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Geographic Diversification, Bank Holding Company Value, and Risk

We assess the association between geographic diversification and bank holding company (BHC) value and risk, controlling for the distance between the headquarters and branches. The distance-adjusted deposit dispersion index used as a measure of geographic diversification accounts for the number of locations where a BHC operates, the level of activity in each location, and the distance between a BHC and its branches. We find that geographic diversification is associated with BHC value enhancement and risk reduction, increased distance between a BHC and its branches is associated with firm value reduction and risk increase, and geographic diversification across more remote areas is associated with greater value enhancement but smaller risk reduction.

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Keywords: bank holding company, geographic diversification, distance, firm value, risk.

THE U.S. BANKING industry has experienced a tremendous level of geographic expansion through mergers and acquisitions (M&As) and establishment of de novo branches and subsidiaries, both in proximate and distant locations, during the recent decades. This pattern can be attributed to deregulation, technological

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progress, and international competition. The important question is how geographic diversification of a bank holding company (BHC), accompanied by an increase in distance between its headquarters and branches (BHC_branch) relates to BHC value and risk in this new banking landscape.[1]

A common weakness in most prior studies of geographic diversification is the failure to control for distance (e.g., Rivard and Thomas 1997, Denis, Denis, and Yost 2002). These two variables exert distinctive effects on firm value. Geographic diversification may be associated with firm value enhancement because of scale and scope economies, cost reduction, synergy gains, and improvement in corporate governance owing to the increase in the number of potential acquirers (Saunders 1994). Such diversification may, on the other hand, induce value loss, due to learning costs, as well as increased agency problems brought about, e.g., by a more complex organization, and intricacy and diversity of region-specific product packages. Distance can also be associated with a gain or loss in firm value. As a BHC expands geographically, it reaches new profitable markets but the distance between its headquarters and branches increases, making it harder for senior managers to monitor the branch managers. This may heighten distance-related agency conflicts and harm firm value.

To the extent that geographic diversification and distance go hand in hand, increased distance can confound the assessment of the geographic diversification effects. Therefore, it is important to account for BHC_branch distance when gauging the impact of geographic diversification on firm value and risk. To this end, we introduce a geographic diversification index and a measure of distance as interrelated determinants of BHC value and risk. The geographic diversification index employed here is a Cobb–Douglas (log-linear) function of the level of geographic dispersion and the distance between the headquarters and branches. Distance is also included in the models as a separate variable in order to account for its effects on firm value and risk through channels other than geographic diversification. These include, e.g., distance-related agency costs, organizational diseconomies, affiliation risk, management ownership, etc. In an extended model, we also examine the effect of the interaction between distance and geographic diversification on firm value and risk.

Our geographic diversification index has two advantages over the measures used in the literature. First, it accounts for both the number of states or metropolitan statistical areas (MSAs) where a BHC operates, and the level of deposits in each location, while conventional measures such as number of branches/states only account for the number of entities but not the size of operation in each entity/region (Fraser et al. 1997). Second, our measure adjusts the deposit dispersion index to account for the distance between BHC headquarters and branches.

Our sample includes the large publicly traded BHCs over the 1994–2005 period, and consists of 505 BHCs, with 2,843 BHC-year observations. Our main results indicate that geographic diversification is associated with firm value enhancement and risk reduction. In terms of magnitude, an increase of 1 standard deviation in the state-based (MSA-based) geographic diversification index is associated with a 7.55% (7.06%) increase in firm value and a decrease of 4.16% in total risk.

1. While we refer to BHC_branch distance, similar arguments hold for subsidiaries.

Increased distance between a BHC and its branches is found to be associated with a firm value discount and an increase in total risk. An increase of 1 standard deviation in the measure of distance between headquarters and branches (151.98 miles) is associated with a decrease of 11.11% (12.23%) in firm value for state-based (MSA-based) diversification measure, and an increase of 3.08% in total risk. The main results generally continue to hold after accounting for serial correlation, by using the Fama–MacBeth approach, and controlling for multicollinearity, by orthogonalizing the geographic diversification index against distance. Another interesting result is that geographic diversification across more distant regions is associated with a more pronounced value enhancement but a smaller risk-reduction effect.

The remainder of the paper is organized as follows. Section 1 presents the related literature and hypothesis development, Section 2 describes the data and model specification, Section 3 provides the empirical results, and Section 4 concludes.

1. RELATED LITERATURE AND HYPOTHESIS DEVELOPMENT

1.1 Geographic Diversification, Firm Value and Risk

Geographically diversified BHCs can achieve a lower cost of funds by enlarging their deposit bases, increase their revenues through new investment opportunities and synergy gains, improve managerial efficiency by spreading their managerial expertise over a larger scale of operation, and see greater productive efficiency due to enhanced takeover threats. Moreover, portfolio theory suggests that geographically diversified BHCs can reduce earning volatility through the "coinsurance effect" documented in Lowellen (1971) and Boot and Schmeits (2000). Some empirical studies support the above arguments. For example, Akhigbe and Whyte (2003) and Hughes et al. (1999) find that interstate banking leads to a higher level of profitability and a lower level of earning volatility, insolvency risk, and market risk.

On the other hand, geographic diversification may be associated with value loss, due to the lack of managerial skills or lack of information when entering new markets, and a more complex organization and product structure and, hence, intensified agency problems (Acharya, Hasan, and Saunders 2006, Baele, Jonghe, and Vennet 2007). These circumstances may reduce profitability, increase risk and reduce firm value. Demsetz and Strahan (1997) and Chong (1991) find that bank diversification does not necessarily result in lower risk because diversified banks may raise their leverage and may pursue riskier activities, such as risky lucrative loans or speculative derivatives positions, due to competitive pressures. DeLong (2001) also demonstrates that activity-diversified and/or geographically diversified mergers destroy firm value. In the end, how geographic diversification is associated with firm value and risk becomes an empirical question.

Based on the above discussion, we propose the following hypothesis:

H1: *Geographic diversification is associated with firm value enhancement and risk decline.*

1.2 BHC to Branch Distance, Firm Value, and Risk

There are several channels through which distance is associated with firm value and risk. The first channel is weakened monitoring and other distance-related agency problems. The farther away a branch is from the headquarters, the more difficult it is for the senior managers to monitor the branch managers (Brickley, Linck, and Smith 2003). Moreover, managers running the distant branches are often at the junior level, trying to learn on the job, and typically under strong pressures to perform. Hence, they tend to be aggressive in making loan and investment decisions. This aggressive attitude, combined with inadequate experience and weak monitoring from the parent company, result in increased risk exposure of the overall enterprise and a value loss. This position is consistent with Berger and DeYoung (2001) who find that the extent of parent control over the efficiency of the affiliates declines as the parent–affiliate distance increases.

A counter case would occur if senior managers are indeed the source of the problems and their unnecessary meddling or incorrect advice causes more harm than good (Berger and DeYoung 2006). In this case increased distance from the headquarters may serve as a barrier to transmission of their inefficiencies and ineptitude to the branches, improving the branch performance as a result. In this scenario, the increase in distance between headquarters and branches will be associated with a decline in agency costs, advancement in BHC value, and reduction in risk. It is also notable that moral hazard problems associated with distance may lead to a greater or a smaller level of risk, depending on the managers' risk attitude. If managers are risk neutral, these problems generally result in increased risk. However, if managers are risk averse, they may respond to increased distance by choosing to be on the safe side by taking a lower level of risk elsewhere, counterbalancing the moral hazard problems. The net effect is again an empirical question.

The second channel is organizational diseconomies. According to Berger et al. (2005), BHCs operating in narrower geographic markets have certain advantages over the more geographically dispersed BHCs. The former are more familiar with the community they serve and rely more heavily on soft information when making local decisions. The opaqueness of soft information makes it very costly to communicate it to BHC headquarters. Therefore, local managers are authorized to make the lending decisions and thus are subject to less red tape and bureaucracy. These features allow these BHCs to offer faster turnaround times, product and service flexibility, and stronger community orientation, which subsidiaries of larger and geographically dispersed institutions generally find difficult to duplicate.

Third, a positive incentive structure associated with managerial ownership also comes to play. While managers of smaller, less dispersed banks usually have a stake in the bank and a strong incentive to perform, branch managers of large BHCs typically lack ownership and are under various constraints imposed by senior managers. These forces weaken the incentives of the branch managers to devote large efforts to produce high-quality information for making better lending decisions, and they adversely affect BHC performance (Brickley, Linck, and Smith 2003, Berger et al. 2005, Sullivan and Spong 2007). Lastly, affiliation risk is expected to be larger for BHCs operating over a wider and more distant geographic horizon because it is more difficult to verify the exact sources and the extent of trouble with the distant affiliates. This can offset the risk diversification gains made possible due to dissimilarity of the economies of distant regions. Overall, the factors enumerated above afford distance a considerable role in determining the BHC value and risk, beyond that captured by diversification effects.[2, 3]

Existing banking studies have focused on the borrower–lender distance and lending conditions (Peterson and Rajan 2002, Degryse and Ongena 2005). To the best of our knowledge, no prior study has examined how parent–branch distance affects firm value and risk in banking. This shortcoming will be addressed here.

Based on the above discussion, we propose the following hypothesis:

H2: *Increased BHC_branch distance is associated with a decrease in firm value and increase in firm risk.*

2. SAMPLE AND METHODOLOGY

2.1 Data Sources and Sample Selection

Data are obtained from three main sources: FDIC's Summary of Deposits (SOD), the BHC, and the Center for Research in Security Prices (CRSP) databases. The SOD database provides information on the level of deposits, branch location, and associated bank name and location for all BHCs. We use this database to construct an index of deposit dispersion across states/MSAs.[4] The BHC database is used to extract BHC-specific variables such as total assets, total loans, and total equity. The CRSP database is used to extract stock prices, stock returns, and market returns. The SOD, BHC, and CRSP databases are available at different frequencies: annual, quarterly, and daily/monthly, respectively. To make a consistent data series, we construct an annual series. We retain the fourth-quarter figures (with the most complete data) from the BHC database as the basis for the annual figures. We use the monthly CRSP data to compute the annual stock return volatility and market return volatility.

Our sample selection procedure is as follows. First, we match the BHC and SOD databases by BHC entity number and obtain 6,443 unique BHCs over the sample period, 1994–2005. Second, we extract all financial firms from CRSP during 1994–2005, based on SIC codes (6000–6999), and obtain 1,959 financial firms including BHCs. Third, we hand-match the 1,959 firms from CRSP with the 6,443 matched

2. Consistent with this viewpoint, Coval and Moskowitz (2001) and Chen et al. (2004) demonstrate that mutual fund managers perform better when investing in the stocks of geographically proximate companies. The rationale is that they have informational advantage in selecting nearby stocks due to their greater monitoring capabilities and/or access to private information associated with investing in local firms.

3. Distance-related effects, e.g., agency costs of distance, may diminish with technology (Berger and DeYoung 2001, 2006). However, this question is beyond the empirical scope of this paper.

4. Note that the data on loan dispersion across state/MSA are not available. Loan and deposit dispersion are expected to be highly, though not perfectly, correlated. Thus, the former can serve as a proxy for the latter.

BHCs from both the SOD and BHC databases by BHC name and obtain 666 matched BHCs. Lastly, after deleting the observations with missing values on some major variables, we get 505 BHCs, with 2,843 BHC-year observations over the 1994–2005 sample period, as the final sample.[5, 6] We compute the distance between the BHC and branches/subsidiaries based on their respective zip codes.

Modern financial institutions operate under complicated organizational structures including tiered BHCs, bank and nonbank subsidiaries, and branches. We focus on BHCs because decisions are made at that level, and diversification affects the performance of the entire organization. Moreover, BHCs are responsible for supervising their subsidiary banks, and regulators are concerned about the well-being of the BHCs, more so than that of an individual subsidiary. In addition, we need to utilize the stock market data, which are available for BHCs but not for the subsidiaries.

2.2 *Variable Construction*

Distance. We measure distance in two ways. First, *DistBHC_Br* is the weighted average of distance (d_j) in miles between a BHC and its branches ($j = 1, 2, \ldots, m$), with the weights being each branch's total deposits (TD_j) as a fraction of the total deposits of the BHC (ΣTD_j). Second, *DistBHC_Sub* is the weighted average of distance (d_k) in miles between a BHC and its subsidiary banks ($k = 1, 2, \ldots, s$), with weights being each subsidiary's assets (TA_k) as a share of total assets of the BHC (ΣTA_k). For a BHC with m branches and s subsidiaries, we have the following measures:

$$(DistBHC\_Br) = \sum_{j=1}^{m} \frac{TD_j}{\sum TD_j} \times d_j \qquad (j = 1, 2, \ldots, m) \tag{1A}$$

$$(DistBHC\_Sub) = \sum_{k=1}^{s} \frac{TA_k}{\sum TA_k} \times d_k \qquad (k = 1, 2, \ldots, s). \tag{1B}$$

The distance measure used here is an underestimation of the corresponding actual distance because it is computed as the distance between the two zip codes, instead of the exact two locations. Hence, if the headquarters and a branch have the same zip codes, distance will be calculated as zero while the actual distance can be several miles.

5. The SOD database became available in 1994. The Riegle-Neal Interstate Banking Act was passed in the same year. Since BHCs can be expected to engage in more geographic expansion after the passage of the Act, it is appropriate to start the sample from 1994. The sample ends in 2005, the most recent year for which data are available. However, there are no concrete data on off balance sheet activities (OBSA, notional principal of interest rate contracts over total assets) and risk-based capital ratio (Riskcapital) in years 1994–95. Thus, the sample period actually spans from 1996 to 2005. This allows for adjustment of BHCs to the new regulation.

6. Many BHCs are not publicly traded and, hence, do not appear on CRSP. As a result, when we match the BHCs from the SOD and BHC databases with those on CRSP, the nontraded BHCs disappear from the list. Thus, after deleting BHCs with missing observations, the number of BHCs in the sample is reduced to 505 from 6443.

Measure of geographic diversification. The conventional variables used to measure geographic diversification in the banking literature include the number of branches, and the number of states where the BHC operates (Fraser et al. 1997), or a binary variable indicating the presence or lack of geographic diversification (Demsetz and Strahan 1997, Dick 2006). These measures fail to account for the level of activity in each region and the distance with the parent company. To overcome these shortcomings, we build upon Hughes et al. (1999) and Deng, Elyasiani, and Mao (2007) to introduce a distance-adjusted, activity-weighted, deposit dispersion index as a measure of geographic diversification (*Div_Index*). This measure is constructed in two steps. First, we construct a deposit dispersion measure, similar to a Herfindahl index, described as one minus the sum of the squared ratios of the deposits in each state ($deposit_i$), to the sum of the deposits in all of the states where the BHC operates ($\sum_i deposit_i$). The deposit dispersion measure based on the MSAs is used as an alternative measure and is constructed similarly:[7]

$$(DepositDispersion\_St) = 1 - \sum_i \left(\frac{deposit_i}{\sum_i deposit_i} \right)^2 \qquad i = 1, 2, \ldots, m \; (m = \#\text{states}) \tag{2A}$$

$$(DepositDispersion\_MSA) = 1 - \sum_j \left(\frac{deposit_j}{\sum_j deposit_j} \right)^2 \qquad j = 1, 2, \ldots, n \; (n = \#\text{MSAs}). \tag{2B}$$

These two measures are continuous, increase in value with the degree of diversification, and are normalized between 0 and 1, with the 0 value indicating no diversification (i.e., all deposits are concentrated in a single state/MSA). These measures are still subject to the shortcoming that they do not account for the distance between the headquarters and the branches. Hence, in the next step, we construct a relative distance measure as the ratio of the distance measure (1A) to the median of the distance between all BHCs in the sample and their branches, and calculate the geographic diversification index for states (*Div_Index_St*) and MSAs (*Div_Index_MSA*) as the

7. Some branches do not belong to any MSA. These are classified as "other branches" when computing the deposit dispersion based on MSA (*DepositDispersion_MSA*). As an alternative, we deleted these branches when calculating the deposit dispersion measure based on MSAs. Results are similar, though the number of observations in the final sample falls from 2,843 to 2,471 after deletion. The data source for MSAs is the FDIC's SOD.

product of the deposit dispersion measure (2A) and the scaled distance measure (1A scaled by the median distance across all BHCs in the sample).[8]

$$(Div\_Index\_St) = (DepositDispersion\_St) \times [(DistBHC\_Br)/Median\ Distance] \quad (3A)$$

$$(Div\_Index\_MSA) = (DepositDispersion\_MSA) \times [(DistBHC\_Br)/Median\ Distance]. \quad (3B)$$

In this specification, an increase in dispersion measure (2A) can occur due to changes in distribution of deposits across states, while an increase in distance (1A) occurs when branches move farther away from their headquarters with the deposit distribution across states remaining intact. Geographic diversification (3A) can, therefore, increase due to changes in one of the two components while the latter component remains unchanged and the effect of each component on the overall measure depends on the level of the other component.

The dispersion measure (2A) has two limiting values. One case occurs when all deposits are concentrated in a single state, resulting in zero value of both the dispersion and diversification measures. The second case is when deposits are equally distributed across states. In this case, the dispersion measure will approach the unit value and the diversification measure will be at its peak for a given level of distance. The diversification measure will reach its overall peak for the BHC with maximum dispersion and the maximum distance from the headquarters.[9]

Firm value and risk. Following Servaes (1996), and Laeven and Levine (2007), we employ *Tobin's Q* (market value of a firm's assets/replacement cost) to proxy for firm value, and, given that the market values of BHC liabilities are unavailable, we calculate it as:

$$Tobin's\,Q = \frac{BV\ of\ total\ assets + MV\ of\ total\ equity - BV\ of\ total\ equity}{BV\ of\ total\ assets}. \quad (4)$$

8. The scaled-distance measure takes the unit value for the BHC with median of the distance between BHCs and their branches. We can scale the relative distance measure to lie between zero and unity by dividing the values over the max distance. This would affect the coefficients values but not the test results. Similar measures can be defined for subsidiaries (using (1B)) instead of branches, and for MSAs (using (2B)) instead of states. We also used the mean distance, instead of the median, as the scale factor. Results remained qualitatively similar.

9. To highlight the difference between the geographic diversification measure (3A) and the deposit dispersion measure (2A) used by Hughes et al. (1999) and Deng, Elyasiani, and Mao (2007), consider five BHCs with dispersion measures 0.1, 0.2, 0.3, 0.4, and 0.5 with corresponding distances to headquarters of 25, 50, 75, 100, and 125 miles (median is 75 miles). The scaled distance and diversification index values (3A) for these BHCs will be, respectively, 0.33, 0.67, 1, 1.33, 1.67 and 0.033, 0.133, 0.3, 0.53, 0.833. As can be seen from these figures although the ranking of these BHCs in terms of dispersion (2A) and diversification (3A) is the same, the rate of change in the latter is more pronounced. Moreover, if the distances are changed to be, respectively, 125, 100, 75, 50, and 25, the rankings by (3A) will be completely reverse to those by (2A).

In this specification *BV* and *MV* refer to book and market values, respectively. Based on portfolio theory, diversification works to reduce firm-specific risk and, in turn, total risk, due to the imperfect correlation among economies of different regions, while systematic risk tends to remain unaffected. Since firm-specific risk and total risk are highly correlated, we focus on total risk, measured by the annual standard deviations of the monthly stock returns (Krishnaswami, Spindt, and Subramaniam 1999).

Control variables. Following Denis, Denis, and Yost (2002), we include a set of BHC-specific variables as control measures in the valuation and risk models. The BHC-specific variables introduced in the valuation model include: profitability (*ROA*), *Risk* (standard deviation of stock return), *Size* (log of total assets), risk-adjusted capital ratio (*Riskcapital*, total risk-based capital/total risk-weighted assets), credit risk (*Netcharge-off*, net charge-offs on loans and leases/total loans), liquidity risk (*Liquidity*, total loans/total assets), and off-balance-sheet activity risk (*OBSA*, notional principal on interest rate contracts/total assets).

There is extensive evidence that firm size is negatively related to average stock returns (e.g., Banz 1981, Fama and French 1992). Capital ratio, credit risk, liquidity risk, and speculation-based OBSA all influence the BHC soundness and are expected to move inversely with BHC value. Money center banks (MCBs) are wholesale oriented, have unique access to international capital markets, and are heavily engaged in derivative products. Since these features may influence firm value and risk, we include *MCB Dummy* (equals 1 for MCBs) to control for this potential effect. To test whether M&A events affect BHC value and risk, we identify the BHCs involved in M&As during the sample period from the Thomson One Merger and Acquisition database and include an M&A dummy (equals 1 for BHCs involved in M&A) in the model. We also include a set of 11 Federal Reserve district dummies to control for differential regulatory and regional economy effects in different districts and a time trend to control for time effect and technological progress. The time trend takes the value of 1 for 1994, 2 for 1995, . . . , and 12 for 2005.

In the risk model, we include market risk and a set of firm-specific variables such as size, capital ratio, liquidity risk, credit risk, OBSA risk, MCB categorization, M&A dummy, time trend, and Fed district dummies as controls. BHC risk is expected to move in the same direction as market, liquidity, credit, and OBSA risks. A larger firm size is expected to be associated with lower risk, since larger BHCs are usually well established, and associated with more diversification capacity, better credit quality, and lower default risk. Capital ratio is also expected to reduce risk, as higher capital means lower leverage, and increased capital can guard against unexpected losses, reducing insolvency risk. Capital is also a factor inspiring public confidence in the BHC and contributing to its survival probability.

2.3 Sample Descriptive Statistics

Sample descriptive statistics are presented in Table 1. For total assets, the sample mean (median) value is \$15,441.52M (\$1,267.12M), indicating that our sample is

TABLE 1

SAMPLE DESCRIPTIVE STATISTICS ($N = 2{,}843$)

Variables	Description	Mean	Median	Std. dev.	Min	Max
Tobin's Q	Firm value	1.13	1.08	0.54	0.90	16.23
Risk	Total risk	0.07	0.07	0.03	0.00	0.28
MktRisk	Market volatility	0.04	0.04	0.01	0.01	0.10
DepositDisperion_St	Deposit dispersion based on state	0.15	0	0.24	0	0.92
DepositDispersion_MSA	Deposit dispersion based on MSA	0.38	0.4	0.31	0	0.97
Div_Index_St	Distance-adjusted deposit dispersion based on state	0.23	0	0.41	0	1.94
Div_Index_MSA	Distance-adjusted deposit dispersion based on MSA	0.48	0.36	0.49	0	2.13
NumBr	Number of branches	133.47	23	406.85	1	5, 914
NumSt	Number of states	1.70	1	1.74	1	21
DistBHC_Br	BHC_branch distance	79.11	23.96	151.98	0	1, 262.36
DistBHC_Sub	BHC-subsidiary distance	37.84	2.17	113.47	0	1, 350.68
LogDistance_Br	Log (1+DistBHC_Br)	3.34	3.22	1.44	0	7.14
LogDistance_Sub	Log (1+DistBHC_Sub)	1.73	1.15	1.89	0	7.21
OBSA	Off-balance-sheet activity risk	0.21	0	2.06	0	43.12
Size	Log (total assets)	14.46	14.05	1.68	11.93	20.98
Liquidity	Liquidity risk (Total loans/assets)	0.65	0.66	0.12	0.01	0.94
ROA	Return on assets	0.01	0.01	0.01	−0.03	0.05
Netcharge-off	Net charge-off ratio (credit risk)	0.00	0	0.01	−0.01	0.10
Riskcapital	Risk-adjusted capital ratio	0.14	0.13	0.04	0.06	0.43
Total assets ($mil)	Total assets	15, 441.52	1, 267.12	72, 072.54	151.35	1, 294, 312.24
MCB Dummy	Money center bank dummy	0.04	0	0.20	0	1

NOTES: *Tobin's Q* = (*BV of total assets* + *MV of equity* − *BV of equity*)/*BV of assets*; *Risk* is the standard deviation of stock return and measures total risk; *MktRisk* is market risk, measured by standard deviation of market return; *DepositDispersion_St/MSA* is deposit dispersion based on *State/MSA* as defined by equations (2A) and (2B), respectively; *Div_Index_St/MSA* is distance-adjusted deposit dispersion based on *State/MSA* (described by equations (3A) and (3B), respectively). *Div_Index_St* = *DepositDispersion_St* × (*DistBHC_Br/Median of DistBHC_Br*); *Div_Index_MSA* = *DepositDispersion_MSA* × (*DistBHC_Br* /*Median* of *DistBHC_Br*); *NumBr/NumSt* are the number of branches/states; *DistBHC_Br* is the travel distance in miles between BHC zipcode and the zipcode of its branches; *DistBHC_Sub* is the travel distance in miles between BHC zipcode and the zipcode of its subsidiary banks; *LogDistance_Br* is the log of (1+*DistBHC_Br*) and *LogDistance_Sub* is the log of (1+*DistBHC_Sub*); *OBSA* is off-balance-sheet risk, measured by notional principal on interest rate contracts/total assets; *Size* is BHC size, measured by log of total assets; *Liquidity* is liquidity risk, measured by total loans / total assets; *ROA* is profitability, measured by return on assets; *Netcharge-off* is a measure of credit risk, proxied by net charge-off /total loans; *Riskcapital* is risk-adjusted capital ratio, measured as total risk-based capital/total risk-weighted assets; *Total assets* is total assets; *MCB Dummy* is a dummy variable for Money Center Bank.

populated with large BHCs with total assets greater than \$15 billion on average. The mean and median ROA are both 0.01, and the average standard deviations of monthly stock return and market return are 7% and 4%, respectively. For the variable of our most interest, the mean (median) of the geographic diversification index stands at 0.23 (0), based on states and at 0.48 (0.36) based on MSAs, indicating that many of the BHCs operate within a single state. The mean (median) of deposit-weighted average distance between BHC and branches is 77.11 miles (23.96 miles); the mean (median) of asset-weighted average distance between BHC and subsidiary banks is 37.84 miles (2.17 miles).[10] On average, a BHC operates 133.47 branches across 1.7 states. The median value of the number of branches (states) where a BHC operates is 23 (1). The average (median) loan to assets ratio is 0.65 (0.66), and the average net loan charge-off ratio is zero, indicating that charge-offs and recoveries were offsetting.

The correlation matrix among the major variables is presented in Table 2. Geographic diversification based on state exhibits an insignificant relationship with firm value and a negative and significant relation (at 1%) to total risk, indicating that BHCs with wider geographic expansion are likely to have lower risk. The BHC_branch/subsidiary distance displays a significant negative relation to firm value, and an insignificant relation to total risk. To account for firm-specific, market-wide, and macro-economy-wide factors, a multiple regression framework will be employed below to further explore the effects.

3. EMPIRICAL RESULTS

The models described by equations (5A) and (5B) will be used to investigate the association between geographic diversification (*Div_Index*) and BHC value (*Tobin's Q*) and risk (stock return volatility). In addition to the geographic diversification index, the explanatory variables in (5A) include distance, *LogDistance_Br*, defined as *log*(1+(*DistBHC_Br*)) and the control variables discussed earlier.[11] Similar variables are used in Fraser et al. (1997). In the risk model (5B), *MktRisk* is market return volatility and other variables are as defined earlier.

$$\begin{aligned} \textit{Tobin's Q} = {} & \alpha_0 + \beta_1(\textit{Div\_Index}) + \beta_2(\textit{LogDistance\_Br}) + \beta_3 \textit{ROA} + \beta_4 \textit{Risk} \\ & + \beta_5 \textit{Size} + \beta_6 \textit{Riskcapital} + \beta_7 \textit{Liquidity} + \beta_8(\textit{Netcharge-off}) \\ & + \beta_9 \textit{OBSA} + \beta_{10} \textit{Trend} + b_{11}(\textit{MCB Dummy}) + \beta_{12}(\textit{M\&A Dummy}) \\ & + \sum_{k=13}^{23} \beta_k \textit{FR Dummy}_k + \varepsilon \end{aligned} \tag{5A}$$

10. It is notable that the much larger size of branches/subsidiaries near the headquarters (e.g., the lead bank) makes the weighted-average distance between a BHC and its branches/subsidiaries small. The maximum average distance between a BHC and its branches is 1,262 miles.

11. We also computed *LogDistance_Sub* based on *BHC–subsidiary* distance as defined by equation (1B). Empirical results are qualitatively similar. In addition, as an alternative to the Cobb–Douglas diversification index (3A) used here, we also defined this index as a Translog function of dispersion and distance. The results on firm value and risk remain by and large valid but some coefficients in the risk equation become less significant due to the collinearity between the quadratic and cross-product terms.

TABLE 2

Correlation Matrix of Major Variables

	Risk	*MktRisk*	*Div_Index_St*	*Div_Index_MSA*	*Numbr*	*Numst*	*LogDistance_Br*	*LogDistance_Sub*	*Size*	*Riskcapital*	*ROA*	*Liquidity*	*Netcharge-off*	*OBSA*
Tobin's Q	−0.012	−0.032	−0.028	−0.045	−0.011	−0.009	−0.120	−0.057	−0.045	0.031	0.048	−0.111	−0.009	−0.013
	0.506	0.084	0.131	0.017	0.563	0.618	<.0001	0.002	0.016	0.102	0.010	<.0001	0.639	0.485
Risk	1	0.378	−0.049	0.033	−0.038	0.012	−0.020	0.018	−0.039	−0.051	−0.154	−0.045	0.178	0.029
		<.0001	0.009	0.079	0.044	0.523	0.277	0.341	0.038	0.007	<.0001	0.017	<.0001	0.123
MktRisk		1	−0.007	0.135	−0.005	0.028	−0.019	0.017	−0.037	0.006	−0.010	−0.044	0.076	−0.001
			0.714	<.0001	0.7701	0.131	0.303	0.365	0.051	0.734	0.610	0.018	<.0001	0.965
Div_Index_St			1	0.699	0.673	0.687	0.721	0.481	0.715	−0.207	0.078	0.030	0.144	0.186
				<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.108	<.0001	<.0001
Div_Index_MSA				1	0.507	0.546	0.772	0.480	0.650	−0.218	0.103	0.030	0.126	0.107
					<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.115	<.0001	<.0001
Numbr					1	0.593	0.461	0.312	0.646	−0.143	0.095	−0.020	0.134	0.355
						<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.276	<.0001	<.0001
Numst						1	0.508	0.552	0.593	−0.132	0.080	−0.025	0.112	0.195
							<.0001	<.0001	<.0001	<.0001	<.0001	0.176	<.0001	<.0001
LogDistance_Br							1	0.605	0.625	−0.277	0.068	0.112	0.112	0.147
								<.0001	<.0001	<.0001	0.000	<.0001	<.0001	<.0001
LogDistance_Sub								1	0.405	−0.137	0.053	0.012	0.061	0.091
									<.0001	<.0001	0.005	0.538	0.001	<.0001
Size									1	−0.236	0.212	−0.137	0.140	0.328
										<.0001	<.0001	<.0001	<.0001	<.0001
Riskcapital										1	0.140	−0.332	−0.061	−0.054
											<.0001	<.0001	0.001	0.004
ROA											1	0.001	−0.122	−0.040
												0.958	<.0001	0.035
Liquidity												1	−0.080	−0.200
													<.0001	<.0001
Netcharge-off													1	0.091
														<.0001
OBSA														1

Note: All variables are as defined in Table 1.

$$Risk = \alpha_0 + \gamma_1(Div\_Index) + \gamma_2(LogDistance\_Br) + \gamma_3 Mktrisk + \gamma_4 Size + \gamma_5 Riskcapital + \gamma_6 Liquidity + \gamma_7(Netcharge\text{-}off) + \gamma_8 OBSA + \gamma_9 Trend + \gamma_{10}(MCB\ Dummy) + \gamma_{11}(M\&A\ Dummy) + \sum_{m=12}^{22} \gamma_m FR\ Dummy_m + \xi. \quad (5B)$$

3.1 Geographic Diversification, Distance and Firm Value

The estimation results on the association between geographic diversification and firm value and risk (5A–5B) are reported in Table 3. The coefficients of state-based and MSA-based geographic diversification indexes (Div_Index_St and Div_Index_MSA)

TABLE 3

GEOGRAPHIC DIVERSIFICATION, DISTANCE AND FIRM VALUE AND RISK

	Firm value			
	Div_Index_St	*Div_Index_MSA*		Total risk
Intercept	2.1023*** (11.66)	1.9199*** (11.40)	Intercept	0.0765*** (7.48)
Div_Index	0.2082*** (4.89)	0.1629*** (4.54)	*Div_Index_St*	−0.0071*** (−2.97)
LogDistBHC_Br	−0.0872*** (−8.05)	−0.0960*** (−7.95)	*LogDistance_Br*	0.0015*** (2.45)
ROA	7.4884*** (3.69)	6.7773*** (3.35)	*MktRisk*	0.6892*** (16.89)
Risk	0.3068 (0.95)	0.2041 (0.63)	*Size*	−0.0004 (−0.82)
Size	−0.0276*** (−2.72)	−0.0196** (−2.05)	*Riskcapital*	−0.0647*** (−3.99)
Riskcapital	−0.7725*** (−2.61)	−0.6723** (−2.27)	*Liquidity*	−0.0094* (−1.80)
Liquidity	−0.6300*** (−6.70)	−0.6057*** (−6.44)	*Netcharge-off*	0.9342*** (9.12)
Netcharge-off	−0.4979 (−0.27)	−0.2611 (−0.14)	*OBSA*	0.0003 (0.94)
OBSA	−0.0015 (−0.30)	0.0007 (0.14)	*Trend*	−0.0013*** (−5.83)
Trend	0.0080** (2.19)	0.0135*** (3.50)		
MCB Dummy	0.0610 (1.12)	0.0987* (1.84)	*MCB Dummy*	−0.0027 (−0.86)
M&A Dummy	0.0966*** (4.44)	0.0886*** (4.08)	*M&A Dummy*	−0.0051*** (−4.19)
FR Dummy	Yes	Yes	*FR Dummy*	Yes
No. of obs.	2,843	2,843	No. of obs.	2,843
F-value	10.69	10.54	F-value	32.39
Adj. R^2	0.0727	0.0717	Adj. R^2	0.1955

NOTES: This table reports the regression results on how geographic diversification index (equations (3A), (3B)) and distance (equations (1A)) affect firm value and risk. Firm value is proxied by Tobin's Q. Total risk is proxied by standard deviations of stock return. *M&A Dummy* is a dummy variable for mergers & acquisitions, takes the unit value if the BHC undertook M&A during the sample period, zero otherwise. *FR Dummy* is a set of 11 Federal Reserve district dummies. All other variables are defined as in Table 1. t-statistics are reported in parentheses below the coefficient estimates. ***, **, * represent statistical significance at 1%, 5%, and 10%, respectively.

are significantly positive at the 1% level, indicating that diversification is associated with a valuation premium. The magnitude of the coefficient estimate for *Div_Index_St* is 0.2082, suggesting that an increase of 1 standard deviation in this measure is associated with an increase of 7.55% in firm value. The corresponding figure for *Div_Index_MSA* is 7.06%.[12] These results support the first half of H1. It seems that synergy gains and economies of scale dominate the agency problem engendered by diversification, resulting in a positive correspondence between diversification and value. It is noteworthy that the value-enhancing effect of geographic diversification in banking is in contrast to Gao, Ng, and Wang (2005) and Laeven and Levine (2007). The former study reports a value reduction associated with domestic geographic diversification in industrial firms. The latter finds a product diversification discount in financial conglomerates; banks diversifying into lending and nonlending financial services have a lower firm value than the specialized financial intermediaries.

Increased distance between BHC and its branches (*LogDistBHC_Br*) is found to be associated with firm value reduction. In terms of magnitude, an increase of one standard deviation in this variable (151.98 miles) is associated with a decrease of 11.11% in firm value in the equation employing *Div_Index_St* and 12.23% when *Div_Index_MSA* is used. This result supports the first half of H_2 and it is also consistent with Berger and DeYoung (2006) who find that agency costs of distance have adverse effects on bank efficiency.[13]

Among the control variables, profitability (*ROA*), time trend and M&A dummy are positively associated with firm value, suggesting that firm value increases with profitability, technology advancement, and M&A event. BHC size, risk-adjusted capital ratio, and liquidity risk are negatively associated with firm value as expected. Total risk, credit risk, off-balance-sheet risk, and MCB dummy are insignificant. The explanation for the negative capital ratio effect is that an increase in capital lowers leverage which is positively associated with firm value. Liquidity risk is inversely related to firm value because the market perceives illiquid banks negatively. The coefficients for most of the Federal Reserve district dummies are significant in the valuation equation, indicating the importance of regional factors in determining BHC value.

3.2 Geographic Diversification, Distance, and BHC Risk

Empirical results on firm risk are also reported in column 3 of Table 3. Geographic diversification is found to be associated with a reduction in total risk, supporting the

12. The figure is computed by multiplying the standard deviation of *Div_Index_St* (*Div_Index_MSA*) in the sample, 0.41 (0.49), by the coefficient estimate 0.2082 (0.1629) in the regression, which gives the average economic impact of 8.54% (7.98%) increase in firm value (*Tobin's Q*). These figures are in absolute value. The relative (percentage change in *Q*) varies with *Q*. Figures reported are the relative change at the mean level, calculated by dividing the absolute changes over the average *Q* in the sample. The same procedure is followed for risk. The standard deviation of *Div_Index_St* (*Div_Index_MSA*) is 0.41 (0.49). Given the ranges of variation for the two diversification indexes (0 to 1.94 and 0 to 2.13), a change of 1 standard deviation in the diversification measures (0.41 and 0.49) can be considered a large change.

13. Since the extent of diversification is correlated with distance, the negative association between distance and value found here may be the effect picked up in other studies as a value discount effect for diversification.

risk component of H1. It seems that the coinsurance effect dominates the agency problems due to diversification and, as a result, diversification is associated with risk reduction. In terms of magnitude, an increase of 1 standard deviation in *Div_Index_St* is associated with a decrease of 4.16% in total risk. The negative association between diversification and risk is consistent with Hughes et al. (1999) and Akhigbe and Whyte (2003). The results of the BHC_branch distance (*LogDistBHC_Br*) on risk paint a different picture. Increased BHC_branch distance is found to be associated with a significant increase in total risks, supporting the risk component of H_2. In terms of magnitude, an increase of 1 standard deviation in the BHC_branch distance (151.98 miles) is associated with an increase of 3.08% in total risk. The signs for the control variables are generally consistent with our expectations.

For the purpose of comparison, we also estimate our models using conventional geographic diversification measures, i.e., the number of branches and the number of states. Unreported results show that the coefficients of these two variables are significantly positive in the firm value equation but insignificant in the risk model. We argue that dissimilarity of results between these conventional measures and the *Div_Index* measures constructed here is due to the weakness of the former in that they fail to account for both the size of operation in each region and the distance between headquarters and branches.

3.3 Interactive Effect of Geographic Diversification and Distance

An alternative approach to examine how distance influences the direction and the magnitude of the diversification effects on firm value and risk is to introduce an interaction term between diversification and distance in the model. This new specification allows for a change in the sensitivity of BHC value and risk to diversification when the BHC_branch distance varies. Results are reported in Table 4.

In the valuation model, the coefficient of the diversification measure is found to be insignificant while that of the interactive term is positive and significant at the 1% level for *Div_Index_MSA* and insignificant for *Div_Index_St*. These results indicate that at zero distance (expansions within the same zip code) geographic diversification is associated with no significant advancement in BHC value. However, as a BHC expands into other MSAs (zip codes), the association between diversification and firm value becomes positive and increasingly more pronounced with increased levels of distance. This effect is, at least partially, due to the fact that new areas offer new sources of funds and more investment opportunities, and allow managerial skills and reputational capital of the BHCs to be spread over a larger scale of production with little cost. Similarly, when the MSA-based diversification measure is used, the negative association between distance and value weakens with increased levels of diversification. In other words, more pronounced gains from diversification in more remote areas tend to somewhat counterbalance the negative effect of distance due to agency and training costs, organizational diseconomies, and other distance-related factors. The impacts of other control variables remain qualitatively similar. Results using state-based geographic diversification index also do show a negative association

TABLE 4

INTERACTIVE RESULT OF GEOGRAPHIC DIVERSIFICATION AND DISTANCE

	Firm value			Total risk
	Div_Index_St	*Div_Index_MSA*		
Intercept	2.1044***	2.0518***	Intercept	0.0767***
	(11.67)	(11.82)		(7.52)
Div_Index	0.0482	−0.0862	*Div_Index_St*	−0.0341***
	(0.32)	(−0.97)		(−4.03)
LogDistance_Br	−0.0876***	−0.0998***	*LogDistance_Br*	0.0014***
	(−8.08)	(−8.24)		(2.35)
Divdist	0.0285	0.0508***	*Divdist*	0.0048***
	(1.10)	(3.07)		(3.33)
ROA	7.4045***	6.9893***	*MktRisk*	0.6860***
	(3.65)	(3.46)		(16.84)
Risk	0.2816	0.1692	*Size*	−0.0004
	(0.87)	(0.53)		(−0.74)
Size	−0.0272***	−0.0257***	*Riskcapital*	−0.0659***
	(−2.68)	(−2.63)		(−4.07)
Riskcapital	−0.7786***	−0.7210***	*Liquidity*	−0.0096*
	(−2.63)	(−2.44)		(−1.82)
Liquidity	−0.6306***	−0.6151***	*Netcharge-off*	0.9387***
	(−6.70)	(−6.55)		(9.18)
Netcharge-off	−0.4598	−0.4731	*OBSA*	0.0001
	(−0.25)	(−0.25)		(0.45)
OBSA	−0.0024	−0.0005	*Trend*	−0.0013***
	(−0.45)	(−0.09)		(−5.90)
Trend	0.0079**	0.0128***	*MCB Dummy*	−0.0052***
	(2.16)	(3.30)		(−1.63)
MCB Dummy	0.0462	0.0569	*M&A Dummy*	−0.0052***
	(0.82)	(1.03)		(−4.30)
M&A Dummy	0.0957***	0.0928***		
	(4.40)	(4.27)		
FR Dummy	Yes	Yes	*FR Dummy*	Yes
No. of obs.	2,843	2,843	No. of obs.	2,843
F-value	10.30	10.52	F-value	31.57
Adj. R^2	0.0728	0.0744	Adj. R^2	0.1983

NOTE: This table reports the regression results on how the interaction term between geographic diversification index and distance (*Divdist*) affects firm value and risk. Firm value is proxied by Tobin's Q. Total risk is proxied by standard deviations of stock returns. *M&A Dummy* is a dummy variable for mergers and acquisitions, takes the unit value if the BHC undertook M&A during the sample period, zero otherwise. *FR Dummy* is a set of 11 Federal Reserve district dummies. All other variables are defined as in Table 1. t-statistics are reported in parentheses below the coefficient estimates. ***, **, * represent statistical significance at 1%, 5%, and 10%, respectively.

between distance and value but fail to demonstrate significance in the interaction term between diversification and distance, at least partially due to the collinearity among the three distance and diversification variables.

In the total risk model (5B), the coefficients of diversification and distance remain negative and positive, respectively, and the coefficient of the interactive term between the two is positive and significant. The positive sign of the interaction term suggests the following: first, as geographic diversification deepens, the comovement between distance and risk strengthens. In other words, for more diversified firms the adverse effect of increased distance on risk is more pronounced. One explanation is that if a firm is not diversified, increased distance will reduce risk due to diversification while it will add to risk because of increased agency conflicts and other distance-related factors. On the contrary, if the firm is already highly diversified, there will be little gain from further diversification into more remote areas while increased distance does still elevate the risk to a higher plateau. Second, as BHCs diversify across more remote regions, the negative association between risk and diversification weakens, and finally disappears, because increased distance works counter to diversification. The effects of other control variables remain qualitatively similar.

3.4 Robustness Checks

Doukas and Pantzalis (2003) argue that the coefficients obtained by ordinary least squares (OLS) regressions of panel data may be biased due to autocorrelation of residuals. To correct the autocorrelation problem, we employ the Fama and MacBeth (1973) approach to estimate a cross-sectional regression for each sample year and then average the coefficients over the sample period. In addition, we follow the Newey and West (1987) procedure, employed also by Deng, Elyasiani, and Mao (2007), and compute the *t*-statistics associated with the coefficients to adjust for heteroskedasticity and serial correlation problems.

TABLE 5

FAMA-MACBETH RESULTS ON FIRM VALUE AND RISK

	Firm value			
	Div_Index_St	*Div_Index_MSA*		Total risk
Intercept	2.3434***	2.2724***	Intercept	0.1128***
	(6.06)	(6.76)		(2.87)
Div_Index	0.2368***	0.2328***	*Div_Index_St*	−0.0062***
	(3.76)	(3.60)		(−2.93)
LogDistance_Br	−0.0945***	−0.1174***	*LogDistance_Br*	0.0013*
	(−4.06)	(−4.68)		(1.81)
ROA	9.6898***	8.7662***	*MktRisk*	−0.2677
	(6.76)	(7.32)		(−0.24)
Risk	0.7629	0.7615	*Size*	−0.0007
	(1.34)	(1.39)		(−0.53)
Size	−0.0358***	−0.0333***	*Riskcapital*	−0.0532**
	(−2.78)	(−3.08)		(−2.17)
Riskcapital	−1.1317**	−1.0353**	*Liquidity*	−0.0076
	(−2.31)	(−2.25)		(−1.63)
Liquidity	−0.6799***	−0.6561***	*Netcharge-off*	1.1184***
	(−4.25)	(−4.31)		(4.25)
Netcharge-off	2.2166*	2.6394**	*OBSA*	0.0002
	(1.76)	(2.00)		(0.60)
OBSA	−0.0005	0.0032	*MCB Dummy*	−0.0039**
	(−0.24)	(1.43)		(−2.08)
MCB Dummy	0.0432***	0.0824***	*M&A Dummy*	−0.0057***
	(4.56)	(3.83)		(−6.99)
M&A Dummy	0.0955***	0.0906***		
	(5.13)	(5.30)		
FR Dummy	Yes	Yes	*FR Dummy*	Yes
No. of obs.	2,843	2,843	No. of obs.	2,843
R^2	0.128	0.1293	R^2	0.1781

NOTES: This table reports the Fama−MacBeth regression results on how geographic diversification index and distance affect firm value and risk. Using the Fama and MacBeth (1973) methodology, we estimate cross-sectional regressions for every sample year. Then, we average the coefficients over the sample years. We follow Newey and West (1987) to compute the associated *t*-statistics to adjust for heteroscedasticity and serial correlation problems. *M&A Dummy* is a dummy variable for merger and acquisition, takes the unit value if the BHC undertook M&A during the sample period, zero otherwise. *FR dummy* is a set of 11 Federal Reserve district dummies. All other variables are defined as in Table 1. Newey and West adjusted t-statistics are reported in parentheses beneath the coefficient estimates. ***, **, * represent statistical significance at 1%, 5%, and 10%, respectively.

Regression results are shown in Table 5. In the valuation model, the coefficients of geographic diversification for both *Div_Index_St* and *Div_Index_MSA* remain positive and significant at the 1% level. The coefficient of distance also continues to be negative and significant at 1%. Similarly, in the risk model, the coefficient of *Div_Index_St* remains negative and significant, and that of distance continues to be positive and significant. The coefficient estimates are also similar in magnitude to those obtained from the OLS procedure (Table 3). These findings suggest that the positive (negative) association between geographic diversification and value (risk), and the negative (positive) association between distance and firm value (risk), are robust to correction for serial correlation and the employment of the Fama–MacBeth procedure. The impacts of most control variables remain qualitatively similar. The MCB dummy becomes positive and significant at the 1% level, suggesting that the previous insignificant result may be due to serial correlation.

TABLE 6

Orthogonized Results on Firm Value and Risk

	Firm value			
	ResDiv_Index_St	*ResDiv_Index_MSA*		Total risk
Intercept	2.0070***	1.8548***	Intercept	0.0797***
	(11.62)	(11.22)		(8.14)
ResDiv_Index	0.2082***	0.1629***	*ResDiv_Index*	−0.0071***
	(4.89)	(4.54)		(−2.97)
LogDistance_Br	−0.0444***	−0.0531***	*LogDistance_Br*	0.0000
	(−4.27)	(−5.34)		(0.07)
ROA	7.4884***	6.7773***	*MktRisk*	0.6892***
	(3.69)	(3.35)		(16.89)
Risk	0.3068	0.2041	*Size*	−0.0004
	(0.95)	(0.63)		(−0.82)
Size	−0.0276***	−0.0196**	*Riskcapital*	−0.0647***
	(−2.72)	(−2.05)		(−3.99)
Riskcapital	−0.7725***	−0.6723**	*Liquidity*	−0.0094*
	(−2.61)	(−2.27)		(−1.80)
Liquidity	−0.6300***	−0.6057***	*Netcharge-off*	0.9342***
	(−6.70)	(−6.44)		(9.12)
Netcharge-off	−0.4979	−0.2611	*OBSA*	0.0003
	(−0.27)	(−0.14)		(0.94)
OBSA	−0.0015	0.0007	*Trend*	−0.0013***
	(−0.30)	(0.14)		(−5.83)
Trend	0.0080**	0.0135***	*MCB Dummy*	−0.0027
	(2.19)	(3.50)		(−0.86)
MCB Dummy	0.0610	0.0987*	*M&A Dummy*	−0.0051***
	(1.12)	(1.84)		(−4.19)
M&A Dummy	0.0966***	0.0886***		
	(4.44)	(4.08)		
FR Dummy	Yes	Yes	*FR Dummy*	Yes
No. of obs.	2,843	2,843	No. of obs.	2,843
Adj. R^2	0.0727	0.0717	Adj. R^2	0.1955
F-value	10.69	10.54	F-value	32.39

Note: This table reports the regression results on how geographic diversification index orthogonalized against distance (*ResDiv_Index_St* and *ResDiv_Index_MSA*), and distance (*LogDistance_Br*) affect firm value and risk. Firm value is proxied by Tobin's Q. Total risk is proxied by standard deviations of stock return. *M&A Dummy* is a dummy variable for mergers and acquisitions, takes the unit value if the BHC undertook M&A during the sample period, zero otherwise. *FR Dummy* is a set of 11 Federal Reserve district dummies. All other variables are defined as in Table 1. t-statistics are reported in parentheses below the coefficient estimates. ***, **, * represent statistical significance at 1%, 5%, and 10%, respectively.

TABLE 7

SIMULTANEOUS EQUATION RESULTS: 2SLS TECHNIQUE

	Firm value			
	Div_Index_St	*Div_Index_MSA*		Total risk
Intercept	2.3064*** (10.83)	2.2929*** (10.82)	Intercept	0.0765*** (7.48)
Div_Index	0.1958*** (4.51)	0.1674*** (4.59)	*Div_Index_St*	−0.0071*** (−2.97)
LogDistBHC_Br	−0.0856*** (−7.84)	−0.0967*** (−7.90)	*LogDistance_Br*	0.0015*** (2.45)
ROA	6.1530*** (2.84)	4.7050** (2.17)	*MktRisk*	0.6892*** (16.89)
Risk	−1.4858 (−1.43)	−2.7032*** (−2.61)	*Size*	−0.0005 (−0.82)
Size	−0.0273*** (−2.68)	−0.0217** (−2.23)	*Riskcapital*	−0.0647*** (−3.99)
Riskcapital	−0.8736*** (−2.88)	−0.8455*** (−2.76)	*Liquidity*	−0.0094* (−1.80)
Liquidity	−0.6448*** (−6.79)	−0.6327*** (−6.60)	*Netcharge-off*	0.9341*** (9.12)
Netcharge-off	1.1390 (0.55)	2.3505 (1.13)	*OBSA*	0.0003 (0.94)
OBSA	−0.0013 (−0.24)	0.0013 (0.25)	*Trend*	−0.0013*** (−5.83)
Trend	0.0029 (0.62)	0.0054 (1.13)	*MCB dummy*	−0.0027 (−0.86)
MCB dummy	0.0555 (1.01)	0.0843 (1.54)	*M&A dummy*	−0.0051*** (−4.19)
M&A dummy	0.0892*** (4.01)	0.0774*** (3.46)		
FR Dummy	Yes	Yes	*FR Dummy*	Yes
No. of obs.	2,843	2,843	No. of obs.	2,843
F-value	10.63	10.52	F-value	32.39
Adj. R^2	0.0723	0.0715	Adj. R^2	0.1955

NOTE: This table reports the regression results under the simultaneous equation framework on how the geographic diversification index and distance affect firm value and risk. Firm value is proxied by Tobin's Q. Total risk is proxied by standard deviations of stock return. *M&A Dummy* is a dummy variable for mergers and acquisitions, takes the unit value if the BHC undertook M&A during the sample period, zero otherwise. *FR Dummy* is a set of 11 Federal Reserve district dummies. All other variables are defined as in Table 1. t-statistics are reported in parentheses below the coefficient estimates. ***, **, * represent statistical significance at 1%, 5%, and 10%, respectively.

Since geographic diversification is generally accompanied by an increase in BHC_branch distance, these two variables tend to be correlated. Collinearity precludes complete separation of the effects due to diversification and distance and distorts the tests of hypotheses. A check on conditional index numbers for the basic model reveals, however, that these index numbers are low (variance inflation factor is less than 3), and hence, collinearity is not a significant problem. To alleviate any residual multicollinearity, we orthogonalize the geographic diversification variable against the distance variable and use the residuals as the measure of geographic diversification. Results are reported in Table 6. In this model, the residual geographic diversification (diversification purified from the distance effect) is still associated with firm-value enhancement, and distance continues to be negatively associated with value. These results suggest that even when the effect of distance is accounted for, geographic diversification is associated with a value premium. In the risk model, the negative association between risk and geographic diversification continues to hold, though the positive association between risk and distance dissipates as the coefficient of distance in the total risk equation becomes insignificant.[14]

4. CONCLUSIONS

Since geographic diversification generally coincides with an increase in BHC_branch/subsidiary distance, it is crucial to control for distance when assessing the association between geographic diversification and firm value and risk. This task is accomplished here. We introduce a distance-adjusted deposit dispersion index across states/MSAs as a new measure of geographic diversification and investigate the association between geographic diversification, BHC value and risk using this measure and accounting for distance.

Several interesting results are obtained. First, geographic diversification is associated with a significant value premium and a reduction in total risk. Second, increased distance between BHC and its branches is inversely related to firm value and directly related to risk. Third, the association between firm value and geographic diversification is more pronounced for expansion into more remote areas (MSAs). Fourth, when the MSA-based measure of diversification is used, increased distance is associated with less value destruction at higher levels of diversification. Increased distance also works to counter the risk-reduction effect of geographic diversification. Specifically, the association between increased distance and risk is stronger for BHCs that are already highly diversified because they would obtain little gain from further diversification but would be subject to higher risk due to distance-related factors.

The positive (negative) association between geographic diversification and value (risk) sheds some light on the motivation for bank geographic expansion and geographically diversifying M&As observed in the recent decades. The results also suggest that BHCs need to take into account the effect of distance on firm value and risk in their decisions concerning the optimal extent of geographic expansion.

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14. To account for the endogeneity of total risk in the value model, we also estimated (5A–5B) as a system using the two-stage least squares (2SLS) technique. Results on diversification and distance continue to hold (Table 7).

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