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Abstract

Banking activities differ in their uniqueness. Common activities are performed by all banks but unique activities by few banks. We find that banks performing more unique activities exhibit higher profitability and lower risk, controlling for bank size, diversification, and other key characteristics. We document that the mechanism behind this effect is product differentiation. Furthermore, we find that banks' sensitivity to systemic risk displays an inversely U-shaped relation with activity uniqueness. Activity uniqueness in pre-crisis times has a positive impact on bank performance during the 2007-09 financial crisis and banks with intermediate pre-crisis activity uniqueness show the highest bailout probability during the crisis. We interpret the evidence on uniqueness in analogy to recent theories showing that systemic diversity promotes financial stability.

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I. Introduction

Banking comprises many different activities that can be categorized in various ways. In this paper, we focus on a dimension that is likely to be important but that has been overlooked in the literature: the uniqueness of banking activities. Some activities are common, they are performed by all banks and relate to basic financial intermediation functions such as deposit taking, lending and payment services. Other activities are unique and performed by few banks. For example, commercial loans are relatively common banking activities, while commodity derivatives are relatively unique. Recently, the relevance of uniqueness in banking has been acknowledged by bank regulators as the "lack of substitutability" has become part of the definition and regulation of systemically important banks (Basel Committee for Banking Supervision, 2013; International Monetary Fund, Bank for International Settlements and Financial Stability Board, 2009). However, there is no direct evidence on the uniqueness of banking activities and its potential impact on bank profitability and risk, neither in general nor for the global financial crisis of 2007-09.

In this paper, we set out to fill this gap and investigate whether and how the uniqueness of banking activities affects bank performance and systemic risk. There are at least two theories suggesting such links. First, banks that perform unique activities for which there are no substitutes in the system might enjoy an implicit "too-important-to-fail" subsidy. This is why regulators consider the "lack of substitutability" as a criterion for systemically important banks, as mentioned beforehand. Under this view, activity uniqueness should increase systemic risk. Second, uniqueness might be a strategy for banks to differentiate themselves from others. Uniqueness originates from financial innovation, expertise, or other product-market strategies that cannot be replicated by competitors (e.g., Foucault and Frésard, 2015; Hoberg and Phillips, 2014; Thakor, 2012; Boot and Thakor, 2000; Barney, 1986). These strategies generate market power, increase short-term profits and market value, and reduce bank risk.

We empirically test the effects of uniqueness of banking activities using a novel measure. We collect information from annual reports of 3,050 U.S. bank holding companies from the period 1986-2013 (Y-9C and Y-9LP/SP forms). We identify a set of activities for which there is sufficient variation across banks. For these activities we compute a yearly uniqueness score, defined as one minus the ratio of the number of banks performing a specific activity relative to the total number of banks in the market. We then aggregate these uniqueness scores at the bank-level by weighting them by the relative volume of each activity as a share of total assets. This measure is transparent and can be easily replicated. It takes high values for banks that perform mainly unique activities and low values for those that perform mainly common activities.

We establish two main results. First, banks that perform more unique activities exhibit significantly higher profitability and lower risk than other banks. We obtain these results from panel data regressions for the full sample period. In the baseline analysis, we isolate the effect of activity uniqueness by controlling for bank size, various dimensions of diversification, key financial characteristics, bank fixed effects and time fixed effects.

In additional analyses, we address the potential endogeneity between activity uniqueness and bank performance in two ways. We estimate instrumental variable regression models, in which we consider peer activity uniqueness as instrument for individual bank activity uniqueness.[1] Furthermore, we consider the Gramm-Leach-Bliley (GLB) Act of 1999, which allowed U.S. banks to engage in activities other than commercial banking, as a source of exogenous variation. Our strategy relies on the identifying assumption that the GLB Act affected more strongly the banks that were previously active in non-commercial banking,

[1] Peer characteristics at the country, industry or state level have been used as instruments for potentially endogenous individual characteristics in various studies (e.g., Demirgüç-Kunt and Detragiache, 2002; Laeven and Levine, 2009; Lin et al. 2011; Suarez et al. 2013; Liu et al. 2014; Khanna et al. 2015; Ferrell et al. 2016). In our setting, we take the average (or size-weighted average) activity uniqueness of all other banks headquartered in the same state as instrument. In addition, we take peer activity uniqueness of banks from the same decile of the yearly bank size distribution at the national level as an alternative instrument and obtain similar results (e.g., Ellul and Yerramilli, 2013).

which is characterized by more unique and innovative activities. We identify these banks as BHCs with Section 20 subsidiaries from 1999, following Cornett, Ors and Tehranian (2002). The instrumental variable analysis and the analysis around the GLB Act confirm the results from the panel data regressions for the whole sample period. We further show that product differentiation is an important mechanism that explains the positive performance impact of activity uniqueness.

Second, we find that activity uniqueness exhibits a significant and inversely U-shaped relation with systemic risk. The results are similar for delta conditional value-at-risk (Adrian and Brunnermeier, 2016) and the marginal expected shortfall (Acharya et al., 2016), which are the most frequently used measures of systemic risk in the literature (Benoit et al., 2017). Hence, banks that perform many common activities exhibit a low sensitivity to systemic risk, similar to banks that perform many unique activities. Banks that perform a mix of common and unique activities are the most vulnerable ones. We further find that banks that display higher activity uniqueness in pre-crisis times exhibit higher profitability and lower risk during the 2007-09 financial crisis. These findings confirm the panel data results for the whole sample period. Finally, we show that banks' bailout probability under TARP/CPP displays an inversely U-shaped with pre-crisis activity uniqueness. The results are consistent with recent theoretical research showing that there is a diversity-diversification trade-off for the overall level of systemic risk. Diversity that arises from heterogeneity in banks' activity mix can reduce the risk system failure and increase welfare (Wagner 2011, 2010). In analogy to diversity in the system, activity uniqueness at the bank level reduces banks' sensitivity to systemic shocks if it exceeds a certain level.

To the best of our knowledge, there is no other study that has directly examined the uniqueness of banking activities yet. We seek to contribute to three strands of literature. We extend and complement earlier research on diversification and specialization in banking (e.g.,

Demsetz and Strahan, 1997; Winton, 1999; Stiroh, 2004; Acharya, Hasan and Saunders, 2006; Stiroh, 2006; Stiroh and Rumble, 2006; Demirgüç-Kunt and Huizinga, 2010; Apergis, 2014; Cai, Eidam, Saunders and Steffen, 2017). These studies are based on bank financial statements or lending data and examine the diversification of asset structure, geographic expansion, revenue composition, funding sources and loan syndication networks. Most of the studies find that bank diversification neither reduces risk nor increases the risk-adjusted return. A subset of this literature examines the diversification discount for financial conglomerates (e.g., Laeven and Levine 2007; Schmidt and Walter 2009; Van Lelyveld and Knot 2009; Klein and Saidenberg 2010). These studies confirm the diversification discount, which is consistent with the overall evidence on the effects of bank diversification. One exception is geographic diversification. In a recent study, Goetz, Laeven and Levine (2016) show that geographic expansion of US banks has on net a risk-reducing effect because it lowers their exposure to idiosyncratic local risks. We note that these studies do not differentiate common and unique activities; they focus on the number of activities per bank and examine how even the distribution of these activities is. Our paper considers the uniqueness of bank activities and our results show that diversifying into *unique* activities improves banks' risk-adjusted performance

Moreover, our study relates to the literature on financial innovation and expertise in banking. Tufano (1989) shows that innovative investment banks manage to retain a substantial market share in the new investments in developing new products despite entry by competitors because they can enjoy lower costs of trading, underwriting and marketing. Thakor (2012) develops a model that identifies a trade-off between positive profits on innovative loans (zero profits on standard loans) and the risk of investor withdrawal at an interim stage if they disagree about the value of the innovative loans. The difference between innovative and standard loans in that model is similar to the difference between high and low uniqueness in our study. Furthermore, uniqueness may originate from other factors such as expertise. Boot and Thakor

(2000) show that sector expertise shields relationship lenders against competition from transaction lenders and capital markets. Almazan (2002) shows that increasing bank expertise decreases the cost of monitoring, thus helping banks to perform their intermediation function more efficiently. Our result of a positive relationship between activity uniqueness and performance is consistent with this literature.

Furthermore, our study contributes to the recent literature on financial stability and systemic risk. Theoretical work on financial stability highlights a trade-off between diversity and diversification in banking (Wagner 2011, 2010). This theory shows that diversification reduces idiosyncratic risk in banking because all banks hold the same fully diversified market portfolio. If a systemic shock occurs, however, banks have to liquidate their identical assets at the same time, generating a fire-sale externality that lowers welfare. Therefore, some degree of diversity in banks' asset portfolios is socially optimal. At the same time, the empirical literature on financial stability has developed and applied measures of systemic risk (e.g., Acharya et al., 2016; Adrian and Brunnermeier, 2016; Berger, Roman and Sedunov, 2016). We employ the most popular measures to document a significant and inversely U-shaped relation between banks' sensitivity to systemic risk and their activity uniqueness. Banks that are "stuck in the middle" in terms of their activity uniqueness are the ones that are most sensitive to systemic shocks.

Our study has several practical and policy implications. For practitioners, our results indicate significant benefits of uniqueness at the bank level and the systemic level. For regulators and policy makers, our results suggest promoting financial innovation and expertise, and, at the same time, to understand and oversee the corresponding risks. The diversity of the financial system will increase if each bank maximizes its own strength and expertise by engaging in different unique activities.

The remainder of the paper is organized as follows. In Section II we develop the economic rationale, propose a set of hypotheses, and explain the empirical measurement. In Section III we describe the data and variables. In Section IV we analyze the effects of activity uniqueness on bank performance and possible mechanisms. In Section V we analyze the effects of activity uniqueness on systemic risk, activity uniqueness during the financial crisis, and its relevance for bank bailouts. Section VI concludes.

II. Economic Rationale, Hypotheses and Measurement

A. Economic Rationale and Hypotheses

The economic rationale why the uniqueness banking activities may affect bank profitability and risk is related to the nature of the activity, its production process and the resulting market structure. Uniqueness can originate from financial innovation, expertise, or other product-market strategies that cannot be replicated by competitors (e.g., Foucault and Frésard, 2015; Hoberg and Phillips, 2014; Thakor, 2012; Barney, 1986). Institutional or regulatory entry barriers (e.g., bank charter, banking license, deposit insurance) and fixed cost-intense quasi natural monopolies (e.g., payment networks, clearing systems, trading platforms) are additional reasons for uniqueness. All these reasons create market power due to differentiation and thereby increase bank profits, the well-known "early mover advantage" (Tufano, 1989).

HYPOTHESIS 1: *Activity uniqueness increases individual bank profitability.*

The uniqueness of banking activities might also influence individual bank risk. Higher profitability due to activity uniqueness may create a capital buffer that helps banks to absorb negative shocks. Furthermore, it might lower banks' return volatility (e.g., Allen and Gale, 2004; Keeley, 1990). Finally, activity uniqueness might reduce uncertainty about future performance (Gaspar, Massa and Matos, 2006).

HYPOTHESIS 2: *Activity uniqueness reduces individual bank risk.*

There are also economic reasons why the uniqueness of banking activities may influence systemic risk. Banks that perform activities for which there are no substitutes might enjoy an implicit "too-important-to-fail" subsidy. That is why regulators consider "substitutability" as one of the criteria to define systemically important banks (Basel Committee for Banking Supervision, 2013; International Monetary Fund, Bank for International Settlements and Financial Stability Board, 2009). This reasoning predicts a positive relation between activity uniqueness and systemic risk. However, recent theoretical work on financial stability suggests that there is a diversity-diversification trade-off that determines the overall level of systemic risk (Wagner 2011, 2010). Activity uniqueness may increase the risk of joint liquidation because of no perfect diversification, but it may also increase the liquidation proceeds in case of liquidation. We expect that activity uniqueness likely increases systemic risk, but at a certain point, this relation might reverse and lower systemic risk in analogy to the diversity benefits at the system level. This reasoning predicts a non-monotonic overall relation.

HYPOTHESIS 3: *Activity uniqueness has a non-monotonic effect on systemic risk.*

B. Empirical Measurement of Activity Uniqueness

To measure the uniqueness of banking activities empirically we proceed as follows. We define a banking activity as any of the items of the FR_Y-9C Consolidated Financial Statements of Bank Holding Companies (BHCs) as shown in Appendix A1. This list excludes activities performed by all banks, i.e., items that are present in the balance sheet of all BHCs in all years of the sample period (e.g., bank equity).[2] Second, we define the *Uniqueness score* for each activity *a* in year *t* as:

$$Uniqueness\ score_{a,t} = 1 - \frac{\sum_{i=1}^{N_t} I_{i,a,t}}{N_t} \quad (1)$$

[2] Our results remain robust if we remove insurance, investment banking, venture capital, and fiduciary activities.

The indicator $I_{i,a,t}$ takes the value one if bank *i* carries out the activity *a* in year *t*. The *Uniqueness score* equals one minus the ratio of the number of banks performing the activity *a* relative to the total number of banks in year *t*. The *Uniqueness score* is a time-varying activity-specific variable for the whole U.S. banking system. Third, we obtain our final measure *Activity uniqueness* by aggregating *Uniqueness score* at the bank level in the following way:

$$Activity\ uniqueness_{i,t} = \sum_{a=1}^{N_i} Uniqueness\ score_{a,t} \frac{Volume_{i,a,t}}{Total\ assets_{i,t}} \quad (2)$$

For each bank *i* and year *t*, *Activity uniqueness* equals to the sum of the *Uniqueness score* weighted by the corresponding activity volumes relative to total assets of the bank.[3] We normalize the measure by its maximum in the sample to obtain values in the range from zero to one. The measure *Activity uniqueness* is straightforward, transparent and can be easily replicated. It takes high values for banks that perform unique activities and low values for those that perform common activities.

III. Data and Variables

We base our analysis on annual data from both consolidated and parent-only financial statements of U.S. bank holding companies (BHC) (Y-9C and Y-9LP/SP). Our data span the period 1986 from 2013. We exclude banks with majority foreign ownership and consider the BHCs at their highest hierarchy position since we assume the strategic business decisions are

[3] Some of the activities exhibit activity volumes that exceed total assets. For example, a bank's derivatives volume may be larger than its total assets. For these activities, we cap the ratios at one to avoid distortions due to extreme values. *Activity uniqueness* differs from the equally weighted average of the uniqueness of banking activities. The reason is that we include off-balance sheet activities and exclude other activities reported in the balance sheet, implying that the weights do not add up to one.

made at the parent level rather than the subsidiary level. We further exclude observations with missing values on key variables. The final sample comprises 3,050 BHCs with 29,673 bank-year observations.

In our analysis, we control for various bank characteristics that have been shown to affect bank performance. In addition, because *Activity uniqueness* increases in the number of banking activities, we control for various dimensions of diversification that have been considered in the related literature. First, we add the ratio *Non-interest income/Total operating income* to control for effects due to revenue diversification. Second, we control for effects due to geographic expansion. For ease of interpretation of our results, we define *Geographic diversification* as one minus the HHI of deposit concentration so that higher values imply higher diversification. Third, we control for *Activity HHI*, which is the bank-level Herfindahl-Hirschman Index (HHI) across banking activities. Since higher values of the HHI indicate low diversification, we express *Activity HHI* as its complement to one. Fourth, we control for *Organizational structure*, which is the logarithm of total number of bank and nonbank subsidiaries. Table 1 presents the main variables, their definitions and summary statistics.

(Insert Table 1 here)

Our main test variable *Activity uniqueness* displays a mean and median of 0.63 and a standard deviation of 0.06. Considering the performance variables, we observe a mean of 0.86 for *ROA* and 3.19 for the *Log Z-Score*, which is consistent with related studies.

Appendix A2 presents a correlation matrix of the main variables. It shows that *Activity uniqueness* exhibits a moderate positive correlation with bank size (*Log Total Assets*; 0.3076), revenue diversification (*Non-Interest Income/Total Operating Income*, 0.2530) and

Geographic diversification (0.1733). Hence, *Activity uniqueness* is associated with diversification measures, but the latter explain only part of its variation.

Appendix A3 provides a list of the TOP 30 banks by *Activity uniqueness* in the year 2013. We report banks' activity uniqueness, size, number of activities, and the average activity volume. Goldman Sachs Group is ranked first, followed by substantially larger BHCs such as Citigroup, JP Morgan Chase and Bank of America. Note that Wells Fargo, American International and Sun Trust display lower ranks in activity uniqueness, although they are on relatively high ranks in bank size.

IV. Activity Uniqueness and Performance

A. Baseline Analysis

In the baseline analysis, we estimate panel data regressions to investigate the effects of the uniqueness of banking activities on bank performance, as measured by profitability (*ROA*) and risk (*Log Z-score*). The regression model includes lags of key bank characteristics to isolate the effect of uniqueness from other variables. Specifically, we add bank size (*Log Total Assets*), leverage (*Equity/Total Assets*), liquidity (*Liquid assets/Total assets*), and efficiency (*Cost to income*). We also add bank and time fixed effects and control for various dimensions of diversification. Table 2 reports the results.

(Insert Table 2 here)

The coefficients of *Activity uniqueness* are positive and statistically significant at least at the 5%-level in all regressions. Based on the results shown in column (1) and (6), a one standard deviation increase in *Activity uniqueness* corresponds to a 2.7% higher ROA and a 1% higher Z-score, relative to the sample mean of these variables. In columns (2) - (5) and columns (7) -

(10), we add bank fixed effects. As a result, the magnitude of the coefficients of *Activity uniqueness* changes, but their statistical significance remains unchanged. This suggests that time-invariant unobservable bank-specific heterogeneity, such as institutional risk culture (e.g., Fahlenbrach, Prilmeier and Stulz, 2012), may affect bank performance but does not eliminate the effect of *Activity uniqueness*.

We control for potential effects from various types of diversification, which may increase bank profitability and/or reduce risk. We consider revenue diversification, as measured by *Non-Interest Income/Total Operating Income,* in all our specifications. The coefficient on this ratio is positive and statistically significant in both the ROA and Z-score regressions, suggesting benefits of diversification in terms of risk-adjusted performance. In columns (3) - (5) and columns (8) - (10), we add additional diversification measures. *Activity HHI* and *Geographic diversification* do not have significant impact on bank performance, while *Organizational structure* has positive and significant impact on both bank profitability and Z-score. Most importantly, the coefficients of *Activity Uniqueness* remain unchanged.

In an additional (unreported) analysis, we consider only commercial banking activities, excluding investment banking, insurance, venture capital and fiduciary activities. The motivation for this analysis is that we measure activity uniqueness based on the number of *banks* but not on the number of *firms* performing an activity. Hence, the measure does not capture that certain activities are offered by non-banks. This sub-sample analysis confirms our baseline results.

Overall, our baseline results show that the uniqueness of banking activities improves banks' risk-adjusted performance. This finding is consistent with our Hypotheses 1 and 2 and the view that uniqueness is a strategy for banks to differentiate themselves from competitors, creating value and reducing risk. These results are consistent with the literature on product

differentiation and uniqueness (e.g., Barney, 1986; Hoberg and Phillips, 2014; Foucault and Frésard, 2015).

B. Instrumental Variable Analysis

The baseline results show that banks performing unique activities exhibit higher profitability and lower risk. However, there might be concerns about endogeneity. For example, higher uniqueness and better performance might be the result of an underlying bank-specific profitability trend. Performance might be persistent and, at the same time, profitable banks might find it optimal to invest in unique activities. Hence, omitting such bank-specific types of trends would bias the estimation.

In this section, we employ an instrumental variable approach to mitigate these endogeneity concerns. We consider instruments using data from peers, which is a common approach to deal with endogeneity problems. Aggregate or average peer characteristics have been frequently used as instruments when individual firm characteristics are potentially endogenous with the dependent variables. For example, many studies in financial economics take average industry characteristics as instruments for individual firm characteristics (e.g., Lin et al. 2011; Suarez et al. 2013; Liu et al. 2014; Khanna et al. 2015; Ferrell et al. 2016). In addition, there are studies that consider average country characteristics as instruments for individual country characteristics (e.g., Demirgüç-Kunt and Detragiache, 2002) or average country-industry characteristics as instruments for individual bank characteristics (Laeven and Levine, 2009).

Specifically, we consider *Peer activity uniqueness per state*, calculated yearly and based on data from all other banks headquartered in the same state. This instrument is exogenously determined by all other banks in the same headquarter state and significantly correlated with the potentially endogenous individual *Activity uniqueness*. Moreover, *Peer activity uniqueness*

per state is not correlated with individual bank omitted variables that might drive the choice to expand into new activities, suggesting that the exclusion restriction is satisfied.

The second instrument is the *Peer size-weighted activity uniqueness per state*, defined as the bank size-weighted peer activity uniqueness of all other banks headquartered in the same state. It is the same instrument as the first one, except that we additionally add bank size weights because bank size might drive activity uniqueness as much as the headquarters state.

The third instrument is motivated by the study of Ellul and Yerramilli (2013). We take the average activity uniqueness of all other banks in the same bank size decile of the nationwide bank size distribution as instrument, which is *Peer activity uniqueness in the same size decile*. We assume that banks compete with others of similar size at the national level. We expect that under such peer pressure, a higher level of activity uniqueness of peer banks induces banks increase its activity uniqueness, while the peer average activity uniqueness does not have a direct impact on bank profitability and risk.

Table 3 reports the results from the instrumental variable regressions. For each of the three instruments, we report the first and second stage regression results, using the two-stage-least squares estimator.

(Insert Table 3 here)

The first stage results are consistent and show a strong correlation between the instruments and the potentially endogenous bank-specific variable *Activity uniqueness*. The coefficient of Peer a*ctivity uniqueness per state* is positive and statistically significant (column 1), indicating that peer activity uniqueness is not a weak instrument. Moreover, the coefficients of the alternative instruments in columns (4) and (7) are positive and statistically significant, indicating also positive correlation with bank's *Activity uniqueness*. We note that in the F-test,

the p-value reported at the bottom of Table 3 strongly rejects the hypothesis that the excluded instruments are zero, confirming the validity of the instruments.

The second stage regressions show positive and statistically significant coefficients of the instrumented bank-specific *Activity Uniqueness*. Consistent with the baseline results, the uniqueness of banking activities improves risk-adjusted performance by increasing *ROA* and *Log Z-Score* (column 2-3; column 5-6; and column 8-9). We note that the coefficients in these IV regressions are larger than the coefficients in the baseline analysis reported in Table 2, indicating that omitted variables bias our estimates downwards (Rajan and Subramanian, 2008). Our estimated coefficients imply that a one standard deviation increase in *Activity Uniqueness* increases the *ROA* by 34% and increase the *Log Z-score*, by 4.1% relative to the sample mean of these variables.

In sum, the instrumental variable regressions demonstrate a positive and statistically significant effect of activity uniqueness on bank risk-adjusted performance, confirming our baseline results from Table 2.

C. The Impact of the Gramm-Leach-Bliley Act

In the next step, we investigate the relation between changes in uniqueness and changes in bank performance, using the Gramm-Leach-Bliley Act of 1999 (GLB) as a source of exogenous variation. The GLB Act repealed the Glass-Steagall (GS) Act of 1933, which required banks to engage only in activities closely related to commercial banking. Under the new rules, banks could establish financial holding companies, combining commercial banking, investment banking, and certain other activities. Hence, not only did the GLB Act make it possible for banks to grow, but also to engage in more innovative, sophisticated and thus unique activities.

Since the GLB Act applied to all U.S. banks, our empirical analysis requires variation at the bank level. We hypothesize that the restrictions of the GS Act were more binding for banks

that were already active to some extent in non-commercial banking before the GLB act. These banks most likely desired to expand their scale and scope of non-commercial banking, but they were not allowed to do so. This reasoning implies that the enactment of the GLB Act should have induced these banks to engage more in new activities than other banks. Empirically, we identify these banks using information on BHCs with Section 20 subsidiaries before the year 1999, following Cornett, Ors and Tehranian (2002). Banks with Section 20 subsidiaries were already active in non-commercial banking, but both the scale and scope of these activities was limited because of a 25% revenue cap. Hence, our empirical strategy relies on the higher sensitivity of Section 20 banks versus Non-Section 20 BHCs to the enactment of the GLB Act.

In the first model, we compare the Section 20 BHCs with all other BHCs using the full sample. In the second model, we match the Section 20 BHCs with a group of other banks from the same year and size decile using a vector of key bank variables to avoid possible biases from time and bank size effects. The bank-specific matching variables are bank size, equity ratio, liquidity ratio, non-interest income to total assets ratio and cost-to-income ratio. These restrictions help to reduce an omitted variable bias, an approach similar to blocking in a randomized experiment. We then look for each Section 20 BHC for another BHC with the closest (lowest absolute value) difference in the probability estimate. The procedure is carried out without replacement.[4]

We first examine the effect of the GLB Act on the uniqueness of banking activities, and then on bank profitability and risk. Our main test variable is the interaction term between the dummy variables *Section 20 BHCs* and *PostGLB,* which is an indicator variable that equals one for Section 20 BHCs after year 1999. A positive coefficient on this variable would indicate that Section 20 BHCs improve their performance more than Non-Section 20 BHCs in the post-GLB

[4] Although the timing of a BHC to set up its first section 20 subsidiary varies among different BHCs, we consider the Section 20 BHCs as bank fixed variable. We are interested in measuring BHCs' revealed preference to expand their activities in the pre-GLB times, not the precise timing.

period, which would be consistent with the results from the previous sections. We include time fixed effects, bank fixed effects and the same control variables as in previous regression models. Table 4 reports the results.

(Insert Table 4 here)

In Panel A of Table 4, the coefficient on the interaction between *Section 20 BHCs* and *PostGLB* is positive and statistically significant in all regressions, regardless of whether we use the full or matched samples. This result suggests that the *Section 20* banks, relative to non-section 20 banks, exhibit a significantly higher activity uniqueness (columns 1 and 4), higher profitability and lower risk after the GLB Act of 1999 (columns 2, 3, 5 and 6). We note that our estimating equation does not include the variables *Section 20 BHCs* and *PostGLB* separately, because these two dummies are absorbed by bank and time fixed effects.

In Panel B of Table 4, we consider the variable *Large* (top 5% banks in terms of total assets)[5] as an alternative proxy to identify the banks who are most sensitive to the GLB act. Consistent with the results from Panel A, we find that the uniqueness of activities increased for large banks relative to the small banks (column 1). Moreover, large banks improve their performance more than their smaller counterparts in the post-GLB period (columns 2 and 3). These findings complement the evidence on the positive stock market reaction of large U.S. banks to the announcement of the Gramm-Leach-Bliley Act of 1999 and the official G-SIBs designation of banks after the financial crisis (e.g., Geyfman and Yeager 2009; Moenninghoff, Ongena and Wieandt, 2015).

The findings indicate that the GLB Act of 1999 led to an increase the uniqueness of activities of Section 20 BHCs (large banks), relative to their Non-Section 20 (small banks)

[5] In robustness tests, we consider various other bank size thresholds. The results are similar.

peers, as well as an improvement in risk-adjusted performance. These results confirm those from the baseline and instrumental variable analyses and provide further evidence in favor of Hypotheses 1 and 2.

D. Mechanisms

We have shown that activity uniqueness has a significantly positive impact on bank performance. We now investigate possible mechanisms that explain this finding. Theory suggests that activity uniqueness is associated with product differentiation as in Sutton (1991) and/or with productivity as in Grossman and Helpman (1991) and Aghion and Howitt (1992). Both mechanisms are important as they related to the economic drivers such as innovation, expertise and natural monopolies. We note that they do not have to be mutually exclusive.

We consider a situation where bank competition increases to examine which mechanism prevails. The setup is similar to the study of Hombert and Matray (2017). The reasoning is that, while higher product differentiation and higher productivity lead to an unconditional increase in performance, they have opposite effects on performance conditional on an increase in competition. In such situation, the marginal effect of higher product differentiation is positive, while the marginal effect of higher productivity is negative.

We consider the period around the introduction of Interstate Banking and Branching Efficiency Act (IBBEA; Riegle-Neal Act) in 1994, which relaxed geographical restrictions to bank expansion across state borders. This relaxation fostered bank competition by enabling banks to enter into new markets in other states, allowing them to compete with those banks in the local market (e.g., DeYoung, 2010; Rice and Strahan, 2010). We adopt the IBBEA restriction index from Rice and Strahan (2010), which decreases with the extent of interstate branching deregulation restrictions in a state, or increase with an increase in bank competition. We interact the *IBBEA index* with *Activity uniqueness*, and add the interaction and single terms

to our baseline regression models. If the mechanism behind the impact of activity uniqueness on bank performance is product differentiation, we expect a significantly positive coefficient of the interaction term. If the mechanism is productivity, we expect a significantly negative coefficient of the interaction term. Table 5 reports the results.

(Insert Table 5 here)

In column (1) and (2), we find that the coefficients of the interaction between *IBBEA index* and *Activity uniqueness* are significantly positive at the 1% level in the regression for the ROA and the Log Z-score, suggesting that the mechanism behind the positive impact of activity uniqueness on bank performance is product differentiation. These results are not only robust, but they become even stronger when we restrict the sample to the period before 2000 in column (3) and (4). This finding is plausible because during this period the effect of the geographic deregulation on competition was more immediate and stronger. Moreover, this period is free of potential confounding effects on competition due to the Gramm-Leach-Bliley Act of 1999.

The analysis suggests that product differentiation is an important mechanism that explains the positive performance impact of activity uniqueness.

V. Activity Uniqueness and Systemic Risk, the Financial Crisis and Bank Bailouts

In the previous section, we document a robust and positive effect of the uniqueness of banking activities on risk-adjusted performance at the bank level. At the systemic level, however, there are arguments suggesting that banks that perform unique activities might be considered as "too-important-to-fail" and therefore enjoy an implicit subsidy from taxpayers. Because of this reason, one of the criteria to define systemically important banks (Basel Committee for Banking Supervision, 2013) is the lack of substitutes for specific banking activities. In the

remainder, we investigate the effects of activity uniqueness on systemic risk, performance during the financial crisis of 2007-09, and its relevance for bank bailouts.

A. Activity Uniqueness and Systemic Risk

Academics, regulators and the financial industry have made substantial efforts in developing measures of systemic risk. Benoit et al. (2017) survey the literature on systemic risk and point out that no global systemic risk measure captures the full range of theoretical drivers of systemic risks. The marginal expected shortfall (*MES*) of Acharya et al. (2016) and delta-conditional value-at-risk (*ΔCoVaR*) of Adrian and Brunnermeier (2016) have emerged as the most popular measures in the systemic risk literature (Benoit et al., 2017; Löffler and Raupach, 2016).

We employ these measures to examine whether and how the uniqueness of banking activities influences systemic risk. Δ*CoVaR* indicates how much the maximum loss to the whole banking system, measured as value-at-risk, would change when an individual bank becomes financially distressed. *MES* indicates the expected capital shortfall of an individual bank in a crisis, defined as a systemic event when the whole banking system is undercapitalized. There are practical benefits of considering both measures. First, the cross-sectional variation in the MES is largely the same as the market beta of banks' stock returns, while the time-series variation of *ΔCoVaR* is proportional to the value-at-risk of banks' stock returns (Benoit et al., 2017). Second, these two measures are non-dimensional and easy to interpret. Third, Löffler and Raupach (2016) identify situations where individual measures of systemic risk falsely indicate a lower risk contribution of a single institution.

We regress Δ*CoVaR* and *MES*, respectively, on *Activity Uniqueness* controlling for time fixed effects, bank fixed effects, and time-varying bank financial characteristics. These characteristics comprise bank size, bank risk (stock return volatility and leverage), stock return,

and the market to book ratio. It is important to control for bank size to disentangle the "too-important-to-fail" from the "too-big-to fail" hypotheses (e.g., Laeven, Ratnovski and Tong, 2014). Since the computation of systemic risk measures requires stock return data, the analysis in this section is based only on the subsample of listed banks. Table 6 reports the results.

(Insert Table 6 here)

We find a non-monotonic effect of the uniqueness of banking activities on both measures of systemic risk. There is no statistically significant effect when we include only *Activity uniqueness* (columns 1 and 3), but a significant and inversely U-shaped relation when we also add its squared term (columns 2 and 4). The result is robust for both measures of systemic risk and across all model specifications.[6] The estimates imply that the initially positive relation between *Activity uniqueness* and $\Delta CoVaR$ (*MES*) becomes negative for values greater than 0.71 (0.72). For approximately 65% of the observations we observe a positive relation between *Activity uniqueness* and systemic risk (left side of the maximum) and for the remaining 35% a negative relation (right side of the maximum).

These findings contrast the view that connects systemic risk with (the lack of) substitutability. Banks scoring very high in uniqueness, which are the ones performing activities with few substitutes, are not the ones contributing the most to systemic risk. In fact, the relation between systemic risk and uniqueness is non-monotonic and has an interior maximum.

We can explain the finding why systemic risk does not monotonically increase in activity uniqueness in analogy to the theory of Wagner (2011, 2010). He shows that diversity of banks'

[6] We confirm the inversely U-shaped relation in an analysis with tercile dummies for *Activity uniqueness*. We find that the middle tercile has significantly higher sensitivity to both measures of systemic risk than the banks in the lower and upper tercile.

portfolios mitigates the risk of joint asset liquidation. By engaging in sophisticated and unique banking activities, a bank differentiates itself from the average bank and is therefore able to significantly reduce the risk of "fire sales" of the same assets in times of systemic shocks. We find that when activity uniqueness increases banks contribute more to systemic risk. However, at a certain point, characterized by relatively high levels of activity uniqueness, this relation reverses and becomes negative, as diversity reduces the negative externalities of systemic shocks. The non-monotonic relation we document here is consistent with our Hypothesis 3.

B. Activity Uniqueness during the Financial Crisis

We show in the previous section that systemic risk does not monotonically increase with the uniqueness of banking activities, potentially because portfolio diversity reduces negative externalities when a systemic shock realizes. We now provide further evidence to support this reasoning by focusing on the financial crisis of 2007-09, a period of extreme systemic risk realization. If there are benefits of diversity, we should observe an improved risk-adjusted performance during the crisis for banks that perform more unique activities.

We consider a broader set of dependent variables that capture different aspects of performance during the financial crisis of 2007-09. This set includes the average *ROA* and *Log Z-Score* during the 2007-09 crisis; *Failure*, a dummy that equals one if the BHC or any of its subsidiaries failed during the 2007-2009 crisis, and zero otherwise; and *Target*, a dummy that equals one if the BHC or any of its subsidiaries were acquired by another bank/BHC during the 2007-2009 crisis, and zero otherwise. The motivation for the latter is that takeovers were an alternative of rescuing banks in distress.

We estimate cross-sectional OLS and probit models, where we regress the performance variables during the 2007-09 crisis on pre-crisis *Activity uniqueness* measured in values from 2006. Since we cannot include bank and time fixed effects in cross-sectional models, we

control for the same bank variables as in the baseline analysis, using their values from 2006. Table 7 reports the results.

(Insert Table 7 here)

Importantly, the estimation results are consistent with our baseline analysis (Table 2). Banks with a higher pre-crisis *Activity Uniqueness* exhibit a better risk-adjusted performance during the crisis, as the coefficients on both *ROA* and *Log Z-Score* are positive, statistically significant and economically large (columns 1 and 2). Our estimates imply that, if one increases *Activity Uniqueness* by one standard deviation, *ROA* increases by 14.3% and the *Log Z-Score* by 4.4%, relative to the sample mean of these variables. Moreover, the estimates show a negative and statistically significant link between pre-crisis *Activity Uniqueness* and the likelihood of being a takeover target (column 4).

Overall, not only does the uniqueness of banking activities improve risk-adjusted performance on average but also in times of extreme systemic shocks during the 2007-09 financial crisis. This finding is in analogy to theoretical arguments that diversity in the system, which is the flip-side of activity uniqueness at the bank level, has beneficial effects on financial stability.

C. Activity Uniqueness and Bank Bailouts

We further investigate whether and how *Activity uniqueness* has an impact on the likelihood of bank bailouts during the financial crisis of 2007-09. Based on our results on systemic risk and the evidence on the link between systemic risk and bank bailouts during the financial crisis (Berger, Roman and Sedunov 2016), we expect that activity uniqueness has an influence on banks' bailout probability.

For this purpose, we gather information from the US Department of Treasury on banks' participation in the largest governmental bank bailout program, the Capital Purchase Program (CPP) that was part of the broader Troubled Assets Relief Program (TARP) that was announced in October 2008. Based on the list of banks participating in TARP/CPP, we create a dummy variable *TARP* that equals one if a bank received government rescue funds during the financial crisis of 2007-09, and zero otherwise. An important feature of TARP/CPP was that banks had to qualify for government capital injections. The motivation for this requirement was to ensure to help only sufficiently healthy banks so that there is a fair chance that they can recover and pay back the government capital aid. The assessment of banks was confidential and involved internal supervisory CAMELS ratings. We can think of three categories of banks: (i) those who did not apply for TARP because they did not need it (sufficient performance; no significant losses during the crisis), (ii) those who needed support, applied for TARP, and were approved (intermediate performance; losses during the crisis), (iii) those who applied and were rejected and those who did not apply because they expected rejection (lowest performance).

In the following analysis, we investigate whether the three categories above correspond to different levels of activity uniqueness. To this end, we decompose *Activity uniqueness* from the year 2006 in three tercile dummy variables, using the third tercile as omitted reference category. Table 8 report the results.

(Insert Table 8 here)

We find that the coefficient of the second tercile of *Activity uniqueness* is positive and statistically significant at the 5% level. Hence, the coefficient of the second tercile is significantly larger than the omitted reference category (the third tercile), while the coefficient of the first tercile is not statistically different from the third tercile. These regression results

indicate an inversely U-shaped relation between pre-crisis activity uniqueness and banks' bailout probability under TARP/CPP.

This finding ties up our main findings on activity uniqueness, performance and systemic risk in a plausible manner: banks that are located in the middle of the activity uniqueness spectrum display intermediate performance, the highest sensitivity to systemic risk, and the highest likelihood of receiving TARP/CPP funds.

VI. Conclusion

In this paper, we investigate whether and how the uniqueness of banking activities affects bank performance and systemic risk. We base the analysis on data from U.S. bank holding companies spanning the period from 1986 to 2013 and control for bank size, different dimensions of diversification, and other key characteristics.

We obtain two main results. First, banks that perform more unique activities exhibit significantly higher profitability and significantly lower risk. These findings are robust in panel data regression with comprehensive controls, in instrumental variable regressions and in an analysis of changes in activity uniqueness due to the Gramm-Leach-Bliley Act of 1999. Second, banks' sensitivity to systemic risk displays an inversely U-shaped relation with activity uniqueness. This result holds for $\Delta CoVaR$ (Adrian and Brunnermeier, 2016) and the marginal expected shortfall (Acharya et al., 2016). We further show that activity uniqueness did not impair bank performance during the 2007-09 financial crisis. It actually increased profitability and lowered risk, similar to the average effect for 1986-2013. Finally, banks with intermediate uniqueness are the ones that had the highest likelihood of receiving government capital support under the TARP/CPP during the financial crisis.

The evidence we provide is novel and robust, suggesting that uniqueness in banking matters. It has a positive effect on bank performance and a non-monotonic effect on banks'

sensitivity to systemic risk and bailout probability. Our differentiated findings speak against the view that banks that perform unique activities exploit a "too-important-to-fail" subsidy and challenge the conventional view that higher activity uniqueness translates generally into more systematic risk. Financial institutions, regulators and policy makers should take these effects into account when they make decisions and rules that affect the uniqueness of banking activities at the micro and macro level.

Appendix A1: Banking activities

Activities	Uniqueness	Activities	Uniqueness
Core domestic deposit		Non-bank financial activities	
· Demand deposits	0.011	· Investment banking activities	0.805
· Savings deposits	0.012	· Venture capital activities	0.987
· Time deposits below limit	0.013	· Insurance activities	0.974
· Time deposits above limit	0.014	Cross Border Activities	
Other borrowing		· Total deposits in foreign offices	0.935
· Federal Funds purchased	0.868	· Total foreign securities invested	0.835
· Commercial paper	0.946	· Loans to foreign government and institutions	0.955
· Subordinated notes and debentures	0.806	· Loans to banks in foreign countries	0.984
· Other unclassified borrowings	0.000	· Trading assets in foreign offices	0.994
Loans		· Assets in foreign non-bank subsidiary	0.987
· Real estate loans	0.150	· Other foreign loans	0.997
· Commercial loans	0.005	Derivative Activities	
· Individual loans	0.360	· Interest rate contracts	0.998
· Agriculture loans	0.290	· Foreign exchange contracts	0.999
· Loans held for sale	0.584	· Equity contracts	0.975
· Other loans	0.195	· Commodity contracts	0.999
· Lease financing receivable	0.703	· Futures and forwards	0.985
Other bank investments		· Written options	0.860
· Held for maturity security	0.578	· Purchased options	0.915
· Available for sale security	0.294	· Swaps	0.978
· Interest-bearing bank balances	0.161	· Held-for-trading derivatives	0.992
· Federal funds sold	0.718	· Securitized assets	0.969
Fiduciary activities		· Credit derivatives bank as guarantor	0.996
· Fiduciary activities	0.999	· Credit derivatives bank as beneficiary	0.996
Bank commitments		· Structured products	0.998
· Letters of credit	0.380	· Over-the-counter derivatives (OTC)	0.990
· Recourse exposure	0.981		
· Loan commitments	0.978		

Appendix A2: Correlation of main variables

This appendix reports the correlation matrix for main variables. * indicates that the correlation coefficient is statistically significant at least at the 10% level.

	Activity uniqueness	*ROA*	*Log Z*	*Log Total assets*	*Equity/Total assets*	*Liquid assets/Total assets*	*Non-interest income/Total operating income*	*Cost to income*	*Organizational structure*	*Geographical diversification*	*Activity HHI*	*Peer average activity uniqueness per state*	*Peer size-weighted average activity uniqueness per state*
Activity uniqueness	1												
ROA	0.1347*	1											
Log Z	0.0165*	0.4683*	1										
Log Total assets	0.3076*	0.0057	-0.1007*	1									
Equity/Total assets	0.0039	0.4077*	0.4649*	0.0281*	1								
Liquid assets/Total assets	-0.0874*	-0.0019	0.0858*	0.1150*	0.1847*	1							
Non-interest income/Total operating income	0.2530*	0.0912*	-0.0551*	0.3614*	0.0898*	0.2837*	1						
Cost to income	-0.0476*	-0.3434*	-0.1546*	0.0853*	0.0047	0.4124*	0.5491*	1					
Organizational structure	-0.4384*	-0.0039	-0.002	-0.2054*	-0.0647*	0.0359*	-0.1144*	-0.0238*	1				
Geographical diversification	0.1733*	0.0475*	-0.0323*	0.3775*	0.0802*	0.2991*	0.3447*	0.2076*	-0.0460*	1			
Activity HHI	0.0503*	0.0436*	0.0440*	0.2723*	0.0935*	0.2884*	0.1608*	0.2276*	-0.1265*	0.1228*	1		
Peer average activity uniqueness per state	0.3704*	0.2159*	0.1000*	-0.0581*	0.0367*	-0.0941*	0.0108*	-0.1024*	0.0109*	0.0059	0.0291*	1	
Peer size- weighted average activity uniqueness per state	0.3645*	0.2095*	0.0978*	-0.0343*	0.0412*	-0.0897*	0.0112*	-0.0975*	0.0049	0.0167*	0.0302*	0.9951*	1

Appendix A3: Top 30 banks by activity uniqueness

This table reports the top 30 banks in descending order by activity uniqueness in 2013. Bank size is measured in billion US dollar. Number of activity indicates the number of activities per bank from the list of 47 activities shown in Appendix A1.

Name	Rank Activity uniqueness	Rank bank size	Activity uniqueness	Bank size	Number of activities
GOLDMAN SACHS GROUP THE	1	5	0.969	911.60	29
CITIGROUP	2	3	0.965	1880.38	33
JPMORGAN CHASE & CO	3	1	0.964	2415.69	33
BANK OF AMERICA CORPORATION	4	2	0.961	2105.00	32
BANK OF NY MELLON CORP	5	8	0.899	374.31	28
NATIONAL CONSUMER CO-OP BK	6	302	0.898	1.81	16
LOVE SVGS HC	7	611	0.896	0.86	15
WELLS FARGO & CO	8	4	0.886	1527.02	32
DORAL FNCL CORP	9	94	0.879	8.49	16
GENERAL ELEC CAP CORP	10	7	0.875	523.97	28
STATE STREET CORP	11	12	0.874	243.03	21
CAROLINA FC	12	596	0.866	0.88	17
NORTHERN TR CORP	13	21	0.864	102.95	23
AMERI-NATIONAL CORP	14	897	0.858	0.57	16
FRANDSEN FC	15	329	0.855	1.64	15
JOHN DEERE CAP CORP	16	35	0.847	31.68	16
AMERICAN INTL GROUP	17	6	0.844	541.33	22
FIRST HORIZON NAT CORP	18	45	0.838	23.79	22
FRANKLIN RESOURCES	19	61	0.835	15.79	11
MIDLAND FC	20	83	0.832	9.62	15
CENLAR CAP CORP	21	668	0.828	0.78	9
CIT GROUP	22	28	0.825	47.14	25
COMMONWEALTH BSHRS	23	644	0.824	0.82	18
BOK FC	24	37	0.823	27.02	25
SUNTRUST BK	25	14	0.822	175.38	29
PNC FNCL SVC GROUP	26	10	0.818	320.60	30
AMERICAN EXPRESS CO	27	15	0.816	153.39	18
SNBNY HOLD	28	109	0.814	6.67	17
LAURITZEN CORP	29	299	0.814	1.83	19
MAINSOURCE FNCL GRP	30	208	0.813	2.86	17

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Table 1
Summary statistics and variable definitions

This table reports the summary statistics and definitions of the variables used in this paper. All the variables other than *Log Total assets* are winsorized at the 2nd and 98th percentiles of their distributions.

Variable	Obs.	Mean	Medium	Std. Dev.	25th Percentile	75th Percentile	Definitions
Activity uniqueness							
Activity uniqueness	33767	0.63	0.63	0.06	0.60	0.66	The sum of the *Uniqueness score* weighted by the corresponding activity volumes relative to total assets of the bank. The variable is normalized to the range from zero to one.
Bank performance							
ROA	33767	0.86	0.96	0.73	0.64	1.24	Net income divided by total assets in %
Log Z-Score	33767	3.19	3.24	0.87	2.60	3.79	Log value of Z-score, where Z-score is the average bank return on assets (net income divided by total assets) plus bank equity to assets ratio, scaled by the standard deviation of return on assets.
TARP	859	0.29	0.00	0.46	0.00	1.00	Indicator variable which equals one if the banks received government TARP funds during the 2007-09 crisis period, and zero otherwise.
Target	859	0.16	0.00	0.37	0.00	0.00	Indicator variable which equals to one if the BHC has any of its subsidiary acquired by another bank/BHC during the 2007-09 financial crisis period, and zero otherwise.
Failure	859	0.10	0.00	0.30	0.00	0.00	Indicator variable which equals one if the BHC itself or has any of its subsidiary failed during the 2007-09 financial crisis period, and zero otherwise.
Systemic risk							
$\Delta CoVaR$	7028	2.96	2.86	2.69	0.93	4.85	Change in the VaR of the system when the bank is at 99% percentile minus the VaR of the system when the bank is at the 50% percentile.
MES	7024	1.54	1.24	1.66	0.43	2.29	Marginal Expected Shortfall, which is a bank's expected equity loss per dollar in a year conditional on the banking sector experiencing one of its 5% lowest returns in that given year.

Bank control variables							
Log Total assets	33767	13.13	12.86	1.18	12.32	13.57	Log value of total assets in millions of US dollars
Equity/Total assets	33767	8.59	8.35	2.60	6.89	9.97	Equity divided by total assets in %
Liquid assets/Total assets	33767	11.73	2.63	14.05	0.00	22.28	The sum of cash and for sale securities divided by total assets in %
Non-interest income/Total operating income	33767	13.50	11.55	8.51	7.82	16.75	Non-interest income divided by total operating income in %
Cost to income	33767	43.42	41.55	12.37	34.61	50.36	Total operating cost divided by total income in %
Organizational structure	33767	0.76	0.69	0.57	0.69	0.69	Log (1+ total number of bank and nonbank subsidiaries)
Geographical diversification	26250	0.57	0.71	0.35	0.29	0.85	One minus the sum of squares of the ratio of deposits for each county over total deposits of the bank.
Activity HHI	33767	0.76	0.75	0.03	0.14	0.19	Hirschmann-Herfindahl index of concentration of all the banking activities, which is the sum of the squares of the ratio of the volume of each Activity divided by the volume of total Activity of each bank each year.
Stock return	7028	12.10	12.98	34.31	-6.87	34.26	Annual stock return in %
Stock return volatility	7028	2.64	2.21	1.44	1.68	3.09	Annual standard deviation of stock return in %
Market to Book ratio	7028	10.38	8.08	7.66	6.25	11.14	The ratio of market value to book value of equity in %
Leverage	7028	1.54	1.46	0.68	1.07	1.93	Market value of total assets divided by market value of total equity in %
Instrumental variables							
Peer average activity uniqueness per state	33767	0.68	0.68	0.02	0.67	0.70	Average activity uniqueness of all other banks headquartered in the same state
Peer size-weighted average activity uniqueness per state	33767	0.68	0.69	0.03	0.67	0.70	Total assets weighted average activity uniqueness of all other banks headquartered in the same

Table 2
The effect of activity uniqueness on bank performance

This table presents regression results on the effect of activity uniqueness on ROA and natural log of Z-Score. For each outcome variables ROA and Log Z-Score, we demonstrate that our Activity uniqueness measure captures effects beyond bank diversification. We add organizational structure, geographical diversification and activity HHI as three additional measures of bank diversification. The sample period is 1986-2013. T-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. Variable definitions are given in Table 1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			ROA					*Log Z-score*		
Activity uniqueness$_{t-1}$	0.395***	0.470***	0.478***	0.459**	0.452***	0.536**	0.165***	0.173***	0.160***	0.160***
	(2.875)	(2.786)	(2.826)	(2.385)	(2.672)	(2.441)	(3.337)	(3.466)	(2.748)	(3.233)
Log Total assets$_{t-1}$	-0.040***	-0.211***	-0.211***	-0.189***	-0.218***	-0.071***	-0.023***	-0.023***	-0.019**	-0.025***
	(-7.970)	(-9.257)	(-9.245)	(-7.654)	(-9.338)	(-6.740)	(-3.122)	(-3.148)	(-2.264)	(-3.354)
Equity/Total assets$_{t-1}$	0.061***	0.033***	0.033***	0.037***	0.033***	0.120***	0.080***	0.080***	0.081***	0.080***
	(24.714)	(8.178)	(8.176)	(7.958)	(8.154)	(26.083)	(58.749)	(58.707)	(52.676)	(58.684)
Liquid assets/Total assets$_{t-1}$	0.003***	0.002**	0.002**	0.002**	0.002**	0.007***	0.000*	0.000*	0.001**	0.000*
	(4.278)	(2.334)	(2.344)	(2.428)	(2.421)	(6.012)	(1.768)	(1.794)	(2.009)	(1.854)
Non-interest income/Total operating income$_{t-1}$	0.024***	0.016***	0.016***	0.016***	0.015***	0.003*	0.004***	0.004***	0.004***	0.004***
	(22.575)	(9.614)	(9.609)	(9.594)	(9.281)	(1.924)	(8.035)	(8.017)	(7.680)	(7.770)
Cost to income$_{t-1}$	-0.026***	-0.021***	-0.021***	-0.023***	-0.021***	-0.017***	-0.005***	-0.005***	-0.005***	-0.005***
	(-31.879)	(-18.192)	(-18.198)	(-18.011)	(-18.210)	(-13.252)	(-12.573)	(-12.560)	(-12.561)	(-12.605)
Activity HHI$_{t-1}$			-0.035					-0.040		
			(-0.187)					(-0.828)		

Table 2 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Geographical diversificatioin$_{t-1}$				0.046					0.005	
				(1.400)					(0.445)	
Organizational structure$_{t-1}$					0.025**					0.007**
					(2.113)					(2.057)
Constant	1.419***	3.944***	3.970***	3.190***	4.040***	3.257***	2.912***	2.941***	2.711***	2.938***
	(12.296)	(10.818)	(9.973)	(9.511)	(10.890)	(18.859)	(25.016)	(23.717)	(24.757)	(25.079)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Number of obs.	33767	33767	33767	26250	33767	33673	33673	33673	26183	33673
R^2	0.324	0.262	0.262	0.282	0.262	0.245	0.450	0.450	0.446	0.450

Table 3
Instrumental variable regressions: Activity uniqueness and bank performance

This table presents the results of instrumental variable regressions (two-stage-least-squares estimator) for the effects of *Activity uniqueness* on *ROA* and *log Z-score*. The instrument used for activity uniqueness is the peer average activity uniqueness per state (column 1-3). Alternatively, we use peer size-weighted average activity uniqueness per state (column 4-6) and peer activity uniqueness of banks i in the same size decile of the yearly national bank size distribution (column 7-9). The sample period is 1986-2013. T-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. Variable definitions are given in Table 1.

	Instrument: Peer average activity uniqueness per state			Instrument: Peer size-weighted average activity uniqueness per state			Instrument: Peer average activity uniqueness in the same size decile$_{t-1}$		
	First stage	Second stage		First stage	Second stage		First stage	Second stage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Activity uniqueness$_{t-1}$	*ROA*	*Log Z-Score*	*Activity uniqueness$_{t-1}$*	*ROA*	*Log Z-Score*	*Activity uniqueness$_{t-1}$*	*ROA*	*Log Z-Score*
Activity uniqueness$_{t-1}$		4.936***	2.095*		4.965***	2.197*		0.362***	2.095*
		(6.207)	(1.897)		(5.906)	(1.870)		(2.758)	(1.897)
Peer average activity uniqueness per state$_{t-1}$	0.626***								
	(47.551)								
Peer size-weighted average activity uniqueness per state$_{t-1}$				0.576***					
				(44.743)					
Peer activity uniqueness in the same size decile$_{t-1}$							0.897***		
							(393.799)		
Log Total assets$_{t-1}$	0.012***	-0.092***	-0.088***	0.011***	-0.092***	-0.090***	0.002***	-0.040***	-0.088***
	(54.849)	(-8.218)	(-5.583)	(53.189)	(-8.045)	(-5.443)	(6.970)	(-7.898)	(-5.583)
Equity/Total assets$_{t-1}$	-0.001***	0.065***	0.121***	-0.001***	0.065***	0.121***	-0.000**	0.061***	0.121***
	(-6.053)	(22.391)	(25.623)	(-6.611)	(22.310)	(25.538)	(-2.575)	(24.662)	(25.623)

Liquid assets/Total assets$_{t-1}$	-0.001***	0.006***	0.008***	-0.001***	0.006***	0.008***	-0.000	0.003***	0.008***
	(-18.144)	(5.749)	(5.871)	(-17.951)	(5.698)	(5.835)	(-1.586)	(4.266)	(5.871)
Non-interest income/Total operating income$_{t-1}$	0.002***	0.016***	0.000	0.002***	0.016***	0.000	0.000***	0.024***	0.000
	(42.696)	(8.715)	(0.120)	(43.623)	(8.394)	(0.043)	(12.747)	(22.643)	(0.120)
Cost to income$_{t-1}$	-0.001***	-0.023***	-0.016***	-0.001***	-0.023***	-0.016***	0.000	-0.026***	-0.016***
	(-18.544)	(-23.464)	(-11.479)	(-19.066)	(-23.155)	(-11.229)	(0.779)	(-31.960)	(-11.479)
Constant	0.122***	-0.987**	2.675***	0.161***	-1.003**	2.619***	0.577***	1.292***	3.039***
	(12.141)	(-2.179)	(4.246)	(16.513)	(-2.095)	(3.924)	(153.928)	(7.279)	(9.228)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	33718	33718	33624	33718	33718	33624	33767	33767	33673
R^2	0.313	0.241	0.238	0.308	0.240	0.237	0.427	0.324	0.243
First stage F test (p-value)		0	0		0	0		0	0

Table 4
Activity uniqueness and bank performance around the GLB Act

We consider the passage of Gramm–Leach–Bliley (GLB) Financial Modernization Act in 1999 as an exogenous shock to Activity Uniqueness to study the causal effects. This table presents regression results for the full sample and a matched sample. In Panel A (Panel B), the dummy variable *Section20* (*Large*) equals one for Section 20 BHCs (5% largest banks), and zero otherwise. PostGLB is one after the year 1999 (including 1999), and zero otherwise. All regressions are estimated with time and bank fixed effects. The sample period is 1986-2006, excluding the extreme years of 2007-09 financial crisis. T-statistics are based on robust standard errors clustered by banks are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. Variable definitions are given in Table 1.

Panel A: Section 20 versus non-Section 20 banks

	Full sample			Matched sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	Activity uniqueness	ROA	Log Z-score	*Activity uniqueness*	ROA	Log Z-score
*Section20*PostGLB*	0.063***	0.219**	0.106***	0.051***	0.230*	0.109*
	(7.574)	(2.514)	(3.446)	(4.729)	(1.898)	(1.898)
Constant	0.632***	0.761***	3.056***	0.746***	0.899***	2.761***
	(446.546)	(34.740)	(331.165)	(130.268)	(19.115)	(136.930)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	31893	31893	31499	655	655	655
R^2	0.253	0.067	0.176	0.575	0.280	0.444

Panel B: Large versus small BHCs

	(1)	*(2)*	*(3)*
	Activity uniqueness	*ROA*	*Log Z-score*
*Large*PostGLB*	0.026***	0.156***	0.037***
	(5.859)	(4.423)	(3.723)
Log Total assets$_{t-1}$	0.001	-0.202***	-0.020**
	(0.652)	(-8.188)	(-2.485)
Equity/Total assets$_{t-1}$	-0.000	0.016***	0.071***
	(-1.282)	(3.929)	(53.169)
Liquid assets/Total assets$_{t-1}$	-0.000***	-0.002**	-0.000
	(-3.556)	(-2.445)	(-1.571)
Non-interest income/Total operating income$_{t-1}$	0.000***	0.008***	0.002***
	(4.429)	(4.750)	(3.650)
Cost to income$_{t-1}$	-0.000	-0.015***	-0.003***
	(-1.527)	(-12.679)	(-7.733)
Constant	0.666***	4.240***	3.070***
	(23.500)	(11.274)	(24.698)
Time fixed effects	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes
Number of obs.	27552	27552	27480
R^2	0.199	0.104	0.429

Table 5
Mechanisms behind the performance impact of activity uniqueness

This table presents estimation results for the mechanism analysis. Time fixed effects are included across the specifications. Column 1 and 2 are based on the full sample, while column 3 and 4 are based on the sample period before the year 2000. T-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. Variable definitions are given in Table 1.

	Full sample		Year < 2000	
	(1)	(2)	(3)	(4)
	ROA	*Log Z-score*	*ROA*	*Log Z-score*
Activity uniqueness	-0.099	-0.039	-0.004	-0.036
	(-0.401)	(-0.586)	(-0.014)	(-0.493)
Activity uniqueness$_{t-1}$ IBBEA index$_{t-1}$*	0.201***	0.072***	0.248***	0.080***
	(3.189)	(4.081)	(3.305)	(3.071)
IBBEA index$_{t-1}$	-0.131***	-0.054***	-0.175***	-0.063***
	(-2.931)	(-4.331)	(-3.275)	(-3.411)
Log Total assets$_{t-1}$	-0.216***	-0.024***	-0.371***	-0.069***
	(-10.173)	(-3.565)	(-8.985)	(-5.280)
Equity/Total assets%$_{t-1}$	0.032***	0.080***	0.002	0.068***
	(8.582)	(62.541)	(0.381)	(35.412)
Liquid assets/Total assets%$_{t-1}$	0.002***	0.000**		
	(2.631)	(2.154)		
Non-interest income/Total operating income%$_{t-1}$	0.015***	0.004***	0.011***	0.002**
	(10.053)	(8.267)	(3.326)	(2.533)
Cost to income%$_{t-1}$	-0.021***	-0.005***	-0.015***	-0.003***
	(-19.413)	(-13.397)	(-6.853)	(-4.346)
Constant	4.398***	3.097***	5.787***	3.515***
	(11.777)	(26.374)	(9.897)	(18.814)
Time fixed effects	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Number of obs.	33767	33673	16075	16045
R^2	0.262	0.451	0.118	0.410

Table 6
The effect of activity uniqueness on systemic risk

This table presents regression results on the effect of Activity uniqueness on systemic risk. We use two measures to proxy bank systemic risk. The first is ΔCoVaR developed by Adrian and Brunnermeier (2008), and the second is the marginal expected shortfall (MES) developed by Acharya et. al. (2010). Both systemic risk measures are transformed into their percentage forms to increase the magnitude of the estimated parameter coefficients. The sample period is 1986-2013. T-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

	ΔCoVar		*MES*	
	(1)	(2)	(3)	(4)
Activity uniqueness$_{t-1}$	-0.081	13.076**	0.171	20.227***
	(-0.154)	(2.007)	(0.281)	(3.707)
Activity uniqueness square$_{t-1}$		-9.264**		-14.122***
		(-1.966)		(-3.804)
Annualized stock return$_{t-1}$	0.002***	0.001***	0.003***	0.002***
	(4.274)	(4.112)	(3.984)	(3.820)
Annualized stock return volatility$_{t-1}$	0.151***	0.152***	0.278***	0.280***
	(8.501)	(8.653)	(10.511)	(10.637)
Leverage$_{t-1}$	0.007**	0.007**	-0.025***	-0.025***
	(2.185)	(2.207)	(-5.493)	(-5.513)
Market to Book ratio$_{t-1}$	-0.018	-0.017	0.043	0.045
	(-0.325)	(-0.302)	(0.771)	(0.803)
Log Total assets$_{t-1}$	-0.110*	-0.103	0.516***	0.528***
	(-1.653)	(-1.542)	(6.675)	(6.852)
Constant	5.058***	0.347	-4.770***	-11.954***
	(4.943)	(0.137)	(-3.890)	(-5.398)
Time fixed effects	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Number of obs.	7028	7028	7024	7024
R^2	0.275	0.276	0.476	0.478

Table 7

Effects of pre-crisis activity uniqueness during the financial crisis

This table presents results of cross-sectional OLS regressions (column 1 and 2) and cross-sectional probit regressions (column 3 and 4). ROA and Log Z-score are the average values from 2007 to 2009. The independent variables are measured in 2006. T-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. Variable definitions are given in Table 1.

	(1)	(2)	(3)	(4)
	ROA	*Log Z-score*	*Failure*	*Target*
Activity uniqueness$_{2006}$	2.061***	2.365***	-1.641	-1.859*
	(4.189)	(4.418)	(-1.411)	(-1.786)
Log Total assets$_{2006}$	-0.189***	-0.085***	0.100	0.277***
	(-7.408)	(-3.178)	(1.584)	(5.418)
Equity/Total assets%$_{2006}$	0.029***	0.094***	-0.063**	0.031
	(2.661)	(7.942)	(-2.374)	(1.432)
Liquid assets/Total assets%$_{2006}$	0.014***	0.017***	-0.027***	-0.006
	(5.202)	(5.607)	(-3.927)	(-1.026)
Non-interest income/Total operating income%$_{2006}$	0.033***	0.005	-0.013	-0.003
	(6.984)	(1.037)	(-1.182)	(-0.400)
Cost to income%$_{2006}$	-0.016***	0.005	-0.020**	0.025***
	(-3.749)	(1.289)	(-2.212)	(3.198)
Constant	1.154**	1.000**	0.456	-4.689***
	(2.502)	(2.213)	(0.439)	(-5.330)
Number of obs.	859	858	859	859
R^2	0.15	0.14		
Pseudo R^2			0.09	0.06

Table 8
Effects of pre-crisis activity uniqueness on bank bailouts

This table presents cross-sectional probit regression results of the impact of pre-crisis activity uniqueness on the likelihood of receiving capital support under the Troubled Asset Relief Program (TARP). *Activity uniqueness$_{2006}$ third tercile* is the omitted reference category. T-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. Variable definitions can be found in Table 1.

	TARP
Activity uniqueness$_{2006}$ first tercile	0.196
	(1.567)
Activity uniqueness$_{2006}$ second tercile	0.301**
	(2.469)
Log Total assets$_{2006}$	0.374***
	(7.910)
Equity/Total assets%$_{2006}$	-0.025
	(-1.215)
Liquid assets/Total assets%$_{2006}$	-0.013***
	(-2.600)
Non-interest income/Total operating income%$_{2006}$	-0.009
	(-1.116)
Cost to income%$_{2006}$	0.016**
	(2.209)
Constant	-5.962***
	(-7.640)
Number of obs.	859
Pseudo R^2	0.08