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The Impact of Supervision on Bank Performance

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Abstract

Does the intensity of supervision affect quantifiable outcomes at supervised firms? We develop a novel proxy to identify plausibly exogenous variation in the intensity of supervision across large U.S. bank holding companies (BHCs), based on the size rank of a BHC within its Federal Reserve district. We begin by demonstrating that the largest five BHCs in a district receive discontinuously more supervisory time than smaller BHCs in the district, even after controlling for size and a variety of other BHC characteristics. Using a matched sample approach, we find that these “top five” BHCs have lower volatility of accounting earnings and market returns than otherwise similar BHCs. These firms also appear to hold less risky loan portfolios and to engage in more conservative loan loss reserving practices. While their risk is lower, top five BHCs do not experience lower accounting returns or slower asset growth. Given that these firms are subject to similar rules, our results support the idea that supervision has a distinct role as a complement to regulation.

Key words: bank supervision, bank regulation, bank performance

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1. Introduction

While bank regulation is readily observed, bank supervision – the monitoring and oversight of banks – is more opaque. Although supervision and regulation are often used interchangeably, in this paper we seek to separate the two by measuring the impact of supervision on bank performance, as distinct from regulation. Does the intensity of supervision affect quantifiable outcomes at supervised firms? We introduce a novel proxy to identify differences in supervision across large firms based on the structure of supervisory responsibilities with the Federal Reserve System. We find a positive relationship between our proxy for increased supervisory attention and lower bank risk and more conservative loan loss reserving. This risk reduction does not appear to represent a trade-off with financial intermediation since these firms have similar earnings and asset growth.

The Federal Reserve is responsible for the prudential supervision of commercial bank holding companies (BHCs) and certain other large, complex financial institutions. Prudential supervision involves oversight and monitoring to detect unsafe or unsound practices that might threaten these firms' current health or ability to withstand stressful economic or financial market environments, with potential negative consequences for other financial firms, the financial system or the broader economy. This type of supervision is distinct from (but related to) regulation, which involves specifying the rules under which BHCs and other financial institutions operate.

For the most part, both the work that bank supervisors do and the outcomes of that work are not publicly visible, except in the broadest of terms – whether the banking system is stable and continues to provide critical financial services to the economy. Bank supervisors have broad access to confidential information about supervised firms, including risk management reports, strategic plans, and detailed information about business activities and risk exposures. Assessments made by supervisors are almost always confidential, though some supervisory actions are announced publicly (Eisenbach et al. 2015). Very little supervisory information is available publicly about individual firms and it is thus extremely difficult to assess how and to what extent supervision affects individual bank risk-taking, performance or long-term viability.

Reflecting the limited public information on supervisory activities, much of the prior literature focuses on the impact of regulation rather than on supervision distinctly defined. This paper aims to help fill that gap by focusing directly on the impact of supervision on risk-taking and performance. In particular, we identify BHCs where supervisors appear to devote greater attention compared to otherwise similar institutions, and examine whether these institutions have significant differences in

performance and risk-taking. To do this, we consider a range of BHC outcome measures based on accounting and market data, as well as on confidential data describing supervisory outcomes such as ratings and enforcement actions, to see how these outcomes are affected by differences in supervisory attention and intensity across firms.

A key element of this analysis is to develop a measure that plausibly captures cross-bank variation in supervisory attention. Further, we need a measure that captures *exogenous* variation, since riskier and worse-performing banks presumably attract more supervisory attention than do safer and better-performing firms. Similarly, supervisors are especially concerned with larger and more complex banks, as difficulties at these firms have the potential to be more disruptive to the financial system and economy. To the extent that risk is related to firm size, this 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 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 begin by presenting evidence supporting the contention that the largest BHCs in a district receive more supervisory attention. We make use of proprietary Federal Reserve data on supervisory hours and show that examiners spend discontinuously more time at the five largest BHCs 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 measuring the impact of supervision 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

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). Supervision of the largest and most complex financial institutions is organized centrally by the Large Institutions Supervision Coordinating Committee (LISCC), chaired by the Director of Supervision and Regulation at the Board of Governors (Board of Governors of the Federal Reserve System 2015).

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 examine a number of accounting, market and supervisory metrics in order to be comprehensive in our approach.

Using these measures, we use a range of empirical approaches to test whether our measure of increased supervisory attention, being one of the “top five” BHCs in a district, is associated with lower risk and improved performance. It is worth noting that additional supervisory attention need not have a positive effect on outcomes. Supervisors might not be effective in achieving these objectives, for a range of potential reasons. 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.

In fact, we find that firms among the five largest institutions in a district have less volatile accounting earnings and market returns than otherwise similar BHCs. These firms also appear to hold less risky loan portfolios and engage in more conservative loan loss reserving practices. The largest BHCs in a district have lower and less volatile non-performing loans, as well as less volatile net interest income, non-interest income, loan loss provisioning, and non-interest expense. While their risk is lower, top five BHCs do not have commensurate decrease in earnings or growth, nor is their market Sharpe Ratio significantly lower than that of similar BHCs not among the top five. These 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 strategy that being in the top five 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 district fixed effects, it could be that differences in the competitive structure of markets in which these firms operate affect the five largest firms differently. Alternatively, certain types of banks may be more likely to become top five in a district due to their type rather than supervision determines their performance. We discuss several of these 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, there is additional work to be done to provide insight into the mechanism by which supervision achieves these outcomes. 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.

The rest of this paper is organized as follows. Section 2 describes prudential supervision in greater detail and provides more information about the structure of supervision within the Federal Reserve. The section also reviews the academic literature on the impact of supervision. 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 approaches to assessing the impact of supervision on bank performance and risk-taking, including identifying a matched sample of BHCs. The section also presents our core results. Section 5 contains a summary and conclusion.

2. Prudential supervision

Prudential supervision comprises a range of activities intended to identify and address any practices or conditions at a bank that could threaten its immediate health or long-term viability. These activities include ensuring compliance with law and regulation, monitoring for unsafe or unsound practices, and enforcing remediation of such practices or failures to comply with regulation (Eisenbach et al. 2015). 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. 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.

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 (Eisenbach et al. 2015). 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 both 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 generally considered to be the least severe supervisory actions, with MOUs and other informal actions and then formal actions being considered increasingly more severe. MRAs are by far the most common supervisory action, with many such actions outstanding at individual banks at any given time (Eisenbach et al. 2015). In general, informal enforcement actions are not publicly disclosed, while formal enforcement actions are disclosed by the Federal Reserve Board.³

As noted above, supervision is complementary to, but distinct from, regulation of these firms. Regulation involves setting the rules by which banks and other financial institutions operate. In the United States, regulation specifies which firms can own commercial banks, what activities banks can and cannot pursue, and the minimum financial standards for banks and BHCs to operate (such as capital and liquidity requirements), as well as many other factors. Banks and other financial firms are assessed with regard to whether they are or are not in compliance with the various regulations they are required to meet. While determining compliance often involves judgment, the “yes-no” nature of regulatory compliance differs from the kinds of judgments made as part of the supervisory process, which often entail placing banks along a spectrum of supervisory concern (e.g., “1 to 5” rating or the range of informal and formal supervisory actions).

³ An exception is formal supervisory actions known as 4(m) agreements, which are not publicly disclosed. (Eisenbach et al. 2015).

The process of determining and promulgating regulation is largely public, with proposed regulations released for public comment and input. The regulations themselves are publicly available.⁴ In contrast, most of supervision is confidential and not easily observed outside the supervisory agency and the supervised firm. Supervisory activities are conducted using extensive confidential data and most supervisory judgments are confidential (although the guidelines, such as Supervision Letters and examination manuals, used by Federal Reserve supervisors to make their judgments are publicly available).⁵ This makes it extremely difficult to assess the impact of supervision on bank behavior and performance and the effectiveness of supervisors in achieving their objectives, since neither the extent and nature of supervisory work nor the direct outcomes of that work (ratings or most supervisory actions) are publicly observable.

Much of the previous work on supervision and regulation of banks focuses on regulation, though the distinction between supervision and regulation is not always clearly recognized or articulated. 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).

Fewer papers focus specifically on supervision distinctly defined. Some of these papers examine supervisory ratings, including papers assessing the quality of information in the ratings and how quickly this information depreciates (Cole and Gunther 1995, Hirtle and Lopez 1999) and whether supervisory ratings contain information not already included in market prices (Berger et al. 2000, Cargill 1989, Hirschorn 1999). Berger and Davies (2000) examines the information content of bank examinations and finds evidence of information related to an auditing effect, a regulatory discipline effect and private information about bank condition. Several papers assess whether different supervisors rate banks consistently. These include Agarwal et al. (2014), which finds persistent differences between state and federal banking supervisors in the stringency of their evaluations and ratings of commercial banks, and Rezende (2014), which finds that banks switching between national and state banking charters typically receive an upgraded rating from their new state or federal supervisor.

⁴ For instance, the Federal Reserve Board of Governors publishes its regulations for banks, bank holding companies, and other institutions and activities on its website:

<http://www.federalreserve.gov/bankinfo/reg/reglisting.htm>.

⁵ Supervision letters (SR Letters) are posted on the Board of Governors website (<http://www.federalreserve.gov/bankinfo/topics/topics.htm>) as is the Bank Holding Company Examination Manual (http://www.federalreserve.gov/boarddocs/supmanual/supervision_bhc.htm).

Several papers have examined how supervisory standards – how tough examiners are in assessing loan quality and risk at banks – change over time and whether these changes affect loan origination and loan growth (Bassett et al. 2012, Berger et al. 1998, Curry et al. 2008, Kiser et al. 2012, Krainer and Lopez 2009, Peek and Rosengren 1995, Swindle 1995). Most find that tougher supervisory standards are associated with slower loan growth and/or higher origination standards. Bassett and Marsh (2014) examine the impact of supervisory guidance on commercial real estate (CRE) lending concentration and find that banks with CRE portfolios exceeding the guidelines had slower loan growth. A recent set of cross-country studies have examined the relationship between supervisory power and bank risk-taking and operating efficiency. These studies, which include Barth et al. (2013), Chortareas et al. (2012) and Klomp and Hahn (2012), generally find that heightened supervisory powers are associated with less risk-taking and increased operating efficiency, especially in countries with independent and experienced supervisory agencies.

Rezende and Wu (2014) and Delis and Staikouras (2011) look at the impact of specific supervisory activities – including both examinations and supervisory enforcement actions – on bank risk-taking and performance. Using a cross-country sample of large banks, Delis and Staikouras (2011) find lower bank risk in countries where supervisors issue relatively more enforcement actions, but a u-shaped relationship between examination frequency and risk, where risk is measured using accounting information (z-scores, non-performing loan ratios and volatility of earnings). Rezende and Wu (2014) look at a sample of U.S. banks and find that more frequent mandated examinations are associated with increased profitability and lower loan losses.

Of the existing literature, Rezende and Wu (2014) and Deli and Staikouras (2011) are closest in approach to the work in this paper, as these papers focus on supervision directly defined and assess the impact on individual institutions. Our paper complements this earlier work by adopting a unique identification strategy based on the structure of supervision at the Federal Reserve and by examining large bank holding companies, rather than commercial bank subsidiaries. We also look at a wider range of outcome variables, including stock market information and confidential supervisory actions such as MRAs and MRIAs. Finally, our work broadly examines supervisory attention, rather than the impact of a specific supervisory tool, such as examinations or enforcement actions.

3. Identification strategy

Our objective is to quantify the impact of supervisory scrutiny on BHC performance. A key empirical challenge is that supervisory attention is endogenously related to current and expected bank risks: supervisors presumably allocate more time to and effort on BHCs that perform poorly. Supervisors

may also spend 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. As noted, each of the 12 Federal Reserve Banks supervises bank holding companies that are located in its district. The initial Federal Reserve Act of 1913 called for between eight and twelve districts, and the location of the twelve Federal Reserve banks was announced in 1914. The locations reflect those regions' importance as banking centers in 1913, and districts are not equally divided in terms of geography or population.⁶ One concern is that certain types of BHCs might 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%).

Both the number and size of BHCs varies 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.⁷ The number of BHCs ranges from a low of 56 in the 4th District (Cleveland) to a high of 157 in the 7th (Chicago). The size of the largest BHCs in a district also varies considerably, with the largest overall BHC in the 2nd District (New York) at \$2.5 trillion and the largest BHC in the 8th District (St Louis) at \$25 billion.

Within the Federal Reserve, 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. 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 the most important BHCs in their district. This hypothesis is motivated by the theories and 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, the notion is that the costs of bank failure are related to size and that district leaders are subject to cognitive costs, thus they focus attention on a discrete set of the largest firms (i.e.

⁶ <http://www.frbsf.org/education/publications/doctor-econ/2001/may/federal-reserve-districts>

⁷ 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.

their span of control) within their geographic area of responsibility. We presume that these factors result in the largest BHCs within a district receiving additional attention relative to similar BHCs in other districts that are not among the largest.⁸

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 whether their time is spent directly supervising a particular institution (as 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 2014.⁹

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, reflecting the fact that they were supervised by a team that oversees a portfolio of firms so supervisors did not directly record time use at individual institutions. For these institutions that have never received directly reported hours, they are left as missing. However, if a BHC has ever had reported hours, we assume that missing directly reported hours are zero.¹⁰ In addition, reporting of hours is subject to variation in reporting conventions, in some cases making it difficult to compare hours across Federal Reserve districts or over time.¹¹ 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

⁸ At the Federal Reserve System level, there are several supervisory programs that result in a discontinuous increase in 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.

⁹ 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 hours cross-firm supervisory programs, such as the CCAR. To the extent that these hours substitute for supervisory hours by the Federal Reserve Banks, their exclusion would serve to attenuate our results.

¹⁰ 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).

¹¹ We explicitly correct for one such instance: The Second district bases hours off of a 35 hour work week whereas the other districts use a 40 hour work week, therefore we rescale second district hours by 40/35.

that are above the median total assets, as our attention measure is focused on the largest firms. In addition, we exclude BHCs with foreign parents or headquarters outside the continental U.S. as these characteristics can influence reported hours or supervisory attention (approximately 4% of the remaining sample). 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, we exclude BHCs where retail deposits are less than 35% of liabilities, trading assets are more than 7.5% of assets, or credit card loans are more than 30% of total loans. Each of these criteria is meant to exclude atypical banking institutions such as payment processors and 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 which are assigned to a supervisor that is distinct from their geographic district (less than 2% of the sample). We will also consider specifications which exclude the very largest BHCs, as it is difficult to credibly 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 within-district variation in log of hours as a function of asset size rank. To account for district-level variation in the reporting of hours, we regress log of hours on district-quarter fixed effects and plot the average of the residuals as well as their 95% confidence intervals for each size rank. Consistent with our hypothesis, the highest ranked BHCs within a district receive more supervisory attention. However, we want to make sure that we are not just capturing size with the rank measure. Therefore, we control for size by including the log of BHC assets in the regression. The size-controlled residuals are attenuated, implying that asset size is an important factor, but the top five BHCs in a district continue to receive above average supervisory hours (the residuals are greater than zero). The results suggest that the five largest BHCs in a district receive 15 to 50 percent more supervisory hours than the average BHC.

Hours may vary for reasons unrelated to size, including the complexity of the BHC and its activities. To further test whether the highly ranked BHCs receive additional attention, we estimate a pooled cross-sectional regression of log hours for BHC i in quarter t on various controls,

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

where Π_{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

characteristics. The coefficient of interest, β , indicates the average difference in log hours spent on the top five BHCs in a district 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 the object of our interest in the next section of the paper. Column 1 regresses log of hours on district-quarter fixed effects; the adjusted R-squared of .07 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 (Column 3) and the coefficient on the top five dummy falls to 0.6, consistent with top five BHCs receiving almost two times the hours of a similarly sized BHC that is not among the top five. In Column 4, we also include a nonlinear size term, log of assets squared, which allows for a nonlinear relationship between size and hours, yet we continue to find a Top Five coefficient of similar magnitude and statistical significance.

Size may not be the only reason that BHCs receive more or less supervisory attention. In Columns 5-8 we consider additional factors that might determine supervisory hours. We consider the complexity of the BHC as a potential determinant of supervisory attention. We measure complexity, as distinct from size, by using the number of legal entities controlled by the bank holding company.¹² These entities may include commercial banks, thrifts, other financial institutions like insurance companies and broker-dealers, or non-financial businesses. We use the log of the number of entities as a measure of complexity, independent of asset size. In Column 5, we find that the number of entities is strongly correlated with supervisory hours, more so than asset size. Nevertheless, the coefficient on Top Five is relatively unchanged.

We also consider how 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 may influence the amount of time spent by Federal Reserve supervisors at the institution. These responsibilities vary with the size

¹² 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.

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 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). Both SMB variables are positively correlated with supervisory hours in Column 6; however, the coefficient on Top Five remains large and statistically significant at the 1% level.

We add activities of the BHC as controls in Columns 7 and 8. Column 7 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 lending and deposit-taking. In Column 8, we control for the diversity of the asset mix using the HHI of assets, with the thought that being in more types of assets may 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 the final specification, Column 9, we include an indicator for public firms. Theoretically, public firms can be subject to additional scrutiny by markets which could either decrease or increase supervisory attention, although we do not estimate a statistically significant relationship between supervision and the public firm indicator variable. Across all these specifications, we find a similar coefficient of around 0.5 on Top Five. The coefficient is statistically significant at the 1% level in these specifications. The addition of these controls attenuates the size of the estimated coefficient, but after all controls have been included, the coefficient of 0.54 suggests that Top Five BHCs receive approximately 70% more supervisory hours than do other BHCs in their districts.

Since our later analysis includes a comparison of Top Five BHCs matched to firms of similar sizes that are not Top Five BHCs, we repeat the analysis by excluding those Top Five BHCs that are larger than the largest non-Top Five BHCs (Appendix Table 1). Excluding the very largest firms results in similar, albeit slightly attenuated, coefficients on the Top Five dummy. In unreported robustness tests we consider additional controls, such as the percent of assets that are trading assets, and the supervisory rating of

the bank. We also consider a sample that excludes the New York district (District 2) as this district has a unique distribution of very large banks.

We tighten the comparison group even further by repeating this analysis in the presence of a top ten dummy variable (See Table 3). In this specification, the Top Five dummy tests whether the top five BHCs are statistically different than the remaining top ten BHCs conditional on each's BHC's 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 ten. The coefficient remains statistically significant, never falling below the 5% significance level.

It is important to emphasize that this analysis is intended to support the validity of our assumption 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. Conversely, simple hours data do not reflect differences in the experience or skill level of the supervisors putting in those hours. 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 assumption is that the hours data we use is a proxy for these other factors, and thus we refer in the analysis to supervisory "attention" rather than supervisory hours.

While these top five firms may receive more supervisory attention, it need not result in differential performance for firms. The largest firms in a district might have outsized influence over the supervisors, resulting in greater forbearance. If supervisors forbear more for the largest banks, then this could attenuate the impact of supervision which would make it more difficult to identify a positive impact of supervisory attention on bank outcomes.

4. Measuring the impact of supervision

Given the empirical evidence of the prior section, we proceed with our analysis using status as a top five BHC in a district as an indication that a BHC receives greater supervisory attention. We identify a sample of similar, untreated BHCs (that is, BHCs that are not among the five largest in a district and thus do not receive the "treatment" of additional supervisory attention) using a matching procedure. We then compare BHCs' outcomes across these two samples and discuss the significant differences. By using top five 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 actual hours data.¹³

a. Matching

To estimate the impact of greater supervisory attention, we use propensity score matching (Rosenbaum and Rubin, 1983) to construct a counterfactual sample of BHCs that are not in the treatment group (i.e. top five 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 supervisory attention, reducing our dependence on the assumption of linearity implied by OLS.

We restrict the sample of BHCs and their potential matches to those above the median asset size of all BHCs in a given quarter, whose headquarters are in the continental United States and whose ultimate parent is a U.S. institution. Again, we exclude the credit card banks, banks that do not rely on retail deposits, and banks for which trading assets are a large part of their assets (See Section 3).

We use several 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, basic balance sheet characteristics, and the presence of State Member 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 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.

The list of controls can be found in Table 4. We use these controls to estimate a logistic regression in each quarter, where the dependent variable is a dummy indicating whether a BHC is in the

¹³ A natural application of our proxy is Two-Stage Least Squares using Top Five as an instrument for supervisory attention. This analysis is presented in Appendix Table 6. Unfortunately, the short sample period and the limited number of treatment banks (<85) result in a marginally weak instrument, particularly for those variables that are not available in the full sample. Therefore, we have chosen to use Top Five as a proxy for supervisory attention over a longer time period, but to be especially careful about constructing a counterfactual of similar banks via matching. To the extent that cross-firm supervisory policies have become more prevalent over time, the proxy should reflect more supervisory attention in earlier periods. Nevertheless, the signs of the 2SLS analysis are broadly consistent with the matching results we present here.

treatment sample, i.e. top five in its district. 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 five BHC in a quarter, we have two others BHCs with similar characteristics that are not among the top five of another district.¹⁴ For this matching to succeed, it is important that the size distribution of BHCs varies across Federal Reserve districts (see Table 1). Figure 2 shows the distribution of Top Five and matched BHCs by asset size across Federal Reserve districts.

It is worth noting 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 five firms in a district do not necessarily align with the top five firms 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 2,789 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. As a result, 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 five 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, clustering by BHC to account for correlation in the error term within BHCs. 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

¹⁴ 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. If a treatment BHC is missing the observation of interest, both the treatment BHC and its matches are excluded.

of a treatment banks is 3.6, the average rank of their match is 9.0. Hence the difference in rank is on average 5.4.¹⁵

b. Omitted variables

Of course, Top Five status is not randomly assigned. There may be omitted variables that are correlated with being a Top Five firm and with firm performance that would bias our estimates. For example, firms that become the largest within a geographic area may possess unique, unobservable characteristics that also impact their riskiness. Our empirical approach emphasizes matching on characteristics related to district rank that could also determine supervisory attention, including asset size, firm complexity, percentage of assets subject to Federal Reserve oversight, business activities, and public status. In addition, we consider analysis that includes district-quarter fixed effects. This means that any omitted variable would need to vary within a district at a given point in time and be conditional on our matching criteria.

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. But, it is worth noting that the top five firms in our analysis compete beyond their districts. BHCs headquartered in a particular Federal Reserve district may compete in different combinations of local or regional markets inside and outside of the district, depending on factors such as the size and location of their branch networks and their focus on activities that do not require local physical presence. Moreover, Federal Reserve districts do not align with the deposit or competitive markets or even with the state borders in which BHCs operate. For differences in geographic footprint or business focus to pollute our identification approach, they would have to be systematically correlated with asset size rank within each Federal Reserve district, which seems unlikely.

Another concern is that top five firms are better run and grow faster, which results in their higher district rank. While we will identify evidence consistent with these firms being better run, we do not find significant differences in asset growth. Finally, larger banks within a district may be subject to greater market discipline. We attempt to control for market discipline using public status and asset size.

c. Measures of BHC performance

We consider three categories of outcome measures to discern the impact of greater supervisory attention. The first is measures of the risk and return at supervised institutions. A stated goal of prudential supervision is to improve the safety and soundness of banking institutions, therefore risk is a

¹⁵ Contrast this with Appendix Table 2, which summarizes Top Five BHC-quarters and the population of all potential matches in our sample.

natural measure to examine. But, lower risk can reduce returns and greater supervision can result in higher compliance costs, potentially lowering the short-term profitability of firms, so we are also interested in understanding the risk-return tradeoff and the performance of the firm. The second is the governance structure of the firm, particularly as it relates to risk management. The third is the use of 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.

Our measures of risk and performance are based on both accounting- and market-based data.¹⁶ Accounting-based measures are constructed using quarterly regulatory filings (FR Y-9C reports). We consider measures of risk that are reflected in the balance sheet of the firm, as well as measures based on income statement. 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 examine the year-over-year asset growth of the firm, as supervisors can inhibit growth when an institution is especially risky or poorly managed.

With respect to earnings, we focus on the return on assets (ROA) to assess risk and return. We compare the level of ROA and the standard deviation of ROA over the next eight quarters 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 backwards looking measures, consistent with the persistence in top five rank. 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 reflects the number of standard deviations ROA would need to fall in order to wipe out the equity in the BHC.¹⁷

¹⁶ Variable definitions are reported in the data appendix.

¹⁷ Z-scores date back to Roy (1952) and 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 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 addition, banking regulation is typically oriented towards book accounting measures. In contrast, market prices impound investor beliefs relatively quickly and therefore represent an important additional source of information. While supervisors may consider market measures, market outcomes are rarely an explicit target of regulation.

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](#).¹⁸ We construct quarterly excess returns with respect to a standard Fama-French three-factor model. 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 are most concerned with. We create indicator variables for firms that have excess returns in the lowest decile for a given quarter and we also calculate the skewness of daily returns. Finally, we calculate market-to-book ratios, which measure the extent to which current market valuation of the firm differs from book values; low market-to-book values may signal distress at a firm that is not yet recognized in accounting-based measures. For the continuous measures of risk and performance, we trim the top and bottom 1% of the observations to remove extreme outliers.

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.¹⁹ CROs are extremely rare prior to 2006; therefore, we only use this indicator from 2006 onward. Our hypothesis is a BHC with a Risk Committee or a CRO places more managerial focus on the importance of monitoring and mitigating risk.

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

¹⁸ The link data is updated as of 2014Q1. We modify the data to account for recent events, including the IPO of Ally Financial in April, 2014.

¹⁹ 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".

practices or conditions and regulatory violations. Our hypothesis is that more MRAs and MRIAs signal greater supervisory concern about the firm. 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.²⁰ A high rating can result in restrictions on BHC activities, including, but not limited to, the acquisition of another institution or expansion into new 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.

d. Differences in means

We begin by comparing the means of these measures between the top five BHCs in a district and their matches. Assuming that top five BHCs receive greater supervisory scrutiny but are otherwise similar to the matched sample, our assumption is that the differences between these two samples is attributable to supervisory attention. We calculate differences in means assuming that standard errors are clustered by BHC. These results are reported in Table 5.

Beginning with the risk-return profile of BHCs, we find that being one of the largest five BHCs in a district does not result in statistically significant differences in RWA or Tier 1 capital ratios. However, we do find that both the level and variability of non-performing loans are lower relative to the matched BHCs, both at the 10% significance level. 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. We do not find a difference in loan loss reserves between the treatment and matched BHCs. So while top five BHCs have safer loans, they reserve equally to their matches, suggesting that they are more conservative than their peers. Lastly, top five 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 earnings, we find further evidence that the largest BHCs in a district are less risky. While the level of ROA is similar between top five BHCs and their matches, the standard deviation

²⁰ 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.

of ROA for top five BHCs is 60% that of their peers. This difference is significant at the 5% level. Given that returns seem unaffected but volatility is lower, it is not surprising that the accounting Sharpe ratio ($SD\ ROA/ROA$) is greater for the top five BHCs. Similarly, Z-scores at top five 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 levels of capital ratios do not differ significantly between the two sets of firms. Overall, it appears that BHCs subject to more intense supervision, as proxied by the largest firms in a district, have a better risk-return trade-off than non-top-five institutions.

The market-based measures echo these results, albeit at weaker levels of statistical significance.²¹ The standard deviation of daily returns is lower for top five BHCs, although only at a p-value of 29%. Average excess returns, the Sharpe ratio and the market-to-book ratio are higher and the likelihood of being in the bottom return decile is lower, but these differences are not statistically significant.

The results for the remaining measures – capturing governance and supervisory tools – provide some further, albeit weak, evidence of the impact of supervisory attention. The two governance variables – whether the firm has a risk committee and whether the firm has a chief risk officer – do not differ significantly between the top five BHCs and the matched sample. But top five BHCs have fewer open and new MRAs and MRIAs and better (lower) supervisory ratings than the non-top-five sample, though these differences are not statistically significant. Nevertheless, these results are broadly consistent with the idea that BHCs subject to more supervisory attention and are safer, or at least generate a lower level of supervisory concern, as measured by supervisory actions and ratings.

Overall, the results suggest that top five 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 five in their district. Top five BHCs have fewer non-performing loans, reserve more conservatively for loan losses, and have less volatile earnings. The results are markedly stronger for accounting-based measures than for market-based measures, though the findings based on market data are broadly consistent. Further, there is some evidence suggesting that top five BHCs may receive fewer supervisory enforcement actions and have somewhat better supervisory ratings than otherwise similar BHCs. This finding is particularly notable given the presumption that supervisors are likely to extend more attention

²¹ Approximately 10% of the sample is not publicly traded. When examining market measures, all non-publicly traded top 5 BHCs and their matches are dropped from the sample.

to risky or poorly performing firms.²² These results are based on simple comparisons of means, however. The next sections of the paper explore these relationships using more structured econometric approaches that account for factors not addressed by the differences in means.

e. Controlling for district effects

A key limitation of the results thus far 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 five banks might experience less economic volatility than those districts with large top five 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 includes district-quarter fixed effects. We augment our sample from the prior section by propensity score matching banks of size rank six through ten to banks not among the Top Five of another districts, where closeness is based on the same propensity score matching described in Section 4.a. Hence, our sample now includes a set of treatment banks (top five) and non-treatment banks (six through ten) in each district and the two nearest neighbor BHCs not among the top five in another district. In this analysis, the sample grows to include each top ten bank that we can match to two other banks in another district.²³

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

$$Y_{ijt} = \mathbf{\Pi}_{it} + \alpha_{jt} + \beta \text{TopFive}_{ijt} + \epsilon_{ijt}, \quad [2]$$

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”), TopFive_{ijt} is a dummy equal to one if a BHC is in the top five in its district. The coefficient of interest, β , estimates the *within* district-quarter difference between a BHC and its matches for a top five firm relative to a top ten firm. Standard errors are clustered by BHC.

²² Indeed, in Appendix Table 5 we show that hours are positively correlated with supervisors’ assessment of risks.

²³ Appendix Table 3 demonstrates that there are not significant differences between top ten banks and their matches.

The results of these estimates are presented in Table 6. In general, controlling for district effects strengthens the accounting-based results. Top five BHCs continue to have lower levels and volatility of NPLs. They also have lower volatility of loan loss reserves, lower volatility of accounting earnings (ROA) and higher accounting Sharpe ratios and Z-Scores, all at least at a 5% significance level. Some market results are also strengthened, with top five BHCs having statistically lower variability of daily returns at the 5% significance level. However, there is also a performance trade-off now, as top five banks have lower returns at the 5% significance level. The combination of lower volatility and lower returns translates to a lower Sharpe Ratio, but not statistically so.

Results based on supervisory tools are also slightly different, with the magnitudes of several differences increasing. Top five BHCs have fewer open and new MRAs and MRIAs. Composite supervisory ratings are also better (lower) for top five BHCs. However these differences are not statistically significant. On the other hand, Top Five banks have slightly more enforcement actions. The results continue to suggest no significant difference in governance measures – the presence of a CRO or Risk Committee – between top five and other BHCs.

f. Sources of earnings volatility

One of the more robust results from this analysis is the finding that top five BHCs have lower earnings volatility than otherwise comparable BHCs that are not among the five largest in their own district. In this section, we explore that finding in more detail to identify the sources of lower earnings volatility for top five 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).²⁴ 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 variables, we repeat the analysis of differences between top five BHCs and the matched sample, controlling for district-time effects. These results are reported in the top panel 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 five BHCs than for the matched sample. The differences are statistically significant for net interest margin, non-interest income, and loan loss, though not for non-interest expense. The lower volatility of provisions is consistent with the finding that top five BHCs have less

²⁴ We calculate non-interest expense net of compensation and fixed asset expense, both of which are relatively more difficult to earnings manage, to focus on the more discretionary 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.

volatile NPLs and could reflect that these firms hold less risky loan portfolios. The lower volatility of net interest income might also reflect this finding to some extent, as more stable loan portfolios could generate less volatile interest income on loans. However, the lower volatility of non-interest income at top five BHCs suggests that the impact of supervision could extend beyond the impact on BHCs' lending to other activities at the firm.

In addition to examining reported income and expense, we calculate a series of variables intended to isolate the discretionary portions of net income. Firms may have some discretion over the timing of 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 top five BHCs and their matches (as described in Section 4a). 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 AFS 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.

These results are reported in the bottom panel of Table 7. The net impact of the discretionary items is lower earnings for top five BHCs than for matched sample firms, though the differences are statistically significant only for the discretionary loan loss provisions component. Once again, this finding is consistent with the idea that BHCs subject to greater supervisory attention, as proxied by top five status, take a more conservative approach to reserving for loan losses, and their provisions are less likely to reflect earnings management since they are less likely to deviate from predictions based on observables.

g. Other analyses

While top five is a highly persistent variable (96% of BHCs that are in the top five in a district remain in the top five in the next quarter), we hoped to use our proxy in an event study format, exploiting firms that enter and leave the top five status in their district. This analysis faces several challenges. First, entrance and exit from the top five are infrequent. Second, they are endogenous. Firms that enter (leave) the top five are likely to be growing faster (slower) than their peers in the same district, and thus may be different. Firms that enter the top five 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. Finally, some firms enter and leave the top five, for example if the sixth largest firm is very close in size. 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.

5. Conclusion

We exploit the geographic assignment of supervisory responsibilities in the Federal Reserve System to examine the impact of supervision on banks' performance. We demonstrate that the top five BHCs in a Fed 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 top five 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 does 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.

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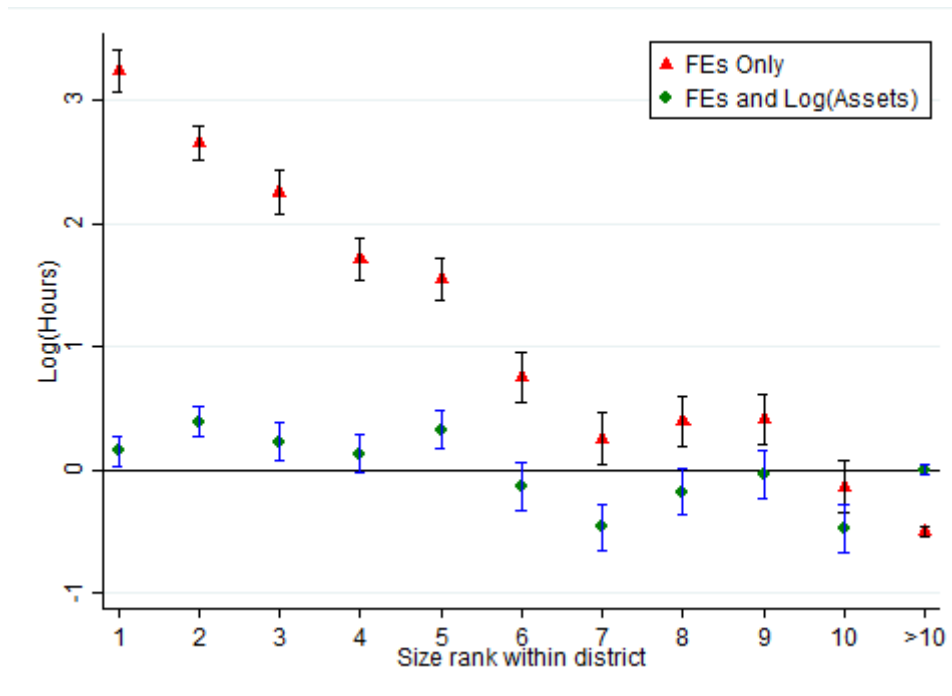
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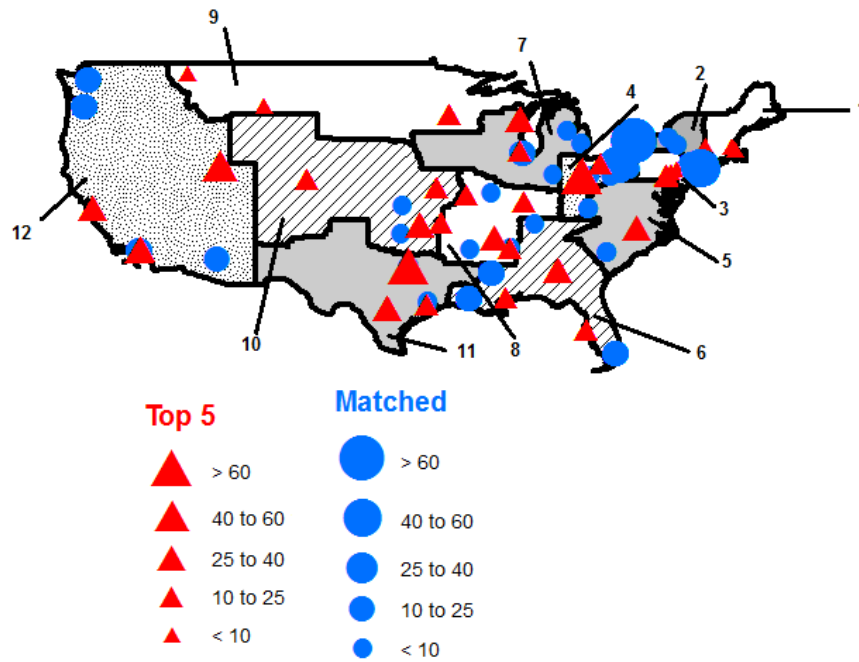
FIGURES

Figure 1: Within District Variation in Supervisory Hours by Size Rank



Note: Log(hours) on the y-axis are the residuals from a regression of log of supervisory hours on district-time fixed effects (triangles) or district-time fixed effects and the log of assets (diamonds). Size rank is determined by book asset size within a district-quarter. Points reflect the average residual for a rank and brackets designate the 95% confidence interval.

Figure 2: Top Five and Matched BHCs by Federal Reserve District



Note: Illustrates the headquarters location of Top Five banks and their matches in 2014Q1. 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	5 th		
1	274.1	133.0	118.4	22.5	9.5	1.1	82
2	2573.1	1842.5	856.3	801.5	515.6	3.2	92
3	248.1	115.9	25.0	18.7	17.1	1.0	61
4	345.2	138.7	93.9	66.3	24.9	1.0	56
5	2106.8	309.1	186.8	30.1	12.3	1.0	89
6	190.4	119.9	27.1	24.3	21.6	0.9	136
7	151.8	109.9	83.1	26.8	20.0	1.0	157
8	25.7	24.0	15.0	13.3	11.6	0.9	98
9	402.5	19.4	9.2	8.6	8.3	0.9	63
10	29.1	24.0	17.5	17.5	14.5	0.9	89
11	130.4	83.2	69.5	28.3	21.5	1.2	100
12	1687.2	154.6	89.8	57.2	39.4	1.5	98

Note: Summarizes the size of the top five BHCs in each Federal Reserve district. The sample consists of FR Y-9C filers in 2014Q4. BHCs with assets greater than \$500m must file an FR Y-9C. Dollars are in billions.

Table 2: Regression of Supervisory Hours on Top Five Indicator and Bank Controls

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top Five		3.277*** (0.199)	0.606** (0.248)	0.632** (0.246)	0.636*** (0.241)	0.539*** (0.180)	0.548*** (0.180)	0.537*** (0.180)	0.537*** (0.181)
log(Assets)			1.053*** (0.081)	1.761** (0.792)	2.128*** (0.776)	1.210* (0.704)	1.231* (0.698)	1.186* (0.701)	1.072 (0.726)
log(Assets) Squared				-0.023 (0.024)	-0.043* (0.024)	-0.013 (0.023)	-0.014 (0.023)	-0.012 (0.023)	-0.009 (0.024)
log(Entities)					0.402*** (0.097)	0.416*** (0.064)	0.407*** (0.064)	0.420*** (0.063)	0.415*** (0.063)
% SMB (> \$10B)						0.020*** (0.002)	0.020*** (0.002)	0.020*** (0.002)	0.020*** (0.002)
% SMB (≤ \$10B)						0.035*** (0.001)	0.035*** (0.001)	0.035*** (0.001)	0.035*** (0.001)
% National Banks						0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
% Loans/Assets							0.001 (0.003)	0.000 (0.003)	-0.000 (0.003)
% Deposits/Liabilities							-0.005 (0.005)	-0.004 (0.005)	-0.004 (0.005)
HHI of Assets								0.965** (0.407)	0.944** (0.407)
Public Indicator									0.074 (0.085)
Observations	14,836	14,836	14,836	14,836	14,783	14,783	14,783	14,783	14,783
District-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.0679	0.218	0.297	0.297	0.306	0.522	0.522	0.523	0.523

Note: Contains results from regressions of log of supervisory hours on a dummy indicating Top 5 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 Ten Indicator and Bank Controls

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top Five		2.204*** (0.243)	0.615** (0.247)	0.656*** (0.244)	0.656*** (0.241)	0.532*** (0.184)	0.541*** (0.184)	0.527*** (0.184)	0.527*** (0.184)
Top Ten		1.297*** (0.187)	-0.070 (0.201)	-0.143 (0.217)	-0.123 (0.215)	0.042 (0.144)	0.047 (0.144)	0.062 (0.142)	0.062 (0.142)
log(Assets)			-0.070 (0.201)	-0.143 (0.217)	-0.123 (0.215)	0.042 (0.144)	0.047 (0.144)	0.062 (0.142)	0.062 (0.142)
log(Assets) Squared				1.996** (0.899)	2.329*** (0.883)	1.141 (0.728)	1.155 (0.722)	1.085 (0.725)	0.971 (0.746)
log(Entities)					-0.049* (0.027)	-0.011 (0.023)	-0.012 (0.023)	-0.009 (0.023)	-0.006 (0.024)
% SMB (> \$10B)					0.401*** (0.097)	0.417*** (0.064)	0.408*** (0.064)	0.420*** (0.063)	0.416*** (0.063)
% SMB (≤ \$10B)						0.020*** (0.002)	0.020*** (0.002)	0.020*** (0.002)	0.020*** (0.002)
% National Banks						0.035*** (0.001)	0.035*** (0.001)	0.035*** (0.001)	0.035*** (0.001)
% Loans/Assets						0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
% Deposits/Liabilities							0.001 (0.003)	0.000 (0.003)	-0.000 (0.003)
HHI of Assets							-0.005 (0.005)	-0.004 (0.005)	-0.004 (0.005)
Public Indicator								0.974**	0.953** (0.407)
Observations	14,836	14,836	14,836	14,836	14,783	14,783	14,783	14,783	14,783
District-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.0679	0.244	0.297	0.297	0.306	0.522	0.522	0.523	0.523

Note: Contains results from regressions of log of supervisory hours on a dummy indicating Top 5 size-rank in a district, a dummy indicating Top 10 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. 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 Five BHCs Compared to Matches on Matching Criteria

Control Variables	Top Five				Matches				Δ Means	p -value
	Mean	Median	S.D.	N	Mean	Median	S.D.	N		
Log of Assets	16.13	16.17	0.78	2,789	16.15	16.24	0.81	5,578	-0.04	0.72
Log of Entities	3.17	3.22	0.76	2,789	3.20	3.22	0.83	5,578	2.01	0.54
% SMB Assets (> \$10B)	6.22	0.00	23.32	2,789	5.00	0.00	21.40	5,578	-1.21	0.73
% SMB Assets (\leq \$10B)	7.28	0.00	22.59	2,789	8.37	0.00	25.13	5,578	2.01	0.54
% Nat. Bank Assets	38.51	2.43	44.08	2,789	40.10	8.39	45.05	5,578	-1.21	0.73
% Loans/Assets	61.70	64.65	13.17	2,789	62.96	65.85	10.91	5,578	-0.8	0.65
% of Deposits/Liabilities	83.73	85.01	9.24	2,789	82.66	84.04	9.31	5,578	1.22	0.41
HHI of Assets	0.19	0.17	0.08	2,789	0.19	0.17	0.08	5,578	0.00	0.99
Public Indicator	0.86	1.00	0.35	2,789	0.89	1.00	0.32	5,578	-0.02	0.66
Rank	3.59	4.00	1.29	2,789	9.02	8.00	4.69	5,578	-5.43***	0.00

Note: Compares sample means between top five BHCs (treatment) and their matches. Matching chooses the two nearest neighbor for each treatment observation based on the listed control variables. 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 Five and Matches

	Top Five				Matches					
Variable	Mean	Median	S.D.	N	Mean	Median	S.D.	N	Δ Means	p -value
RISK-RETURN										
Balance Sheet										
% of RWA/Assets	71.09	72.19	10.90	2,183	71.90	72.74	10.74	4,381	-0.81	0.65
Tier 1 Ratio	11.84	11.40	2.99	2,225	11.97	11.18	3.52	4,430	-0.13	0.76
% of NPL	1.35	0.88	1.33	2,759	1.69	1.03	1.92	5,459	-0.34*	0.07
SD of NPL/Loans	0.32	0.17	0.39	2,329	0.41	0.20	0.53	4,570	-0.10*	0.08
% of Loan Loss Reserves	1.69	1.53	0.60	2,746	1.64	1.49	0.72	5,362	0.05	0.50
SD of Loan Loss Reserves/Loans	0.14	0.09	0.15	2,311	0.16	0.09	0.19	4,601	-0.02	0.47
% Asset growth (YoY)	11.08	7.74	14.17	2,726	10.78	7.85	13.99	5,272	0.30	0.76
Earnings										
ROA	1.01	1.11	0.64	2,762	0.95	1.05	0.75	5,494	0.07	0.26
SD of ROA	0.34	0.16	0.62	2,270	0.54	0.22	0.89	4,683	-0.21**	0.04
Sharpe Ratio of ROA	8.89	6.46	7.71	2,249	7.13	5.04	6.98	4,617	1.77**	0.03
Log Z-Score	3.99	4.12	1.03	2,254	3.65	3.87	1.20	4,581	0.33**	0.01
Market										
Market Cap/Equity	1.74	1.61	0.75	2,352	1.70	1.51	0.84	4,835	0.04	0.68
Quarterly Excess Return %	0.82	0.63	11.51	2,305	0.64	0.25	12.29	4,752	0.20	0.70
SD of Daily Return	0.02	0.02	0.01	2,325	0.02	0.02	0.01	4,824	-0.001	0.29
Sharpe Ratio	0.04	0.04	0.11	2,362	0.04	0.03	0.11	4,885	0.003	0.54
Bottom decile of excess return	0.07	0.00	0.26	2,337	0.08	0.00	0.27	4,872	0.00	0.71
Skew of Daily Return	0.16	0.13	0.62	2,300	0.18	0.16	0.65	4,768	-0.02	0.51
GOVERNANCE										
Risk Committee Dummy	0.39	0.00	0.49	804	0.48	0.00	0.50	1,699	-0.1	0.42
Risk Manager Dummy	0.54	1.00	0.50	804	0.56	1.00	0.50	1,699	-0.02	0.79
SUPERVISORY TOOLS										
Total MRA/MRIAs	8.70	2.00	14.95	819	10.20	4.00	19.14	1,874	-1.49	0.58
New MRA/MRIAs	1.74	0.00	4.47	819	1.92	0.00	6.51	1,874	-0.18	0.71
Closed MRA/MRIAs	1.48	0.00	5.12	819	1.15	0.00	4.77	1,874	0.33	0.49
Total Enforcement Actions	0.61	0.00	2.05	2,789	0.50	0.00	1.21	5,578	0.11	0.46
Rating	1.76	2.00	0.67	2,786	1.83	2.00	0.75	5,569	-0.07	0.35
Ratings Change Dummy	0.03	0.00	0.16	2,786	0.03	0.00	0.16	5,569	0.00	0.98

Note: Compares sample means between top five BHCs (treatment) and their matches. For details on variable construction see the Variable 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 Five Status Controlling for District Fixed Effects

Dependent Variable	Top Five	Std. Error	p-value	N	R-squared	Sample Mean
RISK-RETURN						
Balance Sheet						
% of RWA/Assets	-1.790	(1.187)	0.13	15,732	0.29	71.37
Tier 1 Ratio	0.276	(0.335)	0.41	15,793	0.22	12.35
% of NPL	-0.248**	(0.105)	0.02	19,718	0.46	1.55
SD of NPL/Loans	-0.096***	(0.033)	0.00	16,634	0.38	0.39
% of Loan Loss Reserves	-0.059	(0.055)	0.28	19,479	0.36	1.69
SD of Loan Loss Reserves/Loans	-0.031**	(0.014)	0.03	16,606	0.36	0.15
% Asset growth (YoY)	-1.038	(0.799)	0.19	19,155	0.16	10.88
Earnings						
ROA	0.018	(0.041)	0.66	19,702	0.27	0.94
SD of ROA	-0.178***	(0.062)	0.01	16,687	0.22	0.47
Sharpe Ratio of ROA	1.451**	(0.628)	0.02	16,515	0.22	7.62
Log Z-Score	0.269***	(0.093)	0.00	16,442	0.25	3.78
Market						
Market Cap/Equity	0.063	(0.051)	0.21	15,161	0.61	1.67
Quarterly Excess Return %	-0.90**	(0.400)	0.04	14,745	0.43	0.97
SD of Daily Return	-0.001**	(0.000)	0.02	15,033	0.72	0.02
Sharpe Ratio	-0.004	(0.003)	0.27	15,229	0.55	0.04
Bottom decile of excess return	0.008	(0.012)	0.51	15,078	0.20	0.08
Skew of Daily Return	-0.035	(0.027)	0.19	14,900	0.24	0.19
GOVERNANCE						
Risk Committee Dummy	-0.020	(0.101)	0.84	5,134	0.34	0.35
Risk Manager Dummy	-0.027	(0.081)	0.74	5,134	0.31	0.53
SUPERVISORY TOOLS						
Total MRA/MRIAs	-3.112	(2.772)	0.26	6,354	0.19	6.61
New MRA/MRIAs	-0.532	(0.480)	0.27	6,354	0.10	1.28
Closed MRA/MRIAs	0.290	(0.499)	0.56	6,354	0.07	0.86
Total Enforcement Actions	0.150*	(0.089)	0.09	20,034	0.18	0.43
Rating	-0.058	(0.058)	0.32	19,977	0.29	1.81
Ratings Change Dummy	-0.000	(0.006)	1.00	19,977	0.11	0.03

Note: Regresses dependent variable on a Top Five indicator, a dummy indicating the matching group, and district-quarter fixed effects. Sample is top ten BHCs and their matches. For details on variable construction see the Variable 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.

Table 7: Top Five Status and Earnings Volatility Controlling for District Fixed Effects

Dependent Variable	Top Five	Std. Error	p-value	N	R-squared	Sample Mean
Earnings Volatility						
SD of NIM/Assets	-0.006*	(0.003)	0.055	16,490	0.19	0.05
SD of Noninterest Income/Assets	-0.013*	(0.007)	0.062	16,791	0.13	0.06
SD of Loan Loss Provision/Assets	-0.015**	(0.007)	0.031	16,798	0.36	0.06
SD of NIE Less Comp. and FA/Assets	-0.014	(0.009)	0.13	16,652	0.27	0.07
Discretionary Earnings						
Abs. Value of Disc. LLP %	-0.008*	(0.004)	0.053	18,799	0.23	0.06
Abs. Value of Disc. Security Gains	-0.001	(0.001)	0.275	16,871	0.18	0.01
Discretionary Earnings	-0.003	(0.003)	0.285	16,079	0.23	0.04
Abs. Value of Disc. Earnings	0.003	(0.003)	0.343	16,079	0.14	0.00

Note: Regresses dependent variable on a Top Five indicator, a dummy indicating the matching group, and district-quarter fixed effects. Sample is top ten 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 TABLES

Appendix Table 1: Regression of Supervisory Hours on Top Five Indicator and Bank Controls (Excl. Largest BHCs)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Top Five		3.070*** (0.200)	0.596** (0.254)	0.541** (0.256)	0.552** (0.253)	0.391** (0.184)	0.400** (0.184)	0.388** (0.185)	0.385** (0.186)
log(Assets)			1.103*** (0.088)	0.114 (1.192)	0.564 (1.192)	-0.881 (0.926)	-0.848 (0.928)	-0.895 (0.928)	-1.045 (0.950)
log(Assets) Squared				0.032 (0.038)	0.009 (0.038)	0.057* (0.031)	0.056* (0.031)	0.058* (0.031)	0.062** (0.031)
log(Entities)					0.404*** (0.099)	0.415*** (0.065)	0.407*** (0.065)	0.420*** (0.064)	0.414*** (0.065)
% SMB (> \$10B)						0.019*** (0.003)	0.019*** (0.003)	0.019*** (0.003)	0.019*** (0.003)
% SMB (≤ \$10B)						0.035*** (0.001)	0.035*** (0.001)	0.035*** (0.001)	0.035*** (0.001)
% National Banks						0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
% Loans/Assets							0.001 (0.003)	-0.000 (0.003)	-0.001 (0.003)
% Deposits/Liabilities							-0.005 (0.005)	-0.004 (0.005)	-0.004 (0.005)
HHI of Assets								1.001** (0.415)	0.976** (0.415)
Public Indicator									0.084 (0.086)
Observations	14,538	14,538	14,538	14,538	14,485	14,485	14,485	14,485	14,485
District-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.0637	0.179	0.258	0.258	0.267	0.497	0.497	0.498	0.498

Note: Contains results from regressions of log of supervisory hours on a dummy indicating Top 5 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. Excludes banks that are larger (assets) than the largest non-Top 5 bank. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 2: Top Five BHCs and the Full Sample Prior to Matching

Control Variables	Top Five				Matches				Δ Means	p-value
	Mean	Median	S.D.	N	Mean	Median	S.D.	N		
Log of Assets	16.74	16.64	1.21	4,397	13.73	13.60	0.91	56,421	3.01***	0.00
Log of Entities	3.74	3.58	1.19	4,285	1.46	1.39	0.89	55,332	2.28***	0.00
% SMB Assets (> \$10B)	9.32	0.00	27.73	4,397	0.19	0.00	4.29	56,421	9.13***	0.00
% SMB Assets (\leq \$10B)	4.80	0.00	18.39	4,397	13.29	0.00	32.52	56,421	-8.5***	0.00
% Nat. Bank Assets	36.83	1.81	43.12	4,397	26.21	0.00	41.24	56,421	10.62**	0.02
% Loans/Assets	63.27	65.86	12.13	4,397	64.71	66.06	12.32	56,421	-1.44	0.21
% of Deposits/Liabilities	81.52	82.22	9.48	4,397	89.37	91.21	8.07	56,421	-7.85***	0.00
HHI of Assets	0.18	0.16	0.07	4,397	0.22	0.21	0.09	56,419	-0.04***	0.00
Public Indicator	0.88	1.00	0.33	4,397	0.42	0.00	0.49	56,421	0.46***	0.00
Rank	3.17	3.00	1.40	4,397	40.06	33.00	29.82	56,421	-36.89***	0.00

Note: The Top Five sample includes the top five ranked BHC-quarter observations in a district and Below Top Five sample is all other BHCs above the median asset size and excluding special banks. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 3: Top Ten BHCs and Matches for District FE Regressions

Control Variables	Top Ten				Matches				Δ Means	p-value
	Mean	Median	S.D.	N	Mean	Median	S.D.	N		
Log of Assets	15.51	15.54	0.88	6,678	15.52	15.51	0.90	13,356	-0.01	0.93
Log of Entities	2.69	2.71	0.85	6,678	2.69	2.71	0.91	13,356	-0.01	0.92
% SMB Assets (> \$10B)	2.60	0.00	15.38	6,678	2.09	0.00	14.05	13,356	0.51	0.62
% SMB Assets (\leq \$10B)	11.80	0.00	29.44	6,678	12.03	0.00	30.03	13,356	-0.23	0.90
% Nat. Bank Assets	33.85	0.00	43.08	6,678	34.70	0.00	43.62	13,356	-0.85	0.83
% Loans/Assets	63.15	65.54	12.42	6,678	63.71	65.78	11.10	13,356	-0.56	0.54
% of Deposits/Liabilities	85.22	86.89	9.04	6,678	84.76	86.47	9.10	13,356	0.46	0.52
HHI of Assets	0.20	0.18	0.08	6,678	0.20	0.18	0.08	13,356	0	0.90
Public Indicator	0.76	1.00	0.42	6,678	0.78	1.00	0.42	13,356	-0.01	0.68
Rank	6.27	6.00	2.65	6,678	11.87	10.00	7.10	13,356	-5.6***	0.00

Note: The Top Ten sample includes the top ten BHC-quarter observations in a district and Matches contains matches based on the controls variables. Matching is done separately for each quarter. All matches must be below top five in rank and in another district. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 4: Top Five Status Controlling for District Fixed Effects, 2006-2014

Dependent Variable	Top Five	SE	N	R-squared	Sample Mean
RISK-RETURN					
Balance Sheet					
% of RWA/Assets	-1.456	(1.567)	8,094	0.29	71.94
Tier 1 Ratio	0.720	(0.456)	8,021	0.24	12.87
% of NPL	-0.366*	(0.202)	7,980	0.38	2.13
SD of NPL/Loans	-0.171**	(0.068)	6,628	0.28	0.63
% of Loan Loss Reserves	0.241***	(0.082)	7,999	0.38	1.63
SD of Loan Loss Reserves/Loans	-0.019	(0.027)	6,682	0.33	0.20
% Asset growth (YoY)	-2.277*	(1.256)	7,825	0.12	8.16
Earnings					
ROA	0.011	(0.075)	7,982	0.24	0.71
SD of ROA	-0.262*	(0.145)	6,710	0.20	0.73
Sharpe Ratio of ROA	1.396	(1.032)	6,617	0.20	5.35
Log Z-Score	0.279	(0.178)	6,463	0.27	3.53
Market					
Market Cap/Equity	0.096	(0.090)	6,026	0.48	1.27
Quarterly Excess Return %	0.400	(0.700)	5,794	0.49	0.00
SD of Daily Return	0.000	(0.001)	5,987	0.82	0.02
Sharpe Ratio	0.005	(0.005)	6,094	0.60	0.02
Bottom decile of excess return	0.005	(0.020)	6,046	0.23	0.08
Skew of Daily Return	-0.009	(0.050)	5,959	0.33	0.16
GOVERNANCE					
Risk Committee Dummy	-0.020	(0.101)	5,134	0.34	0.35
Risk Manager Dummy	-0.027	(0.081)	5,134	0.31	0.53
SUPERVISORY TOOLS					
Closed MRA/MRIAs	0.290	(0.497)	6,309	0.08	0.86
New MRA/MRIAs	-0.532	(0.000)	6,309	0.11	1.29
Total MRA/MRIAs	-3.112	(2.763)	6,309	0.19	6.65
Total Enforcement Actions	0.383*	(0.226)	8,217	0.14	0.76
Rating	0.048	(0.085)	8,217	0.21	2.01
Ratings Change Dummy	0.003	(0.012)	8,217	0.12	0.05

Note: Regresses dependent variable on a Top Five indicator, a dummy indicating the matching group, and district-quarter fixed effects. Sample is top ten BHCs and their matches in the 2006-2014 period. For details on variable construction see the Variable 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 5: OLS of Outcome Measures on Hours in the Top Ten Matched Sample, 2006-2014

Dependent Variable	Log(Hours)	Std. Error	N	R-squared	Sample Mean
RISK-RETURN					
Balance Sheet					
% of RWA/Assets	0.514***	(0.177)	7,956	0.30	71.88
Tier 1 Ratio	0.046	(0.046)	7,870	0.24	12.87
% of NPL	0.050*	(0.026)	7,819	0.38	2.14
SD of NPL/Loans	0.011	(0.013)	6,486	0.28	0.63
% of Loan Loss Reserves	0.025*	(0.013)	7,868	0.37	1.64
SD of Loan Loss Reserves/Loans	0.004	(0.003)	6,539	0.33	0.20
% Asset growth (YoY)	-0.117	(0.179)	7,699	0.12	8.11
Earnings					
ROA	-0.035***	(0.011)	7,824	0.25	0.70
SD of ROA	0.031	(0.027)	6,566	0.20	0.74
Sharpe Ratio of ROA	0.038	(0.089)	6,471	0.21	5.35
Log Z-Score	-0.019	(0.029)	6,319	0.27	3.53
Market					
Market Cap/Equity	0.002	(0.010)	5,984	0.48	1.27
Quarterly Excess Return %	0.003**	(0.100)	5,752	0.49	-0.25
SD of Daily Return	0.000	(0.000)	5,945	0.82	0.02
Sharpe Ratio	0.002*	(0.001)	6,052	0.60	0.03
Bottom decile of excess return	-0.010	(0.000)	6,004	0.23	0.08
Skew of Daily Return	0.020**	(0.008)	5,920	0.33	0.16
GOVERNANCE					
Risk Committee Dummy	0.003	(0.010)	5,093	0.34	0.35
Risk Manager Dummy	0.014	(0.012)	5,093	0.31	0.53
SUPERVISORY TOOLS					
Closed MRA/MRIAs	0.183***	(0.037)	6,214	0.08	0.88
New MRA/MRIAs	0.456***	(0.077)	6,214	0.15	1.30
Total MRA/MRIAs	1.990***	(0.411)	6,214	0.27	6.75
Total Enforcement Actions	0.110***	(0.027)	8,053	0.16	0.77
Rating	0.074***	(0.012)	8,053	0.25	2.01
Ratings Change Dummy	0.015***	(0.002)	8,053	0.14	0.05

Note: OLS regression of dependent variable on a log of supervisory hours. Controls include a dummy indicating the matching group and district-year fixed effects. Sample is top ten BHCs and their matches. For details on variable construction see Variable Appendix. Standard errors are clustered by BHC. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 6: Two-Stage Least Squares, 2006-2014

Dependent Variable	Log(Hours)	Std. Error	N	F-Stat	Sample Mean
RISK-RETURN					
Balance Sheet					
% of RWA/Assets	1.058	(1.900)	14,578	8.98	73.49
Tier 1 Ratio	-1.294*	(0.751)	14,579	9.86	12.70
% of NPL	-0.888	(0.553)	14,517	9.16	2.30
SD of NPL/Loans	-0.323	(0.209)	11,795	7.97	0.75
% of Loan Loss Reserves	0.079	(0.152)	14,599	9.51	1.71
SD of Loan Loss Reserves/Loans	-0.060	(0.055)	11,769	7.70	0.23
% Asset growth (YoY)	-1.082	(2.006)	14,355	9.93	7.46
Earnings					
ROA	-0.091	(0.168)	14,556	9.32	0.54
SD of ROA	-0.527	(0.346)	11,776	6.92	0.81
Sharpe Ratio of ROA	1.928	(1.743)	11,754	7.09	4.12
Log Z-Score	0.562	(0.440)	11,622	7.13	3.30
Market					
Market Cap/Equity	-0.208	(0.146)	7,826	6.71	1.20
Quarterly Excess Return %	-0.70	(1.10)	7,554	7.99	-1.51
SD of Daily Return	0.000	(0.002)	7,701	6.89	0.03
Sharpe Ratio	0.002	(0.006)	7,855	6.84	0.02
Bottom decile of excess return	0.032	(0.033)	7,724	7.67	0.11
Skew of Daily Return	-0.002	(0.062)	7,696	6.38	0.23
GOVERNANCE					
Risk Committee Dummy	0.042	(0.129)	6,726	7.22	0.17
Risk Manager Dummy	0.062	(0.146)	6,726	7.22	0.42
SUPERVISORY TOOLS					
Closed MRA/MRIAs	0.903	(0.664)	10,903	9.46	0.60
New MRA/MRIAs	0.306	(0.389)	10,903	9.46	0.83
Total MRA/MRIAs	-0.240	(2.194)	10,903	9.46	4.25
Total Enforcement Actions	0.532	(0.418)	14,783	8.93	0.61
Rating	-0.008	(0.145)	14,783	8.93	2.05
Ratings Change Dummy	0.000	(0.017)	14,783	8.93	0.06

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 top ten BHCs and their matches. For details on variable construction see Variable 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
Skew of Daily Return	The skew of daily returns in every quarter	CRSP, Ken French website	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
Ongoing MRA/MRIAs	Defined as the number of MRA and MRIA initiated in previous quarter(s) that have not been closed as of the 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
Ongoing 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
Composite 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 (BHCK2170) 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