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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 novel identification strategies based on the dynamic process of interstate bank deregulation, we find that exogenous increases in geographic diversity reduce BHC valuations. These findings are consistent with the view that geographic diversity makes it more difficult for shareholders and creditors to monitor firm executives, allowing corporate insiders to extract larger private benefits from firms.

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1. Introduction

Does geographic diversification boost corporate valuation? Several theories suggest that geographic diversity will enhance efficiency, spread idiosyncratic risk, and reduce agency costs, with positive ramifications on corporate valuations. Specifically, geographic diversity could enhance market valuations through economies of scale (Chandler, 1977; Gertner, Scharfstein, and Stein, 1994; Houston, James, and Marcus, 1997; and Berger, Demsetz, and Strahan, 1999) and by reducing exposure to idiosyncratic local shocks. And, for the case of banks, Diamond (1984) holds that it is easier for outside investors to monitor whether a bank is well-diversified than it is to assess the idiosyncratic investments of a specialized bank.

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 if small shareholders find it difficult to monitor and govern geographically dispersed corporations then corporate insiders will have greater latitude to extract private benefits from geographically diversified firms with adverse effects on firm valuations. Even if diversification intensifies agency problems and reduces market valuations, insiders might still diversify the corporation's assets if the insider's additional private benefits are greater than their own losses from the corporation's lower value.

Identifying the causal impact of diversity on the performance and valuation of firms has proven challenging. For nonfinancial firms, a considerable body of research finds that firms that diversify across different activities tend to have lower valuations, e.g., Lang and Stulz (1994), Berger and Ofek (1995), Servaes (1996), and Denis, Denis, and Sarin (1997). For financial firms, Laeven and Levine (2007) find a diversification discount in an international cross-section of banks that diversify across different financial activities, and Acharya et al.

(2006) find that activity diversification reduces bank performance and increases risk in a sample of Italian banks. But, many researchers 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). In particular, concerns remain about causality because it is difficult to identify exogenous sources of variation in diversification across firms.

Research on the valuation effects of geographic diversification are subject to similar identification concerns. For nonfinancial firms, Denis, Denis, and Yost (2002) show that global diversification is associated with valuation discounts. For banks, Deng and Elyasiani (2008) find that diversification across U.S. states is associated with valuation premiums. But, it is difficult to draw causal inferences about the impact of diversification on corporate valuations from these studies.

In this paper, we design and implement two new empirical strategies for identifying the causal impact of geographic diversification on firm valuation. Specifically, we use data on U.S. bank holding companies (BHCs) to study the impact of geographic diversification across the states of the United States on the market valuation of those BHCs.

We study U.S. BHCs for three reasons. First, specific regulatory changes that we describe below and that applied only to banks provide a natural setting for identifying the causal impact of geographic diversity on BHC valuations and behavior. Second, we have detailed information on BHC subsidiaries and their geographic diversity. Third, banks provide vital services to all sectors of the economy (Levine, 2005), so the impact of diversity on BHC valuation and performance is of central importance. In this way, we contribute to the debate about the impact of the diversity on the valuation and performance of firms in general and BHCs in particular.

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 at the BHC level. From the 1970s through the 1990s, individual states of the United States removed restrictions on the entry of out-of-state banks. Not only did states start deregulating in different years, states also signed bilateral and multilateral reciprocal interstate banking agreements in a somewhat chaotic manner over time. There is enormous cross-state variation in the twenty-year *process* of interstate bank deregulation, which culminated in the Riegle-Neal Interstate Banking Act of 1995.

There are good economic and statistical reasons for treating this process of deregulation as exogenous to bank valuation. 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 statistical 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. Thus, the process of interstate bank deregulation provides a natural 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. 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. We believe that we are the first to exploit the state-specific dynamics of deregulation. In this first strategy, we only provide information on the dynamic impact of diversity of a state's "average" BHC, because our instrument does not have a BHC-specific component.

The second identification strategy imbeds 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 and growth, 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 and where 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*. We believe that we are the first to exploit the gravity model to examine the "foreign" direct investment decisions of banks. More importantly, we use this framework to differentiate among banks within the same state while exploiting each state's specific process of deregulation.

Both identification strategies indicate that increases in geographic diversity reduce BHC valuations, which is consistent with the idea that diversification intensifies agency problems within BHCs. This finding holds after controlling for BHC fixed effects, state-quarter fixed effects, and a wide-array of time-varying BCH characteristics, such as size, profitability, and market competition. The results reflect the impact of geographic diversification per se, not the effects of greater competition triggered by interstate deregulation. Even when conditioning on the degree to which the BHC engages in a diversity of activities, there is still a significant, negative impact of geographic diversity on q. Robustness tests further indicate that the results are not driven by changes in the accounting value of assets, or other oddities, around the time of mergers and acquisitions.

This paper relates to several strands of research. For instance, while Goldberg (2009), Jayaratne and Strahan (1996), and Morgan, Rime, and Strahan (2004) find that cross-economy banking boosts efficiency and growth while reducing economy volatility, Liberti and Mian (2009), 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. Moreover, Demsetz and Strahan (1997) find that diversification tends to increase bank leverage and risk. Deng and Elyasiani (2008) explicitly test for the role of geographic diversification in US banks and find that geographic diversification boosts valuations while increased distance between bank headquarters and branches reduces valuations. However, they do not identify exogenous sources of variation in geographic diversification.

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). Drucker and Puri (2005) find that conglomerates that combine lending and underwriting activities tend to charge lower fees. Rather than attempting to measure costs, margins, idiosyncratic risk, and agency frictions directly, we assess the net effect of BHC diversity on q. More generally, the purpose of this paper is to identify and estimate the net effect of diversification on firm valuation and not to examine the precise nature of the underlying channels of this effect.

Examining the geographic diversity of U.S. BHCs in the 1980s and 1990s informs current debates on the value of international and cross-border banking. By examining the geographic diversification of BHCs across U.S. states, we consider a very simple form of diversity that can easily be measured. Our prior expectations were that geographic diversity within a single country and industry should have positive effects on valuations through economies of scale and risk diversification, with only minor agency effects. If, on the other hand, the adverse valuation effects of diversifying across states *dominate* these positive effects, then this suggests that consequential agency problems shape the behavior of financial conglomerates. Our results are consistent with the latter.

The paper is organized as follows. Section 2 summarizes the data and interstate bank deregulation. Section 3 provides the ordinary least squares results, while Sections 4 and 5 discuss the instrumental variable findings. Section 6 concludes.

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. Since June 1986, domestic BHCs report their consolidated balance sheet, income statement, and detailed supporting schedules to the Federal

Reserve.[1] 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 Reserve data on bank branches rather than subsidiaries, and constructing a measure of diversification based on branches. The drawback of using information on branches is that such information is available only on an annual basis and limited to commercial banks, while data on subsidiaries is available at a quarterly level and for a broader set of financial institutions that includes commercial banks, state-chartered savings banks, and cooperative banks.[2]

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. 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

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

[2] We exclude subsidiaries that exclusively engage in foreign activities since they do not contribute to domestic diversification, which is the focus of our study.

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. 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 through 2007 using information from each state's bank regulatory authority.

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. We 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.

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 bank holding company 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 bank holding company. Our third measure of geographic diversification is a bank holding company'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 using information on the location of counties in which the holding company and 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.[3]

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[3] Income Diversity is computed as follows:

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

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

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

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

2.4. Other factors

To account for other influences, we control for several bank-specific as well as state-specific characteristics. To capture differences in the size of BHCs, we include the natural log of total assets, the natural log of operating income, as well as the growth rate of these two variables. In further robustness tests, we also include the ratio of bank capital to total assets and its return on equity. To control for time-varying, state-specific characteristics, we include the median level of q, the concentration of banking assets, and the real growth rate of state personal income in our regression models.

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

We further exclude observations below the 1st and above the 99th percentile of *q* to mitigate the influence of outliers. Our final sample contains 28,337 BHC-quarter observations of 756 BHCs. The time period of our sample ranges from the second quarter of 1986 to the last quarter of 2007 and includes all publicly traded BHCs, headquartered in one of the 50 states of the U.S. and the District of Columbia.

Table 1 reports descriptive statistics of the main variables, with the sample of 756 BHCs split into diversified and nondiversified BHC-quarter observations. Since BHCs diversify during our sample period, the same entity can appear in both columns of Table 1, being categorized as a nondiversified BHC in the quarters before it diversifies and a diversified BHC afterwards. About one quarter of our sample consists of BHCs with subsidiaries in more than one state. Also, more than half of all geographically diversified BHCs have at least five subsidiaries located in at least three different states. The majority of nondiversified BHCs, on the other hand, operate only one subsidiary.

As shown, diversified banks tend to (1) have higher Tobin's *q*, (2) be more profitable as

[4] 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.

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. Thus, it is important to consider BHC traits in assessing the relationship between diversity and *q*.

Table 2 presents ordinary-least-squares (OLS) regression results focusing on differences between diversified and nondiversified BHCs. The regressions condition on state- and quarter fixed effects. The results suggest that geographic diversification is associated with greater activity diversity. Moreover, compared to nondiversified BHCs, geographically diversified BHCs are more profitable and larger.

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:

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

where q_{ist} denotes the Tobin's *q* of BHC *i* in state *s* during quarter *t*, D_{ist} denotes alternative measures of a BHC's geographic diversification, $\boldsymbol{X}'_{ist}$ is a matrix of conditioning information, and δ's are fixed effects, where we use BHC, state, quarter, and state-quarter fixed effects in various specifications. Throughout the paper, the reported standard errors are heteroskedasticity robust and adjusted for clustering. The BHC fixed effects account for unobserved, time-invariant differences across BHCs and focuses the analysis on how the valuation of a BHC changes after diversification changes. State-quarter fixed effects account for time-varying, state-specific traits, including economic activity, changes in fiscal, labor, tax, and other economic policies at the state level. In alternative specifications, we also consider different combinations of fixed effects, including time-varying state fixed effects for the states in which a BHC has subsidiaries.

In Table 3, 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 BHC's central office and its subsidiaries (including subsidiaries within the home state). In the first four regressions, we simply condition on state and quarter fixed effects. In the next four regressions, we also control for BHC fixed effects.

The relationship between geographic diversity and q depends on whether the regression excludes or includes BHC fixed effects. Without BHC fixed effects, there is a positive association between each of the four diversity measures and q, which confirms the results in Deng and Elyasiani (2008). But, with BHC fixed effects, there is a strong negative relationship between diversity and q, although only three of the four measures of diversification—the fraction of assets held by out-of-state banks being the exception—enter significantly.[5] 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.[6]

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

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

Without addressing causality, the economic magnitudes are small. For example, the estimated coefficient in column 7 indicates that if the median nondiversified BHC switched to the median level of diversity, this would be associated with a drop in *q* of about 0.4, i.e., about 0.4% since median *q* is about 100. This drop translates into a drop in market capitalization of the average bank of about $15 million. Aggregating across all banks in our sample, the coefficient estimates suggest a drop of bank capitalization in the neighborhood of $20 billion associated with geographic diversification. While small, the coefficients from Table 3 reflect a net result that also incorporates the positive ramifications of diversification.

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

One concern about the results in Table 3 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, then the regressions in Table 3 would still indicate that *q* fell after diversification. However, it would not imply that diversification was the cause of this fall as there was no break in the evolution of *q* following diversification.

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

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

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, 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 marked break in BHC *q* after it first diversifies across state boundaries and 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 Robustness tests with additional controls

In Table 4, 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 4 use our broadest measure of geographic diversity, i.e., 1 – the Herfindahl index of BHC assets across states.

The literature has raised several concerns about drawing inferences about a diversification discount without accounting for the effects of mergers and acquisitions (M&A). For example, using plant-level data from U.S. manufacturing firms, Maksimovic and Phillips (2002) find that less productive firms tend to diversify, but diversity does not cause lower productivity. Campa and Kedia (2002) find that the same characteristics that induce manufacturing firms to diversify also lower firm values. Graham, Lemmon, and Wolf (2002) argue that nonfinancial conglomerates tend to purchase already discounted target firms, which produces the diversification discount. Custodio (2010) notes that M&As typically trigger an upward revaluation of the book value of assets, which will mechanically reduce q, potentially leading to spurious inferences about the relationship between diversity and valuations. Thus, a proper examination of the impact of diversification must account for the potential complexities introduced by M&As.

The particulars of BHC diversification permit us to assess the empirical importance of these concerns. In our sample, changes in BHC diversity occur for three reasons: (1) M&As of subsidiaries in other states, (2) de novo expansion, where a BHC establishes new subsidiaries, and (3) organic diversification, where there are changes in the relative size of a BHC's subsidiaries. In the nonfinancial diversification literature, concerns have primarily been raised about M&As, not the other methods of diversification. We consider both acquisitions and sales of subsidiaries. While acquisitions tend to increase BHC complexity, sales of subsidiaries tend to simplify the subsidiary structure of BHCs. According to the view that the complexity of BHCs is positively associated with agency problems within the BHC, simplifying transactions should increase q, while complicating transactions should reduce a BHC's q. To control for the influence of acquisitions and sales of bank subsidiaries on BHC q, we include a variable that equals the share of BHC assets acquired or sold in quarter t.

We find that the negative association between BHC diversity and q is quite robust. First, the results hold when controlling for BHC-specific factors, including the median q of all BHCs in the state, the degree of market concentration in the BHC's home state, the growth of total assets and operating income, the return on equity, the capital-to-asset ratio, BHC asset size and operating income, the degree to which the BHC receives income from diverse financial activities and invests its assets in diverse activities, a dummy variable that denotes whether the BHC has a subsidiary with international activity, and the share of assets acquired or sold during the quarter, and after we control for time-varying, state-specific factors, such as the growth of personal income. While the diversity of BHC activities, as measured by the degree to which the BHC receives income from non-interest earning assets and invests in assets beyond loans, is negatively associated with *q*, the regression still indicates an independent, negative association between cross-state asset diversity and BHC *q*. Moreover, the results do not seem to be driven by changes in the accounting value of assets or other oddities around the time of M&As. We continue to find that a larger degree of BHC diversity is associated with lower *q* after conditioning on BHC acquisitions and sales.

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 4, 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 time-varying differences in BHC management, could drive both diversification and *q*. To address this concern we employ an instrumental variables approach.

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. Our first strategy employs time-varying, state-level instruments. The next section develops an instrumental variable strategy to identify diversity at the BHC-level.

4.1. The time-varying, state-level instruments

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

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

The remaining six instrument sets explicitly account for state differences in the evolution of deregulation. The fourth instrument set equals the logarithm of the number of states in which a BHC can open subsidiaries, including its home state. This is a simple measure of the number of states in which a BHC can potentially operate, and we refer to this variable as Ln (Number of accessible states). Fifth, we weight the number of accessible states by the inverse of their distance from the home state, since it might be less costly for a bank in California to open a subsidiary in, say, Nevada than in, say, New Hampshire (Number of accessible states – weighted).[7]

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

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[7] The closest state receives a weight of one and the farthest a weight of zero: $w_{ij} = \left(\frac{d_f - d_{ij}}{d_f} \right) \frac{d_f}{d_f - d_c}$, where d_{ij} is the distance between home state i and state j, and d_f (d_c) is the distance between the home state and the farthest (closest) state.

this variable as Ln(Market Population – Weighted), where we use the aforementioned weighting scheme.

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

4.2. First-stage regression results and instrument validity

The first-stage regressions are presented in Panel B of Table 5. As shown in columns one through nine, we find that interstate deregulation increased the degree of cross-state diversity of BHC assets. The positive impact of deregulation on BHC diversity holds across the different indicators of interstate bank deregulation. When considering the time-varying evolution of interstate restrictions (column (4) to (9)), we find the link between diversification and deregulation to be statistically weakest when focusing only on the number of states in which a BHC can potentially open a subsidiary. The explanatory power of our measure of deregulation in explaining BHC diversification increases when we also incorporate the size and distance of potential markets into our instrument. This suggests that the distance and population of potential markets shape BHC ("foreign-state") direct investment decisions.

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

Several pieces of evidence support the validity of the instrumental variables. First, the *F*-test results show that interstate deregulation explains BHC diversity after controlling for many potential influences. For seven out of the nine sets of instrumental variables, the F-test is above ten and sometimes exceeds 30. For these sets of instrumental variables, there is a strong statistical link between deregulation and BHC diversity. Second, for these seven sets of instruments, the Hansen J-test results (not reported) indicate that we cannot reject the null hypothesis of the validity of the instruments. Thus, there is no evidence that these seven instruments explain BHC valuations beyond their ability to account for variation in the cross-state diversity of BHC assts. Third, as depicted in Figure 1, there is no indication of any trends in q prior to deregulation and hence no suggestion that changes in q prior to deregulation predict the timing of deregulation or the evolution of q following deregulation. Fourth, we could find no evidence—either in the historical evidence on how states formed bilateral and multilateral interstate banking agreements or in the data—that states selected other states based on BHC valuations. As suggested by Amel (1993), the state-specific process of forming a series of interstate banking agreements with other states evolved in a relatively chaotic manner, in which there is no evidence that states signed reciprocal interstate banking treaties based on q. Indeed, Figure 2 shows that there is essentially no relationship between the valuations of BHCs that sign interstate agreements.

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

Panel A of Table 5 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 5.

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

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

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

5. Instrumental variables: gravity-deregulation model

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

In this section, we design a strategy to identify the impact of diversity on *q* at the BHC-level—or, more precisely, at the county-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 county to other states (as well as other county demographic traits) 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-county-specific instrumental variable for diversification, which we then use in our two-stage least squares evaluation of the impact of diversity on *q*. Frankel and Romer (1999) developed this approach to study whether international trade causes economic growth. They first use a gravity model of international trade to estimate bilateral trade volumes between countries. Based on the projected bilateral trade volumes, they construct the projected aggregate trade volume of each country. Using this projected trade share as their instrument for actual trade in their first stage regression, they assess the causal impact of trade on growth.

Based on the gravity model, we hypothesize that BHCs will invest more in geographically close states than in far states. BHCs that are close to another state might have greater familiarity with its economic conditions and face lower costs to establishing and maintaining subsidiaries than farther states. From this perspective, a BHC in the southern part of California will tend to invest more in Arizona than Oregon and a BHC in the northern part 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 the county of each BHC's headquarters to each other state's capital, which we call "Distance in 100 miles." Since we are focusing on interstate banking diversification, we assume that the distance to the capital of a BHC's home state is equal to zero.

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).

We also allow for the possibility that the comparative size of the BHC's home county affects its "foreign-state" direct investment decisions. BHCs based in a relatively urban, active county might require a larger foreign market before investing abroad than BHCs in smaller counties. At the same time, distance might matter less for a BHC from an urban, active county than BHCs from smaller, less active environments. Adding these additional county-specific traits also helps in differentiating between BHCs in the same state.

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:

$$Share_{b,i,j,t} = a*Distance_{b,i,j} + b*Ln(pop_{i,t}/pop_{j,t}) + c*\mathbf{X}_{b,i,j,t} + \delta_b + \delta_i + \delta_j + \delta_{i,j} + \delta_t + \delta_{i,t} + \varepsilon_{b,i,j,t}\,, \quad (3)$$

where $Share_{b,i,j,t}$ is the percentage of assets of BHC *b*, headquartered in state *i*, held in its subsidiaries in state *j* in quarter *t*; $Distance_{b,i,j}$ is the distance in 100s of miles between the county of BHC *b*'s headquarters and state *j*'s capital; and $Ln(pop_{i,t}/pop_{j,t})$ is the Ln(Population-ratio) defined above. In some specifications, we also control for a matrix of variables $\mathbf{X}_{b,i,j,t}$, including (a) the interaction of $Ln(pop_{i,t}/pop_{j,t})$ and a dummy variable that equals one if the BHC is headquartered in a comparatively big county (e.g., in the top-third of counties in the home state by population) in quarter *t*, (b) the interaction of $Distance_{b,i,j}$ and a dummy variable that equals one if the BHC is headquartered in a comparatively big county, and (c) a dummy variable taking on the value of one if BHC *b* is located in a comparatively big county, as defined above.

Furthermore, we condition on many possible fixed effects. In the specifications, we control for various combinations of BHC fixed effects (δ_b), separate fixed effects for each state ($\delta_i + \delta_j$), state-pair fixed effects ($\delta_{i,j}$), quarter fixed effects (δ_t), and state-quarter fixed effects

($\delta_{s,t}$). In this first step, we only include observations in which it is legally feasible for BHC *b* with headquarters in state *i* to open a subsidiary in state *j* during quarter *t*.[8]

As reported in Table 6, 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 foreign state and the distance between the BHC's county and the foreign state. Distance, however, matters less when the BHC is headquartered in a comparatively urban county, as demonstrated in regressions (2) – (5). 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* and the nature of the county in which the BHC in state *i* is headquartered. 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 and this is particularly pronounced effect for BHCs from more urban counties.

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 6. 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

[8] In this first step of the gravity-deregulation model, we tried several variations. Since many BHCs do not diversify, the dependent variable has many zeros. Thus, we estimate a Tobit rather than a linear OLS model. This yields stronger results than those reported below.

diversity on *q*. We use the various specifications from the "zero stage" equations from Table 6 to construct the first-stage instruments.

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

The first-stage results in Table 7 suggest that the instrumental variable is very useful in explaining BHC diversity as the F-test of the excluded instruments is above ten. In this table, we use regression (5) of Table 6, but the results hold for the other gravity models provided in Table 6.

As shown in Table 7, the second-stage results indicate that geographic diversity reduces Tobin's *q*. By using time-varying, BHC-county-specific instrumental variables, this gravity-deregulation strategy differentiates among BHCs within the same state and quarter. It identifies the impact of BHC's diversity on *q*, so we can condition on BHC and state-time fixed effects throughout. Indeed, following Frankel and Romer (1999), all of the fixed-effects included in the zero stage are also included in the first and second stages.[9]

In columns (2) and (3), we show that the influence of diversification on Tobin's *q* operates primarily through changes in market capitalization rather than changes in other components of Tobin's *q.* This provides additional evidence that the findings on *q* do not simply reflect accounting quirks around cross-state mergers and acquisitions that alter a bank's book value. Rather, the change in *q* reflects a change in the market's valuation of the BHC.

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[9] Furthermore, Rubinstein (2011) has critiqued the Frankel and Romer (1999) approach because the fixed effects from the zero stage enter in a nonlinear manner when aggregating to produce the instrument for the first-stage. Thus, we also conducted the analyses in two ways to address this concern. First, we excluded all fixed effects from the zero-stage. Second, we did the estimation in the zero-stage with the fixed effects, but did the projections to form the instrumental variables while setting the coefficients on the fixed effects in the zero-stage to zero. All of the results hold. Indeed the magnitude of the coefficient in the valuation regression increases markedly.

Columns (4)-(6) provide additional evidence on the robustness of the Table 7 findings. Since some of the banks in our sample engage in international activities, we wanted to assess whether the banks drive the results. As shown, the results are robust to excluding BHCs with subsidiaries that engage in international activities. Moreover, we were concerned that there might be accounting oddities around the time of BHC M&As. Although the results in columns (2) and (3) suggest that accounting factors are not driving the results, we tried eliminating the period immediately around M&As. The results are even stronger when excluding observations during quarters when BHCs acquire or sell subsidiaries.

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

The BHC-county-level instrumental variable results in Table 7 have two particularly valuable properties relative to the results based on state-level instruments (Table 5). First, the BHC-county-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-county-level instrumental variable specification provides information on the average BHC within each state's county. This allows us to draw sharper inferences about the impact of BHC diversity on valuations.

Second, the BHC-county-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. However, the county-level analyses reduce these concerns for two reasons. First, they 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 helps identify the impact of diversity on valuations 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 affects state A's entire banking market since banks within state A compete with one another. Thus, by differentiating among counties within state A, we show that only BHCs in treated counties that diversified into other states experienced a drop in q; the drop in q cannot be due to a state-level effect because we are differentiating by county. Under the assumption that a state is the relevant banking market, these results suggest that geographic diversification lowered BHC valuations.

Economically, the BHC-county-level instrumental variable results—based on the gravity-deregulation model—are substantially larger in magnitude than the results 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. As the treatment becomes more refined, moving from a state-time treatment to a county-time instrument, we better identify the impact of an exogenous increase of diversification on BHCs' valuations—and, the estimated impact has a larger economic magnitude.

The results are consistent with the following view. First, the process of interstate bank deregulation that started in 1978 increased the cross-state asset diversity of some BHCs. Second, this increased diversity boosted the complexity of BHCs and intensified agency problems, making it more difficult for small shareholders and creditors to monitor corporate insiders and easier for insiders to extract larger private benefits from controlling these financial institutions. Lower market valuations reflect such increase in agency problems due to BHC diversity triggered by interstate bank deregulation.

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 and we then also incorporate a gravity model of BHC investments across states to differentiate among BHCs within the same state. This allows us to draw more precise inferences about the causal impact of geographic diversity on the valuation of firms than previous research.

We find that increases in geographic diversity due to interstate bank deregulation reduced BHC valuations. These results can be interpreted more broadly than simply providing information about the increased complexity of monitoring geographically diffuse BHCs. The results are consistent with the view that an exogenous increase in complexity—by making it more difficult for outside investors to exert effective corporate control—allows corporate insiders to extract larger private rents with adverse implications on firm value.

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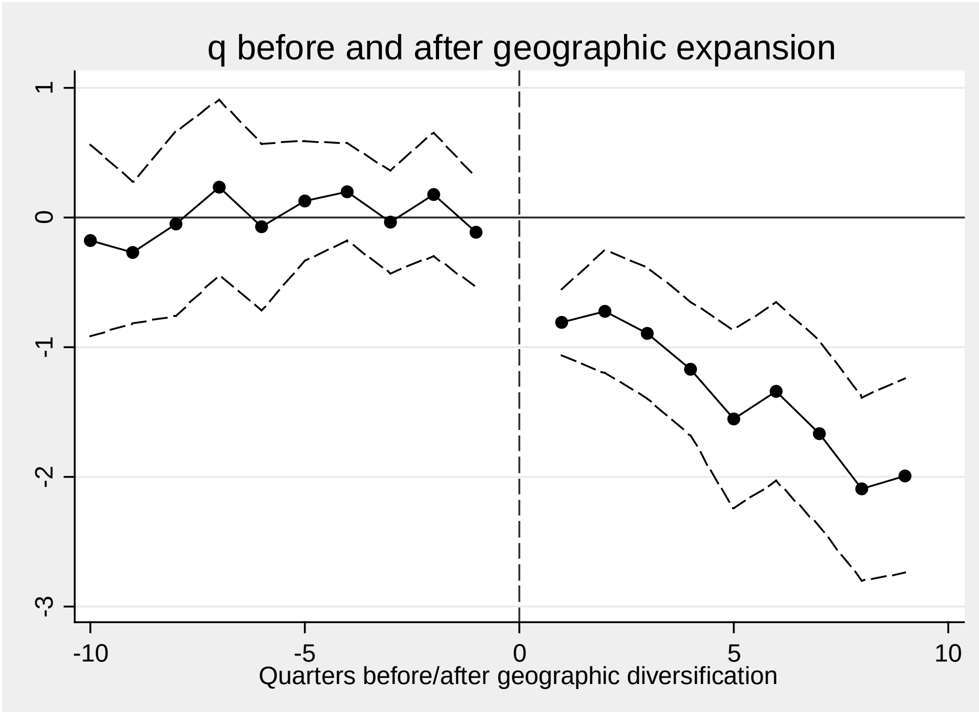

Figure 1. The Dynamic Impact of Geographic Expansion on *q*. This figure plots the impact of a geographic expansion on BHC's q. We consider a window of 20 quarters, spanning from 10 quarters before diversification until 10 quarters after geographic expansion. We report estimated coefficients from the following regression: $q_{it} = \alpha + \beta_{-10} D_{-10t} + \beta_{-9} D_{-9t} + \ldots + \beta_{10} D_{10t} + \varepsilon_{it}$, 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. 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.

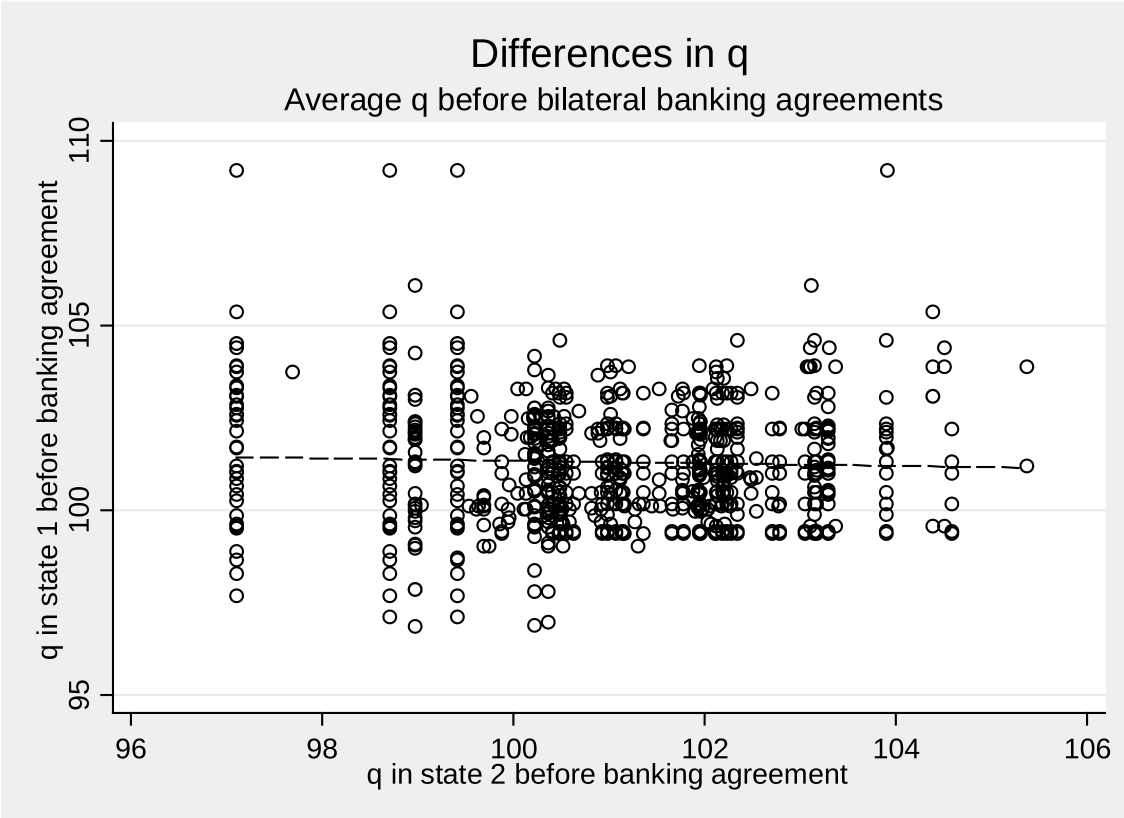

Figure 2. Differences in *q* before (bilateral) interstate banking agreement. This figure plots the average q in state 1 against the average q in state 2 before both states remove their interstate banking. The dashed line represents the linear relationship, computed from an OLS regression.

Table 1: Summary Statistics

	Nondiversified bank holding companies						Diversified bank holding companies					
	N	Mean	Std.Dev.	Min.	Max.	Median	N	Mean	Std.Dev.	Min.	Max.	Median
Tobin's Q	21,837	105.76	5.70	94.95	130.59	104.85	6,500	106.17	6.17	95.00	130.69	104.80
Fraction of assets held by out-of-state-banks	21,833	0	0	0	0	0	6,497	0.19	0.17	0.00	0.90	0.14
1 - Herfindahl index of assets across states	21,833	0	0	0	0	0	6,487	0.43	0.26	0.00	1.00	0.40
Number of states	21,837	1	0	1	1	1	6,500	3.20	1.86	2	14	3
Number of subsidiaries	21,837	1.99	2.62	1	38	1	6,500	8.41	9.62	2	72	5
Income diversity	21,268	0.64	0.12	0.02	1	0.63	6,443	0.74	0.12	0.06	1.00	0.73
Asset diversity	21,706	0.77	0.17	0.00	1	0.80	6,395	0.81	0.14	0.00	1.00	0.84
=1 if BHC has subsidiary with international activity	21,837	0.03	0.16	0	1	0	6,500	0.24	0.42	0	1	0
Share of assets acquired or sold in quarter	21,834	6.14	21.80	0.00	96.68	0.00	6,500	10.51	23.41	0.00	93.80	0.00
Equity (in $millions)	21,837	227.23	837.51	1.72	2.07E+04	67.68	6,500	3,187.83	1.16E+04	11.63	1.47E+05	575.57
Total assets (in $ millions)	21,837	2,793.69	1.11E+04	77.28	2.99E+05	792.34	6,500	4.21E+04	1.52E+05	150.62	2.36E+06	7,146.60
Net interest income (in $ millions)	21,277	23.03	65.50	-77.54	1,195.28	7.88	6,444	308.66	979.57	-1.57	1.29E+04	64.97
Total operating income (in $ millions)	21,277	57.30	219.01	1.69	5,287.60	16.07	6,444	927.79	3,112.60	-685.44	4.57E+04	155.00
Return on equity	20,893	3.00	1.58	-9.61	6.81	3.18	6,339	3.31	1.58	-9.55	6.81	3.54
Average distance between HQ and subsidiaries	21,755	5.33	12.78	0	893.21	0.00	6,500	91.38	125.52	1.13	807.80	47.13
Capital-to-asset ratio	21,837	8.68	2.32	0.48	40.87	8.43	6,500	8.03	1.81	3.01	17.76	7.95
Growth of total assets	20,797	0.03	0.05	-0.08	0.40	0.02	6,317	0.03	0.06	-0.08	0.40	0.02
Growth of total operating income	20,250	0.03	0.08	-0.26	0.59	0.02	6,208	0.03	0.08	-0.26	0.59	0.02

This table shows summary statistics for the used samples. Banks are 'nondiversified' if they have subsidiaries in only one state. 'Diversified' banks have subsidiaries in at least two states. The sample ranges from the second quarter of 1986 to the last quarter of 2007. State-quarter observations for 756 BHCs.

Table 2: Differences between Diversified and Undiversified Bank Holding Companies

	(1)	(2)	(3)	(4)
Dependent variable	Income diversity	Asset diversity	Return on equity	Ln(Total assets)
Diversification dummy	0.090***	0.024***	0.329***	2.316***
	(0.003)	(0.002)	(0.026)	(0.035)
State-quarter fixed effects	✓	✓	✓	✓
Observations	28,476	28,696	27,946	29,732

This table reports regression results from a state-quarter fixed effects OLS analysis. The dependent variable is given in the second row. Diversification dummy is a dummy variable that takes on the value of one if a bank holding company has subsidiaries in other states, and zero otherwise. 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) |.
State-specific 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

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Diversification dummy	1.158***				-0.205**			
	(0.072)				(0.096)			
Fraction of assets held by out-of-state-banks		3.189***				-0.305		
		(0.269)				(0.313)		
1 - Herfindahl index of assets across states			1.534***				-0.395**	
			(0.129)				(0.161)	
Ln(Average distance between HQ and subsidiaries)				0.284***				-0.056**
				(0.020)				(0.026)
Quarter fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
State fixed effects	✓	✓	✓	✓				
Bank holding company fixed effects					✓	✓	✓	✓
Observations	28,337	28,330	28,320	28,255	28,337	28,330	28,320	28,255

This table reports regression results from a fixed effects OLS analysis. The dependent variable is Tobin's q and given as (Capitalization + Perpetual Preferred Stock + Total Liabilities and Minority Interest)/(Total Assets). For expositional purposes, Tobin's q is multiplied by 100. 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 headquarters' county and the county of its affiliated subsidiary banks. Regressions in columns (1) through (4) include state and time dummies for each quarter (not reported). Regressions in columns (5) through (8) include bank holding company and quarter fixed effects (not reported). Standard errors are robust, clustered at the state-quarter level and reported in parentheses. Significance stars are: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Geographic Diversification and Bank Holding Company Value: Controls

	(1)	(2)	(3)	(4)	(5)	(6)
1 - Herfindahl Index of assets across states	-0.930***	-0.777***	-0.458***	-1.187***	-0.374**	-2.150***
	(0.133)	(0.128)	(0.139)	(0.194)	(0.182)	(0.305)
Median q in state and quarter	0.840***	0.618***	0.644***	0.655***		
	(0.009)	(0.011)	(0.011)	(0.011)		
Market concentration (HHI)	-1.438***	-0.928***	-1.002***	-1.048***		
	(0.241)	(0.270)	(0.340)	(0.340)		
Growth of total assets		3.852***	2.943***	2.959***	2.745***	-0.672
		(0.596)	(0.476)	(0.473)	(0.558)	(0.602)
Return on equity		0.989***	0.434***	0.420***	0.469***	0.591***
		(0.035)	(0.021)	(0.021)	(0.026)	(0.029)
Capital-to-asset ratio		0.267***	-0.027	-0.037**	-0.013	0.118***
		(0.021)	(0.019)	(0.019)	(0.023)	(0.024)
Growth of total operating income		-4.950***	-3.904***	-4.034***	-4.364***	-1.091***
		(0.440)	(0.328)	(0.329)	(0.397)	(0.422)
Ln(Total operating income)		6.836***	7.294***	7.486***	7.789***	0.934**
		(0.313)	(0.349)	(0.348)	(0.424)	(0.386)
Income diversity		-6.912***	-5.940***	-5.770***	-6.017***	-5.466***
		(0.324)	(0.369)	(0.368)	(0.434)	(0.456)
Asset diversity		-1.121***	-0.369**	-0.329*	-0.188	-1.207***
		(0.192)	(0.183)	(0.182)	(0.222)	(0.231)
=1 if BHC has subsidiary with international activity		-0.734***	-0.424***	0.029	-0.407**	-0.249
		(0.126)	(0.151)	(0.160)	(0.199)	(0.251)
Share of assets acquired or sold in quarter		0.003***	0.004***	0.004***	0.005***	0.004***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln(Total assets)	0.716***	-5.995***	-7.467***	-7.679***	-8.066***	0.263
	(0.029)	(0.312)	(0.360)	(0.358)	(0.437)	(0.361)
Growth of state personal income	3.907	-1.853	2.565	2.379		
	(2.684)	(2.830)	(2.658)	(2.626)		
Growth of state personal income (lag)	6.931***	-2.663	3.848	3.837		
	(2.679)	(3.025)	(2.840)	(2.818)		
State fixed effects	✓	✓				
Subsidiary state fixed effects				✓		
Quarter fixed effects	✓	✓	✓	✓		
Bank holding company fixed effects			✓	✓	✓	✓
State-quarter fixed effects					✓	
Subsidiary state quarter fixed effects						✓
Observations	28,320	25,505	25,505	25,505	25,505	25,505

This table reports regression results from a fixed effects OLS analysis. The dependent variable is Tobin's q and given as (Capitalization + Perpetual Preferred Stock + Total Liabilities and Minority Interest)/(Total Assets). For expositional purposes, Tobin's q is multiplied by 100. '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 Net income / 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. Significance stars are: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 5: Geographic Diversification and Bank Holding Company Value: 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	-1.912	-1.822	-3.291***	-14.081*	-11.264***	-22.442**	-17.341***	-12.620***	-11.728***
	(2.639)	(1.162)	(1.028)	(7.494)	(3.848)	(10.405)	(5.151)	(4.842)	(3.185)
Bank and macro controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
State fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Quarter fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	25,431	25,431	25,431	25,431	25,431	25,431	25,431	25,431	25,431
F Test of instruments' joint significance	32.08	67.30	15.94	6.864	23.38	6.335	19.88	16.58	36.74
Excluded instrument:									
Years since interstate branching deregulation	✓	✓							
(Years since interstate branching deregulation)^2		✓							
Years since interstate branching deregulation [nonparametric]			✓						
Ln(Number of accessible states)				✓					
Ln(Number of accessible states - weighted)					✓				
Ln(Market population)						✓			
Ln(Market population - weighted)							✓		
Ln(Market potential)								✓	
Ln(Market potential - weighted)									✓

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

Panel B: First Stage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Years since interstate branching deregulation	0.008***	0.037***							
	(0.001)	(0.003)							
(Years since interstate branching deregulation)^2		-0.003***							
		(0.000)							
Ln(Number of accessible states)				0.018***					
				(0.007)					
Ln(Number of accessible states - weighted)					0.035***				
					(0.007)				
Ln(Market population)						0.011**			
						(0.004)			
Ln(Market population - weighted)							0.020***		
							(0.004)		
Ln(Market potential)								0.018***	
								(0.004)	
Ln(Market potential - weighted)									0.028***
									(0.005)
=1 if one year after interstate branching deregulation, 0 otherwise			0.079***						
			(0.012)						
=1 if two years after interstate branching deregulation, 0 otherwise			0.115***						
			(0.013)						
=1 if three years after interstate branching deregulation, 0 otherwise			0.129***						
			(0.013)						
=1 if four years after interstate branching deregulation, 0 otherwise			0.134***						
			(0.013)						
=1 if five years after interstate branching deregulation, 0 otherwise			0.146***						
			(0.014)						
=1 if six years after interstate branching deregulation, 0 otherwise			0.143***						
			(0.014)						
=1 if seven years after interstate branching deregulation, 0 otherwise			0.154***						
			(0.015)						
=1 if eight years after interstate branching deregulation, 0 otherwise			0.161***						
			(0.016)						
=1 if nine years after interstate branching deregulation, 0 otherwise			0.160***						
			(0.016)						
=1 if more than 10 years after interstate branching deregulation, 0 otherwise			0.145***						
			(0.017)						
Bank and macro Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
State fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Quarter fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
F Test of joint significance	32.08	67.30	15.94	6.864	23.38	6.335	19.88	16.58	36.74
Observations	25,431	25,431	25,431	25,431	25,431	25,431	25,431	25,431	25,431

Table 6: The Relationship between Population, Distance and BHC Asset Holdings: Zero-Stage

	(1)	(2)	(3)	(4)	(5)
Distance (in 100 miles)	-1.165***	-1.100***	-1.912***	-0.243***	-1.948***
	(0.006)	(0.008)	(0.013)	(0.012)	(0.014)
Ln(population ratio)	-0.827***	-0.954***	-3.473***	-0.035	-5.829***
	(0.005)	(0.008)	(0.129)	(0.042)	(0.248)
(County population in state-quarter above 66th percentile) * Ln(Population ratio)		0.257***	0.208***	0.032***	0.369***
		(0.011)	(0.014)	(0.005)	(0.026)
(County population in state-quarter above 66th percentile) * Distance (in 100 miles)		-0.134***	-0.111***	0.035***	-0.097***
		(0.013)	(0.013)	(0.003)	(0.014)
County population in state-quarter above 66th percentile		0.002***	0.002**	-0.002***	0.001
		(0.001)	(0.001)	(0.000)	(0.001)
State fixed effects			✓		
Quarter fixed effects			✓	✓	
Bank holding company fixed effects				✓	✓
State-pair fixed effects				✓	
State-quarter fixed effects					✓
Observations	1,123,007	1,122,940	1,122,940	1,122,940	1,122,940

This table reports regression results from a state-quarter fixed effects OLS analysis. The dependent variable is the share of assets (in %) a BHC holds in a state. 'Population ratio' is the total population in a BHC's home state divided by the population in state A; 'Distance in 100 miles' is the distance between a BHC's home county 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 7: Geographic Diversification and Bank Holding Company Value: BHC-Specific Instrumental Variables Based on a Gravity-Deregulation Model

	(1)	(2)	(3)	(4)	(5)	(6)
		Panel A: Components of q		Panel B: Sample: BHCs without subsidiaries that engage in international activities		
					Exclude quarter if a bank holding company acquires/ sells a subsidiary	
	Tobin's Q	Market Capitalization / Total Assets	(Total Liabilities + Perpetual Preferred Stock)/ Total Assets		… in that quarter	… up to two quarters after acquisition/sale.
1 - Herfindahl Index of assets across states	-33.740***	-31.718**	-0.322	-28.338***	-40.632***	-55.587***
	(12.237)	(12.478)	(0.845)	(9.298)	(12.704)	(20.366)
Bank and macro controls	✓	✓	✓	✓	✓	✓
Bank holding company fixed effects	✓	✓	✓	✓	✓	✓
State-quarter fixed effects	✓	✓	✓	✓	✓	✓
Observations	24,524	24,751	24,565	22,762	19,597	18,022
F-test of instruments' joint significance	12.84	11.98	12.08	14.35	12.47	8.182
Fixed effects in gravity model:						
Bank holding company fixed effects	✓	✓	✓	✓	✓	✓
State-quarter fixed effects	✓	✓	✓	✓	✓	✓

This panel reports 2nd stage regression results from 2SLS analysis. The dependent variable is given in the column header. 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 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 home county and the capital of state A and (b) the difference in population between a BHC's home state and state A, and (c) an indicator variable taking on the value of one if a BHC is located in a populous county are related to the share of assets a BHC holds in state A using a OLS regression. Using coefficient from this regression, we predict the share 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. Significance stars are: * p<0.10, ** p<0.05, *** p<0.01.