The Impact of Supervision on Bank Performance

Beverly Hirtle, Anna Kovner and Matthew Plosser[1]
Federal Reserve Bank of New York

FIRST DRAFT: January 2016
CURRENT DRAFT: October 2016

Abstract

We introduce a novel instrument to identify exogenous variation in the intensity of supervision across U.S. bank holding companies based on the size rank of a firm within its Federal Reserve district. We demonstrate that supervisors record more hours at the largest firms in a district, even after controlling for size and other characteristics. Using a matched sample approach, we find that these "top" firms are less volatile, hold less risky loan portfolios and engage in more conservative reserving practices, but do not have lower earnings or slower asset growth. Given these firms are subject to similar rules, our results support the notion that supervision has a distinct role as a complement to regulation.

Keywords: bank supervision, bank regulation, bank performance
JEL Codes: G21, G28

[1] The authors thank Angela Deng and Samantha Zeller for excellent research assistance. The authors thank Mark Carey, Mark Levonian, Antoinette Schoar, Philip Strahan, Vish Viswanathan and seminar participants at the NY Fed, NBER Summer Institute, and FDIC/JFSR Bank Research Conference. The views in this paper are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of New York or of the Federal Reserve System.

1. Introduction

Bank supervision involves oversight and monitoring to detect unsafe or unsound practices that might threaten individual firms or the broader economy. Supervision is a distinct policy tool that complements regulation – the rules governing banking firms. In contrast to regulation, information about supervisory efforts is rarely publicly available, which makes it difficult to assess how and to what extent supervision affects bank risk-taking, performance or long-term viability. As a result, there is little research that specifically considers how the intensity of supervision affects firm outcomes.

In this paper, we introduce a novel strategy to identify increased supervisory attention based on the structure of supervisory responsibilities within the Federal Reserve System. We validate this strategy using confidential data on the hours supervisors spend at an institution, which we interpret as a quantifiable proxy for supervisory attention. Using this approach, we are able to estimate the effect supervision has on risk-taking and performance at supervised firms. We find a negative relation between our proxy for supervisory attention and measures of bank risk. The decrease in risk does not appear to represent a trade-off with financial intermediation at the firm level as those firms that receive more supervisory attention have similar earnings and asset growth.

By focusing on the broad concept of supervisory attention, our analysis seeks to capture all types of supervisory efforts. Traditionally, supervisors ensured compliance with regulations and verified the quality of bank assets during an annual examination of an individual bank. While critical, these activities are inherently backward looking as they assess the condition of banks based on decisions that have already been made. Beginning in the mid-1990s, financial innovation pushed supervisors to be more forward looking and they began to emphasize risk-management practices and corporate governance arrangements at supervised institutions. However, there is very little work that assesses supervisors' efforts to promote sound management. Our use of supervisory attention fills this gap by capturing the holistic influence of supervisors, and not restricting our analysis to a single supervisory program.

A key element of this analysis is to develop a measure that captures cross-bank variation in supervisory attention. Further, we need a measure that captures *exogenous* variation, since riskier and worse-performing banks typically attract more supervisory attention than do safer, better-performing firms. Similarly, supervisors are especially concerned with large and complex banks, as difficulties at these firms have the potential to be more disruptive to the financial system and broader economy. If

size and complexity are related to risk or performance, then supervisory focus on the largest institutions also poses an endogeneity issue.

To identify plausibly exogenous variation in supervisory attention, our strategy is to exploit the structure of supervision within the Federal Reserve System. Each of the 12 regional Federal Reserve Banks supervises bank holding companies (BHCs) that are headquartered within its district.[2] The distribution of BHCs varies significantly across districts in terms of asset size, complexity, geographic reach, business focus and other characteristics. We hypothesize that within each district, the largest institutions receive more supervisory attention, ceteris paribus, than institutions that are not among the largest. We thus compare outcomes for BHCs that are among the largest in a district to otherwise similar BHCs that are not among the largest in other districts, and interpret differences in outcomes as reflecting the impact of greater supervisory attention.

To validate this hypothesis, we demonstrate that the largest BHCs in a district receive more supervisory resources. We make use of proprietary Federal Reserve data on the hours supervisors report that they spend at specific institutions. We show that examiners spend more time at the largest firms in a district, even when controlling for firm characteristics like size and complexity. Although supervisory hours do not capture all aspects of supervisory intensity, this finding is broadly consistent with our hypothesis and supports our identification strategy.

The second challenge to assessing supervision's impact is to quantify firm outcomes. A prominent supervisory goal is to reduce the incidence of bank failures that could negatively affect the real economy, but bank failures are infrequent, especially among the largest firms. Risk as measured by individual metrics such as loan loss rates or net income variability will fail to summarize failure risk without also considering the leverage and liquidity of the firm. In addition, book accounting measures are subject to discretion and can lag business conditions. In contrast, market-based measures are timely, but can be distorted and overly volatile. Rather than focus on any single measure, we consider a variety of financial outcome measures based on accounting and market data. In addition, we examine confidential data describing non-financial supervisory outcomes such as ratings and enforcement actions, to see how these outcomes are affected by differences in supervisory attention across firms. We test whether our measure of increased supervisory attention, being one of the top size-ranked BHCs in a district, is associated with lower risk and improved performance.

[2] The Board of Governors of the Federal Reserve System has authority and responsibility for supervision of financial institutions, and the supervisory activities of the Reserve Banks are conducted under delegated authority from the Board (Eisenbach et al. 2015).

It is worth noting that additional supervisory attention need not have a positive effect on outcomes. For instance, supervisors could be resource constrained, such that an increase in supervisory attention is not sufficient to meaningfully influence bank behavior. Alternatively, being one of the largest firms in a district might increase the likelihood that the bank has outsized influence over its supervisors, resulting in greater forbearance. If supervisors forbear more for the largest banks in a district, then this could attenuate any positive impact of supervision.

To estimate the impact of supervisory attention, we match top-ranked firms by size to similar firms in another district that are not among the largest BHCs. Doing so allows us to construct a sample of banks that are observably similar but with varying ranks in their Federal Reserve districts. In particular, we match banks based on size, organizational complexity, types of banking subsidiaries and the diversity of their activities. Our focus is on controlling for institutional differences across banks that might be correlated with rank, but to avoid matching on outcome variables that might be directly influenced by supervision. We then compare performance across these two sets of firms to estimate the impact of supervisory attention. We also consider an empirical specification that exploits the matched sample and controls for district-quarter fixed effects to account for unobserved differences across districts and over time.

We find that firms among the largest institutions in a district have accounting earnings and market returns that are less volatile than otherwise similar BHCs. These firms also appear to hold less risky loan portfolios and engage in more conservative loan loss reserving practices. The highest size-ranked BHCs in a district have lower and less volatile non-performing loans, as well as less volatile net interest income, non-interest income, and loan loss provisioning. While "top" BHCs appear less risky, they do not have lower profitability nor do they exhibit significantly slower asset growth. The market Sharpe Ratio of these firms is similar to BHCs not among the top size-ranked firms. Our findings are consistent with the notion that additional supervisory attention has a positive-to-neutral impact on the risk-adjusted performance of BHCs.

This interpretation rests on the validity of our identification assumption that being among the largest firms in a Federal Reserve District is not associated with other unobserved factors that also impact bank performance. For instance, while we control for average differences in bank performance across districts using fixed effects, there could be differences in the competitive structure of markets that affect the top firms differently. However, Federal Reserve Districts are not necessarily aligned with competitive banking markets, particularly for larger firms. The largest BHCs in the U.S. compete well beyond their district borders. As a result, the bank with the most market share in a district, as measured

by summary of deposits data, is headquartered elsewhere in more than 60% of the district-quarters. We discuss alternative stories throughout our analysis, but do not find evidence consistent with them.

While our results suggest that increased supervisory attention results in lower risk, the mechanism by which supervision achieves these outcomes remains an open question. Our analysis focuses on the quantity of supervision (hours, the extensive margin) and not the quality of supervision (differentially skilled supervisors doing more with every hour that they work, the intensive margin). Our analysis also does not shed light on the question of whether supervisory resources are deployed efficiently, as we do not attempt to measure the social welfare benefits of supervisory impact.

Much of the previous work on the supervision and regulation of banks focuses on regulation, though the distinction between supervision and regulation is not always clearly recognized or articulated.[3] Fewer papers focus specifically on supervision distinctly defined. Some of these papers examine the information content of supervisory ratings (Cargill 1989, Cole and Gunther 1995, Hirtle and Lopez 1999, Berger et al. 2000) and examinations (Berger and Davies (1998)) but not specifically the impact of supervision on bank outcomes.

Several papers have examined how supervisory standards – how tough examiners are in assessing risk at banks – affect loan origination and loan growth (Peek and Rosengren 1995, Swindle 1995, Krainer and Lopez 2009 Kiser et al. 2012, Bassett et al. 2012, Basset and Marsh 2014) with most finding that tougher supervisory standards are associated with slower loan growth and/or higher origination standards. Others have examined the use of enforcement actions on bank sector risk (Delis and Staikouras, 2011). Relative to the extant literature, our use of supervisory attention allows us to estimate the impact of all supervisory interactions with firms.

Another core contribution of our paper is that we develop a new identification strategy based on the structure of supervision at the Federal Reserve. Plausibly exogenous variation in supervisory attention allows us to go beyond correlations to discern the impact of supervision. The paper is similar in this spirit to recent work that examines state versus federal banking supervisor including Agarwal et al. (2014), which finds persistent differences between state and federal banking supervisors in the rating of commercial banks, and Rezende (2011), which finds that banks switching between national and state banking charters typically receive an upgraded rating from their new supervisor. Most closely related, Rezende and Wu (2014) employ a regression discontinuity approach to look at a sample of U.S. banks

[3] For instance, there is a substantial body of work examining the impact of regulatory capital requirements (for a recent example, see Bridges et al. 2014) and of legislative changes that enabled previously prohibited cross-state bank mergers or mergers involving commercial banks and non-banking financial companies (see, for instance, Morgan et al. 2004, Jayaratne and Strahan 1996).

and find that more frequent mandated examinations are associated with increased profitability and lower loan losses. In comparison to these papers, we focus on supervisory attention more broadly rather than a specific activity like examinations; we consider novel data on the hours supervisors spend at institutions; and, we are able to consider the impact on relatively large firms.

The paper is organized as follows. Section 2 describes the role of prudential supervision within the Federal Reserve and develops hypotheses related to bank outcomes and supervisory attention. The next section discusses our identification strategy, describes the supervisory hours data and presents analysis of differences in supervisory hours for the largest firms in a district. Section 4 describes our empirical methodology to assess the impact of supervision on bank performance and risk-taking, including identifying a matched sample of BHCs. Section 5 summarizes our empirical results. Section 6 concludes.

2. Prudential supervision

What do supervisors do? Modern prudential supervision comprises a range of activities intended to identify and address conditions at a bank or practices that could threaten its immediate health or long-term viability. These activities include conventional supervisory work to ensure compliance with law and regulation as well as efforts to monitor for unsafe or unsound business practices. In addition supervisors enforce remediation of such practices or failures to comply with regulation (Eisenbach et al. 2015). As such, supervision is complementary to, but distinct from, regulation.

Within the Federal Reserve, the Board of Governors has authority and responsibility for supervision of financial institutions, and the supervisory activities of the Reserve Banks are conducted under delegated authority from the Board. Under this delegated authority, day-to-day oversight of the firms is conducted by the regional Reserve Banks, which host dedicated supervisory teams responsible for the firms located in their respective districts. Typically, Reserve Bank supervisors are organized into teams that focus specifically on one or more individual banks or BHCs.

The work of the supervisory teams consists of information gathering and analysis and follow-on to that work. Information gathering can involve review and analysis of internal reports and management information, discussions with firm management and boards of directors, and independent analysis based on market or other confidential and public data. Some of this work is focused specifically on individual BHCs while other work is part of examinations covering particular issues across several firms (“horizontal examinations”). Based on this work, supervisors make qualitative and quantitative

assessments of the financial health and performance of the supervised firms, as well as assessments of the structure and effectiveness of the firms' internal controls, risk management, and governance.

Follow-on work is intended to make banks address any shortcomings or violations of law or regulation identified through this analysis. These steps include assigning confidential "1 to 5" supervisory ratings to banks and BHCs ("1" indicates the lowest level of supervisory concern, "5" indicates the highest) and issuing supervisory actions that direct the bank and its management and board to remediate unsafe or unsound practices or conditions at the firm. These supervisory actions generally take the form of written communication to the firm's board of directors or an executive-level committee of the board (Board of Governors of the Federal Reserve System 2013). Supervisory actions include matters requiring attention (MRAs), matters requiring immediate attention (MRIAs), other informal enforcement actions such as memoranda of understanding (MOUs), and formal supervisory actions such as written agreements, cease and desist orders, and fines. MRAs and MRIAs are the most common supervisory action and are generally considered to be the least severe. In general, informal enforcement actions are not publicly disclosed, while formal enforcement actions are disclosed by the Federal Reserve Board.[4]

In addition to conducting examinations, supervisors' efforts at larger banks are directed toward monitoring firms for sound risk management and internal controls. The transition toward a more holistic, forward-looking approach to supervision began in the early to mid-1990s as supervisors sought to make institutions more robust in the face of rapid financial innovation. For example, in 1995 the Federal Reserve and the Office of the Comptroller of the Currency (OCC) formally announced that they would be assessing banks' risk management practices. Today the majority of interactions between bankers and supervisors center on risk management, risk modeling and governance. [5]

How might these supervisory activities impact banks? We primarily focus on how supervision impacts the riskiness and profitability of banks. On whole, the intent of these supervisory efforts is to detect unsafe or unsound practices that might threaten banks' current health or ability to withstand stressful economic or financial market environments and to make sure that they remediate any problems that have been identified (Eisenbach et al. 2015). If supervisors are successful, banks that are subject to more intense supervision should take less risk and use more conservative risk management

[4] Eisenbach et al. (2015) provides a more detailed overview of the organizational structure and activities of bank supervisors at the Federal Reserve Bank of New York.

[5] See Mishkin (2001) for more details on the evolution of bank supervision in the U.S. and Goldsmith-Pinkham, Hirtle and Lucca (2016) for an in-depth characterization of the issues supervisors focus on at banks.

practices.[6] Hence, one hypothesis is that greater supervisory efforts, all else equal, result in less risky institutions.

Of course, there are many reasons that intense supervision might not result in safer banks. Supervisors could fail to achieve their objectives due to resource constraints that could make it difficult to work effectively at large and complex institutions, even with increased attention to those firms (Eisenbach et al. 2016). Also, being one of the larger, more scrutinized banks in a district might increase the likelihood that the bank has outsized influence over its supervisors, resulting in greater forbearance and, thus, more risk. A second hypothesis is that increased supervisory attention results in less profitable, slower growing banks. Compliance costs can lower profitability, and cross-country analysis suggests supervision can reduce bank efficiency (e.g. Barth et al. 2013). In addition, the empirical literature suggests that tougher supervisory standards are associated with slower loan growth (e.g. Peek and Rosengren 1995).

3. Identification strategy

The primary empirical challenge in identifying the impact of supervision is that supervisory attention is endogenously related to current and expected bank performance: supervisors presumably focus on BHCs that perform poorly. Supervisors may also expend more resources on large, complex institutions that pose a greater threat to financial stability.

In order to identify plausibly exogenous variation in supervisory attention, we exploit the geographic assignment of BHCs to Federal Reserve districts. The location of the twelve banks and the boundaries of the districts were determined pursuant to the Federal Reserve Act of 1913. The locations reflect the various regions' importance as banking centers in 1913. Districts are not equally divided in terms of geography or population.[7]

Both the number and size of BHCs vary considerably across districts. Table 1 shows the number of top-tier BHCs with assets above $500 million in each of the 12 districts as of December 2014, along with information about the asset size of these firms.[8] The number of BHCs ranges from a low of 57 in the 4th District (Cleveland) to a high of 157 in the 7th (Chicago). The size of the largest BHCs in a district

[6] Indeed, scheduled exams have been found to reduce bank risk (for example, Rezende and Wu, 2014).
[7] http://www.frbsf.org/education/publications/doctor-econ/2001/may/federal-reserve-districts
[8] We report information on BHCs with assets greater than $500 million because these institutions are required to file FR Y-9C reports to the Federal Reserve. These reports, which contain balance sheet and income statement information, are an important data source for our empirical analysis.

also varies considerably, with the largest overall BHC in the 2nd District (New York) at $2.6 trillion and the largest BHC in the 8th District (St Louis) at $26 billion.

Each of the twelve Federal Reserve Banks supervises the bank holding companies located in its geographic district, hosting dedicated supervisory teams responsible for the firms located in their respective districts. Given this structure, we posit that the largest BHCs in a given district, all else equal, receive relatively more supervisory attention.

There are several reasons why this might occur. Attention constraints on senior managers can require that they prioritize a discrete set of the most important BHCs in their district (i.e. Miller's Law[9]). This hypothesis is motivated by research on the concept of span of control and the allocation of managerial attention, such as Bolton and Dewatripont (1994), Garicano (2000), Geanakoplos and Milgrom (1991), and Radner (1993). In this context, district leaders are subject to cognitive costs, thus they focus attention on a discrete set of the largest firms (i.e. their span of control) within their geographic area of responsibility.[10]

Another possible rationale for this behavior is that supervisory teams in each district are particularly concerned with large bank failures because they pose outsized negative externalities on the regional economy. As a result, supervisors could be allocated and incentivized to spend time in a way that seeks to ensure the safety of the largest institutions under the District bank's purview. Ultimately, our analysis is indifferent as to which of these mechanisms results in greater supervisory attention as long as the largest BHCs within a district receive additional attention relative to similar BHCs in other districts that are not among the largest.

a. Is rank a valid proxy for supervisory attention?

We provide evidence in support of this hypothesis with a simple measure of supervisory scrutiny: the hours spent by Federal Reserve supervisors examining a particular institution. We use confidential Federal Reserve System managerial data on the time use of supervisors at the Reserve Banks. Supervision personnel are required to self-report time-use. As part of this reporting, they are instructed to indicate what hours of their time are spent directly supervising a particular institution (as

[9] Miller's Law refers to the findings in a 1956 psychology paper "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information." (Miller 1956) which describes various experiments on retaining sounds, colors, points, tastes, letters and numbers.

[10] For example at the Federal Reserve System level, there are several supervisory programs that select a set of banks for increased supervisory attention. These include the distinct supervisory treatment of the LISCC firms and annual supervisory programs, such as the Comprehensive Capital Analysis and Review (CCAR) and Dodd-Frank Act stress testing (DFAST), that apply to a discrete set of firms based on asset size. These programs apply only to the largest banks in the U.S. and are typically excluded from our analysis. They are not the subject of this paper since they do not vary across Districts.

opposed to broadly contributing to the supervision of a portfolio of banks or participating in other activities). The data include supervisory staff in all twelve Federal Reserve districts over the period 2006 to 2014.[11]

On a quarterly basis we aggregate the hours reported by examiners at each BHC and its subsidiaries to generate a measure of supervisory attention for an organization – the total quantity of directly reported supervisory hours. Many BHC-quarters do not have directly reported hours. If the institution has never received directly reported hours, then hours are left as missing reflecting the fact that the firm was supervised by a team that oversees a portfolio of firms so supervisors did not directly record time use at individual institutions. However, if a BHC has had reported hours in a prior quarter, we assume that missing reported hours are zero.[12] In addition, reporting conventions can vary, in some cases making it difficult to compare hours across Federal Reserve districts or over time.[13] We will account for this variation when we analyze how hours vary with the size rank of a BHC.

We match the time-use data to the consolidated financials of the parent BHC. The financials are based on FR Y-9C reports submitted quarterly to the Federal Reserve. We start with the sample of firms that are above the median total assets, as smaller firms rarely receive reported hours and our attention measure is focused on the largest firms. Using this sample of BHCs, we calculate the asset size rank of each BHC within its geographic Federal Reserve district. At its core, our analysis attempts to compare outcomes of BHCs that are similar except for their geographic assignment and size rank. Thus, after ranking, we exclude BHCs where retail deposits are less than 25% of liabilities, trading assets are more than 7.5% of assets, or credit card or automobile loans are more than 30% of total loans. Each of these criteria is meant to exclude atypical banking institutions such as payment processors or credit card banks. These atypical firms are difficult to match to firms of similar size and business focus, due to the relatively small number of such firms. These criteria drop 8% of BHC-quarters from 2006 to 2014. Lastly, we exclude BHCs with foreign parents (2.5% of the firm-quarters) and BHCs which are assigned to a supervisor that is distinct from their geographic district (1.5%) as these characteristics can influence reported hours or supervisory attention. We will also consider specifications that exclude the very

[11] We do not capture hours that are not allocated to specific firms, or hours spent by Board of Governors supervisory staff. One example of such activity is cross-firm supervisory programs, such as the stress tests. To the extent that these hours substitute for supervisory hours by the Federal Reserve Banks, their exclusion would serve to attenuate our results.

[12] Approximately 40% of BHC quarters do not receive directly reported supervisory hours. On average, BHCs without reported hours are significantly smaller (average asset size of $1.1bn) than BHCs with reported hours (average asset size of $22.1bn).

[13] We explicitly correct for one such instance: The Second District reports hours based on a 35 hour work week whereas the other districts use a 40 hour work week; therefore we rescale Second District hours by 40/35.

largest BHCs, as it is difficult to match them to firms of similar size that are not themselves among the largest in their own district.

We observe significant variation in supervisory hours based on the asset size rank of a BHC within its district. Figure 1 illustrates the variation in log of hours as a function of asset size rank conditional on district and bank-level controls.[14] Consistent with our hypothesis, the highest ranked BHCs within a district receive more supervisory attention, particularly the five largest banks. Therefore one candidate for excess attention is simply a dummy variable indicating a bank is within the top five in its district.

We do not have a hypothesis about any particular discontinuity at rank five. Indeed, in some districts, the distribution of banks may be such that the sixth or seventh largest bank is similar in size to the fifth largest and we would expect these banks to receive similar attention. Therefore we define an additional group of banks whose assets are within 25% of the assets of fifth largest bank in the district. Figure 2 breaks these banks out and labels them "5+". We can see that the banks that are close in size to the fifth largest banks also receive greater supervisory attention on average.[15] The results suggest that the largest BHCs in a district receive 70 to 170 percent more supervisory hours than the average BHC (for reference, a difference in log hours of 0.69 implies 100 percent more hours or two times). [16]

To explicitly test whether the highly ranked firms receive additional attention, we estimate a pooled cross-sectional regression of log hours for BHC i in quarter t,

$$\log(hours_{it}) = \mathbf{\Pi_{it}} + \beta TopFive_{it} + \Gamma Controls_{it} + \varepsilon_{it}, \qquad [1]$$

where $\mathbf{\Pi_{it}}$ is a vector of district-quarter fixed-effects indicating the district of bank i, $TopFive$ is a dummy variable indicating the BHC is in the top five by size rank within a district in quarter t, and $Controls_{it}$ is a vector of various BHC-level controls for income statement and balance sheet

[14] Specifically, we regress log of hours on indicators for size ranks 1 through 15, district-quarter fixed effects and controls that capture the size, complexity and business mix of these institutions. We then plot the estimated coefficients for each rank as well as their 95% confidence intervals. The control specification corresponds to the regression summarized in Table 2 Column 5.

[15] An added benefit of this measure is that when the 5th and 6th largest banks are very close in size they may enter in and out of a simpler "Top 5" measure. This measure better captures the common sense notion that districts focus attention on the largest firms, and allows our selection of the measure of top firms to be driven by the actual supervisory hours data.

[16] One concern might be that certain types of BHCs opportunistically switch districts to reduce supervisory attention. However, BHCs rarely switch districts, as this would require relocating their headquarters. Such switches generally occur in the context of cross-district mergers, where the merged entity opts to locate its headquarters in the district of one of the pre-merger firms. During the period from 1991 to 2014, of 353 unique BHCs that ever appear in the top 10 between 1991 and 2014, only 5 move districts (less than 2%).

characteristics. We also consider specifications where $TopFive$ is replaced with TOP which includes the top five ranked banks as well as those banks within 25% of the asset size of the fifth largest bank in a district. The coefficient of interest, β, estimates the average difference in log hours spent between the treatment group (*e.g. TOP)* relative to other BHCs. The sample is the set of bank holding companies with reported hours between 2006Q1 and 2014Q4. Standard errors are clustered by BHC.

Table 2 summarizes our findings. Progressing across the columns we incrementally add control variables. We do not add controls related directly to risk, since that is an object of interest in the next section of the paper. Column 1 regresses log of hours on district-quarter fixed effects; the adjusted R-squared of 7% demonstrates that fixed-effects alone explain meaningful variation in hours. An additional 15 percent of the variation in hours is explained by the difference between the Top Five firms and the remaining BHCs – we estimate a large, statistically significant coefficient on the Top Five dummy variable in Column 2. Of course, size is correlated with being in the top five and is a logical determinant of supervisory attention. We control for asset size by including log of assets and a non-linear term, log of assets squared. In addition, more complex banks tend to be larger and to receive more attention; we measure complexity as distinct from size by using the log of the number of legal entities controlled by the bank holding company.[17] These entities may include commercial banks, thrifts, other financial institutions such as insurance companies and broker-dealers, or non-financial businesses. Conditional on these size and complexity controls, the coefficient on the Top Five dummy falls to 0.82 (Column 3), consistent with top five BHCs receiving more than twice the hours of a similarly sized BHC that is not among the top five.

In Columns 4 and 5 we consider additional factors that might be associated with supervisory hours. The charter of the banks owned by a BHC can impact the Fed's supervisory role. In addition to BHCs, the Federal Reserve has supervisory responsibilities over State Member Banks (SMBs). The degree to which a BHC's assets consist of SMBs can influence the amount of time spent by Federal Reserve supervisors at the institution. These responsibilities vary with the size of the State Member Bank, with oversight of smaller SMBs rotating with state supervisors (Agarwal et al. 2014). Therefore, we construct two control variables using Call Report data: the percent of BHC assets in SMB subsidiaries greater than or equal to $10 billion and the percent of assets in SMB subsidiaries smaller than $10 billion. We also

[17] The data is based on quarterly regulatory filings and constructed by the Statistics department at the Federal Reserve Bank of New York. See Cetorelli and Stern (2015) for a description of the data. The entity data ends in 2013; we extend the series by assuming entity numbers are the same for 2014 as in 2013Q4. Given the series is highly persistent we are comfortable with this extrapolation, particularly since the analysis is focused on cross-sectional variation. Our findings are robust to restricting our analysis to pre-2013Q4.

control for the percent of assets at nationally chartered banks, as these banks are supervised by the Office of the Comptroller of the Currency (OCC), and the public status of the firm using an indicator. Theoretically, public firms can be subject to market scrutiny which could either be a substitute for or complement to supervisory attention. Both SMB variables are positively correlated with supervisory hours in Column 4; however, the coefficient on Top Five remains large and statistically significant at the 1% level.

Lastly, we add activities of the BHC as controls. Column 5 includes the percent of assets that are loans as well as the percent of liabilities that are deposits to control for potential differences in the supervisory hours related to lending and deposit-taking. In addition, we control for the diversity of the asset mix using the HHI of assets, with the thought that more business complexity (being in more types of assets) can influence supervisory attention. HHI of assets is calculated as the sum of the squares of the percentage of assets in the following categories: Credit card loans, residential real estate loans, commercial real estate loans, commercial and industrial loans, investment securities, and trading assets. (See Kovner, Vickery and Zhou 2014 for an analysis of the impact of concentration on BHC operating efficiency.) We find that a more concentrated portfolio increases supervisory attention, conditional on the size and complexity of the institution. But, we do not find a meaningful change in the coefficient on Top Five.

In Columns 6 and 7 we repeat the specifications in 2 and 5, with the expanded treatment group *TOP,* which includes the set of banks that are similar in size to the top five (combining "1 to 5" and "5+" shown in Figure 2). We find coefficients of similar magnitude and statistical significance. We estimate that these top size-ranked banks receive roughly two times the hours of non-*TOP* firms. The coefficient is statistically significant at the 1% level.

In Table 3 we consider several robustness tests. In the first column, we add an additional dummy variable for the Top Fifteen firms. In this specification, the Top Five dummy tests whether the top five BHCs are statistically different than the remaining top fifteen BHCs conditional on BHC characteristics. This specification does not attenuate the coefficient on Top Five, which suggests the five largest BHCs receive roughly 70% more supervisory hours than BHCs with asset size ranks six to fifteen. The coefficient remains statistically significant, never falling below the 1% significance level. The very largest BHCs in the treatment groups (Top Five or *TOP)* are not on a common size support with the untreated groups, therefore we repeat the analysis by excluding those BHCs that are larger than the largest non-Top Five BHCs (Column 2). Excluding the very largest firms results in similar, albeit slightly attenuated, coefficients on the Top Five dummy. In the third column, we exclude the New York district

(District 2), as this district has a unique distribution of very large banks, with very little effect on the coefficient on Top Five. Columns 4 through 6 repeat these three analyses using the *TOP* measure, with similar results. The statistical significance of the coefficient is also robust to other controls such as the percent of assets that are trading assets, the supervisory rating of the BHC, and the market share of a BHC as measured by deposits (not shown).

It is important to emphasize that this analysis is intended to support the validity of our hypothesis that the largest BHCs in a district receive outsized attention. Supervisory hours rarely capture the time allocation of senior management at the Reserve Banks, which may also be skewed towards the largest firms in the district. In addition, logged hours do not reflect differences in the experience or skill level of supervisors. Our assumption is that the hours data proxy for these other factors, and thus we refer in the analysis to supervisory "attention" rather than supervisory hours.

4. Measuring the impact of supervision

Given the empirical evidence of the prior section, we proceed with our analysis using status as a *TOP* BHC in a district as an indication that a firm receives greater supervisory attention. We identify a sample of similar, untreated BHCs (that is, BHCs that are not among the largest in a district and thus do not receive the "treatment" of additional supervisory attention) using a matching procedure. We then compare outcomes across these two samples. [18] By using *TOP* status to identify differences in supervisory attention, we are able to conduct our analysis over the entire history of Y-9C filers, 1991 to 2014, rather than being limited to the 2006 to 2014 sub-period for which we have hours data.

[18] We repeat all the primary analysis in the paper using the Top 5 dummy rather than *TOP* and find similar results (Appendix Table 7 and Appendix Table 8).

a. Matching

To estimate the impact of greater supervisory attention, we use propensity score matching (Rosenbaum and Rubin, 1983) to construct a sample of BHCs that are not in the treatment group (i.e., not *TOP* by size rank). We choose a matching methodology for several reasons. First, our treatment sample is naturally restricted to some of the largest, most complex BHCs. As a result, there may not be a comparable BHC in the untreated group. Matching allows us to restrict our comparisons to a common support of similar BHCs. Second, a semi-parametric matching procedure can better account for nonlinearities between control variables and bank outcomes, reducing our dependence on the assumption of linearity implied by OLS.

We begin with the sample of banks described in Section 3: above median asset size domestic headquartered BHCs excluding atypical banking institutions. We match on observable characteristics to construct the untreated matched sample of BHCs. Similar to the prior section, we choose variables that may account for variation in supervisory scrutiny, including size, complexity, balance sheet characteristics, and the presence of State Member Banking or national chartered banking assets. In addition, we include a dummy variable indicating whether the BHC has publicly traded stock to incorporate a measure of market discipline. Our controls are the same as those in Table 2, Columns 5 and 7, but we exclude log assets squared as log assets is sufficient for matching purposes.

Our set of controls is not meant to be exhaustive, and there are of course additional factors that can impact supervisory scrutiny. For example, BHCs that perform worse may receive additional attention from supervisors. But our analysis is also relying on our presumption that size rank within a district provides exogenous variation in supervisors' attention. Hence, our matching variables are meant to control for factors that are likely to be correlated with rank.

We estimate a logistic regression in each quarter, where the dependent variable is a dummy indicating whether a BHC is in the treatment sample, i.e. *TOP* in its district, and the independent variables are our bank-level controls. Using these estimates we calculate predicted values, also known as propensity scores. For each treatment observation, we select two nearest neighbors with respect to propensity score. The nearest neighbors must be non-treatment observations in a different Federal Reserve district than the treatment BHC. The result is that for each *TOP* BHC in a quarter, we have two other BHCs with similar characteristics that are not among the *TOP* of another district. Matches are made with replacement; therefore, a BHC may appear multiple times in the control sample if it has been matched to multiple treatment observations.

For this matching to succeed, it is important that the size distribution of BHCs varies across Federal Reserve districts (see Table 1). Figure 3 illustrates the geographic diversity of *TOP* and matched BHCs by asset size across Federal Reserve districts. Note that the geography of Federal Reserve districts is not necessarily aligned with other common geographic regions. For instance, the districts sometimes cut across state lines and span multiple states, so that state-charted banks in BHCs in a particular Federal Reserve district may fall under the jurisdiction of different state supervisors and banks under the jurisdiction of individual state supervisors may fall into different Federal Reserve districts. Further, the *TOP* firms in a district do not necessarily align with firms that are the highest size ranked in a state or census region. Finally, the geographic regions of other federal supervisory agencies do not fully align with the twelve Federal Reserve districts.

Table 4 compares our treatment group and their matches. Over the entire sample period we have 3,027 treatment BHC-quarters for which we are able to find two nearest neighbors on a common support. Many treatment BHCs are not matched because there are not BHCs of similar size and complexity that are untreated. In particular, the very largest BHCs are not included in the treatment sample because there are no similar BHCs in other districts that are not among the *TOP* banks in that district. The largest BHC in the treatment group has assets of just under $100bn. The median rank of the matched treated bank is 4.

We verify that these two samples are balanced by testing for differences in the matching covariates (the far right columns). We estimate the difference in means and cluster the standard errors by BHC to account for repeated observations of matched BHCs and correlations within BHCs over time. The treatment BHCs are slightly smaller than their matches, comprise fewer entities, contain more large SMB assets and use more deposit funding; however, none of these differences approach statistical significance at standard levels. The average rank of a treatment banks is 4.3, the average rank of their match is 10.6. Hence the difference in rank is on average 6.3.[19] For the subset of quarters for which we have hours data, we see that on average *TOP* firms receive twice as many supervisory hours per quarter, a difference that is statistically significant.

b. Financial Outcome Measures

We focus our analysis on financial measures that allow us to consider the impact of supervision on bank risk and performance. We examine both accounting-based measures as well as market measures at supervised institutions. Accounting-based measures are constructed using

[19] Contrast this with Appendix Table 1, which summarizes Top Five BHC-quarters and the population of all potential matches in our sample.

quarterly regulatory filings (FR Y-9C reports).[20] We consider measures of risk that are reflected in the balance sheet of the firm, as well as measures based on income statement items. With respect to the balance sheet, we examine the risk-weighted assets (RWA) of the BHC relative to total assets, the Tier 1 capital ratio (a measure of risk-weighted leverage), the percent of non-performing loans (NPLs), and the ratio of loan loss reserves to total loans. One would expect riskier firms to have higher RWA/Assets, lower Tier 1 capital ratios, and higher NPLs. More conservative firms will have higher loan reserves given a similar NPL profile. We also consider the variability of NPLs and loan loss reserves by calculating the standard deviation over an eight-quarter forward horizon. Greater variability in NPLs is consistent with greater risk, whereas greater variability in loan loss reserves may reflect less conservative provisioning practices. Finally, we test whether supervisors inhibit growth by examining the year-over-year asset growth of the firm.

With respect to earnings, we focus on the return on assets (ROA) to assess risk and return. We compare the level and the standard deviation of ROA over an eight quarter forward horizon to measure risk. We use a forward horizon since we expect supervisory attention to affect outcomes in the future, although results are similar when we use backward-looking measures due to the persistence of treatment status. If supervision imposes costs or reduces risk-taking, we would expect a lower ROA. However, reduced risk-taking would also reduce variability in ROA. We also consider two measures that relate performance to riskiness: the Sharpe Ratio of ROA and the log Z-score of the firm. We construct the Sharpe Ratio as the average ROA over the next eight quarters relative to the standard deviation of ROA over that period. The Z-score measures distance to default as it is the number of standard deviations ROA would need to fall in order to wipe out book equity.[21]

We supplement accounting-based measures with market prices. Accounting-based measures are subject to discretion and may lag market developments, especially for loan portfolios which are generally reported as historical book values. In contrast, market prices impound investor beliefs relatively quickly and therefore represent an important additional source of information. In addition, regulation is typically oriented towards accounting measures; hence, supervisors and supervised institutions might target accounting measures without influencing the firm's risk as assessed by the market. Market outcomes are not as easily influenced and they are rarely an explicit target of regulation.

[20] Variable definitions are reported in the data appendix.

[21] Z-scores were popularized by Altman (1968) for industrial firms. See also Hannan and Hanweck (1988) and Boyd et al. (1993) for the use of Z-scores in the banking context.

We obtain daily stock returns from the Center for Research in Security Prices (CRSP) and we match to public BHCs using the New York Fed PERMCO-RSSD dataset. We calculate market-to-book ratios, which measure the extent to which the current market valuation of the firm differs from its book value; low market-to-book values may signal distress at a firm that is not yet recognized in accounting-based measures. We construct quarterly excess returns with respect to a standard Fama-French three-factor model (Fama and French, 1993). We also calculate daily return volatility to assess the riskiness of returns. Similar to the accounting measures, we consider return per unit of risk using Sharpe Ratios. For each quarter, we scale the average daily return in excess of the risk free rate by its standard deviation. Lastly, we focus on extreme negative events – precisely the scenarios supervisors might be most concerned with – by creating indicator variables for firms that have excess returns in the lowest decile of public BHCs. We trim the continuous measures at the top and bottom 1% to remove extreme outliers.

5. Empirical Results

a. Differences in Means

We begin by comparing the means of these financial measures between the *TOP* BHCs in a district and their matches. Assuming that *TOP* BHCs receive greater supervisory scrutiny but are otherwise similar to the matched sample, we attribute the differences between these two samples to differences in supervisory attention. We calculate differences in means assuming that standard errors are clustered by BHC. If a treatment BHC is missing the variable of interest, then both the treatment BHC and its matches are excluded. These results are reported in Table 5.

Beginning with balance sheet measures of the risk-return profile of BHCs, the largest firms in a district do not have RWA/Assets or Tier 1 capital ratios that are statistically different from matched firms. However, we do find that both the level and variability of non-performing loans are significantly lower relative to the matched BHCs. So while these BHCs appear comparable based on risk-weighted assets, the largest firms in a district appear to have higher quality loans whose performance varies less over time. Despite having safer loans, *TOP* BHCs loan loss reserves are equal to their matches, suggesting that they are more conservative than their peers. Lastly, *TOP* BHCs do not appear to grow more slowly than their peers, suggesting that they achieve this lower risk profile without sacrificing overall asset growth.

When we examine accounting earnings, we find further evidence that the *TOP* ranked BHCs in a district are less risky. While the level of ROA is similar between *TOP* BHCs and their matches, the standard deviation of ROA for *TOP* BHCs is 60% that of their peers. This difference is significant at the 5%

level. Given that returns seem similar but volatility is lower, it is not surprising that the accounting Sharpe ratio (SD ROA/ROA) is greater for the *TOP* BHCs. Similarly, Z-scores at *TOP* BHCs are significantly higher than those at matched firms, suggesting that these BHCs hold higher amounts of capital relative to the riskiness of their earnings streams and are therefore less likely to default. Note, however, that the actual capital ratios do not differ significantly between the two sets of firms. Overall, it appears that BHCs subject to more intense supervision, as proxied for by being one of the largest firms in a district, have a better risk-return trade-off than lower size-ranked institutions.

The market-based measures echo these results, albeit at weaker levels of statistical significance. In particular, *TOP* BHCs are less frequently in the bottom decile of returns, statistically significant at the 5% level, while average excess returns, the Sharpe ratio and the market-to-book ratio are higher, though these differences are not statistically significant. For these measures inference is based on a smaller sample as approximately 10% of the sample is not publicly traded.

Overall, the results suggest that *TOP* BHCs – those subject to greater supervisory attention – are less risky and enjoy a better risk-return trade-off than otherwise similar BHCs not among the *TOP* in their district. The results are stronger for accounting-based measures than for market-based measures, though the findings based on market data are broadly consistent. These results are based on simple comparisons of means, however. The remainder of the paper explores these relationships using more structured econometric approaches that account for factors not addressed by the differences in means and digs deeper into a wider range of outcome measures.

b. Controlling for district effects

A key limitation of the means comparison is that we compare BHCs across Federal Reserve districts. While most large BHCs have geographically diverse operations, if there are unobserved district-level effects such as geographic differences in business conditions and if our sample of treatment and controls is unbalanced across districts, then our results may be biased. For example, those districts with smaller *TOP* banks might experience less economic volatility than those districts with large *TOP* banks that tend to populate the control sample.

To account for district-level differences, we construct a larger sample of BHCs, allowing us to specify an empirical model that controls for differences in average district business conditions (district-quarter fixed effects). We augment our matched sample by propensity score matching non-*TOP* BHCs of size rank six through fifteen to banks not among the *TOP* of another district, where closeness is based on

the same propensity score matching described in Section 4.a. Hence, in this analysis, the sample grows to include each top fifteen bank that we can match to two other banks in another district.[22]

We estimate the differential impact of *TOP* status (additional supervisory attention) in a panel time series of top fifteen BHCs and their matches,

$$Y_{ijt} = \mathbf{\Pi_{it}} + \alpha_{jt} + \beta \ \ TOP_{ijt} + \ \epsilon_{ijt}, \qquad [2]$$

where Y_{ijt} is the value of the outcome measure at time *t*, *i* indexes the BHC out of the set of all BHCs in the sample, *j* indexes the treated firms and indicates for which treatment BHC the observation is a match (for treatment BHCs $i = j$), $\mathbf{\Pi_{it}}$ is a vector of district-quarter fixed-effects indicating the district of BHC i, α_{jt} is a fixed effect for each treated BHC and its matches (i.e. the "match-group"), TOP_{ijt} is a dummy equal to one if a BHC is in the top five in its district or within 25% of the asset size of the fifth ranked bank. The coefficient of interest, β, estimates the *within* district-quarter difference between a BHC and its matches for a top ranked firm relative to a top fifteen firm. Standard errors are clustered by BHC.

The results of this analysis are reported in Table 6. In general, controlling for district fixed effects strengthens the accounting-based results. *TOP* BHCs continue to have lower, less volatile NPLs. They also have lower volatility of accounting earnings (ROA) and higher accounting Sharpe ratios and Z-Scores, all at least at the 5% significance level.

Market results are also considerably strengthened, with *TOP* BHCs having less volatile daily returns, and a smaller probability of being in the lowest decile of returns, both at the 5% significance level. The lower risk does not seem to be accompanied by an outsized performance trade-off, as *TOP* BHCs have similar Sharpe Ratios and higher market-to-book ratios. Thus it seems that the lower risk we observe in accounting returns is mirrored in market price data, suggesting that increased supervisory attention is associated with less risky firms. We do not find a statistically significant difference in asset growth at *TOP* BHCs, although they on average grow 50 bps slower. As before, we cannot conclude that lower risk is coming at the expense of financial intermediation.

Of course, *TOP* status is not randomly assigned. There may be omitted variables that are correlated with being a *TOP* firm and with firm performance that would bias our estimates but that are not captured by fixed effects or matching characteristics. One such concern might be that being large in a district has implications for the firms' competitive environment compared to being a similar firm but of lower rank in another district. Specifically, highly ranked banks might have more market power than

[22] Appendix Table 2 demonstrates that there are not significant differences between top fifteen banks and their matches.

lower ranked peers. But, it is worth noting that banks compete across Federal Reserve districts. The *TOP* firms in our analysis are often not the firms with the most market share in the district because they face larger competitors headquartered outside the district.[23] In unreported robustness tests, we verify that the inclusion of market power measures based on local deposit share do not meaningful alter our findings.[24]

c. Sources of earnings volatility

One of the more robust results from this analysis is the finding that *TOP* BHCs have lower earnings volatility than otherwise comparable BHCs that are not among the largest in their districts. In this section, we explore that finding in more detail to identify the sources of lower earnings volatility for *TOP* BHCs. We decompose net income (the numerator of ROA) into four key components: net interest margin (NIM), non-interest income such as fees and trading revenue, loan loss provisions (LLP), and other non-interest expense (non-interest expense excluding compensation and fixed asset expenses).[25] Each of these is scaled by total assets. We calculate the standard deviation of each of the resulting ratios over an eight-quarter forward horizon. Using these outcome variables, we repeat the analysis of differences between *TOP* BHCs and the matched sample, controlling for district-time effects. These results are reported in the top four rows of Table 7.

Consistent with the overall results for the volatility of ROA, the volatility of each of these key net components is lower for *TOP* BHCs than for the matched sample. The differences are statistically significant for net interest margin, non-interest income, and loan loss, though not for other non-interest expense. The lower volatility of provisions is consistent with the finding that *TOP* BHCs have less volatile NPLs and could reflect that these firms hold less risky loan portfolios and are more conservative over time. The lower volatility of net interest income might also reflect this finding to some extent, as more stable loan portfolios can generate less volatile interest income on loans. The lower volatility of non-interest income at *TOP* BHCs suggests that the impact of supervision extends beyond the impact on BHCs' lending to other activities at the firm.

---

[23] The market share leader in a district is headquartered in another district approximately 60% of the time. For example, in District 11 (Dallas) the three largest banks by market share in 2014 are JPMorgan, Bank of America and Wells Fargo – each of which is based outside the district. In addition, most of the banks that are largest by market share in their own district are dropped from the analysis as they do not share a common size support with the control groups.

[24] The reason we do not account for these measures in our primary specifications is that the FDIC's Summary of Deposits data, which is used to calculate local market share, is not readily available for the entire sample period.

[25] We calculate non-interest expense net of compensation and fixed asset expense to focus on the more volatile components of non-interest expense. This includes corporate overhead, IT and data processing, consulting and advisory, some legal expenses and other expenses as well as one-time losses not otherwise categorized.

In addition to examining reported income and expense, we calculate a series of variables intended to isolate the discretionary portions of net income. Firms have discretion over the recognition of some parts of income and expense, to the extent that these components rely on models or management judgment. These areas include the timing of loan loss provisions and net charge-offs, the timing of losses on securities held in the available-for-sale portfolio, and reserving for events such as legal settlements (part of non-interest expense). In this way we try to distinguish between decreased volatility that arises from lower risk from decreased volatility that reflects earnings management.

Following practices in the accounting literature (e.g. Moyer 1990), we estimate discretionary accounting behavior by using deviations from predicted values for loan loss provisions and realized security gains. To estimate discretionary behavior we use the sample of above median asset size BHCs and estimate deviations as follows: For loan loss provisions, we regress changes in the ratio of loan loss provisions to average loans held in a quarter on changes in the ratio of NPLs to loans, the change in net charge offs to loans, the level of loan loss reserve to total loans and district-quarter fixed effects. Discretionary loan loss provisions are the residuals from this regression, and thus measure the deviation from the time period average after adjusting for the firm's loss experiences. Similarly, for security gains, we regress quarterly realized security gains/losses scaled by assets on unrealized security gains in the available-for-sale portfolio scaled by assets and time fixed effects. We focus on the absolute value of these residuals to measure the discretionary activity. Finally we estimate total discretionary earnings as discretionary security gains less discretionary loan loss provisions scaled by assets. The results for the discretionary measures are reported in the bottom four rows of Table 7.

The net impact of the discretionary items is lower earnings for *TOP* BHCs than for matched firms, with statistically significant differences for the discretionary loan loss provisions, as well as for overall discretionary earnings. Hence, top size-ranked firms are less likely to deviate from typical provision levels given their experiences. Once again, this finding is consistent with the idea that BHCs subject to greater supervisory attention, as proxied by *TOP* status, take a more conservative approach to reserving for loan losses. This is not driven by earnings management of provisioning since they are less likely to deviate from predictions based on observables.

d. Other risks

While we find lower accounting measures of risks, we may be concerned that banks substitute other risks that are more difficult to observe. The market based measures such as stock price volatility suggest that market participants do not perceive an increase in other risks. We also find decreased volatility in both ROA and noninterest income, two accounting measures which might be correlated with

off balance sheet risks. However, we do additional analysis to understand if banks that receive more supervisory attention are taking in other risks that may not be well-captured by the accounting and market measures.

First, firms may be taking other risks that are realized only in the worst macroeconomic outcomes such as tail risks. In Table 8 we show the estimated coefficients on specifications that add an interaction between *TOP* and a dummy variable for the financial crisis period (2007:Q3-2009:Q2). If banks that receive more supervisory attention take more tail risk, we would expect to see worse financial performance for these firms relative to other firms in the financial crisis. We find mixed evidence about *TOP* firms' relative performance during the crisis. The magnitudes of the sum of the coefficients (*TOP* + *TOP x Crisis*) suggest that *TOP* BHCs earned higher market returns and had higher ROA relative to non-*TOP* BHCs during the crisis as compared to non-crisis periods, but also were relatively more volatile and had higher NPLs. However, none of the estimated coefficients on the interaction between *TOP* and the crisis period are statistically significant. We interpret this as evidence that these *TOP* firms are not more exposed to tail risks than are firms that receive less supervisory attention.[26]

Second, we look for measures of off-balance sheet activity. Unfortunately many measures of off-balance sheet activity were only added to regulatory reports after 2009, so we examine only the subset of measures that are available over our full sample period. Results of regressions on the matched sample including district quarter fixed effects are shown in the bottom panel of Table 8. We look at unused loan commitments, securitization income and noninterest income, all normalized by assets. These measures should capture activities where income is not as closely linked to balance sheet activities. *TOP* BHCs do not earn more net securitization income, nor do they have more noninterest income. We do find that *TOP* BHCs have higher amounts of unused loan commitments. This may reflect additional liquidity risk, since these firms have similar ratios of loans to assets; however this result is also consistent with the idea that more supervisory attention does not reduce intermediation, since loan commitments are a critical channel of credit supply.

[26] We estimated all of the specifications in Table 6 and 9 interacting the *TOP* measure with a dummy variable equal to one in NBER recession quarters. The estimated coefficients on these interactions were generally of the same sign as the coefficient on the *TOP* variable, but rarely statistically significant. In contrast to the mixed results in the financial crisis quarters, this suggests that the lower risk associated with supervisory attention is found across the business cycle. Results are available upon request.

e. Non-Financial Outcome Measures

In addition to these financial measures of risk, we look at non-financial measures that may relate to firm risk. First, we examine the governance structure of the firm, particularly as it relates to risk management. We also look at supervisory actions at a particular institution. Greater scrutiny, all else equal, may increase the degree to which supervisors use ratings and enforcement actions to influence a bank's behavior. However it is also possible that increased supervisory attention means that firm behavior may be influenced without need for more formal actions.

While there is a wealth of data on BHCs' financials, information on internal governance is not as easily to measure over a long time horizon. We attempt to characterize the importance of risk management at a BHC by determining whether it has a Risk Committee or a Chief Risk Officer (CRO). We match public BHCs to their proxy filings and then conduct text searches on these filings. If the filing mentions a Risk Committee or a Chief Risk Officer, we construct an indicator variable that notes their presence.[27] CROs are extremely rare in filings prior to 2006; therefore, we only use this indicator from 2006 onward. Our presumption is that a BHC with a Risk Committee or a CRO places more managerial focus on the importance of monitoring and mitigating risk. Hence, we can test whether supervisory attention results in greater risk governance.

The last category of comparison is supervisory tools. We are able to measure several tools that supervisors use to influence BHC behavior. The first are MRAs and MRIAs. As described previously, MRAs and MRIAs are supervisory actions intended to ensure that firms remediate unsafe or unsound practices or conditions and regulatory violations. MRAs and MRIAs are by far the most common type of supervisory action (Eisenbach et al. 2015) and are assigned to banks much earlier than public enforcement actions. We construct variables for the number of open MRAs and MRIAs at the end of each quarter, as well as the number of new MRAs and MRIAs generated by supervisors during the quarter. These data are available over the period from 2009:Q4 to 2014:Q4.

The third tool we use is BHC supervisory ratings. As described above, supervisors assign composite ratings to BHCs reflecting the overall extent of concerns about the institution, where a rating of "1" is the lowest level of concern and "5" is the highest.[28] A high rating can result in restrictions on BHC activities, including, but not limited to, the acquisition of another institution or expansion into new

[27] Specifically, a BHC is said to have a CRO if the proxy filing mentions "Risk Officer", "Chief Risk", "Chairman of Risk", or "Chair of Risk". A BHC is said to have a Risk Committee if the proxy mentions "Risk Committee".

[28] The composite ratings used in the analysis span two different rating methods used by the Federal Reserve. The BOPEC rating system was replaced with the RFI rating system in 2006:Q1. While the specifics of the two systems differ, both generate "1 to 5" ratings with similar overall interpretations about the degree of supervisory concern associated with a given composite rating level.

activities. We examine the level of the rating, to see if supervisory attention induces lower ratings, as well as the frequency of ratings changes, as more supervisory attention might lead to a greater use of this tool to influence bank behavior.

These results are reported in Table 9. There are no significant differences in the governance measures or most supervisory measures between *TOP* BHCs and other firms. More MRAs and MRIAs are closed at *TOP* BHCs, however, consistent with the idea that increased supervisory attention might allow BHCs and supervisors to address and resolve supervisory concerns more quickly.

f. Two-Stage Least Squares

Our underlying identification assumption, that the top ranked firms receive more attention all else equal, can be applied in an alternative empirical framework. Rather than estimating reduced form estimates based on the *TOP* dummy, we instrument for log hours using two-stage least squares (2SLS). This methodology comes at a cost, as we are restricted to the smaller sample period for which we have hours, 2006-2014. But, 2SLS allows us to verify our results using an alternative estimation procedure and to quantify changes in bank outcomes in terms of our proxy for attention, supervisory hours.

Table 10 presents the results of 2SLS estimations for the primary financial outcome and non-financial outcome measures discussed in earlier in this section. In the analysis we begin with a sample of all bank holding companies above median size and exclude those that are larger than the largest untreated bank.[29] Because we are working with the supervisory hours data, our sample is restricted to Q1 2006 to Q4 2014. We instrument for supervisory hours with *TOP*, and the first stage of the analysis is similar to that reported in Table 3, Column 5. The F-statistics are reported in the third column of Table 10, and satisfy standard tests for weak instruments (all greater than 10).

Results from the 2SLS analysis are similar to those in Table 6, although with somewhat lower statistical significance, reflecting the lowering of statistical power from the shorter time series. An increase in supervisory hours of 10 percent is associated with 3.8% lower non-performing loan rate relative to the mean (coefficient of -0.857*0.10 divided by the sample mean of 2.28), and a 4.3% decrease in the standard deviation of the percentage of non-performing loans. Increased supervisory hours are also associated with significantly less volatile ROA which results in higher accounting Sharpe Ratios and higher Z-scores. A 10% increase in hours reduces the volatility of BHC earnings by 6.3%. Increased supervisory hours are associated with lower standard deviation of returns and a lower likelihood of having returns in the bottom decile, however these results are not statistically significant in this time period.

[29] Results are similar if those firms are included, see Appendix Table 6.

After instrumenting for supervisory hours, we find a statistically significant relationship between supervisory hours and MRAs and MRIAs – A 10% increase in instrumented hours more than doubles new supervisory actions. However, more hours are not associated with worse ratings or with more frequent changes in ratings, hence these firms do not appear to be more risky from the perspective of supervisors.

We can compare the 2SLS results to standard OLS estimates of bank outcomes on log hours (see Appendix Table 5). In general, standard OLS are consistent with more risky firms receiving more supervisory hours. More hours are positively associated with NPLs, volatility, and supervisory issues. These findings suggest that at a minimum our instrument helps ameliorate the underlying identification problem that risky firms receive more hours.

In general, these results support our findings in the longer time period, both in terms of statistical significance and directional impact. However, the quantification should be interpreted cautiously. First, while we believe that hours data are a useful proxy for supervisory attention, hours data fail to capture any information on the quality of hours. While our prior is that quality and quantity of supervisory hours are positively related, the reverse could attenuate our estimated coefficients. In addition, the hours data are only available for 2006 onward, thereby limiting our statistical power. This time period is also one that is particularly volatile for financial performance.

g. Other potential analyses

We had hoped to use our proxy in an event study format, exploiting firms that enter and leave the *TOP* status in their district. However, this analysis faces several challenges. First, entrance and exit from the *TOP* are infrequent; (96% of BHCs that are in the *TOP* in a district remain in the *TOP* in the next quarter). Second, entry and exit is likely to be endogenous to firm performance. Firms that enter (leave) the *TOP* are likely to be growing faster (slower) than their peers in the same district. Firms that enter the *TOP* due to an acquisition of a large firm by an out-of-district firm may be facing a changed competitive environment. Third, the power of an event study is limited by the fact that we do not have a sense for the time that it takes for increased supervisory attention to result in different outcome. This biases us against finding anything both in our main analysis and in an event study context, where the effect of supervisory attention is unlikely to be instantaneous.

6. Conclusion

We exploit the geographic assignment of supervisory responsibilities in the Federal Reserve System to examine the impact of supervision. We demonstrate that the largest bank holding companies

in a Federal Reserve District receive greater supervisory attention in the form of more dedicated supervisory hours, even after controlling for factors such as the size and complexity of the institution. Using this phenomenon, we compare these top-size-ranked firms within a district to similar firms in another district. Our results are consistent with increased supervisory attention resulting in lower risk as measured by less risky lending, lower earnings volatility and more conservative accounting practices. Given these institutions are subject to similar regulatory regimes, our findings provide novel evidence that supervision matters.

Why might greater supervisory hours affect bank outcomes? One mechanism may be by promoting conservative accounting practices, which result in smoother accounting-based measures over time, but do not lower the underlying riskiness of the firm. However, we find evidence that non-performing loans are lower and suggestive evidence in market measures that these institutions are actually less risky. If true riskiness is lower without a commensurate trade-off in earnings or returns, then the results might be explained by the presence of supervisors resolving governance problems *within* firms*,* effectively improving their overall performance. Unfortunately, given the available data, we are not able to identify the specific supervisory practices or programs that might produce this result.

These findings suggest a positive role for supervision, but any policy implications are subject to several important caveats. First, our analysis focuses on the quantity of supervision and not the quality of supervision. We do not look directly at complementarities within Federal Reserve Banks, or at the specific activities pursued by supervisors. To explore this avenue, we would require more detailed information about the specific activities pursued by supervisors and the costs of these supervisors, not just the number of hours spent working on particular institutions. Some information of this type is available in confidential Federal Reserve supervisory data (e.g., from systems intended to assist management of the supervisory areas of the System) and our hope is to explore these data in future work.

Second, we do not attempt to measure the social welfare benefits of supervision. It is hard to measure the costs of bank financial distress and the ways in which these externalities may be associated with geography and firm characteristics. While we find a role for supervisory attention with regards to reducing risk, we do not find a statistically significant impact of increased supervision on asset growth. This suggests that risk reduction is not coming at the expense of financial intermediation. However, a true measure of social welfare would need to quantify the tradeoff between the provision of credit and financial stability as well as the cost of supervision.

REFERENCES

Agarwal, Sumit, David Lucca, Amit Seru, and Francesco Trebbi. 2014. "Inconsistent Regulators: Evidence from Banking." *The Quarterly Journal of Economics*. 189:2, pp. 889-938.

Altman, Edward. 1968. "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *Journal of Finance.* 23:4, pp. 589-609.

Barth, James R., Chen Lin, Yue Ma, Jesús Seade, and Frank M Song. 2013. "Do Bank Regulation, Supervision and Monitoring Enhance or Impede Bank Efficiency?" *Journal of Banking and Finance* 37:8, pp. 2879–92.

Bassett, William F., and W. Blake Marsh. 2014. "Assessing Targeted Macroprudential Financial Regulation: The Case of the 2006 Commercial Real Estate Guidance for Banks." FEDS Working Paper 2014-19. www.federalreserve.gov/pubs/feds/2014/201449/201449pap.pdf.

Bassett, William F., Seung Jung Lee, and Thomas W. Spiller. 2012. "Estimating Changes in Supervisory Standards and Their Economic Effects." FEDS Working Paper 2012-55. http://www.federalreserve.gov/pubs/feds/2012/201255/201255pap.pdf.

Berger, Allen N., and Sally M. Davies. 1998. "The Information Content of Bank Examinations." *Journal of Financial Services Research*.14:2, pp. 117–44.

Berger, Allen N., Sally M. Davies, and Mark J. Flannery. 2000. "Comparing Market and Supervisory Assessments of Bank Performance: Who Knows What When?" *Journal of Money, Credit and Banking.* 32:3, pp. 641-67.

Board of Governors of the Federal Reserve System. 2013. "Supervisory Considerations for the Communication of Supervisory Findings." SR 13-13. June 17, 2013. http://www.federalreserve.gov/bankinforeg/srletters/sr1313.htm

_____. 2015. "Governance Structure of the Large Institution Supervision Coordinating Committee (LISCC) Supervisory Program." April 17, 2015. http://www.federalreserve.gov/bankinforeg/srletters/sr1507.htm

Bolton, Patrick and Mathias Dewatrtipont. 1994. "The Firm as a Communication Network." *The Quarterly Journal of Economics*, 109:4, pp. 809-839.

Boyd, John H., Stanley L. Graham, and R. Shawn Hewitt. 1993. "Bank holding company mergers with nonbank financial firms Effects on the risk of failure." *Journal of Banking & Finance* 17:1, pp. 43-63

Bridges, Jonathan, David Gregory, Mette Nielson, Silvia Pezzini, Amar Radia and Marco Spaltro. 2014. "The Impact of Capital Requirements on Bank Lending." Bank of England Working Paper no. 486. January 2014.

Cargill, Thomas F. 1989. "CAMEL Ratings and the CD Market." *Journal of Financial Services Research.* 3: 4, pp. 347–58.

Cetorelli, Nicola and Stern, Samuel 2015. "Same Name, New Businesses: Evolution in the Bank Holding Company." *Liberty Street Economics Blog,* Septemeber 28, 2015.

Cole, Rebel A., and Jeffery W. Gunther. 1995. "A CAMEL Rating's Shelf Life." *Financial Industry Studies*. December 1995., pp. 13-20.

Delis, Manthos D., and Panagiotis K. Staikouras. 2011. "Supervisory Effectiveness and Bank Risk." *Review of Finance*. 15:3, pp. 511-43.

Eisenbach, Thomas, Andrew Haughwout, Beverly Hirtle, Anna Kovner, David Lucca and Matthew Plosser. 2015. "Supervising Large, Complex Financial Firms: What Do Supervisors Do?" Federal Reserve Bank of New York *Staff Report* No. 729. https://www.newyorkfed.org/research/staff_reports/sr729.html

Eisenbach, Thomas M., David O. Lucca and Robert M. Townsend. 2016. "The Economics of Bank Supervision." Federal Reserve Bank of New York *Staff Report* No. 769. https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr769.pdf?la=en

Fama, Eugene F. and Kenneth R. French. 1993. "The Cross-section of Expected Stock Returns." *The Journal of Finance* 47:2, pp. 427-465.

Garicano, Luis. 2000. "Hierarchies and the Organization of Knowledge in Production." *Journal of Political Economy*. 108: 5, pp. 874-904.

Geanakoplos, John and Paul Milgrom. 1991. "A Theory of Hierarchies Based on Limited Managerial Attention." *Journal of the Japanese and International Economies*. 5:3), pp. 205-25.

Goldsmith-Pinkham, Paul, Beverly Hirtle and David Lucca. 2016. "Parsing the content of bank supervision." *Federal Reserve Bank of New York Staff Report*. No. 770.

Hannan, Timothy H. and Gerald A. Hanweck. 1988. "Bank Insolvency Risk and the Market for Large Certificates of Deposit." *Journal of Money, Credit and Banking*. 20:2, pp. 203-11.

Hirtle, Beverly J., and Jose A. Lopez. 1999. "Supervisory Information and the Frequency of Bank Examinations." Federal Reserve Bank of New York *Economic Policy Review*. April 1999, pp. 1-19.

Jayaratne, Jith and Philip E. Strahan. 1996. "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation." *Quarterly Journal of Economics*. 111:3, pp. 639-70.

Kiser, Elizabeth K., Robin A. Prager, and Jason R. Scott. 2012. "Supervisor Ratings and the Contraction of Bank Lending to Small Businesses." FEDS Working Paper 2012-15. http://www.federalreserve.gov/pubs/feds/2012/201259/201259pap.pdf.

Kovner, Anna, James Vickery and Lily Zhou. 2014. "Do Big Banks Have Lower Operating Costs?" Federal Reserve Bank of New York *Economic Policy Review*. 20:2, pp. 1-27.

Krainer, John, and Jose A. Lopez. 2009. “Do Supervisory Rating Standards Change over Time?” Federal Reserve Bank of San Francisco *Economic Review*, 13–24.

Miller, George A. 1956. “The magical number seven, plus or minus two: some limits on our capacity for processing information. *Psychological Review*, 63:2, pp. 81-97.

Mishkin, F. S. 2001. “Prudential supervision: Why is it important and what are the issues?” *Prudential Supervision: What Works and What Doesn’t*, University of Chicago Press, 1-30.

Morgan, Donald P., Rime Bertrand, and Philip E. Strahan. 2004. “Bank Integration and State Business Cycles.” *Quarterly Journal of Economics*. 119:4, pp. 1555-84.

Moyer, S. 1990. “Capital adequacy ratio regulations and accounting choices in commercial banks.” *Journal of Accounting and Economics*. 13 (July), pp. 123-154.

Peek, Joseph, and Eric Rosengren. 1995. “Bank Regulation and the Credit Crunch.” *Journal of Banking and Finance.* 19:3, pp. 679–92.

Radner, Roy. 1993. “The Organization of Decentralized Information Processing.” *Econometrica.* 61:5, pp. 1109-46.

Rezende, Marcelo. 2011. “The Effects of Bank Regulator Switching on Supervisory Ratings.” FEDS Working Paper 2014-20. http://www.federalreserve.gov/pubs/feds/2014/201420/201420pap.pdf.

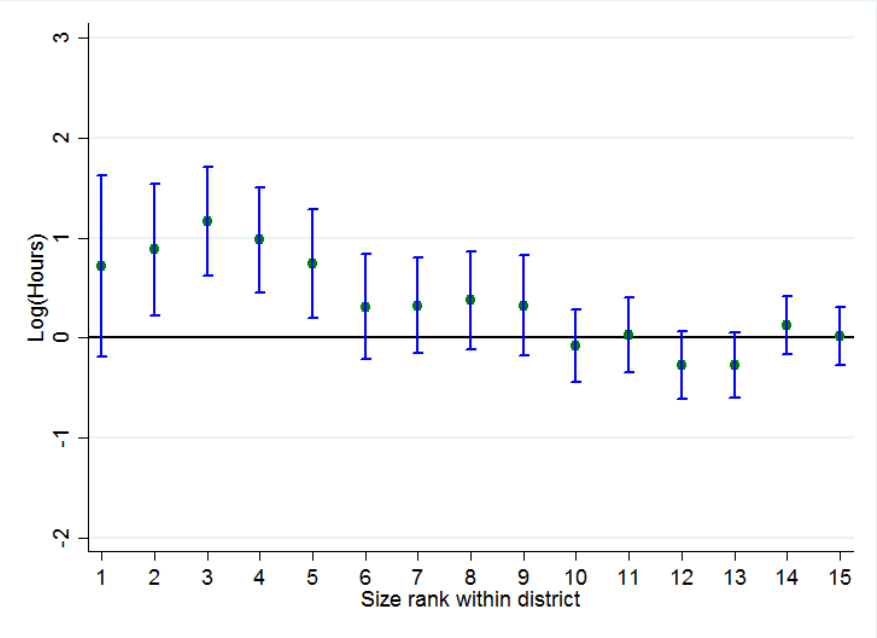
Rezende, Marcelo, and Jason J. Wu. 2014. “The Effects of Supervision on Bank Performance: Evidence from Discontinuous Examination Frequencies.” *Midwest Finance Association 2013 Annual Meeting Paper*.

Rosenbaum, P. and Rubin, D.B. 1983. “The Central Role of the Propensity Score in Observational Studies for Causal Effects," *Biometrika*, vol. 70, no. 1, 41-55.

Swindle, C. Sloan. 1995. “Using CAMEL Ratings to Evaluate Regulator Effectiveness at Commercial Banks.” *Journal of Financial Services Research.* 9:2, pp. 123–41.

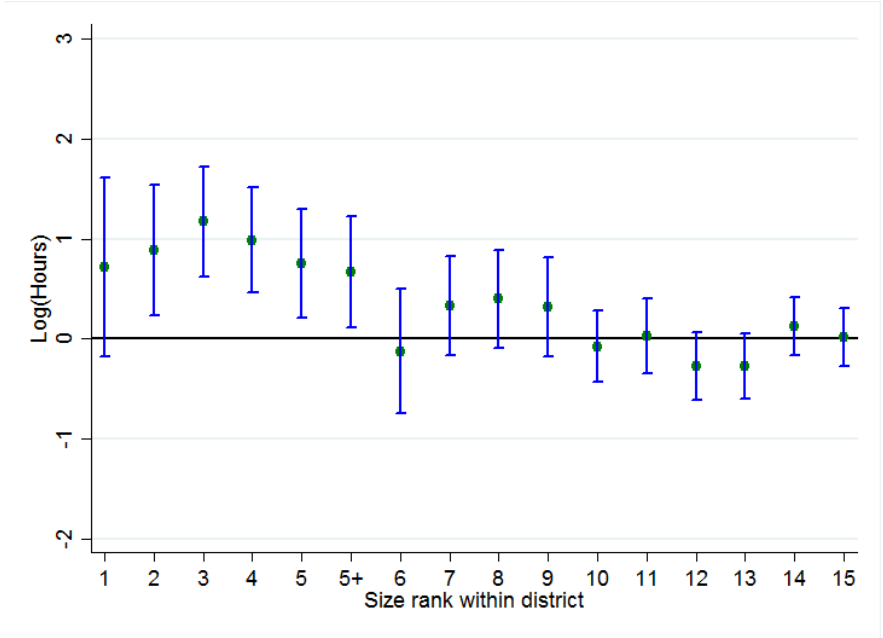
FIGURES

Figure 1: Variation in Supervisory Hours by Size Rank



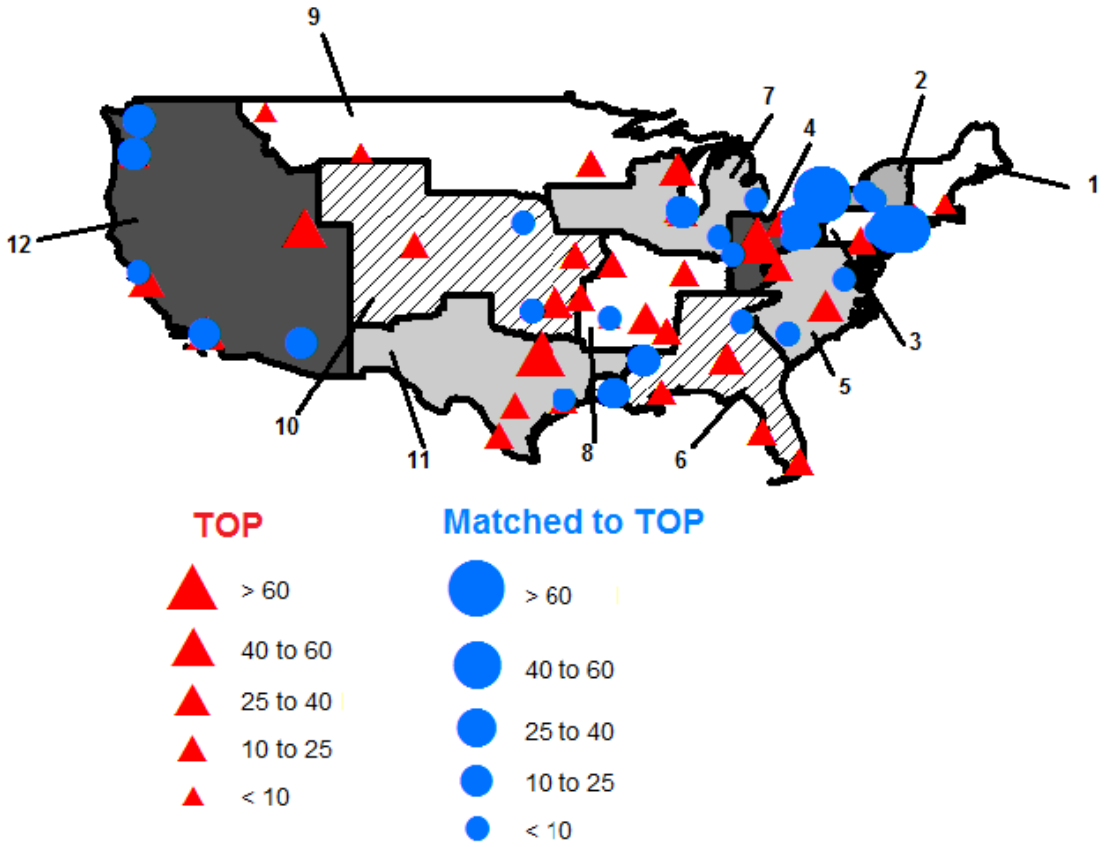
Note: Plots the average excess log(hours) based on the size rank of a bank within a district. Excess hours are estimates based on a regression of log hours on rank dummies and various controls for size, complexity, business composition and time-district fixed effects. Circles signify the value of the coefficient on rank dummies 1 through 15. Lines illustrate 95% confidence intervals.

Figure 2: Variation in Supervisory Hours by Size Rank Including Five Plus



Note: Plots the average excess log(hours) based on the size rank of a bank within a district. Excess hours are estimates based on a regression of log hours on rank dummies and various controls for size, complexity, business composition and time-district fixed effects. Circles signify the value of the coefficient on rank dummies 1 through 15. The "5+" category includes banks ranked 6-15 but within 25% of the asset size of fifth ranked bank in their district. Note that banks included in "5+" are excluded from 6-15. Lines illustrate 95% confidence intervals.

Figure 3: *TOP* and Matched BHCs by Federal Reserve District



Note: Illustrates the headquarters location of *TOP* BHCs and their matches in 2014. Shapes are sized based on total assets where the categories are in billions of dollars. Size rank is determined by book asset size within a district-quarter. Numbers indicate Federal Reserve Districts.

TABLES

Table 1: Asset Size by Rank across Federal Reserve Districts

Fed District	Assets by Size Rank ($bn)						Median Assets	N
	1st	2nd	3rd	4th	5th	Mean (6th - 10th)		
1	274.1	133.0	118.4	22.5	9.5	6.2	1.1	82
2	2572.8	1842.2	856.3	801.5	515.6	291.3	3.2	92
3	248.1	115.9	25.0	18.7	17.1	6.2	1.0	61
4	345.2	138.7	93.9	66.3	24.9	10.0	1.0	57
5	2106.8	309.1	186.8	30.1	12.3	5.8	1.0	89
6	190.4	119.9	27.1	24.3	21.6	15.2	0.9	136
7	151.8	109.9	83.1	26.8	20.0	11.4	1.0	157
8	25.7	24.0	15.0	13.3	11.6	7.9	0.9	98
9	402.5	19.4	9.2	8.6	8.3	2.6	0.9	63
10	29.1	24.0	17.5	17.5	14.5	7.7	0.9	89
11	130.4	83.2	69.5	28.3	21.5	10.6	1.2	100
12	1687.2	154.6	89.8	57.2	39.4	27.9	1.5	98

Note: Summarizes the size of the largest BHCs in each Federal Reserve district. The sample consists of FR Y-9C filers in 2014Q4. Dollars are in billions.

Table 2: Regression of Supervisory Hours on *TOP* Indicator and Bank Controls

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Top Five		3.492***	0.818***	0.725***	0.730***		
		(18.12)	(3.51)	(4.05)	(4.07)		
TOP						3.330***	0.730***
						(17.74)	(4.26)
log(Assets)			2.244***	1.389**	1.426**		1.214*
			(3.14)	(2.22)	(2.31)		(1.96)
log(Assets) Squared			-0.049**	-0.020	-0.021		-0.015
			(-2.21)	(-0.99)	(-1.06)		(-0.74)
log(Entities)			0.427***	0.423***	0.421***		0.418***
			(4.34)	(5.64)	(5.95)		(5.92)
% SMB (> $10B)				0.019***	0.020***		0.019***
				(8.90)	(9.08)		(9.01)
% SMB (≤ $10B)				0.033***	0.034***		0.034***
				(33.18)	(32.92)		(33.12)
% National Banks				0.000	0.000		0.000
				(0.01)	(0.14)		(0.03)
Public Indicator				0.068	0.042		0.048
				(0.80)	(0.49)		(0.56)
% Loans/Assets					0.001		0.001
					(0.35)		(0.33)
% Deposits/Liabilities					-0.007		-0.007
					(-1.18)		(-1.19)
HHI of Assets					0.747		0.760
					(1.58)		(1.61)
Observations	14955	14955	14908	14908	14908	14955	14908
District-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.07	0.22	0.31	0.51	0.52	0.23	0.52

Note: Contains results from regressions of log of supervisory hours on a dummy indicating Top 5 or TOP size-rank in a district and controls. Size rank is determined by book asset size within a district-quarter. Log of assets based on consolidated book assets. Percent of assets at a State Member Bank (SMB) or National Bank determined using Call Report data. HHI of assets is based on asset shares for credit card loans, residential real estate loans, commercial real estate loans, commercial and industrial loans, investment securities, and trading assets. Each regression includes district-quarter fixed effects. Observations are BHC-quarters from 2006Q1 to 2014Q4. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Regression of Supervisory Hours on Top Five Indicator, Top Fifteen Indicator and Bank Controls

VARIABLES	(1)	Excl. Large (2)	Excl. D2 (3)	(4)	Excl. Large (5)	Excl. D2 (6)
Top Five	0.698***	0.594***	0.729***			
	(3.77)	(3.08)	(4.07)			
TOP				0.700***	0.600***	0.725***
				(3.87)	(3.23)	(4.16)
Top Fifteen	0.149	0.151	0.084	0.096	0.103	0.029
	(1.02)	(1.05)	(0.56)	(0.65)	(0.71)	(0.19)
log(Assets)	1.208*	-0.008	1.591***	1.079*	-0.216	1.453**
	(1.89)	(-0.01)	(2.75)	(1.68)	(-0.25)	(2.47)
log(Assets) Squared	-0.015	0.025	-0.028	-0.011	0.032	-0.023
	(-0.75)	(0.91)	(-1.52)	(-0.54)	(1.15)	(-1.25)
log(Entities)	0.422***	0.426***	0.437***	0.419***	0.424***	0.433***
	(5.96)	(5.93)	(6.00)	(5.93)	(5.91)	(5.96)
% SMB (> $10B)	0.019***	0.019***	0.020***	0.019***	0.018***	0.019***
	(9.18)	(8.15)	(9.53)	(9.06)	(7.82)	(9.37)
% SMB (≤ $10B)	0.034***	0.034***	0.033***	0.034***	0.034***	0.033***
	(33.10)	(33.33)	(32.22)	(33.21)	(33.43)	(32.36)
% National Banks	0.000	0.000	0.000	0.000	0.000	0.000
	(0.11)	(0.13)	(0.34)	(0.02)	(0.04)	(0.24)
Public Indicator	0.042	0.047	0.064	0.048	0.052	0.070
	(0.49)	(0.55)	(0.73)	(0.56)	(0.61)	(0.80)
% Loans/Assets	0.001	0.001	0.001	0.001	0.001	0.001
	(0.37)	(0.23)	(0.34)	(0.34)	(0.19)	(0.31)
% Deposits/Liabilities	-0.007	-0.007	-0.009	-0.007	-0.007	-0.009
	(-1.24)	(-1.17)	(-1.48)	(-1.23)	(-1.15)	(-1.47)
HHI of Assets	0.779	0.797*	0.850*	0.781*	0.800*	0.854*
	(1.65)	(1.68)	(1.67)	(1.65)	(1.69)	(1.68)
Observations	14908	14762	14049	14908	14744	14049
District-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.52	0.50	0.52	0.52	0.50	0.52

Note: Contains results from regressions of log of supervisory hours on a dummy indicating Top 5 or TOP size-rank in a district, a dummy indicating Top 15 rank, and controls. Size rank is determined by book asset size within a district-quarter. Log of assets based on consolidated book assets. Percent of assets at a State Member Bank (SMB) or National Bank determined using Call Report data. HHI of assets is based on asset shares for credit card loans, residential real estate loans, commercial real estate loans, commercial and industrial loans, investment securities, and trading assets. Each regression includes district-quarter fixed effects. Columns 2 and 4 exclude banks that are larger than the largest non-treatment bank. Columns 3 and 6 exclude District 2 banks. Observations are BHC-quarters from 2006Q1 to 2014Q4. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: *TOP* BHCs Compared to Matches on Matching Criteria

	TOP				Matches					
Control Variables	**Mean**	**Median**	**SD**	**N**	**Mean**	**Median**	**SD**	**N**	**Δ Means**	***p*-value**
Log of Assets	16.07	16.13	0.86	3,027	16.10	16.18	0.89	6,054	-0.03	0.77
Log of Entities	3.14	3.22	0.81	3,027	3.19	3.22	0.88	6,054	-0.06	0.59
% SMB Assets (> $10B)	5.94	0.00	22.88	3,027	4.88	0.00	20.84	6,054	1.05	0.67
% SMB Assets (<= $10B)	7.16	0.00	22.17	3,027	9.14	0.00	25.03	6,054	-1.98	0.53
% Nat. Bank Assets	40.34	9.78	44.02	3,027	40.11	10.29	44.75	6,054	0.24	0.97
% Loans/Assets	61.29	63.86	12.63	3,027	62.00	64.55	10.82	6,054	-0.71	0.66
% of Deposits/Liabilities	83.81	85.34	9.25	3,027	83.29	85.26	10.01	6,054	0.52	0.70
HHI of Assets	0.19	0.17	0.07	3,027	0.18	0.17	0.08	6,054	0.00	0.88
Public Indicator	0.83	1.00	0.37	3,027	0.84	1.00	0.36	6,054	-0.01	0.85
Rank	4.28	4.00	1.72	3,027	10.61	9.00	5.51	6,054	-6.33***	0.00
Log(Hours)	5.84	6.17	1.93	1,139	5.15	5.71	2.43	2,283	0.69**	0.04

Note: Compares sample means between the TOP BHCs (treatment) and their matches. Matching chooses the two nearest neighbor for each treatment observation based on the listed control variables (rows 1-9). The difference in means is the treatment less the matches. *p*-values assume standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Differences in Means between *TOP* and Matches

	TOP				Matches					
Dependent Variable	**Mean**	**Median**	**S.D.**	**N**	**Mean**	**Median**	**S.D.**	**N**	**Δ Means**	***p*-value**
Balance Sheet										
% of RWA/Assets	71.03	71.80	10.93	2,236	70.85	71.66	11.23	4,425	0.18	0.92
Tier 1 Ratio	11.76	11.42	2.86	2,266	12.23	11.29	3.94	4,519	-0.47	0.29
% of NPL	1.38	0.94	1.31	3,003	1.72	1.02	1.98	5,951	-0.34*	0.08
SD of NPL/Loans	0.32	0.18	0.38	2,595	0.44	0.22	0.57	5,135	-0.12**	0.03
% of Loan Loss Reserves	1.72	1.54	0.65	2,979	1.71	1.55	0.77	5,849	0.01	0.88
SD of Loan Loss Reserves/Loans	0.15	0.09	0.16	2,562	0.16	0.09	0.19	5,127	-0.01	0.51
% Asset Growth (YoY)	10.89	7.77	13.70	2,958	10.38	6.99	14.29	5,738	0.51	0.58
Earnings										
ROA	1.01	1.11	0.62	3,001	0.96	1.07	0.77	5,924	0.06	0.35
SD of ROA	0.33	0.16	0.56	2,503	0.54	0.21	0.91	5,149	-0.22**	0.01
Sharpe Ratio of ROA	8.75	6.46	7.67	2,490	7.20	5.16	6.93	5,104	1.54**	0.04
Log Z-Score	3.96	4.09	1.01	2,489	3.68	3.91	1.19	5,062	0.28**	0.03
Market										
Market Cap/Equity	1.74	1.61	0.75	2,475	1.65	1.50	0.78	4,970	0.09	0.34
Quarterly Excess Return %	0.01	0.01	0.12	2,412	0.00	0.00	0.13	4,901	0.01	0.27
SD of Daily Return	0.02	0.02	0.01	2,435	0.02	0.02	0.01	4,975	0.00	0.41
Sharpe Ratio	0.04	0.04	0.11	2,476	0.04	0.03	0.11	5,031	0.01	0.23
Bottom decile of excess return	0.07	0.00	0.25	2,452	0.10	0.00	0.30	5,020	-0.03**	0.04

Note: Compares sample means between *TOP* BHCs (treatment) and their matches. For details on variable construction see the Data Appendix. The difference in means is the treatment less the matches. *p*-values assume standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Impact of *TOP* Status Controlling for District Fixed Effects

Dependent Variable	TOP	Std. Error	*p*-value	N.	R-Squared	Sample Mean
Balance Sheet						
% of RWA/Assets	-0.613	(1.329)	0.65	24,171	0.26	71.32
Tier 1 Ratio	-0.221	(0.342)	0.52	24,261	0.18	12.50
% of NPL	-0.236**	(0.119)	0.05	29,957	0.42	1.51
SD of NPL/Loans	-0.123***	(0.042)	0.00	25,562	0.33	0.40
% of Loan Loss Reserves	-0.065	(0.057)	0.25	29,654	0.30	1.68
SD of Loan Loss Reserves/Loans	-0.010	(0.013)	0.45	25,509	0.28	0.15
% Asset Growth (YoY)	-0.495	(0.810)	0.54	29,088	0.14	11.06
Earnings						
ROA	-0.019	(0.042)	0.65	29,775	0.27	0.94
SD of ROA	-0.164**	(0.064)	0.01	25,417	0.16	0.47
Sharpe Ratio of ROA	1.354**	(0.562)	0.02	25,299	0.21	7.34
Log Z-Score	0.228**	(0.097)	0.02	25,189	0.22	3.76
Market						
Market Cap/Equity	0.153***	(0.052)	0.00	21,171	0.54	1.64
Quarterly Excess Return %	0.005	(0.005)	0.31	20,479	0.40	0.01
SD of Daily Return	-0.002**	(0.001)	0.01	21,033	0.66	0.02
Sharpe Ratio	0.002	(0.004)	0.55	21,254	0.52	0.04
Bottom decile of excess return	-0.031*	(0.017)	0.07	20,918	0.17	0.10

Note: Regresses dependent variable on a *TOP* indicator, a dummy indicating the matching group, and district-quarter fixed effects. Sample is top 15 BHCs and their matches. For details on variable construction see the Data Appendix. The coefficient on *TOP* can be interpreted as the differential impact of *TOP* status within a district-quarter. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: *TOP* Status and Earnings Volatility Controlling for District Fixed Effects

Dependent Variable	TOP	Std. Error	*p*-value	N.	R-Squared	Sample Mean
Earnings Volatility						
SD of NIM/Assets	-0.007**	(0.003)	0.04	25,376	0.16	0.05
SD of Noninterest Income/Assets	-0.017**	(0.007)	0.02	25,598	0.10	0.06
SD of Loan Loss Provision/Assets	-0.011*	(0.007)	0.10	25,691	0.29	0.07
SD of NIE Less Comp. and FA/Assets	-0.007	(0.009)	0.47	25,374	0.11	0.07
Discretionary Earnings						
Absolute Value of Disc. LLP %	-0.010***	(0.004)	0.01	28,641	0.20	0.06
Absolute Value of Disc. Security Gains	-0.002	(0.001)	0.15	25,798	0.14	0.01
Discretionary Earnings	-0.000	(0.003)	0.90	24,653	0.12	0.00
Absolute Value of Disc. Earnings	-0.005**	(0.003)	0.04	24,653	0.23	0.04

Note: Regresses dependent variable on a *TOP* indicator, a dummy indicating the matching group, and district-quarter fixed effects. Sample is top 15 BHCs and their matches. For details on variable construction see Data Appendix. The coefficient on *TOP* can be interpreted as the differential impact of *TOP* status within a district-quarter. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: *TOP* Status, Off-Balance Sheet and Crisis Performance

Dependent Variable	Top	Std. Error	*p*-value	Top X Crisis	Std. Error	*p*-value	N.	R-Squared	Sample Mean	Sample Mean (Crisis)
Off-Balance Sheet										
Net Securitiz. Inc./Assets	0.001	(0.001)	0.49				30,357	0.08	0.00	
Unused Commitments/Assets	0.004*	(0.002)	0.07				30,357	0.10	0.02	
Non-interest Inc./Assets	0.010	(0.026)	0.69				29,888	0.13	0.34	
Crisis Performance										
Quarterly Excess Return %	0.004	(0.005)	0.40	0.023	(0.023)	0.34	20,830	0.50	0.03	-0.02
SD of Daily Return	-0.002***	(0.001)	0.00	0.003	(0.003)	0.37	21,018	0.67	0.02	0.04
ROA	-0.024	(0.042)	0.57	0.057	(0.147)	0.70	29,751	0.27	0.95	0.56
% of NPL	-0.271**	(0.122)	0.03	0.481	(0.300)	0.11	29,950	0.42	1.51	1.62

Note: Regresses off-balance sheet measures on a *TOP* indicator, a dummy indicating the matching group, and district-quarter fixed effects, and regresses Excess Return, SD of Daily Return, ROA, and % of NPL on a *TOP* indicator, interaction between Crisis dummy (2007Q3 – 2009Q2) and *TOP* indicator, a dummy indicating matching group, and district-quarter fixed effects. Sample is top 15 BHCs and their matches. For details on variable construction see Data Appendix. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: *TOP* Status, Governance, and Supervision Controlling for District Fixed Effects

Dependent Variable	TOP	Std. Error	*p*-value	N.	R-Squared	Sample Mean
Governance						
Risk Committee Dummy	-0.006	(0.089)	0.95	7,094	0.31	0.26
Risk Manager Dummy	0.078	(0.101)	0.44	7,094	0.27	0.47
Supervisory						
Total MRA/MRIAs	0.228	(1.857)	0.90	8,405	0.05	3.03
New MRA/MRIAs	0.244	(0.352)	0.49	8,405	0.05	0.59
Closed MRA/MRIAs	0.714**	(0.337)	0.04	8,405	0.03	0.38
Total Enforcement Actions	0.086	(0.086)	0.32	30,357	0.17	0.27
Rating	-0.008	(0.057)	0.89	30,274	0.29	1.83
Ratings Change Dummy	-0.005	(0.006)	0.37	30,274	0.09	0.03

Note: Regresses dependent variable on a *TOP* indicator, a dummy indicating the matching group, and district-quarter fixed effects. Sample is top 15 BHCs and their matches. For details on variable construction see Data Appendix. The coefficient on *TOP* can be interpreted as the differential impact of *TOP* status within a district-quarter. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Table 10: Two-stage least squares regression, 2006-2014 (excl. large BHCs)

Second Stage Coefficients	Log(Hours)	SE	F-Stat	N	Sample Mean
Balance Sheet					
% of RWA/Assets	-0.012	(1.653)	12.65	14,564	73.38
Tier 1 Ratio	-1.024	(0.639)	13.64	14,545	12.71
% of NPL	-0.857*	(0.491)	13.6	14,495	2.28
SD of NPL/Loans	-0.321*	(0.182)	12.75	11,752	0.75
% of Loan Loss Reserves	-0.094	(0.160)	13.52	14,599	1.71
SD of Loan Loss Reserves/Loans	-0.073	(0.050)	12.26	11,737	0.23
% Asset Growth (YoY)	-0.825	(1.673)	13.94	14,335	7.49
Earnings					
ROA	0.110	(0.165)	13.39	14,510	0.55
SD of ROA	-0.524*	(0.299)	10.89	11,723	0.83
Sharpe Ratio of ROA	3.056*	(1.624)	11.35	11,695	4.08
Log Z-Score	0.732*	(0.420)	11.1	11,563	3.29
Market					
Market Cap/Equity	-0.042	(0.108)	11.15	7,803	1.21
Quarterly Excess Return %	-0.003	(0.010)	12.44	7,532	-0.01
SD of Daily Return	-0.002	(0.002)	11.64	7,695	0.03
Sharpe Ratio	-0.008	(0.006)	11.16	7,836	0.02
Bottom decile of excess return	-0.000	(0.025)	12.46	7,701	0.11
Governance					
Risk Committee Dummy	0.023	(0.107)	11.69	6,693	0.18
Risk Manager Dummy	0.121	(0.140)	11.69	6,693	0.41
Supervisory					
Total MRA/MRIAs	3.270***	(1.183)	17.07	10,019	2.63
New MRA/MRIAs	0.787***	(0.261)	17.07	10,019	0.52
Closed MRA/MRIAs	0.764	(0.496)	17.07	10,019	0.36
Total Enforcement Actions	0.362	(0.370)	12.75	14,740	0.37
Rating	-0.094	(0.143)	12.75	14,740	2.05
Ratings Change Dummy	-0.014	(0.017)	12.75	14,740	0.06

Note: Two-stage least squares regression where a *TOP* indicator instruments for log hours. Controls include log assets, log entities, share of assets at SMBs, share of assets at national banks, loans/assets, deposits/liabilities, HHI of assets, a public indicator and district-quarter fixed effects. Sample is 2006:Q1-2014Q4 BHCs above median asset size excluding foreign BHCs, atypical BHCs, and BHCs that are larger than the largest non-*TOP* bank. For details on variable construction see Data Appendix. F-Stats are tests for weak instruments. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX TABLES

Appendix Table 1: *TOP* BHCs and Full Sample Prior to Matching

Control Variables	TOP				Below TOP				Δ Means	*p*-value
	Mean	Median	S.D.	N	Mean	Median	S.D.	N		
Log of Assets	16.71	16.62	1.28	4,835	13.75	13.62	0.91	55,354	2.95***	0.00
Log of Entities	3.73	3.58	1.23	4,707	1.47	1.39	0.89	54,289	2.26***	0.00
% SMB Assets (> $10B)	9.15	0.00	27.45	4,835	0.23	0.00	4.66	55,354	8.92***	0.00
% SMB Assets (<= $10B)	4.77	0.00	18.04	4,835	14.19	0.00	33.45	55,354	-9.42***	0.00
% Nat. Bank Assets	40.96	16.49	43.70	4,835	26.28	0.00	41.30	55,354	14.68***	0.00
% Loans/Assets	62.70	65.12	12.08	4,835	64.89	66.26	12.26	55,354	-2.19**	0.05
% of Deposits/Liabilities	81.43	82.33	9.65	4,835	88.89	90.90	8.60	55,354	-7.46***	0.00
HHI of Assets	0.17	0.16	0.07	4,835	0.22	0.21	0.09	55,352	-0.05***	0.00
Public Indicator	0.86	1.00	0.34	4,835	0.43	0.00	0.49	55,354	0.44***	0.00

Note: Compares sample means between the *TOP* BHCs (treatment) and the remaining BHCs. The difference in means is the treatment less the group of remaining BHCs. *p*-values assume standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 2: Top 15 BHCs and Matches

Control Variables	Top 15				Matches				Δ Means	*p*-value
	Mean	Median	S.D.	N	Mean	Median	S.D.	N		
Log of Assets	15.14	15.02	0.94	10,119	15.15	15.04	0.96	20,238	-0.01	0.88
Log of Entities	2.43	2.40	0.89	10,119	2.43	2.40	0.95	20,238	-0.01	0.92
% SMB Assets (> $10B)	1.78	0.00	12.80	10,119	1.46	0.00	11.62	20,238	0.31	0.68
% SMB Assets (<= $10B)	14.36	0.00	32.83	10,119	14.92	0.00	33.26	20,238	-0.56	0.71
% Nat. Bank Assets	31.77	0.00	42.43	10,119	31.82	0.00	42.69	20,238	-0.06	0.98
% Loans/Assets	63.89	65.98	12.25	10,119	64.11	65.95	11.22	20,238	-0.23	0.74
% of Deposits/Liabilities	85.60	87.67	9.14	10,119	85.43	87.39	9.33	20,238	0.18	0.74
HHI of Assets	0.20	0.19	0.08	10,119	0.20	0.19	0.08	20,238	0	0.93
Public Indicator	0.71	1.00	0.45	10,119	0.71	1.00	0.45	20,238	0	0.87

Note: Compares sample means between the Top 15 BHCs and their matches. Top 15 are matched to non-TOP banks. The difference in means is the treatment less the group of remaining BHCs. *p*-values assume standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 3: Differences in Means between *TOP* and matches

Dependent Variable	TOP				Matches				Δ Means	*p*-value
	Mean	Med.	S.D.	N	Mean	Med.	S.D.	N		
Earnings Volatility										
SD of NIM/Assets	0.05	0.04	0.03	2,545	0.06	0.04	0.04	5,079	-0.01*	0.07
SD of Noninterest Income/Assets	0.06	0.04	0.07	2,597	0.07	0.04	0.08	5,070	-0.01	0.29
SD of Loan Loss Provision/Assets	0.05	0.02	0.07	2,594	0.06	0.03	0.09	5,152	-0.01	0.12
SD of NIE Less Comp. and FA/Assets	0.06	0.04	0.08	2,548	0.08	0.04	0.12	5,095	-0.01	0.30
Discretionary Earnings										
Abs. Value of Disc. LLP %	0.05	0.03	0.07	2,907	0.06	0.03	0.09	5,627	-0.01	0.28
Abs. Value of Disc. Security Gains	0.01	0.01	0.02	2,462	0.02	0.01	0.02	4,915	-.003**	0.04
Disc. Earnings	0.00	0.00	0.05	2,393	0.00	0.01	0.06	4,686	0.00	1.00
Abs. Value of Disc. Earnings	0.03	0.02	0.04	2,393	0.04	0.02	0.05	4,686	-0.01	0.12
Off-Balance Sheet										
Net Securitiz. Inc./Assets	0.00	0.00	0.03	3,027	0.00	0.00	0.01	6,054	0.00	0.40
Unused Commitments/Assets	0.03	0.02	0.05	3,027	0.02	0.02	0.01	6,054	0.01*	0.06
Non-interest Inc./Assets	0.45	0.39	0.26	2,991	0.37	0.34	0.26	5,956	0.08**	0.01
Governance										
Risk Committee Dummy	0.39	0.00	0.49	799	0.44	0.00	0.50	1,633	-0.05	0.65
Risk Manager Dummy	0.56	1.00	0.50	799	0.49	0.00	0.50	1,633	0.07	0.47
Supervisory										
Total MRA/MRIAs	4.51	0.00	12.10	763	3.31	0.00	17.39	1,551	1.20	0.44
New MRA/MRIAs	0.96	0.00	3.75	763	0.54	0.00	4.01	1,551	0.43*	0.09
Closed MRA/MRIAs	0.82	0.00	4.97	763	0.23	0.00	1.04	1,551	0.59	0.11
Total Enforcement Actions	0.41	0.00	1.84	3,027	0.37	0.00	1.06	6,054	0.04	0.76
Rating	1.79	2.00	0.68	3,024	1.83	2.00	0.79	6,045	-0.03	0.69
Ratings Change Dummy	0.03	0.00	0.16	3,024	0.03	0.00	0.17	6,045	0.00	0.55

Note: Compares sample means between *TOP* BHCs (treatment) and their matches for additional outcome measures. For details on variable construction see the Data Appendix. The difference in means is the treatment less the matches. *p*-values assume standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 4: *TOP* Status Controlling for District Fixed Effects, 2006-2014

Dependent Variable	TOP	Std. Error	*p*-value	N.	R-Squared	Sample Mean
Balance Sheet						
% of RWA/Assets	-1.049	(1.539)	0.50	12,031	0.25	72.50
Tier 1 Ratio	0.094	(0.436)	0.83	11,968	0.20	13.01
% of NPL	-0.350	(0.226)	0.12	11,923	0.34	2.08
SD of NPL/Loans	-0.210**	(0.097)	0.03	9,858	0.21	0.64
% of Loan Loss Reserves	0.174*	(0.091)	0.06	11,972	0.33	1.65
SD of Loan Loss Reserves/Loans	0.029	(0.026)	0.26	9,901	0.22	0.20
% Asset Growth (YoY)	-2.243*	(1.214)	0.07	11,784	0.11	8.06
Earnings						
ROA	-0.045	(0.074)	0.55	11,824	0.24	0.72
SD of ROA	-0.269*	(0.157)	0.09	9,875	0.13	0.72
Sharpe Ratio of ROA	1.729*	(0.903)	0.06	9,830	0.21	5.06
Log Z-Score	0.291	(0.183)	0.11	9,619	0.24	3.50
Market						
Market Cap/Equity	0.128	(0.080)	0.11	8,329	0.46	1.28
Quarterly Excess Return %	0.005	(0.008)	0.55	8,017	0.45	0.00
SD of Daily Return	-0.000	(0.001)	0.72	8,312	0.74	0.02
Sharpe Ratio	0.001	(0.006)	0.88	8,443	0.54	0.02
Bottom decile of excess return	-0.011	(0.024)	0.65	8,344	0.20	0.09

Note: Regresses dependent variable on a *TOP* indicator, a dummy indicating the matching group, and district-quarter fixed effects. Sample is top 15 BHCs and their matches in the 2006-2014 period. For details on variable construction see the Data Appendix. The coefficient on *TOP* can be interpreted as the differential impact of *TOP* status. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 5: OLS of Outcome Measures on Hours, 2006-2014

Dependent Variable	Log(Hours)	Std. Error	*p*-value	N.	R-Squared	Sample Mean
Balance Sheet						
% of RWA/Assets	0.158*	(0.091)	0.08	14,564	0.66	73.38
Tier 1 Ratio	-0.018	(0.053)	0.74	14,545	0.29	12.71
% of NPL	0.165***	(0.023)	0.00	14,495	0.32	2.28
SD of NPL/Loans	0.035***	(0.007)	0.00	11,752	0.24	0.75
% of Loan Loss Reserves	0.034***	(0.008)	0.00	14,599	0.30	1.71
SD of Loan Loss Reserves/Loans	0.009***	(0.002)	0.00	11,737	0.23	0.23
% of RWA/Assets	0.158*	(0.091)	0.08	14,564	0.66	73.38
Earnings						
ROA	-0.078***	(0.011)	0.00	14,510	0.21	0.55
SD of ROA	0.072***	(0.015)	0.00	11,723	0.18	0.83
Sharpe Ratio of ROA	-0.226***	(0.044)	0.00	11,695	0.24	4.08
Log Z-Score	-0.083***	(0.013)	0.00	11,563	0.29	3.29
Market						
Market Cap/Equity	-0.030***	(0.006)	0.00	7,803	0.47	1.21
Quarterly Excess Return %	-0.002	(0.001)	0.14	7,532	0.22	-0.01
SD of Daily Return	0.001***	(0.000)	0.00	7,695	0.61	0.03
Sharpe Ratio	-0.001	(0.001)	0.29	7,836	0.41	0.02
Bottom decile of excess return	0.005*	(0.003)	0.06	7,701	0.04	0.11
Governance						
Risk Committee Dummy	0.012***	(0.004)	0.01	6,693	0.26	0.18
Risk Manager Dummy	0.001	(0.007)	0.90	6,693	0.20	0.41
Supervisory						
Total MRA/MRIAs	0.421***	(0.099)	0.00	10,019	0.32	2.63
New MRA/MRIAs	0.121***	(0.021)	0.00	10,019	0.12	0.52
Closed MRA/MRIAs	0.015	(0.016)	0.35	10,019	0.09	0.36
Total Enforcement Actions	0.092***	(0.017)	0.00	14,740	0.13	0.37
Rating	0.092***	(0.010)	0.00	14,740	0.27	2.05
Ratings Change Dummy	0.031***	(0.002)	0.00	14,740	0.08	0.06

Note: OLS regression of dependent variable on a log of supervisory hours. Controls include a dummy indicating the matching group and district-quarter fixed effects. Sample includes all BHCs above the median asset size in every quarter. For details on variable construction see Data Appendix. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 6: Two-stage Least Squares Including Large BHCs, 2006-2014

Second Stage Coefficients	Log(Hours)	SE	F-Stat	N	Sample Mean
Balance Sheet					
% of RWA/Assets	0.786	(1.374)	18.19	14,709	73.46
Tier 1 Ratio	-0.935*	(0.541)	19.39	14,713	12.67
% of NPL	-0.847**	(0.409)	19.25	14,663	2.28
SD of NPL/Loans	-0.291*	(0.153)	16.91	11,889	0.75
% of Loan Loss Reserves	-0.052	(0.126)	19.17	14,767	1.71
SD of Loan Loss Reserves/Loans	-0.054	(0.042)	16.31	11,874	0.23
% Asset Growth (YoY)	-1.230	(1.424)	19.4	14,498	7.51
Earnings					
ROA	0.073	(0.140)	19.02	14,676	0.55
SD of ROA	-0.479*	(0.256)	14.67	11,858	0.83
Sharpe Ratio of ROA	2.197*	(1.316)	15.18	11,825	4.08
Log Z-Score	0.589*	(0.341)	15	11,698	3.29
Market					
Market Cap/Equity	-0.094	(0.091)	17.67	7,970	1.22
Quarterly Excess Return %	-0.003	(0.008)	19.72	7,697	-0.01
SD of Daily Return	-0.001	(0.001)	18.33	7,851	0.03
Sharpe Ratio	-0.005	(0.005)	17.9	8,004	0.02
Bottom decile of excess return	-0.002	(0.021)	19.65	7,869	0.10

Note: Two-stage least squares regression where a *TOP* indicator instruments for log hours. Controls include log assets, log entities, share of assets at SMBs, share of assets at national banks, loans/assets, deposits/liabilities, HHI of assets, a public indicator and district-quarter fixed effects. Sample is BHCs above median asset size. For details on variable construction see Data Appendix. F-Stats are tests for weak instruments. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 7: Differences in Means between Top 5 and Matches

	Top 5				Matches					
Dependent Variable	**Mean**	**Median**	**S.D.**	**N**	**Mean**	**Median**	**S.D.**	**N**	**Δ Means**	***p*-value**
Balance Sheet										
% of RWA/Assets	70.77	71.79	11.12	1,967	71.32	72.42	11.55	3,973	-0.55	0.80
Tier 1 Ratio	11.69	11.31	2.96	2,016	12.05	11.21	3.74	4,019	-0.36	0.48
% of NPL	1.39	0.93	1.32	2,564	1.69	1.01	1.96	5,082	-0.3	0.16
SD of NPL/Loans	0.32	0.18	0.38	2,221	0.41	0.20	0.51	4,253	-0.09	0.10
% of Loan Loss Reserves	1.70	1.53	0.62	2,549	1.70	1.53	0.76	5,042	0	0.98
SD of Loan Loss Reserves/Loans	0.14	0.09	0.15	2,192	0.16	0.09	0.19	4,282	-0.01	0.46
% Asset Growth (YoY)	10.68	7.63	13.62	2,539	10.47	7.14	13.94	4,926	0.21	0.84
Earnings										
ROA	1.04	1.13	0.59	2,573	0.99	1.09	0.71	5,061	0.06	0.33
SD of ROA	0.30	0.16	0.48	2,157	0.51	0.22	0.85	4,242	-0.21**	0.02
Sharpe Ratio of ROA	8.95	6.67	7.67	2,136	7.22	5.21	7.00	4,203	1.73**	0.03
Log Z-Score	3.99	4.11	0.97	2,145	3.70	3.87	1.14	4,199	0.29**	0.03
Market										
Market Cap/Equity	1.76	1.64	0.75	2,190	1.69	1.56	0.80	4,439	0.07	0.51
Quarterly Excess Return %	0.01	0.00	0.11	2,162	0.01	0.01	0.12	4,373	0	0.94
SD of Daily Return	0.02	0.02	0.01	2,172	0.02	0.02	0.01	4,373	0	0.22
Sharpe Ratio	0.04	0.04	0.11	2,200	0.04	0.04	0.11	4,450	0	0.95
Bottom decile of excess return	0.06	0.00	0.25	2,181	0.07	0.00	0.26	4,443	-0.01	0.46

Note: Compares sample means between Top five BHCs (treatment) and their matches. For details on variable construction see the Data Appendix. The difference in means is the treatment less the matches. *p*-values assume standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 8: Impact of Top Five Status Controlling for District Fixed Effects, 1991-2014

Dependent Variable	Top 5	Std. Error	*p*-value	N.	R-Squared	Sample Mean
Balance Sheet						
% of RWA/Assets	-1.797	(1.458)	0.22	24,016	0.26	71.27
Tier 1 Ratio	-0.110	(0.361)	0.76	24,079	0.19	12.48
% of NPL	-0.191	(0.118)	0.11	29,590	0.43	1.49
SD of NPL/Loans	-0.102***	(0.035)	0.00	25,094	0.33	0.39
% of Loan Loss Reserves	-0.086	(0.060)	0.15	29,346	0.29	1.67
SD of Loan Loss Reserves/Loans	-0.020	(0.014)	0.17	25,059	0.28	0.15
% Asset Growth (YoY)	-0.879	(0.800)	0.27	28,783	0.16	11.06
Earnings						
ROA	-0.016	(0.042)	0.71	29,424	0.26	0.96
SD of ROA	-0.173***	(0.066)	0.01	24,919	0.17	0.45
Sharpe Ratio of ROA	1.745***	(0.621)	0.01	24,776	0.22	7.45
Log Z-Score	0.284***	(0.101)	0.01	24,705	0.21	3.79
Market						
Market Cap/Equity	0.085	(0.062)	0.17	20,928	0.54	1.65
Quarterly Excess Return %	-0.006	(0.004)	0.16	20,237	0.41	0.01
SD of Daily Return	-0.002***	(0.000)	0.00	20,686	0.66	0.02
Sharpe Ratio	-0.005*	(0.003)	0.09	20,957	0.53	0.04
Bottom decile of excess return	-0.014	(0.013)	0.28	20,599	0.16	0.09

Note: Regresses dependent variable on a Top Five indicator, a dummy indicating the matching group, and district-quarter fixed effects. Sample is top 15 BHCs and their matches. For details on variable construction see Data Appendix. The coefficient on Top Five can be interpreted as the differential impact of Top Five status. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 9: Top Five Two-stage Least Squares, 2006-2014

Second Stage Coefficients	Log(Hours)	SE	F-Stat	N	Sample Mean
Balance Sheet					
% of RWA/Assets	0.620	(1.567)	16.61	14,709	73.46
Tier 1 Ratio	-0.811	(0.551)	17.97	14,713	12.67
% of NPL	-0.598	(0.393)	17.53	14,663	2.28
SD of NPL/Loans	-0.246*	(0.149)	16.5	11,889	0.75
% of Loan Loss Reserves	0.009	(0.128)	17.57	14,767	1.71
SD of Loan Loss Reserves/Loans	-0.050	(0.044)	16.23	11,874	0.23
% Asset Growth (YoY)	-2.200	(1.623)	17.69	14,498	7.51
Earnings					
ROA	0.028	(0.140)	17.76	14,676	0.55
SD of ROA	-0.673**	(0.305)	14.49	11,858	0.83
Sharpe Ratio of ROA	2.653*	(1.494)	14.45	11,825	4.08
Log Z-Score	0.699*	(0.360)	15.53	11,698	3.29
Market					
Market Cap/Equity	-0.145	(0.100)	15.1	7,970	1.22
Quarterly Excess Return %	-0.003	(0.008)	17.14	7,697	-0.01
SD of Daily Return	-0.002	(0.002)	15.61	7,851	0.03
Sharpe Ratio	-0.001	(0.005)	15.02	8,004	0.02
Bottom decile of excess return	-0.016	(0.024)	16.52	7,869	0.10

Note: Two-stage least squares regression where a Top Five indicator instruments for log hours. Controls include log assets, log entities, share of assets at SMBs, share of assets at national banks, loans/assets, deposits/liabilities, HHI of assets, a public indicator and district-quarter fixed effects. Sample is BHCs above median asset size. For details on variable construction see Data Appendix. F-Stats are tests for weak instruments. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

DATA APPENDIX: VARIABLE DEFINITIONS

VARIABLE	DEFINITION	SOURCE	TIME PERIOD
Balance Sheet:			
% of RWA to Total Assets	Percentage of risk weighted assets (BHCAA223) to total assets (BHCK2170).	FR-Y9C	1996Q1-2014Q4
Tier 1 Capital Ratio	Percentage of Tier 1 Capital (BHCA8274) to risk weighted assets (BHCAA223).	FR-Y9C	1996Q1-2014Q4
% of NPL	Percentage ratio of non-performing loans (BHCK5525+BHCK5526-BHCK3506-BHCK3507) to total loans (BHCK2122).	FR-Y9C	1991Q1-2014Q4
SD of NPL/Loans	Standard deviation of the % ratio of non-performing loans to total loans over the next 8 quarters	FR-Y9C	1991Q1-2014Q4
% of Loan Loss Reserves	Percentage ratio of loan loss reserves (BHCK3123) to total loans (BHCK2122).	FR-Y9C	1991Q1-2014Q4
SD of Loan Loss Reserves/Loans	Standard deviation of the % ratio of loan loss reserves to total loans over the next 8 quarters	FR-Y9C	1991Q1-2013Q4
% Asset Growth (YoY)	Percentage change in total assets (BHCK2170) year-over-year.	FR-Y9C	1991Q1-2014Q4
Earnings:			
Return on Assets (ROA)	Annualized ratio of net income (BHCK4340) to total assets (BHCK2170).	FR-Y9C	1991Q1-2014Q4
SD of ROA	Standard deviation of ROA over the next 8 quarters.	FR-Y9C	1991Q1-2013Q4
Sharpe Ratio of ROA	Ratio of the next 8 quarters' average of return on assets to the standard deviation of the next 8 quarter's return on assets.	FR-Y9C	1991Q1-2013Q4
Log of Z-Score	Z-Score is defined as the ratio of the sum of the average of the next 8 quarters' return on assets and the average of the next 8 quarters' ratio of equity BHCK3210+BHCK3000) to assets (BHCK2170) to the standard deviation of the next 8 quarters' return on assets.	FR-Y9C	1991Q1-2013Q4
Market:			
Market Cap to Equity	Ratio of the product of stock price(PRC) and shares outstanding (SHROUT) to book equity (BHCK3210 + BHCK3000)	CRSP, FR-Y9C	1991Q1-2014Q4
Quarterly Excess Return	Excess return based on a 3-Factor model (Market, SMB, HML). Betas calculated using daily returns over rolling 12 month period.	CRSP, Ken French website	1991Q1-2014Q4
SD of Daily Return	Standard deviation of daily returns in a quarter	CRSP	1991Q1-2014Q4
Sharpe Ratio	Defined as next quarter's ratio of the average daily return subtracted by the risk free rate to the standard deviation of daily excess return.	CRSP, Ken French website	1991Q1-2014Q4
Bottom Decile of Excess Return	Indicator that is equal to 1 if the observation's value of quarterly excess return is in the quarter's bottom 10th percentile.	CRSP, Ken French website	1991Q1-2014Q4
Off-Balance Sheet:			
Net Securitiz. Inc./Assets	Percentage of net securitization income (BHCKB493) to total assets (BHCK2170)	FR-Y9C	2001Q1-2014Q4
Unused Commitments/Assets	Percentage of the sum of unused commitments for loans secured by 1-4 family residential properties (BHCK3814), credit card lines (BHCKJ455 + BHCKJ456), loan funds (BHCK3815 + BHCK6550), securities underwriting (BHCK3817), commercial and industrial loans (BHCKJ457), loans to financial institutions (BHCKJ458) and all other unused commitments (BHCKJ459) to total assets (BHCK2170)	FR-Y9C	1991Q1-2014Q4
Non-interest Inc./Assets	Annualized ratio of non-interest income (BHCK4079) to total assets (BHCK2170)	FR-Y9C	1991Q1-2014Q4
Governance:			

Risk Committee Dummy	Indicator that is equal to one if proxy mentions a risk committee.	Proxy Filings	2006Q1-2014Q3
Risk Manager Dummy	Indicator that is equal to one if proxy indicates the presence of a risk manager.	Proxy Filings	2006Q1-2014Q3
Supervisory Tools:			
New MRA/MRIAs	Defined as the number of MRA and MRIA initiated in a given quarter	NED	2005Q3-2014Q4
Closed MRA/MRIAs	Defined as the number of MRA and MRIA initiated in previous quarter(s) that are closed in the given quarter	NED	2005Q3-2014Q4
Total MRA/MRIAs	Defined as the number of MRA and MRIA initiated or ongoing in a given quarter	NED	2005Q3-2014Q4
Total Enforcement Actions	Defined as the number of Formal and Informal Enforcement Actions initiated in previous quarter(s) that have not been closed as of the given quarter	NED	1991Q1-2014Q4
Rating	Calculated as the average of all rated component ratings of RFI/CD from 2005 to present or BOPEC/F-M 1991 to 2004	NED	1991Q1-2014Q4
Ratings Change Dummy	Dummy variable equal to 1 if any of the components used in RFI or BOPEC change from previous quarter	NED	1991Q1-2014Q4
Earnings Volatility:			
SD of % NIM/Assets	The standard deviation of the percentage of net interest income (BHCK4074) to total assets (BHCK2170) over the next 8 quarters.	FR-Y9C	1991Q1-2013Q4
SD of % Noninterest Income/Assets	The standard deviation of the percentage of noninterest income (BHCK4079) to total assets (BHCK2170) over the next 8 quarters.	FR-Y9C	1991Q1-2013Q4
SD of % Loan Loss Provision/Assets	The standard deviation of the percentage of loan loss provision (BHCK4230) to total assets (BHCK2170) over the next 8 quarters.	FR-Y9C	1991Q1-2013Q4
SD of % NIE less Compensation and FA/Assets	The standard deviation of the percentage noninterest expense less compensation and fixed assets (BHCK4093-BHCK4135-BHCK4217) to total assets (BHCK2170) over the next 8 quarters.	FR-Y9C	1991Q1-2013Q4
Abs. Value of %Discretionary LLP	The absolute value of the discretionary loan loss provision. Discretionary LLP is calculated as the residual from a regression of loan loss provisions to average loans (BHCK2122) on district-quarter fixed effects, the change in non-performing loans (BHCK5525+BHCK5526-BHCK3506-BHCK3507) to loans, the change in net charge offs (BHCK4635-BHCK4605) to loans, and the level of loan loss reserves (BHCK3123) to loans.	FR-Y9C	1991Q1-2014Q4
Abs. Value of %Discretionary Realized Security Gains/Losses	The absolute value of the discretionary realized security gains/losses. Discretionary gains/losses calculated as the residual from a regression of realized securities gains/losses (BHCK3521 + BHCK3196) over average assets (BHCK2170) on quarter fixed effects and the unrealized gains/losses on AFS securities (BHCKA221) over average assets.	FR-Y9C	1994Q1-2014Q4
Absolute Value of Discretionary Earnings	Absolute value of the sum of discretionary realized security gains/losses and discretionary loan loss provisions (normalized by assets).	FR-Y9C	1994Q1-2014Q4
Discretionary Earnings	Sum of discretionary realized security gains/losses and discretionary loan loss provisions (normalized by assets).	FR-Y9C	1994Q1-2014Q4