28,735	28,735	28,735	28,735	28,735	28,735
Observations	45.92	90.13	20.60	7.589	19.16	13.97	30.51	28.07	51.11

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

	(1)	(2)	(3)	(4)	(5)
Distance (in 100 miles)	-7.141***	-7.027***	-0.180***	-0.216***	-0.198***
	(0.030)	(0.031)	(0.005)	(0.006)	(0.013)
ln(Population-ratio)	-0.882***	-0.873***	-0.104***	-0.100***	-0.257***
	(0.009)	(0.009)	(0.003)	(0.004)	(0.060)
Quarter fixed effects		✓	✓	✓	✓
Home-state fixed effects			✓		
State fixed effects				✓	
State-Pair fixed effects					✓
Observations	1,186,881	1,186,881	1,186,881	1,186,881	1,186,881
Chi-squared test of joint significance (p-value)	0.000	0.000	0.000	0.000	0.000

This table reports average marginal effects from a fractional logit regressions. 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 - BHC Instrumental Variables based on a Gravity-Deregulation Model

Panel A: Second Stage Results

	(1)	(2)	(3)	(4)	(5)	(6)
	Tobin's q	Market Capitalization / Total Assets	(Total Liabilities + Perpetual Preferred Stock)/ Total Assets	Credit Extension to Insiders Indicator	Credit Extension to Insiders / Total Loans	Share of Nonperforming Loans
1 - Herfindahl Index of assets across states	-53.291***	-51.221***	-0.481	1.006*	11.928***	10.776***
	(18.548)	(17.160)	(0.659)	(0.528)	(4.239)	(3.669)
Bank and Macro Controls	✓	✓	✓	✓	✓	✓
Bank Holding Company fixed effects	✓	✓	✓	✓	✓	✓
State-Quarter fixed effects	✓	✓	✓	✓	✓	✓
Observations	26,030	25,888	25,768	22,777	22,738	22,792
F Test of instruments' joint significance	8.687	9.549	9.454	14.88	14.76	14.84

Panel B: First Stage Results

	(1)	(2)	(3)	(4)	(5)	(6)
1 – Herfindahl Index of assets across states (predicted)	0.110***	0.116***	0.118***	0.152***	0.151***	0.151***
	(0.037)	(0.038)	(0.038)	(0.039)	(0.039)	(0.039)

Panel A reports 2nd stage regression results from 2SLS analysis. The dependent variable is given in the column header. Tobin's Q is given as (Market Capitalization + Perpetual Preferred Stock + Total Liabilities)/(Total Assets). For expositional purposes Tobin's q is multiplied by 100. 'Credit Extension to Insiders Indicator' is a dummy variable taking a value of one when at least one of the BHC's subsidiaries extends credit to insiders; 'Credit Extension to Insiders/ Total Loans' is the amount of credit extended to insiders relative to the total amount of loans extended by the BHC's subsidiaries aggregated at the BHC level, where Insiders are executive officers, directors, principal shareholders and their related interests; 'Share of Nonperforming Loans' is the share of nonperforming loans in total loans of a BHC's subsidiaries aggregated at the BHC level, where nonperforming loans are defined as loans that are at least 90 days past due or that have been placed on nonaccrual. 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 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 fractional logit regression. Using coefficient from this regression, we predict the share 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). First stage results are reported in Panel B.
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 - Subsamples

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Second Stage Results						
		Exclude BHC-quarter observations if the BHC… ...acquires or sells a subsidiary …				
Sample Selection:	Full sample - no exclusion	a subsidiary in that quarter	… up to one quarter before and after acquisition/sale	… up to two quarters before and after acquisition/sale	… up to two quarters after acquisition/sale	… up to four quarters after acquisition/sale
1 - Herfindahl Index of assets across states	-55.774***	-51.558***	-61.973**	-74.004**	-51.454***	-52.400***
	(19.931)	(17.617)	(25.393)	(37.368)	(17.484)	(19.666)
Share of assets in acquisitions	-0.026***					
	(0.008)					
Share of assets in sales	-0.005					
	(0.066)					
Bank and Macro controls	✓	✓	✓	✓	✓	✓
Bank holding company fixed effects	✓	✓	✓	✓	✓	✓
State-quarter fixed effects	✓	✓	✓	✓	✓	✓
Observations	26,030	25,359	24,161	23,125	24,728	23,569
F-test of instruments' joint significance	8.107	8.762	5.915	3.809	8.770	7.244
Panel B: First Stage: Dependent Variable: 1 - Herfindahl index of assets across states						
1 - Herfindahl index of assets across states (predicted)	0.105***	0.114***	0.099**	0.082*	0.117***	0.111***
	(0.037)	(0.039)	(0.041)	(0.042)	(0.040)	(0.041)

Panel A reports regression results from a state-quarter fixed effects 2SLS analysis using different subsamples. Observations are dropped according to the row labeled 'Sample Selection'. The dependent variable is Tobin's q and given as (Capitalization + Perpetual Preferred Stock + Total Liabilities)/(Total Assets). For expositional purposes Tobin's q is multiplied by 100. 'Share of Assets in Acquisitions (Sales)' is the share of a BHC's assets that are associated with an acquisition (sale) during that quarter. 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 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 fractional logit regression. Using coefficient from this regression, we predict the share 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). First stage results are reported in Panel B. State-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 A1: Interstate Banking Deregulation and Bank Holding Company Value (Reduced Form)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Years since interstate branching deregulation	-0.030	-0.099**							
	(0.021)	(0.042)							
(Years since interstate branching deregulation)^2		0.006*							
		(0.003)							
=1 if one year after interstate branching deregulation, 0 otherwise			-0.499***						
			(0.156)						
=1 if two years after interstate branching deregulation, 0 otherwise			-0.721***						
			(0.133)						
=1 if three years after interstate branching deregulation, 0 otherwise			-0.748***						
			(0.157)						
=1 if four years after interstate branching deregulation, 0 otherwise			-0.564***						
			(0.166)						
=1 if five years after interstate branching deregulation, 0 otherwise			-0.717***						
			(0.187)						
=1 if six years after interstate branching deregulation, 0 otherwise			-0.721***						
			(0.181)						
=1 if seven years after interstate branching deregulation, 0 otherwise			-0.582***						
			(0.194)						
=1 if eight years after interstate branching deregulation, 0 otherwise			-0.656***						
			(0.206)						
=1 if nine years after interstate branching deregulation, 0 otherwise			-0.572***						
			(0.208)						
=1 if more than 10 years after interstate branching deregulation, 0 otherwise			-0.811***						
			(0.227)						
ln(Number of accessible states)				-0.245**					
				(0.107)					
ln(Number of accessible states - weighted)					-0.285***				
					(0.107)				
ln(Market Population)						-0.234***			
						(0.075)			
ln(Market Population - weighted)							-0.258***		
							(0.081)		
ln(Market Potential)								-0.189**	
								(0.078)	
ln(Market Potential - weighted)									-0.200**
									(0.083)
Bank and Macro controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
State fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Quarter fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	28,737	28,737	28,737	28,737	28,737	28,737	28,737	28,737	28,737

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)/(Total Assets). For expositional purposes Tobin's q is multiplied by 100. '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 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.

Table A2: Predicted Diversification and Bank Holding Company Value (Reduced Form)

	(1)	(2)	(3)	(4)	(5)	(6)
	Tobin's q	Market Capitalization / Total Assets	(Total Liabilities + Perpetual Preferred Stock)/ Total Assets	Credit Extension to Insiders Indicator	Credit Extension to Insiders / Total Loans	Share of Nonperforming Loans
1 - Herfindahl index of assets across states	-5.850***	-6.146***	-0.065	0.152**	1.781***	1.741***
(predicted)	(0.841)	(0.846)	(0.079)	(0.068)	(0.412)	(0.327)
Bank and Macro controls	✓	✓	✓	✓	✓	✓
Bank holding company fixed effects	✓	✓	✓	✓	✓	✓
State-quarter fixed effects	✓	✓	✓	✓	✓	✓
Observations	26,669	26,710	26,719	23,794	23,755	23,807

This table reports regression results from a fixed effects OLS 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. 'Credit Extension to Insiders Indicator' is a dummy variable taking a value of one when at least one of the BHC's subidiaries extends credit to insiders; 'Credit Extension to Insiders/ Total Loans' is the amount of credit extended to insiders relative to the total amount of loans extended by the BHC's subsidiaries aggregated at the BHC level, where Insiders are executive officers, directors, principal sharesholders and their related interests; 'Share of Nonperforming Loans' is the share of nonperforming loans in total loans of a BHC's subsidiaries aggregated at the BHC level, where nonperforming loans are defined as loans that are at least 90 days past due or that have been placed on nonaccrual. '1 - Herfindahl Index of assets across states (Predicted)' 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 fractional logit regression. Using coefficient from this regression, we predict the share 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.

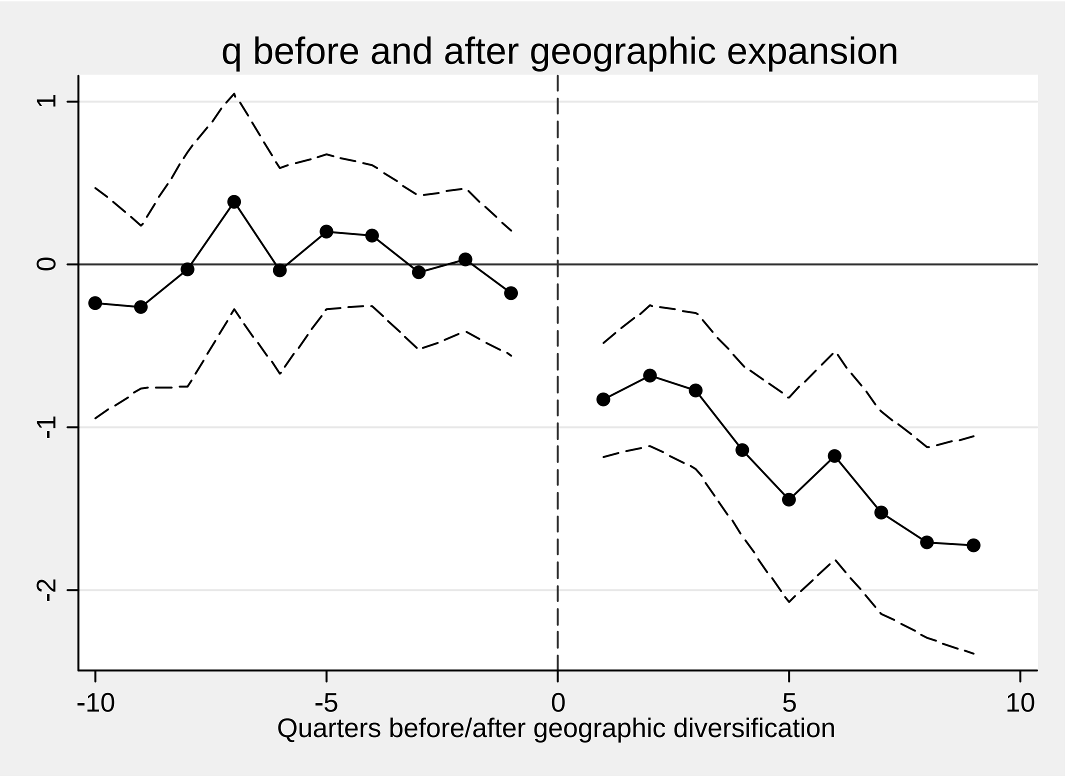

Figure 1. The Dynamic Impact of Geographic Expansion on *q*. This figure plots the impact of a geographic expansion on BHC's q. We consider a window of 20 quarters, spanning from 10 quarters before diversification until 10 quarters after geographic expansion. We report estimated coefficients from the 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.

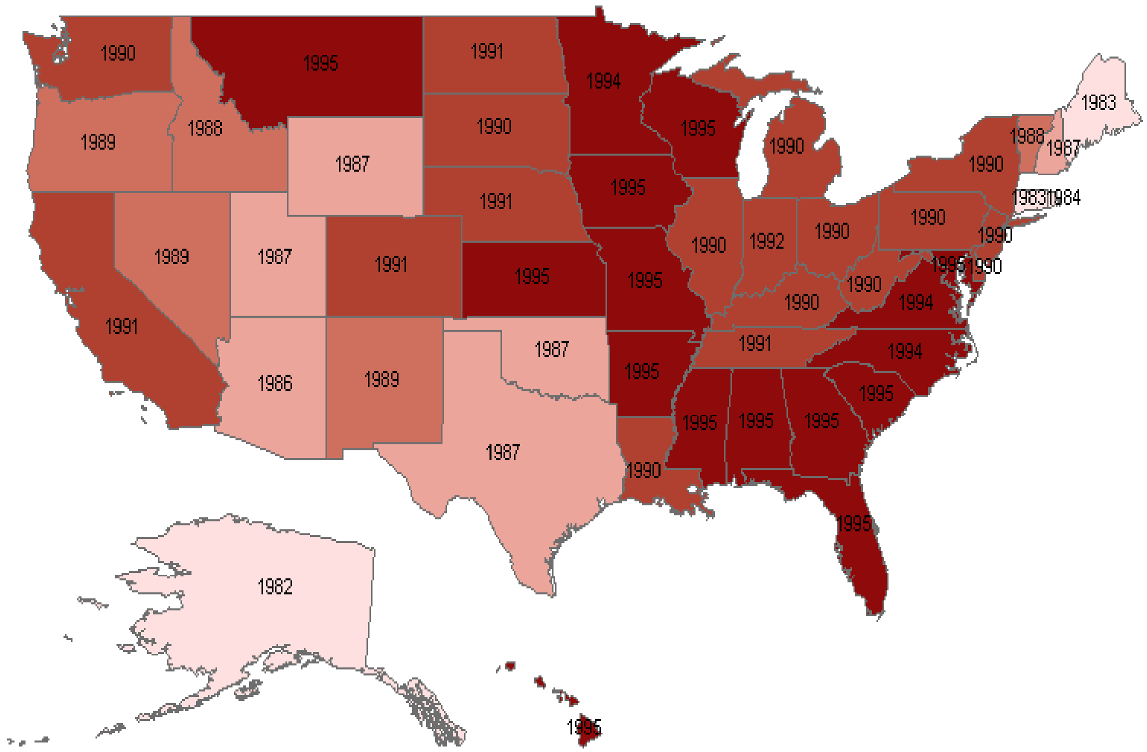

Figure 2. Pattern of Interstate Banking Deregulation: The Case of the State of Massachusetts. This map presents the geographic evolution of interstate banking deregulation for the state of Massachusetts and other states. For each state, this figure displays the year when BHCs located in Massachusetts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

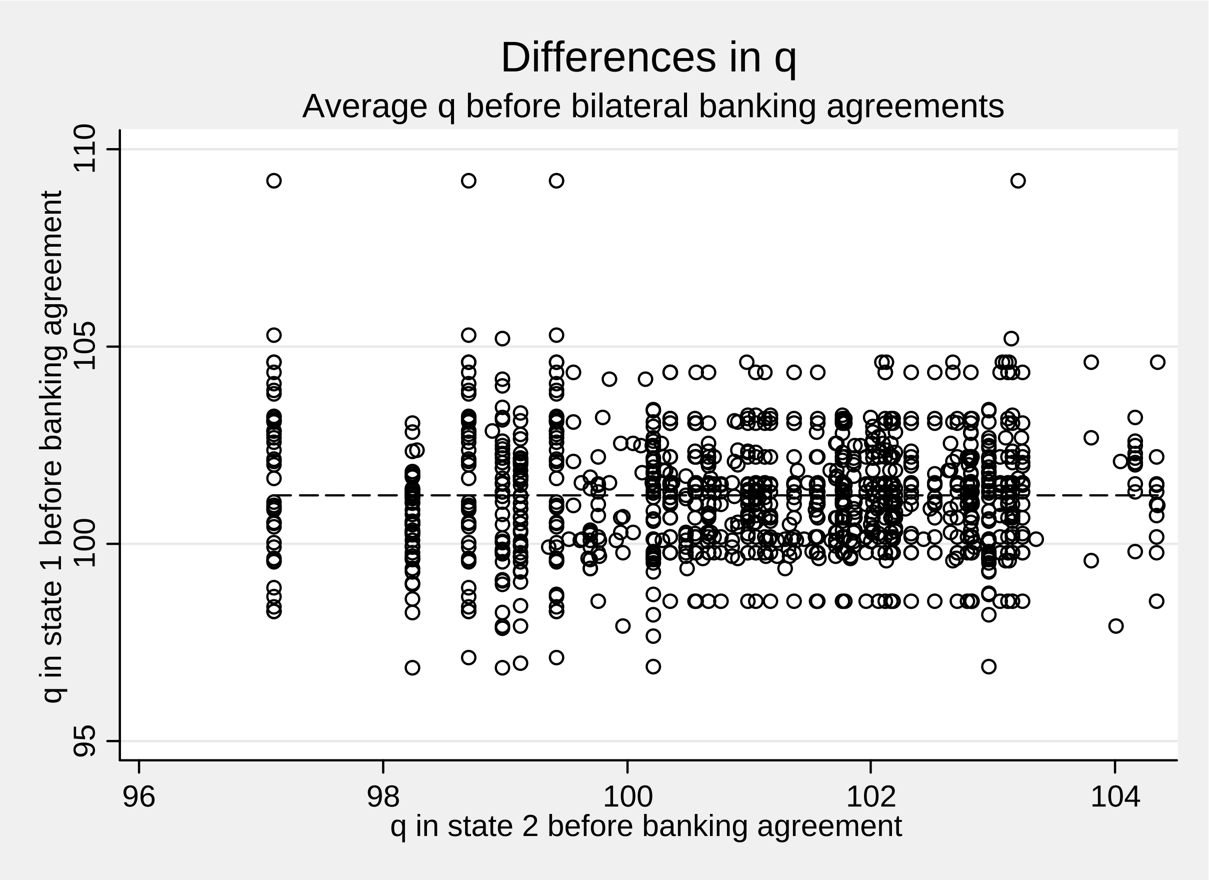

Figure 3. Differences in *q* Before (Bilateral) Interstate Banking Agreements. This figure plots the average q (in %) in state 1 against the average q (in %) in state 2 before both states remove their interstate banking. The dashed line represents the linear relationship, computed from an OLS regression.

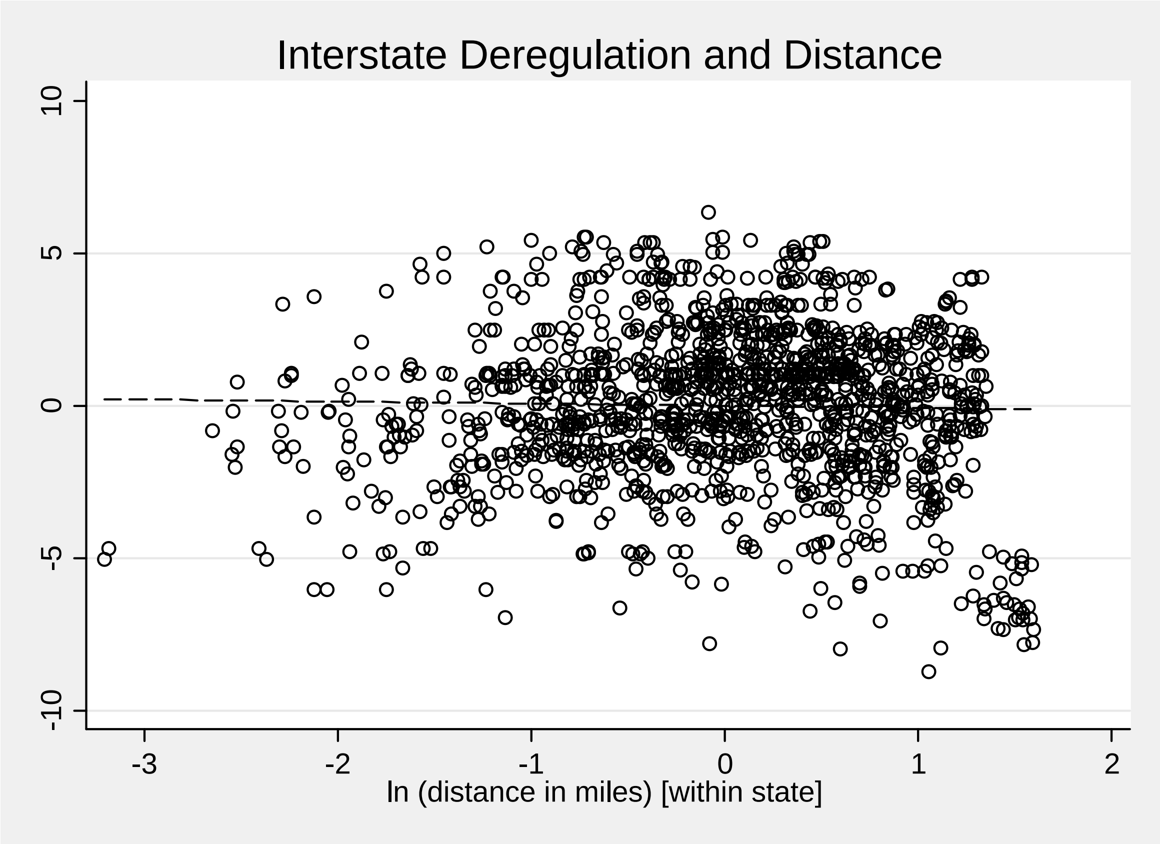

Figure 4. Within State Analysis: Year of Regulation with Another State and Distance. This figure plots the relationship between the year of interstate banking agreement and ln(distance) within a state, excluding all state-pairs that deregulate in 1995. For each state pair A-B, the y-axis measures the 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.