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Bank Managerial Ability and Accounting:

Do Better Managers Report Higher Quality Loan Loss Reserves and Fair Values?

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Bank Managerial Ability and Accounting:

Do Better Managers Report Higher Quality Loan Loss Reserves and Fair Values?

by

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Bank Managerial Ability and Accounting:

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The University of Texas at Austin, 2013

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Given the high level of scrutiny on top executives in recent years, particularly those at banks, examining the impact of bank managers' ability on financial reporting is of great value. This paper builds on models of bank efficiency in the banking literature to derive a measure of bank managerial ability, and examines how bank managerial ability impacts the quality of accounting information related to unique bank accounting issues. I find evidence that higher ability managers do report higher quality accounting estimates for the allowance for loan losses and fair values of securities. Additionally, I identify two settings that affect the strength of the relation between bank managerial ability and accounting quality, the Financial Crisis and when capital ratios are binding. I find evidence that this relation is stronger during the recent Financial Crisis but is attenuated when capital ratios are binding. These findings should be of interest to investors, standard setters, and particularly bank regulators tasked with monitoring the stability of banks.

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1. INTRODUCTION

The Financial Crisis of 2007-2009 brought bank performance and bank financial reporting to the forefront of public attention. Given the high level of scrutiny on top executives in recent years, particularly those at banks, examining the impact of bank managers' ability on bank performance and reporting is of great value. This paper builds on models of bank efficiency in the banking literature to derive a measure of bank managerial ability (hereafter BMA), and examines how bank managerial ability impacts the quality of accounting information related to unique bank accounting issues. I examine two questions surrounding critical accounting issues at banks: 1) Do higher ability managers provide higher quality accounting for loan loss reserves and fair values? 2) What settings strengthen or diminish the relation?

Loans and securities make up the vast majority of bank assets (on average 89% in my sample). Losses in the lending and securities portfolios are the primary causes for the capital deterioration that led to bank failures during the recent Financial Crisis (Cullen, 2011). Losses from loans or securities not only affect the individual banks experiencing those losses but can also have far-reaching and serious negative consequences for liquidity throughout the whole economy (Ivashina and Scharfstein, 2010; European Central Bank, 2011). Evidence on the relation between bank managerial ability and critical bank-specific accounts enhances investors', standard setters', and regulators' understanding of the quality of bank reporting.

Understanding the relation between managers and accounting quality at banks should be of particular interest to bank regulators. Such evidence gives regulators a

valuable mechanism to evaluate managerial performance and to determine best practices in bank accounting. In addition, evidence on BMA and bank reporting can help regulators more efficiently allocate their monitoring resources through a better understanding of an important determinant of reporting quality. This study also contributes to the academic literature by offering a measure of managerial ability designed specifically for banks that controls for bank characteristics.

I define managerial ability as managers' ability to efficiently convert resources to revenues, similar to past studies in the banking and accounting literature. Thus a bank manager that generates greater revenues from the same set of resources would be deemed a higher ability manager. I define accounting quality for the bank-specific accounts in this study as the ability for reported or disclosed accounting information to predict future economic realizations. Thus, high quality accounting indicates that reported loan loss reserves and security fair values better predict future economic outcomes associated with that type of transaction.

Converting bank resources into revenues requires bank managers to gather information from within the bank, from existing and potential loan recipients, and from the market as a whole. To most efficiently allocate bank resources across numerous investment opportunities, bank managers must synthesize and weight information from these various sources. Similarly, developing high quality accounting estimates also requires managers to gather information from within the bank, from existing loan customers, from the financial markets, and from the underlying economies of the regions

in which they invest. Managers must understand and weight the information acquired from various internal and external sources. As a result, managers with the skills to more effectively allocate the bank's resources and more efficiently manage the bank should also have the skills to develop more predictive accounting estimates.[1] Accordingly, this intuition predicts that high ability bank managers will report higher quality accounting estimates.

However, managers face myriad and diverse reporting incentives that might incentivize them to over- or under-report loan loss reserves or fair values of securities. These incentives can arise from litigation costs, product market competition, cost of capital concerns, reputation concerns, and political pressure. These diverse reporting incentives may dominate or obfuscate the relation between managerial ability and accounting quality. Thus my primary hypothesis remains an empirical question.

I also examine two settings where the predicted relation above may be strengthened or weakened: the Financial Crisis of 2007-2009 and when firm-specific capital ratios are binding. These settings are of particular importance to bank regulators as they represent settings where banks are on average more distressed.

Task complexity theory in the psychology literature notes that the difficulty of a task impacts the extent that ability leads to greater judgment performance (Abdolmohammadi and Wright, 1987; Libby and Luft, 1993; Bonner, 1994). Ability has a lesser impact on relatively easy tasks, but as tasks become more difficult ability

[1] Demerjian, Lewis, Lev, and McVay (2011) also maintain this assumption.

becomes more important for judgment performance. The inherent uncertainty of the Financial Crisis makes developing accounting estimates more complex, so during this period the relation between managerial ability and accounting quality may be strengthened. However, many banks suffered considerable losses during the recent Financial Crisis, and bank managers were widely criticized in the popular press for their inability to see the oncoming economic problems. It is possible that even the most able managers were unable to anticipate and understand the conditions of the recent Financial Crisis. Thus, ex ante, the relation between managerial ability and accounting quality during the Financial Crisis is unclear.

Banks face unique minimum capital requirements to ensure their outstanding deposits. Past research shows that bank accounting estimates are sensitive to binding capital ratios (Moyer, 1990; Beatty, Chamberlain, and Magliolo, 1995; Collins, Shackelford, and Wahlen, 1995; Nissim, 2003). Fear of violating capital ratios may cause all managers, regardless of ability, to report optimistic accounting numbers. If the desire to report favorably dominates the ability to report accurately, one would expect no difference between the quality of accounting estimates reported by high and low ability managers.

I build on an existing banking literature which uses Data Envelopment Analysis (DEA) to measure a bank's efficiency in converting its resources into revenues (Barr, Seiford and Siems, 1993; Luo, 2003; Kao and Liu, 2004), and I regress my bank efficiency measure on a set of bank characteristics deemed outside of the purview of

management. The residual from this regression is my measure of Bank Managerial Ability (BMA).[2]

I find evidence that bank managerial ability is positively associated with accounting quality. Specifically, my full sample results show a positive and significant relation between BMA and the accounting quality for the allowance for loan losses and for the fair values of securities.

The above relation is strengthened in the Financial Crisis. This evidence is consistent with task complexity theory but inconsistent with allegations in the popular press. Finally, I provide evidence that the relation between bank managerial ability and accounting quality is weakened when banks face binding capital ratios but only for the allowance for loan losses. This evidence is consistent with both high and low ability managers reporting optimistic loan loss reserves when capital ratios are tight.

This study provides the first evidence addressing the impact of bank managerial ability on unique bank accounting issues, the allowance for loan losses and fair value of securities. The quality of accounting surrounding loan quality and securities fair values is of particular interest to investors, bank regulators, standard setters, and the academic community given the recent financial crisis. Increasing the quality of reserves for loan losses has been an objective of the SEC, and increasing the quality and use of fair value accounting remains on the agenda of accounting standard setters such as the FASB and

[2] While this approach is similar to the approach adopted by Demerjian, Lev, and McVay (2012), which uses a managerial ability measure based on the DEA procedure for non-financial firms, my BMA measure is designed specifically for the banking sector, allowing me to examine the unique and critical bank accounting estimates.

the IASB. Understanding how managerial ability impacts financial reporting and the settings that impact this relation should directly aid bank regulators in determining best practices and in efficiently allocating their monitoring resources.

This study is most similar to Demerjian, Lewis, Lev, and McVay (2011), which uses a managerial ability measure based on the DEA procedure for non-financial firms and relates that measure to accounting quality. My BMA measure is designed for the banking sector, allowing the study to examine the unique and critical bank accounting estimates unlike Demerjian et al. (2011).

The banking industry provides a particularly strong setting to examine the relation between managerial ability and accounting quality. First, the nature of the banking business model mirrors the accounting function more closely than most industries. It is easy to envision success in the pharmaceutical industry driven by the ability to develop unique drugs, or success in the computer software industry driven by higher caliber computer coding. However, it is not clear how managers' skills in managing those processes would translate to the accounting function. In the banking industry management must identify the optimal investments from a set of financial asset to efficiently manage the bank and assess the values and risks of these assets when making accounting estimates.[3] The abilities required to complete each of these tasks more closely align than industries. Additionally, due to the critical nature of the bank accounting estimates examined in this study (particularly the allowance for loan losses),

[3] Nadler (1991) and Lewellyn and Muller-Kahle (2012) note the importance and responsibility of CEOs in establishing lending policies.

top level bank management is intricately involved in the estimation process for these accounts. Thus unlike in many industries, at banks the same managers who determine the policies and procedures surrounding the investment decisions (such as the CEO, CFO, and Head of the Asset and Risk Management Division) are also involved in the accounting function for these assets.[4] By utilizing this powerful setting to examine the role of managers, this study extends a growing literature in accounting, finance, and economics that examines the influence of managers on the organizational, investing, financial and accounting practices of firms (Bertrand and Schoar, 2003; Milbourn, 2003; Graham, Li and Qui, 2012; etc.).

The remainder of the paper is organized as follows. Section 2 discusses relevant literature and develops my hypotheses. Section 3 defines the variables used in the study. Section 4 presents the research design for two different empirical models. Section 5 tabulates and discusses results of the study, and Section 6 concludes.

[4] Regulators note the significance of these individuals in developing loan loss estimates by addressing guidance surrounding the issue to top management. The Office of Thrift Supervision directed its 2009 memorandum concerning the allowance for loan losses to CEOs (OTS 2009; later superseded by OCC, 2013). The SEC directed its 2009 letter concerning the allowance for loan losses to CFOs (SEC, 2009).

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Managerial Characteristics and Accounting

Recent research in accounting, finance, and economics attempts to understand the impact of managers, particularly CEOs, on the organizational, investing, financial and accounting practices of firms. Bertrand and Schoar (2003) use manager fixed effects to capture a manager's "style" and find CEOs to be instrumental in affecting firm's policy decisions and performance. Manager fixed effects and reputation measures are also linked to the extent and nature of executive compensation (Milbourn, 2003; Graham et al., 2012). Recent survey research by Dichev, Graham, Harvey, and Rajgopal (2012) calls for more research that explores the "human element" to provide "a deeper analysis of the character of the managers running the firm."

Accounting managerial characteristics research to date has focused exclusively on non-financial firms. Three such studies use manager fixed effects (either CEO or CFO) to determine how a manger's "style" correlates to certain accounting choices (Bamber, Jiang and Wang, 2010; DeJong and Ling, 2010; Ge, Matsumoto and Zhang, 2011). These studies refer to managerial fixed effects broadly as "style," which may encompass abilities, risk preferences, personality, etc. Bamber et al. (2010) finds that manager fixed effects explain differences in the frequency, precision, and bias of voluntary management financial forecast disclosures. They also find that demographic information (career track, military background, period born) explains some of the differences between managers. Ge et al. (2011) finds that CFO fixed effects explain differences in accounting policies,

such as accruals, the use of operating leases, and the propensity to meet or beat earnings targets. DeJong and Liang (2010) find that CEOs and CFOs impact accrual levels even after controlling for the managers' economic and operating choices.[5] These studies can determine that specific managers influence accounting choices and quality. However, the use of manager fixed effects does not allow these studies to determine why specific managers influence accounting quality nor make any a priori predictions about managers or managerial ability.

Several studies use specific proxies to capture managerial ability to study its relation to accounting quality. The results are mixed. Aier, Comprix, Gunlock, and Lee (2005) finds a significant negative relation between CEO financial expertise (experience, advanced degrees, and professional certifications) and accounting restatements. Francis, Huang, Rajgopal, and Zang (2008) finds a significantly negative relation between CEO media mentions (potentially a proxy for CEO reputation, but also a potential proxy for other CEO characteristics such as ego) and accounting quality. Demerjian et al. (2011) uses a DEA-based measure of managerial ability for non-financial firms and finds managerial ability at non-financial firms to be positively related to earnings and accruals persistence.

The DEA-based measure used here has a distinct advantage over fixed-effect measures in that the DEA-based measure does not require managers to switch firms

[5] Recent studies examine managers' influence on earnings quality. Jiang, Petroni and Wang (2010) find accruals and beating earnings forecasts to be more sensitive to CFO than CEO equity incentives. However Feng, Ge, Luo, and Shevlin (2011) find that CFOs equity incentives do not explain material accounting manipulations but CEO equity incentives and power (board position, founder, etc.) do explain manipulations.

during the sample period in order to document the manager's effect. Rather the DEA-based measure can be constructed from widely available financial data and can be calculated for a broad sample. Additionally, the DEA-based measure compares management teams to the appropriate peer firms as described in detail below. All of the above studies exclude financial firms. This study offers a measure of bank managerial ability to the accounting literature and examines the relation between bank managerial ability and critical bank accounting estimates unexamined by past research.

2.2Bank Managerial Ability and Accounting Quality

Managing a bank requires a diverse set of skills. Should the bank invest its marginal resources in securities, loans, trading assets, derivatives or federal funds? What mix of loan types (residential real-estate, commercial real-estate, commercial, consumer, etc.) should the bank attempt to initiate, and what credit standards and lending policies will achieve that mix? To answer these questions bank managers must acquire information from numerous sources, comprehend the internal and external factors that influence their business model and synthesize these components into a successful strategy. For example, bank managers must understand their own current exposures as well as prevailing market trends in different industries, such as real estate prices or retail spending, to determine the risks and rewards of different investments.

Many of the skills required to effectively manage a bank can also translate to developing accurate accounting estimates. Demerjian et al. (2011) provide the most relevant discussion on this point. They use a DEA-based measure of managerial ability

for non-financial firms and find accounting quality to be positively associated with this measure. They attribute this relation to higher ability managers being "better able to synthesize information into reliable forward-looking estimates." Higher ability bank managers may be able to gather, understand and weight information to better value their assets and estimate risks. If the skills and abilities required to manage a bank translate to developing accounting estimates, one would expect higher ability managers to develop higher quality estimates of loan losses and fair values.

The banking industry provides a particularly strong setting to examine managerial ability's influence on accounting. The skills required to make investment decisions more closely mirror the skills needed to make accounting estimates in the banking industry than in other industries (pharmaceuticals, computer software, manufacturing, etc.). Additionally, the top bank managers responsible for developing the policies and procedures that govern the banks operations are heavily involved in the estimation process of the critical bank accounting estimates studied here.

Note that managers face myriad and diverse reporting incentives. The "skills transfer" prediction that higher ability bank managers will offer higher quality accounting estimates may not hold when managers' incentives to under/over report dominate their ability to report accurately. Managers may wish to under-report or over-report their accounting numbers for various reasons. Managers may under-report to reduce *ex post* litigation costs (Skinner, 1994; Kasznik and Lev, 1995), to discourage new market entrants (Clarkson et al., 1994), or to protect proprietary information when competition is

high (Botosan and Stanford, 2005; Bens, Berger, and Monahan, 2011). Political pressures can also lead managers to under report firm value (Watts and Zimmerman, 1986). A bank manager could report higher, more conservative loan loss reserves or lower fair values to minimize law suits if results are poor or to discourage new entrants to a particular lending market.

On the other hand, managers may wish to over-report earnings when trying to raise new equity or debt (Korajczyk, Lucas, and McDonald, 1991; Lang and Lundholm, 2000), to maximize their own equity incentives when selling shares or exercising stock options (Noe, 1999; Aboody and Kasznik, 2000), or to bolster their own job prospects (Fudenberg and Tirole, 1995). A bank manager could report lower, more optimistic loan loss reserves or higher fair values to bolster the stock price of the bank.

Thus, while higher ability managers may offer higher quality accounting estimates on average by transferring their skills from an operating setting to an accounting setting, reporting incentives may dominate the influence of ability.[6] Similar to prior studies (McNichols and Wilson, 1988; Evans, Hodder, and Hopkins, 2010; Cantrell, McInnis, and Yust, 2012), I define accounting quality for the allowance for loan losses and fair values of securities as the ability for current period estimates to predict future period economic realizations, such as loan charge-offs and gains and losses from securities sales. A stronger association between current loan loss reserves (fair values)

[6] Offering accurate disclosures also bring managers benefits, such as lower cost of capital (Brown, 1979), higher information quality (Easley and O'Hara, 2004; Lambert, Leuz, and Verrecchia, 2007) or enhanced reputation (Stocken, 2000).

and future loan losses (realized gains and losses on sales) represents higher quality accounting. As the existence of the proposed relation is an empirical question I formally state the following hypothesis in the null form:

> *H_1: Higher ability bank managers do not provide higher accounting quality by reporting current period accounting estimates that better predict future economic realizations.*

In addition to investigating the overall relation between bank managerial ability and accounting quality, I identify two settings where the relation may be stronger, weaker or non-existent: the Financial Crisis and when capital ratios are binding. These settings are of particular interest to bank regulators and are discussed in the following subsection.

2.3 Settings That May Influence the Role of Bank Managerial Ability on Accounting Quality

The Financial Crisis of 2007-2009

The Financial Crisis of 2007-2009 provides a unique and important setting to investors and regulators as the uncertainty during the period made understanding the quality of bank accounting estimates more difficult and more critical. The uncertain nature of the period raises interesting questions about whether the ability of managers will impact the predictive ability of accounting estimates.

Task complexity theory posits that as a task becomes more complex, ability has a greater influence on judgment performance (Abdolmohammadi and Wright, 1987; Libby

and Luft, 1993; Bonner, 1994). For relatively simple tasks, high or low ability individuals reach similar judgments. However, as tasks become increasingly complex, high ability is required to maintain adequate judgment performance; as such, high ability individuals outperform low ability individuals. During the Financial Crisis, gathering, processing, and synthesizing information into accounting estimates would be a much more complex task than during a more stable economic period. The increase in task complexity may cause bank managerial ability to exercise an even greater impact on accounting quality during the Financial Crisis.

However, task complexity theory also posits that if tasks become exceedingly complex, ability no longer improves judgment: "as task complexity exceeds some maximum threshold…variance in skill or motivation is not relevant because performance is uniformly poor (Bonner, 1994)." The complexity of judgments about the future during a period as uncertain as the Financial Crisis could exceed this maximum threshold where ability no longer increases accounting quality. Banks suffered large losses during the Financial Crisis with numerous bank failings, suggesting that some bank managers did not understand their own current exposures during the period. Fahlenbrach and Stulz (2011) find evidence that bank managers lost a considerable portion of their personal wealth during the Financial Crisis. Thus, it appears that at least many bank managers did not anticipate the economic conditions. If the setting is exceedingly complex, one would expect ability to have a significantly reduced influence on accounting quality, perhaps no influence. It is uncertain whether, on average, bank managers of high ability could

provide higher accounting quality during the period. Thus, I formally state the following hypothesis in the null form:

> *H_2: The relation between bank managerial ability and accounting quality is unaffected during the Financial Crisis.*

Binding Capital Ratios

The second setting I examine is where bank managers face binding capital ratios, a unique constraint due to the high level of regulatory oversight of the banking industry. A bank must maintain certain capital reserves (measured with capital ratios) to ensure adequate funding for its deposits. Prior academic research finds that banks' reported accounting numbers, including loan loss reserves, are sensitive to capital adequacy pressures (Moyer, 1990; Beatty et al., 1995; Collins et al., 1995). Even though fair values disclosed under ASC 825-10 (originally SFAS 107) do not directly affect capital ratios, Nissim (2003) provides evidence that banks overstate their disclosed fair values when capital ratios are tight, presumably to appear less risky to the market and bank regulators.

Fear of violating capital ratios or revealing that they are capitally constrained may constrain a bank manager *of any ability* from revealing his or her private information. The ability to develop more predictive estimates may be dominated by the desire to report favorably. High ability and low ability managers may both choose to report loan loss reserves and fair values that are optimistic to appear more stable to bank regulators and investors. Thus, when capital ratio constraints are binding, high ability and low ability

bank managers may issue accounting estimates with similar predictive ability. I formally state the following hypothesis in the null form:

> *H_3: The relation between bank managerial ability and accounting quality is unaffected when capital ratios constraints are binding.*

2.4 The Importance of Loan Loss Reserves and Fair Value Estimates

Loans and securities make up an overwhelming portion of a bank's balance sheet (roughly 89% in my sample). Evaluating these accounts is critical in evaluating the bank as a whole. A small change in the expected loss in the lending portfolio can result in a large change in income and bank equity. For example, in my sample the average bank charges off only 0.4% of gross loans in any given year. However, 0.1% of gross loans corresponds on average to roughly 12% of the bank's net income, and one standard deviation-change in the value of net charge-offs is slightly larger than net income. This is why the American Banking Association referrs to managing the credit risk of loan customers as "the most important aspect of the banking business model" (ABA, 2010).

Securities are the second largest asset type held by banks, and the largest asset type for which fair value accounting plays a prominent role. The fair value of available-for-sale securities are recorded on the balance sheet with changes recorded in other comprehensive income, while held-to-maturity securities are reported at historical cost with fair values disclosed in the footnotes to the financial statements.[7] The recent

[7] Designating securities as trading securities is a rare practice at banks as price changes flow through income. Trading securities makes up only 0.5% of total securities in my sample.

financial crisis has placed fair value accounting at the center of a controversy. Critics assert that fair value accounting can increase systematic risk through pro-cyclical trading (European Central Bank, 2004; Plantin, Sapra, and Shin, 2008; Barth and Landsman, 2010), while others assert that no such relationship exists (Badertscher, Burks and Easton, 2012).

Thus, understanding the accounting estimates designed to gauge the value of the loans and securities at a bank is critical to investors and regulators when assessing the value and stability of the bank. Cullen (2011) finds that losses in the lending portfolio are the leading driver of bank failures during the recent financial crisis with 97.5% of failed banks from 2008 to 2010 experiencing deterioration in their lending portfolio in the quarters prior to failure. He also finds losses from securities to be the second most prominent reason for capital deterioration leading to failures. Reductions in capital from loan and securities losses not only affect the bank. Reductions in capital can also have a systematic effect through the industry and the economy as a whole. If capital tightens in the banking industry, the industry as a whole will be less willing to lend leading to a reduction in liquidity to the entire economy and restricting economic growth (Ivashina and Scharfstein, 2010; ECB, 2011). For both fair values and loan loss reserves, understanding the quality of the accounting estimates may prove useful not only in assessing the stability of the individual bank but the stability of the banking system as a whole.

3. VARIABLE MEASUREMENT

This section describes the stand alone measures of bank managerial ability and accounting quality used in hypothesis tests in the following sections.

3.1 Measuring Bank Managerial Ability

Following a long stream of banking literature, I use Data Envelopment Analysis to construct a measure of bank efficiency. I then purge firm-specific factors from this DEA-based bank efficiency measure to arrive at efficiency attributed to managerial ability. The DEA-based measure offers distinct advantages over other measures of managerial ability proposed in prior literature, such as historical stock return, historical ROA, CEO compensation, or CEO tenure. First, the DEA-procedure measures each bank relative to its peers and provides a relative ranking of all banks. Second, the DEA-based measure can be calculated for each bank-year, or manager-year, observation without needing explicit CEO data, a long time series of data, or particular events like CEO turnovers. Thus, the DEA-based measure can be generated for a much larger sample.

The DEA procedure models efficiency with a ratio of outputs (incomes) to inputs (bank resources) similar to a return on investment measure. However, unlike other efficiency ratios of outputs over inputs, the DEA efficiency measure does not require an "a priori specification of weights" (i.e. does not assume that all inputs and outputs are equally valuable across all banks). For a more in depth discussion of the DEA procedure

as it relates to this paper and a summary of prior DEA-based banking literature, see Appendix B.[8]

The DEA procedure produces a ratio-based efficiency scores resulting in an ordinal ranking of banks. The efficiency scores are scaled to range from zero to one with higher scores representing more efficient banks. I group banks by year and by size to ensure banks are benchmarked to their reasonable peers.[9] In spite of or perhaps due to the sizeable DEA banking literature, no singular agreed-upon measure of bank efficiency or bank managerial ability exists (Luo, 2003). My objective is to measure the efficiency with which a bank manager converts the bank's resources into revenues. The inputs and outputs chosen differ from previous bank studies that simply address bank efficiency. In other studies, bank equity may serve as a sufficient measure of bank resources in determining the efficiency of a bank. I further differentiate amongst bank resources as the mix of resources can have a significant influence on what investments managers seek. Thus, the inputs selected below better attune this measure towards the contributions of management than past DEA banking studies.

For the largest 100 banks I optimize:[10]

[8] Section 1 of Banker, Charnes and Cooper (1984) provides perhaps the most detailed discussion of the intuition behind the DEA procedure.

[9] Grouping by year controls for time variant factors that may influence the conversion of resources to revenues. Prior research notes the unique role of large banks in the economy (Janicki and Prescott, 2006; Khan, 2010). I group the largest 100 banks within each year and calculate the DEA procedure separately for the largest banks and all other banks. When the DEA procedure has many inputs but few banks, many banks will end up on the efficient frontier. I assign 100 banks to the largest tier for each year to ensure an adequate sample size for the DEA procedure (Demerjian et al., 2012).

[10] I estimate numerous variations of Equation 1 including more and less aggregated inputs, combining the two revenue measures, and dropping individual inputs. The inferences of the study remain unchanged across the different DEA specifications.

$$\text{Max}_{u,\,v}\ \theta = (u_1\text{Interest Revenue}_{i,t} + u_2\text{Non-interest Revenue}_{i,t}) / (v_1\text{Deposits}_{i,t} + v_2\text{FHLB Advances}_{i,t} + v_3\text{Fed Funds Purchased}_{i,t} + v_4\text{Other Short Term Borrowings}_{i,t} + v_5\text{Goodwill}_{i,t} + v_6\text{Other Acquired Intangibles}_{i,t} + v_7\text{Derivatives}_{i,t} + v_8\text{Loans Sales}_{i,t}) \quad (1a)$$

For average and small banks I optimize:

$$\text{Max}_{u,\,v}\ \theta = (u_1\text{Interest Revenue}_{i,t} + u_2\text{Non-interest Revenue}_{i,t}) / (v_1\text{Deposits}_{i,t} + v_2\text{Borrowings}_{i,t} + v_3\text{Goodwill}_{i,t} + v_4\text{Other Acquired Intangibles}_{i,t} + v_5\text{Derivatives}_{i,t}) \quad (1b)$$

The eight input variables are measured at the beginning of year *t* with the exception of loan sales, which are measured over the course of the year. The outputs include both interest and non-interest income, which make up the entire income stream for banks. For bank's resources I model a set of inputs associated with funds available for investment and acquired intangibles as these accounts are influenced by management and impact management's ability to generate revenue. I vary the inputs between the DEA procedure for the largest 100 banks in each year and for the remaining banks due to data availability and the differences in business model between the two tiers of banks. Appendix B offers a more in depth discussion of the inputs and outputs selected.

After creating the bank efficiency measure, I purge the measure of bank characteristics that affect efficiency but are outside of the control of management, similar to Demerjian et al. (2012). I regress the bank efficiency measure on five such

characteristics: bank size, bank age, cash availability, leverage, and auditor type. I use a Fama-Macbeth specification of the following regression:

$$\text{Bank Efficiency}_{i,t} = \alpha + \beta_1 \ln(\text{Total Assets})_{i,t} + \beta_2 \ln(\text{Employees})_{i,t} + \beta_3 \text{Free Cash Flow Indicator}_{i,t} + \beta_4 \ln(\text{Bank Age})_{i,t} + \beta_5 \text{Leverage}_{i,t} + \beta_6 \text{BigN}_{i,t} + \text{BMA}_{i,t} \quad (2)$$

The residual from the above regression, BMA, serves as my empirical measure of bank managerial ability. [11] By regressing the DEA bank efficiency measure on firm characteristics that may affect efficiency but are outside of management's control, the residual captures the efficiency that is not related to these firm characteristics. I offer a more detailed discussion of how each of the independent variables included above may influence bank efficiency but not through the purview of management in Appendix B.

As noted in Demerjian et al. (2012) this regression approach likely understates the ability measure as the variables used in the regression above could be influenced by managerial ability or could influence the hiring of a manager (i.e. large firms hiring better managers). But conservatively attributing some managerial ability to the characteristics of the firm increases the likelihood that the residual captures only efficiency related to bank managerial ability and works against finding results in this study.

I am able to estimate the bank efficiency score and BMA for 19,426 bank-year observations. Of this sample, 10,971 bank-year observations have sufficient data available to perform my subsequent hypothesis tests. Table 1 reports the descriptive

[11] Similar to Demerjian et al. (2012), my measure of managerial ability applies collectively to the entire management team. In one validation test I attribute bank managerial ability to a specific manager, the CEO, as the manager most responsible for outcomes and most visible to the capital markets (Fee and Hadlock, 2004).

statistics for these variables as well as others used in my hypothesis tests.[12] The mean bank efficiency score for the sample is 0.535, as expected given the variable ranges from zero to one. The mean BMA is close to zero at -0.018. The value is consistent with the variable's construction as a residual. Higher values of BMA correspond to higher managerial ability, so positive BMA values can be considered above average managers, and negative BMA values can be considered below average managers. However, I use BMA as a continuous variable in my tests.

To determine the validity of my BMA measure I compare it to several measures used as rough proxies for managerial ability proposed by prior studies. I find that my BMA differs from the prior measures and better explains the short-term market returns around CEO turnovers than other measures. I discuss the validation tests performed in Appendix C.

3.2 Measuring Accounting Quality

I define accounting quality as the ability of current period estimates to predict future period economic realizations, similar to prior studies (McNichols and Wilson, 1988; Evans, Hodder and Hopkins, 2010; Cantrell, McInnis, and Yust, 2012). First, I estimate accounting quality for the allowance for loan losses using the following regression:

$$\text{Charge-offs}_{i,t+1} = \alpha + \beta_1 ALL_{i,t} + \beta_2 ALL_{i,t-1} + \beta_3 ALL_{i,t-2} + \varphi_{i,t} \qquad (3a)$$

[12] See Appendix D for all tables.

In equation (3a) Charge-offs$_{i,t+1}$ represents the loans charged-off by bank *i* during year *t* +1 scaled by total gross loans at the end of year *t* and ALL$_{i,t}$ represents the allowance for loan losses for bank *i* at the end of year *t* scaled by total gross loans at the end of year *t.*[13] Appendix A offers detailed variable definitions.

Bank investors are highly concerned with the potential credit risk in the lending portfolio. Expectations of charge-offs significantly impact market prices for banks (Wahlen, 1994). Net charge-offs are loans deemed to be uncollectible and written-off from the bank's balance sheet during the period, net of recoveries and serve as a widely accepted measure of credit loss for loans in the banking literature. [14]

The allowance for loan losses at a bank is analogous to the allowance for doubtful accounts at a non-financial firm, and the bank income statement account the *loan loss provision* is analogous to bad debt expense. At non-financial firms managers focus their estimates on the income statement side (for example bad debt expense as a historical percentage of sales). However, at banks managers are required to derive their estimates using a balance sheet approach. Bank managers estimate the reserve needed based on their current understanding of the loan portfolio, past historical trends, and qualitative information. [15] This estimate is the allowance for loan losses on the balance sheet. Thus one would expect the allowance for loan losses to become realized in the form of future

[13] Total gross loans is the gross historical cost of loans, before considering the allowance for loan losses, as presented on the balance sheet.
[14] Recoveries represent collections, either whole or in part, of previously charged-off loans similar to the collection of a previously written-off receivable balance at a non-financial firm.
[15] This estimate requires regular review of outstanding loans and historical averages/trends across loan types. Banks additionally identify specific loans that require reserves. For a more detailed discussion of the processes used to estimate the allowance for loan losses see http://www.fdic.gov/regulations/laws/rules/5000-4700.html.

charge-offs, the ultimate realization of loan loss at the bank. Therefore, the relation between the allowance and charge-offs is the appropriate accounting relation to consider when examining accounting quality for loans. Consistent with the conceptual definition of accounting quality above, banks with higher quality accounting surrounding its loan portfolio should report allowance for loan losses more highly correlated with future charge-offs.

The purpose of Equation (3a) is to determine the ability of accounting (the allowance for loan losses) to explain the realization (charge-offs). I include only accounting estimates as independent variables in the model, as I am only concerned with the information conveyed by accounting estimates. However, the results of my hypotheses tests are unaffected by including prior period economic variables, such as Charge-offs at time t, in Equation (3a).[16] I include a time series of accounting estimates for the allowance for loan losses as the realization period for Charge-offs can span multiple years. The regression coefficients, β's, measure the average relation between the current and lagged accounting and future charge-offs. For example, β_1 measures the amount of each dollar of loan loss reserve that gets charged-off during the following

[16] The results in following hypotheses tests are robust to several design choices surrounding equation set (3). First results are unchanged if the lagged accounting variables are removed leaving only accounting at period t. Additionally, results are unchanged if current period economics are included as independent variables. For example, if charge-offs at time t is added to equation (3a) as an independent variable results remain unchanged. Additionally, I controlled for non-performing loans at time t in equation (3a) and found similar results. I find similar results if current economics are included as dependent variables and the incremental residual is measured before and after current period accounting is added. Finally, results remain unchanged if I consider charge-offs cumulated over numerous periods (2 years and 3 years) as the dependent variable.

year[17]. While this slope tells us about the average relation between the loan loss reserve and future charge-offs for the industry, I focus on the residual, φ. As the regression equation estimates the portion of charge-offs that are explained by current accounting, I interpret the residuals as future charge-offs that are not predicted by accounting.

The absolute value of the residual, $Abs|\varphi_{i,t}|$, serves as the empirical proxy for the accounting quality of the allowance for loan losses, where higher values of $Abs|\varphi_{i,t}|$ correspond to more unexplained charge-offs and lower accounting quality. Lower values of $Abs|\varphi_{i,t}|$ correspond to higher accounting quality.[18]

Similar to the logic above, I define accounting quality surrounding securities fair value estimates as the ability of securities fair values to predict future realized gains and losses from securities sales. Banks commonly estimate the fair value of their available-for-sale (AFS) securities and their held-to-maturity (HTM) securities. The difference between historical cost and fair value of AFS securities is captured in other comprehensive income until those securities are sold. The difference between historical cost and fair value of HTM securities is disclosed in the footnotes as required under ASC 825-10 (originally SFAS 107). Thus, I use the difference between historical cost and

[17] While the allowance for loan losses attempts to estimate the losses incurred in the loan portfolio, not all estimated loan losses are expected to reach the realization/charge-off point within the following year. The multi-period, rolling nature of the allowance account leaves one expecting β coefficients significantly positive yet less than 1.

[18] The methodology described here runs a pooled regression within each year across all banks in the industry to capture the residual deemed accounting quality. Inherent to the approach is the underlying assumption that the average firm is a reasonable benchmark for investors' expectations and for adequate accounting. Comparing firms to the industry norm in developing expectations for the future is an appropriate approach from a financial statement user perspective. This assumption is maintained in numerous other proxy measures in accounting such as bad debt errors in McNichols and Wilson (1988), abnormal accurals in Jones (1991), and accruals quality in Dechow and Dichev (2002).

management's estimate of fair value for each of these security types to predict future realized gains and loss on securities sales with the following model:

$$RealizedGLSec_{i,t+1} = \alpha + \beta_1 FVAFSSec_{i,t} + \beta_2 FVHTMSec_{i,t} + \varphi_{i,t} \quad (3b)$$

In Equation (3b) $RealizedGLSec_{i,t+1}$ represents the realized gain or loss related to securities recognized for accounting purposes scaled by total book value of securities at the end of year *t*, $FVAFSSec_{i,t}$ represents the unrealized gain or loss from AFS securities held by the bank scaled by the book value of securities at the end of year *t*, and $FVHTMSec_{i,t}$ represents the difference between the disclosed fair value of securities and the book value of securities scaled by the book value of securities at the end of year *t*.

Equation (3b) includes both types of fair value estimates at banks. Thus, the residual should serve as an appropriate proxy for the accounting quality of securities' fair values. I am only interested in the predictive ability of current period accounting and, therefore, include only accounting estimates as independent variables in Equation (3b). The above model requires no time series of accounting information, as dated fair value information should provide no additional information over the current fair values. Consistent with my definition above, I measure accounting quality for fair values as the extent that a bank's fair value estimates map into future gains and losses from securities sales.

As fair values attempt to capture what the market is willing to pay for a security, the difference between the fair value and book value of a bank's securities portfolio

should be predictive of future gains and losses when securities are actually sold. Higher quality fair value estimates would be better able to predict future gains or losses.[19] The slope coefficient, β_1, measures the average gain (loss) in year t+1 for each dollar that the fair value of securities exceeds its historical cost. The residuals estimate the portion of future gains and losses that are unexplained by current accounting. The absolute value of the residual, $Abs|\varphi_{i,t}|$, serves as the empirical proxy for the accounting quality of fair values with higher values representing lower quality accounting.

[19] Fair value estimates are a point in time estimate rather than a prediction of a future realization, and the time interval between estimate of fair value and the sale of the security can lead to appropriate disconnect between the fair value estimates and gains and losses on sales. However, changes in fair values between estimation and realization should merely add noise to my measure working against finding significant results in my hypotheses tests. As an empirical matter, the β_1 coefficient in Equation (3b) is positive and statistically significant, verifying the accounting estimates and realizations are empirically linked.

4. EMPIRICAL MODELS & DATA

I utilize two different empirical models by which to test the relation between bank managerial ability and accounting quality: the residual model and the interaction model. The residual model uses the free standing measure of accounting quality discussed in Subsection 3.2, while the interaction model regresses BMA directly on the future economic realization. The following subsections lay out the models and discuss their relative strengths and weaknesses.

4.1 Residual Model

I estimate the following regression equation to test Hypothesis H_1:

$$\begin{aligned} Abs|\varphi_{i,t}| = {} & \alpha + \beta_1 BMA_{i,t} + \beta_2 \ln(\text{Total Assets})_{i,t} + \beta_3 LoanGrowth_{i,t} + \\ & \beta_4 DepositGrowth_{i,t} + \beta_5 BigN_{i,t} + \beta_6 COVol_{i,t} + \beta_7 CommLoans_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (4a)$$

$$\begin{aligned} Abs|\varphi_{i,t}| = {} & \alpha + \beta_1 BMA_{i,t} + \beta_2 \ln(\text{Total Assets})_{i,t} + \beta_3 LoanGrowth_{i,t} + \\ & \beta_4 DepositGrowth_{i,t} + \beta_5 BigN_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (4b)$$

Where $Abs|\varphi_{i,t}|$ is the absolute value of the estimated residual to Equation set (3) for bank *i* during year *t* and $BMA_{i,t}$ is the bank managerial ability measure discussed in Section 3.1 for bank *i* during year *t*. The coefficient, β_1, serves as the test for the relation between BMA and accounting quality. Since larger residual values from Equation set (3) correspond to less predictive accounting, a negative β_1 is consistent with high ability bank managers providing better accounting estimates for loan losses and securities fair values.

Equation (4a) is used to test the hypothesis related to the allowance for loan losses, while Equation (4b) tests the hypothesis related to the fair value of securities. In each equation I include ln(Total Assets)$_{i,t}$, the natural log of total bank *i* assets at the end of year *t*, to control for the effect of size on accounting quality. Large firms may have more stable operations than small firms and thus be better able to estimate their future realizations (Dechow and Dichev, 2002). Conversely, large banks may face more pressure to appear stable and thus report more biased and low quality accounting estimates. I use both LoanGrowth$_{i,t}$, the percent change in loans from the beginning of year *t* to the end of year *t*, and DepositGrowth$_{i,t}$, the percent change in deposits from the beginning of year *t* to the end of year *t*, to control for the effect growth may have on accounting quality. Firms experiencing considerable growth may find it more difficult to develop estimates of future realizations due to the changing nature of their size or scope. I include BigN$_{i,t}$, an indicator equal to 1 when bank *i* uses a Big N auditor in year *t* and zero otherwise, to control for the effect of audit quality on accounting quality, as past research suggests that high audit quality correlates with high accounting quality (Becker, Defond, Jiambalvo, and Subramanyam, 1998).[20]

For the test related to the allowance for loan losses, I include two additional controls. COVol$_{i,t}$ is the standard deviation of charge-offs at the bank over the three years culminating in year *t*. This measure proxies for the underlying volatility of the bank's loan defaults and controls for the inherent difficulty faced by management in estimating

[20] In untabulated analysis, I also include the standard deviation of cash flows over the preceding five years as a control for volatility. This variable considerably limited sample sizes and was not statistically significant in any analyses, and thus is not included in those analyses presented here in the paper. The results are unaffected by the inclusion of this control.

the allowance for loan losses. $CommLoans_{i,t}$ is the percentage of the loan portfolio outstanding to commercial lenders at the beginning of year *t*. These loans are less standardized than consumer loans and losses related to them are more difficult to predict (Ryan, 2007, pg. 91).[21]

The residual model utilizes a stand-alone measure of accounting quality. By measuring accounting quality as the absolute value around the realized economic outcome the residual model addresses the impact of bank managerial ability on the predictive accuracy of accounting. However, the residual model does not reveal the direction of accounting inaccuracies. The interaction model developed in the following subsection does allow for the direction of accounting errors. However, the residual model most closely relates to the research question of the nature of the relation between bank managerial ability and accounting posed in this study. Additionally, it requires less complicated inferences when examining subsample and sensitivity results. Therefore, I restrict my analysis of the subsample hypotheses and sensitivity tests to the residual model.

4.2 Interaction Model

In estimating the interaction model I regress the future economic realization directly on bank managerial ability and controls:

[21] I also consider the composition of the securities portfolio as a measure of the inherent difficulty of estimated the fair values of securities. However, a control that captured the portion of the securities portfolio classified as available-for-sale returned statistically insignificant results in all models and was dropped from the tests. Thus, the quality of fair value estimates for securities is not sensitive to classification related to management's intended horizon to sell.

$$\text{Charge-offs}_{i,t+1} = \alpha + \beta_1 ALL_{i,t} + \beta_2 BMA_{i,t} + \beta_3 ALL_{i,t}*BMA_{i,t} + \beta_4 \text{Charge-offs}_{i,t} + \beta_5 NPL_{i,t} + \varepsilon_{i,t} \quad (5a)$$

$$\text{RealizedGLSec}_{i,t+1} = \alpha + \beta_1 FVSec_{i,t} + \beta_2 BMA_{i,t} + \beta_3 FVSec_{i,t}*BMA_{i,t} + \beta_4 \text{RealizedGLSec}_{i,t} + \varepsilon_{i,t} \quad (5b)$$

Where $\text{Charge-offs}_{i,t+1}$ represents the loans charged-off by bank *i* during year *t* +1 scaled by total gross loans at the beginning of year *t* + 1, $ALL_{i,t}$ represents the allowance for loan losses for bank *i* at the end of year *t* scaled by total gross loans at the beginning of year *t*, $BMA_{i,t}$ is the bank managerial ability measure discussed in section 3.1 for bank *i* during year *t*, $NPL_{i,t}$ represents non-performing loans for bank *i* during year *t* scaled by total gross loans at the beginning of year *t*, $\text{RealizedGLSec}_{i,t+1}$ represents the realized gain or loss related to securities recognized for accounting purposes scaled by total book value of securities at the end of year *t*, and $FVSec_{i,t}$ represents the sum of the unrealized gain or loss from AFS securities held by the bank (previously defined as FVAFSSec) and the difference between the disclosed fair value of securities and the book value of securities (previously defined as FVHTMSec) scaled by the book value of securities at the end of year *t*.

The above regressions are used to analyze how bank managerial ability and controls explain the variance in economic realizations. Both the allowance for loan losses and the fair value of securities estimate the future realizable values of assets, and like all accounting estimates they contain some level of measurement error. The greater the measurement error in the account, the lower the quality of accounting. In both

equations, the β_1 coefficient measures the relation (holding ability constant) between the accounting estimates and the economic realizations.

First consider the loan loss equation. The β_1 coefficient in Equation (5a) can be interpreted as the average portion of each dollar of the loan loss reserve that results in charge-offs in the following year. A significant positive relation of 0.5 would mean that a bank with an additional $1 of loan loss reserve experiences an additional $0.50 of charge-offs. The β_2 coefficient in Equation (5a) measures the relation (holding accounting estimates constant) between bank managerial ability and charge-offs. One would expect higher ability bank managers to minimize loan losses (Barr, Seiford and Siems, 1993). Thus, I expect a negative and significant β_2. In Appendix C I document that higher ability managers (higher BMA scores) experience lower future charge-offs.

Likewise, the β_1 coefficient in Equation (5b) can be interpreted as the average portion of each dollar of the estimated unrecognized gain or loss related to the fair value of securities that results in a realized gain or loss in the following year. A significant positive relation of 0.5 would mean that a bank with an additional $1 of unrealized gains related to securities experiences an additional $0.50 of realized gain in the following year. The β_2 coefficient in Equation (5b) measures the relation (holding accounting estimates constant) between bank managerial ability and realized gains and losses. Obviously, one would expect higher ability bank managers to generate greater gains from securities, anticipating a positive and significant β_2.

For both equations, β_3 is the critical coefficient of interest in the interaction model. Greater measurement error in the accounting estimates will attenuate the relation between accounting estimates and future economic realizations, resulting in lower estimated regression coefficients. Likewise, a higher coefficient would correspond to less measurement error and higher quality accounting. A significant and positive coefficient β_3 implies that the relation between the accounting estimates and future economic realizations is stronger when managerial ability is high. Such evidence is consistent with the accounting estimates being measured with less measurement error by high ability managers and supports the hypothesis that high ability managers offer higher quality accounting.

Consider an example at the extremes. For a bank with the highest ability manager (assume a BMA score of one) $\beta_1 + \beta_3$ would represent the relation between the accounting estimate and the future realization. However, for bank with the lowest ability manager (assume a BMA score of zero) β_1 would represent the relation between the accounting estimate and the future realization. If the β_3 term is positive, then the relation is stronger for the bank with the high ability manager and weaker for the low ability manager, consistent with high ability managers making accounting estimates with less measurement error. The difference between the two, β_3, represents measurement error in the accounting estimate that is not present for the high ability managers.

The major strength of the interaction model is that its β_3 coefficient can be interpreted as a percentage of the accounting estimate that is predictive only for high

ability managers. However, the interaction model becomes increasingly complex when I conduct subsample analyses as additional terms must be added to the interaction. Therefore, I proceed using the residual model for my subsample analyses for the remainder of the study.

4.3 Data and Descriptive Statistics

I obtain empirical bank data from SNL Financial from 1994 to 2010 to serve as the inputs and outputs for the DEA model as well as other control variables throughout the study. I am able to obtain the necessary data for 10,971 bank year observations to perform tests related to the allowance for loan losses. For the fair value tests machine readable data from SNL Financial begins only in 2005 (primarily during the recent Financial Crisis). I randomly select 300 banks and hand collect data from 1999-2004 to supplement the machine readable data. All empirical tests regarding the accounting quality of the fair values of securities is constrained to the random sample of 300 banks, totaling 2,447 bank-year observations. Table 1 presents descriptive statistics for the BMA measure, accounting quality measures and other variables used in hypothesis tests. The statistics presented are for variables winsorized at the 1% and 99% levels.

BMA has a mean and median value very close to zero by construction, similar to Demerjian et al. (2011, 2012). The mean bank size is roughly $2.1 billion while the median bank size is only $360 million. This skewness reflects the fact that the US banking sector is heavily skewed by a small set of very large "money center" banks (Janicki and Prescott, 2006; Khan, 2010). On average, banks establish a reserve equal to

1.39% of gross loans and charge-off roughly 0.4% of loans each year in my sample. Roughly 1.43% of gross loans are non-performing. The distributions of these variables are consistent with prior published studies. While the percentages represent small portions of gross loans, they can represent very large portions of income (Greenawalt and Sinkey, 1988; Hasan and Wall, 2004).

Table 2 presents univariate correlations amongst the variables of interest in the study. Most notably the BMA measure is significantly negatively correlated with the accounting quality measure for both the allowance for loan losses and the fair value of securities (both Pearson and Spearman correlations), consistent with higher ability managers offering higher quality accounting estimates. Multivariate correlations are explored below.

5. RESULTS

5.1 Bank Managerial Ability and Accounting Quality

Table 3 reports the results for Equation (4a) related to the allowance for loan losses.[22] Both levels (Column I) and changes (Column II) specifications are presented. For the changes analysis, I regress the change in the dependent variable from year *t+1* to year *t+2* on the change in the independent variables from year *t* to year *t+1*. The estimated "levels" coefficient on BMA is -0.159 and is statistically significant at the 5% level (two-tailed tests). The estimated "changes" coefficient on BMA is -0.177 and is statistically significant at the 5% level (two-tailed tests). Recall higher values of $Abs|\varphi_{i,t}|$ correspond to lower accounting quality, thus the significant negative coefficients on BMA and $Abs|\varphi_{i,t}|$ suggest that higher ability bank managers *do* provide higher accounting quality by reporting current period allowances for loan losses that better predict charge-offs.

Columns (III) and (IV) of Table 3 report the level results of Equation (4a) within subsamples of the largest 100 banks and other banks. In both sub-samples, I find similar results to the full sample with a negative coefficient of -0.164 for the small and average sample and a coefficient of -0.140 for the largest 100 banks sample. Both coefficients are

[22] For all tests in this study, I adjust t-statistics using two-way clustering (clustering by firm and by time) as suggested by Petersen (2009) unless otherwise specified.

statistically significant at the 5% level. Thus, the relation between BMA and accounting quality exists in both groups.[23]

Table 4 reports the results for Equation (4b) related to the fair values of securities. Again, the estimated coefficients are negative and significant at the 5% level, -0.254 in the levels analysis and -0.292 in the changes analysis. Columns (III) and (IV) break down the levels analysis into large banks and small and average banks and regresses Equation (4b) for the fair values of securities. The negative and significant relation holds within each subsample. Thus, the evidence from the fair value analysis is consistent with the evidence from the analysis on the allowance for loan losses: higher ability bank managers offer fair values of securities that better predict future securities gains and losses.

Larger banks report lower quality fair value numbers, but size is unrelated to the quality of the allowance for loan losses. The Big N auditor variable correlates with higher quality estimates for the allowance of loan losses but not for fair value estimates. The growth variables were expected to correlate to lower quality accounting estimates (positive coefficients) as managers would generally find it more difficult to develop accounting estimates for an expanding business than a static business. The deposit growth variable does indeed have a positive and significant coefficient in the loans and securities specifications. However the coefficient on the loan growth variable is significantly negative in the allowance for loan losses specification.

[23] Levels analysis is tabulated, though inferences are unchanged with a changes specification.

One possible explanation is that loans are not likely to incur losses during the year the loan is originated. Banks would rarely lend to borrowers in such poor financial condition that they default in the first year. Thus, managers would find it easy to develop accounting estimates for these new loans as the estimates would be very small. Bank managers with many new loans (high loan growth) could report higher quality allowances for loan losses than comparable bank managers with few new loans (holding other factors constant), explaining the negative coefficient on loan growth in Table 3. However, the low number of defaults for these new loans should have no bearing on manager's ability to estimate the fair value of the bank's securities. Therefore, I would not expect a negative coefficient on loan growth in the securities analysis presented in Table 4. Indeed the coefficients on loan growth in Table 4 are either insignificant or positive.

The controls for charge-off volatility and for the percentage of the loan portfolio devoted to commercial loans both load positively in Table 3. The findings are consistent with the expectations. More volatile charge-off behavior is more difficult to predict resulting in less predictive accounting estimates. Likewise, the more commercial loans issued the less predictive accounting as these loans are less standardized and are more difficult to estimate.

Table 5 presents the results for the interaction model. Specifically, I estimate Equation set (5) above to test whether the relation between the accounting estimates and economic realizations is strengthened by BMA. I predict and find a positive and significant coefficient on β_1, higher accounting estimate corresponds to higher economic

realization, in both the allowance for loan losses model and the fair value of securities model. I predict and find a negative and significant coefficient β_2 in the allowance for loan losses model, consistent with better managers experiencing lower charge-offs. I predict a positive coefficient β_2 in the fair value of securities model and find it to be marginally significant, consistent with better managers generating more realized gains and losses from securities.

The primary variable of interest in Table 5 is the interaction term. I find the coefficient β_3 on this term to positive and significant in the loans model, consistent with bank managerial ability strengthening the relation between the allowance for loan losses and future charge-offs. This finding supports the intuition that high ability managers report an allowance with less measurement error and support the findings in the residual model. However, β_3 coefficient in the securities model is insignificant and, thus, does not provide evidence that BMA relates to less measurement error for the fair values of securities. Taken together the combined results in Tables 3 to 5 suggest that bank managerial ability does relate to accounting quality and that higher ability bank managers do offer more predictive accounting estimates around these critical bank issues.

5.2 Bank Managerial Ability and the Financial Crisis of 2007-2009

To study the relation between bank managerial ability and accounting quality during the Financial Crisis, I estimate the following model:

$$Abs|\varphi_{i,t}| = \alpha + \beta_1 BMA_{i,t} + \beta_2 FC_{i,t} + \beta_3 BMA*FC_{i,t} + \beta_4 ln(Total\ Assets)_{i,t} + \beta_5 LoanGrowth_{i,t} + \beta_6 DepositGrowth_{i,t} + \beta_7 BigN_{i,t} + \beta_8 COVol_{i,t} + \beta_9 CommLoans_{i,t} + \varepsilon_{i,t} \quad (6)$$

where FC is an indicator equal to one when the bank-year observation is in years 2006-2009 and zero otherwise (years 2006-2009 are used so that all years of data where either the accounting estimate or the economic realization falls during the 2007-2009 crisis period are included in the analysis), BMA*FC is the interaction of BMA and the FC indicator, and all other variables are as previously defined.

I expect a positive coefficient β_2 on the financial crisis indicator because I expect the uncertainty of the period to negatively impact accounting quality. Hypothesis H_2 focuses on β_3. Since β_1 is the relation between BMA and accounting quality during normal economic times, the interaction coefficient β_3 tells us whether that relation is strengthen or weakened during the Financial Crisis. Because I find β_1 in Equation (4) to be negative, a significantly negative coefficient (same sign as β_1) would imply the relation between managerial ability and accounting quality is strengthened during the crisis. A significantly positive coefficient (opposite sign from β_1) would imply a weakened relation, and an insignificant coefficient would imply that we could not reject the null hypothesis of no relation.

Table 6 provides regression results for Equation (6). The coefficient β_1 is negative and significant for the loans specification and the securities specification, as reported in Tables 3 and 4. The coefficient β_2 is positive and significant at the 5% level

for both the loans and securities specifications, consistent with lower quality accounting estimates during the financial crisis. Most importantly β_3 is negative and significant in both specifications. Thus I reject the null hypothesis, as the evidence supports a strengthened relation between managerial ability and accounting quality during the Financial Crisis. The evidence is consistent with task complexity theory, with the Financial Crisis providing a more complex setting. Bank managers were widely criticized in the popular press for failing to understand their own exposures during the financial crisis. But the evidence here suggests that higher ability managers did better estimate the exposures in their lending and securities portfolios during the crisis.[24]

5.3 Bank Managerial Ability and Binding Capital Constraints

To test H_3 I select a subsample of all banks in the lowest quintile of Tier 1 capital ratio and label those banks as having binding capital ratios. The model is as follows:

$$Abs|\varphi_{i,t}| = \alpha + \beta_1 BMA_{i,t} + \beta_2 CapTight_{i,t} + \beta_3 BMA*CapTight_{i,t} + \beta_4 ln(Total\ Assets)_{i,t} + \beta_5 LoanGrowth_{i,t} + \beta_6 DepositGrowth_{i,t} + \beta_7 BigN_{i,t} + \beta_8 COVol_{i,t} + \beta_9 CommLoans_{i,t} + \varepsilon_{i,t} \quad (7)$$

Where Captight is an indicator variable equal to one when the bank-year observation is in the bottom quintile of Tier 1 capital ratio in the given year and zero otherwise, BMA*CapTight is the interaction of BMA and the CapTight indicator, and all other variables are as previously defined.

[24] Inferences are unchanged if changes models are used for the tests of the financial crisis and binding capital constraints. These results are untabulated for space consideration.

I expect a positive coefficient β_2 on the capital ratio tightness indicator because I expect binding capital ratios to negatively impact accounting quality on average. The coefficient β_3 is the coefficient of interest for testing H_3. Since β_1 is the relation between BMA and accounting quality when capital ratios are not binding, the interaction coefficient β_3 tells us whether the above relation is strengthen or weakened when capital ratios are binding. A negative coefficient (same sign as β_1) would suggest the relation is strengthened, a positive coefficient (opposite sign as β_1) would suggest the relation is weakened, and an insignificant coefficient would suggest that capital ratios have no effect on the relation.

Table 7 presents the regression results for the capital ratio tests corresponding to Equation (7). β_1 is negative and significant in each specification consistent with the primary findings for H_1. β_2 is positive and significant in the loans specification suggesting that when capital ratios are tight banks offer lower quality allowances for loan losses. Most importantly the coefficient β_3 is positive, 0.167, and statistically significant with a t-statistic of 2.86 for the loans specification. This finding suggests that binding capital ratios weaken the relation between BMA and accounting quality for loans. However for the securities specification β_2 and β_3 are insignificant, providing no evidence that capital ratios influence the quality of securities' fair value estimates.[25]

5.4 Alternative Explanation

[25] In addition to the test described here, I also estimate Equation (4a) in the subsample of firms with tier 1 capital ratios in the lowest quintile of each year. The coefficient estimates for BMA's relation to accounting quality for this subsample was statistically insignificant from zero for the allowance for loan losses test.

Throughout the study I posit that higher ability managers may provide higher quality accounting estimates because the skills necessary to manage a bank efficiently may also be required to develop high quality estimates. In this subsection I discuss and examine another mechanism by which bank managerial ability may be related to higher quality accounting. In addition to "skills transfer," managers with greater ability generate revenues more efficiently (by definition) and thus have stronger operating results. These good managers may be more willing to disclose accurately simply because their strong results reflect favorably on them and the bank. In contrast poor managers may be less inclined to disclose predictive accounting estimates for fear they may reflect unfavorably on them and the bank. As such, low ability managers would be more likely to report optimistically biased accounting estimates because reporting more accurate estimates would reveal poor performance.

This alternative explanation suggests that managers' reporting incentives not their skills lead to the increase in accounting quality for high ability managers. I perform two tests related to this alternative explanation. First, I attempt to find evidence for the alternative explanation in my full sample. Second, I select a setting where the reporting incentives are weak and the alternative explanation is least likely to explain the result and test whether the skills-transfer explanation holds.

The alternative explanation posits that high ability managers report accurately because they have good results, and low ability managers skew their estimates optimistically because their true results would reflect poorly on them. If the alternative

explanation is true then one would expect low ability managers to offer more optimistically biased accounting estimates. Therefore in my first test I regress the signed residual from equation set (3), φ, which I term accounting bias, on BMA and control variables for my full sample.

While the absolute value of these residuals is used to measure how well accounting predicted future economics, the signed residual allows us to see in which direction accounting estimates and realizations differ. For the allowance for loan losses specification negative values of the residual would imply that charge-offs were lower than expected and would represent conservatively biased accounting estimates. Positive values of the residual would imply that charge-offs were higher than expected and are optimistically biased. For the fair values of securities specification negative values of the residual would imply that gains (losses) were lower (higher) than expected and would represent optimistically biased accounting estimates. Positive values of the residual would imply that gains were higher than expected and accounting is conservatively biased.

Table 8 Column (I) reports the loans specification result with a negative coefficient on BMA, -0.086, which is marginally significant with a t-statistic of -1.67. Column (II) reports the securities specification result with a negative coefficient on BMA, -0.178, which is significant with a t-statistic of -2.42. Thus there is marginal evidence that low ability managers offer more optimistic accounting estimates for the allowance for loan losses. However, high ability managers actually offer more optimistically biased securities fair values. This finding is in direct contradiction to the

alternative explanation explored here. Thus Table 8 provides weak evidence that the alternative explanation explains the primary findings of the study.

Next I examine whether my primary findings hold in banks in the top quintile of Tier 1 capital. These banks should be far less concerned about signaling low quality through accounting estimates as they possess considerable capital reserves, thus dampening the impact of reporting incentive. As such, the subsample offers a setting to examine the skills transfer intuition.

Table 9 reports results of regressing Equation Set (4) in the top capital-ratio quintile of banks. Consistent with previous findings, I find negative and significant coefficients on BMA for both specifications. The evidence here provides support that the primary finding is driven at least in part by the abilities of managers and not by their reporting incentives.

6. CONCLUSION

The banking industry has been under increased scrutiny in the wake of the recent Financial Crisis. Standard setters and bank regulators have become increasingly concerned with understanding the potential losses at banks and how accounting reflects those exposures. This study examines the role bank managers play in determining accounting quality. Specifically, I examine how bank managerial ability relates to the predictive ability of key accounting estimates surrounding the lending and securities portfolios.

The recent financial crisis highlights how losses in the lending and securities portfolios can have serious ramifications at individual banks (bank failures) and throughout the global economy (reduced lending and liquidity). Investors, standard setters and regulators look to the accounting for loan losses as well as fair value estimates for securities to help evaluate the overall health of the bank. Thus understanding a critical determinant of accounting quality for these estimates should aide these financial statement users in their judgments. Bank regulators in particular could benefit from understanding the relation between bank managerial ability and accounting quality, as identifying high quality managers could help determine best practices in financial reporting for the industry and aide in efficiently allocating monitoring resources.

I use a DEA-based measure of bank managerial ability with model inputs specifically designed for the banking industry. I find that bank managerial ability is positively related to accounting quality, defined as the predictive ability of the allowance

for loan losses and securities fair values. High ability managers possess skills in gathering, understanding, and synthesizing information into decisions about how to allocate bank resources. The primary finding of this study suggests that these high ability bank managers are able to translate those skills to an accounting setting.

Additionally, I identify two settings where the relation between ability and accounting quality may be strengthened or weakened: the recent Financial Crisis and when capital ratios are binding. I find that the relation between managerial ability is strengthened during the Financial Crisis. This finding is consistent with task complexity theory which states that ability has a greater impact on more complex tasks or in more complex settings, but is inconsistent with popular allegations that banks managers were unable to understand their own exposures during the crisis. Finally, I find that the relation between bank managerial ability and accounting quality is weakened by the presence of binding capital ratios for the allowance for loan losses. I do not find evidence that capital ratios impact the relation for the fair value of securities. The findings are consistent with bank managers of any ability offering more optimistic allowances for loan losses in the presence of binding capital ratios, but not more optimistic securities fair values. Taken together the findings support managerial ability playing a significant role in determining the accounting quality of key bank estimates.

APPENDIX A

Variable Definitions

Panel A: Variables Used in Measuring Bank Efficiency and Bank Managerial Ability

For all variables the subscript *i* refers to the bank *i*, and the subscript *t* refers to year *t* (during year *t* for income or flow items and end of year *t* for balance or stock items).

Variable	Definition
Bank Efficiency$_{i,t}$	The result of the DEA procedure estimated on Equation (2) as described in Section 3.1.
BMA$_{i,t}$	Bank Managerial Ability as measured by the residual from the residual from Equation (3) described in Section 3.1.
ln(Total Assets)$_{i,t}$	The natural logarithm of the book value of total assets (source: SNL Financial).
ln(Employees)$_{i,t}$	The natural logarithm of the number of full-time equivalent employees of the bank. (source: SNL Financial).
Free Cash Flow Indicator$_{i,t}$	An indicator variable equal to 1 when a bank reports non-negative change in cash on its Statement of Cash Flows (source: SNL Financial).
ln(Bank Age)$_{i,t}$	The natural logarithm of the number of years the bank has been listed in SNL including year *t*.
Leverage$_{i,t}$	The ratio of total liabilities to total equity (source: SNL Financial).
BigN$_{i,t}$	An indicator variable equal to 1 when the bank uses a Big N auditor and zero otherwise (source: SNL Financial).

Panel B: Variables Used in Hypotheses Tests

For all variables the subscript *i* refers to the bank *i*, and the subscript *t* refers to year *t* (during year *t* for income or flow items and end of year *t* for balance or stock items).

Variable	Definition
Charge-offs$_{i,t+1}$	The net loans charged-off (written-off as uncollectable) scaled by total gross loans at the end of year *t* (source: SNL Financial).
ALL$_{i,t}$	The allowance for loan losses scaled by total gross loans at the end of year *t* (source: SNL Financial).
FVAFSSec$_{i,t}$	The unrealized gain or loss from AFS securities held by the bank reported in other comprehensive income scaled by the book value of securities at the end of year *t* (source: SNL Financial).

Variable	Definition
$FVHTMSec_{i,t}$	The difference in the disclosed fair value of securities and the book value of securities scaled by book value of securities under ASC 825-10 (originally SFAS 107) as this amount relates to HTM securities at the end of year *t* (source: SNL Financial and hand collected).
$FVSec_{i,t}$	The sum of the unrealized gain or loss from AFS securities held by the bank (previously defined as FVAFSSec) and the difference between the disclosed fair value of securities and the book value of securities (previously defined as FVHTMSec) scaled by the book value of securities at the end of year *t* (source: SNL Financial).
$RealizedGLSec_{i,t+1}$	The realized gain or loss related to securities recognized for accounting purposes scaled by total book value of securities at the end of year *t* (source: SNL Financial).
$Abs\|\varphi_{i,t}\|$	Accounting quality measured as the absolute value of the estimated residual to Equation set (3) multiplied by 100, as described in Section 3.2. Higher values of $Abs\|\varphi_{i,t}\|$ correspond to lower values of accounting quality. Used to measure accounting quality of the allowance for loan losses, loan fair values and security fair values.
$\varphi_{i,t}$	The signed residual from Equation set (3) multiplied by 100. Used to measure accounting bias.
$FC_{i,t}$	An indicator variable equal to 1 when the bank-year is during the Financial Crisis (years 2006-2009) and zero otherwise (years 2006-2009 are used so that all years of data where either the accounting estimate or the economic realization falls during the 2007-2009 crisis period are included in the analysis).
$CapTight_{i,t}$	An indicator variable equal to 1 when the bank is in the lowest quintile of tier 1 capital during year t and zero otherwise (source: SNL Financial).
$ln(Total\ Assets)_{i,t}$	The natural logarithm of the book value of total assets (source: SNL Financial).
$LoanGrowth_{i,t}$	The percent change in loans from the beginning of year *t* to the end of year *t* (source: SNL Financial).
$DepositGrowth_{i,t}$	The percent change in deposits from the beginning of year *t* to the end of year *t* (source: SNL Financial).
$BigN_{i,t}$	An indicator variable equal to 1 when the bank uses a Big N auditor and zero otherwise (source: SNL Financial).
$COVol_{i,t}$	The standard deviation of Charge-offs at the bank over the three years culminating in year *t* (source: SNL Financial).

Variable	Definition
$CommLoans_{i,t}$	The percentage of the loan portfolio outstanding to commercial lenders at the beginning of year *t* (source: SNL Financial).

APPENDIX B

DEA Methodology

Introduced in the late 1970's, DEA uses a nonlinear non-convex programming model to estimate the relative efficiency of distinct "decision making units" at converting inputs (in this case bank resources) into outputs (in this case incomes) (Charnes, Cooper, and Rhodes, 1978). The DEA models efficiency with a ratio of outputs to inputs similar to a return on investment measure:

$$\Sigma^{s}_{i=1} u_i y_{ik} / \Sigma^{m}_{j=1} v_j x_{jk} \qquad k = 1,\ldots, n \qquad (8)$$

where s = the set of outputs considered, y = the known value of the output s for the k^{th} bank, m = the set of inputs considered, x = the known value of the input m for the k^{th} bank, and n = the number of decision making units (i.e. banks). However, unlike other efficiency ratios of outputs over inputs, the DEA efficiency measure does not require an "a priori specification of weights and /or explicit delineation of assumed functional forms of relations between inputs and outputs." In other words the DEA procedure does not assume that all inputs and outputs are equally valuable across all decision making units.

DEA is used in the banking literature in a variety of settings. For example DEA is used to measure the efficiency of individual bank branches (e.g. Sherman and Gold, 1985; Sherman and Ladino, 1995; Schaffnit, Rosen and Paradi, 1997; Wu, Yang and Liang, 2006), the technical efficiency of banks in converting deposit resources into outstanding loans (Miller and Noulas, 1996; Luo 2003), and overall bank efficiency (Barr, Seiford and Siems, 1993; Luo, 2003; Kao and Liu, 2004).

DEA bank efficiency research often focuses on predicting performance. DEA analysis has been proposed as a regulatory tool to be used as an early screening device for potential bank failure. Barr, Seiford and Siems (1993; as well as Barr and Siems, 1997) use a DEA model to measure overall bank efficiency at distressed banks and find bank efficiency to be negatively correlated with future bank failures. Luo (2003) uses DEA bank efficiency to explain the acquisition behavior in the industry. He finds target banks exhibit low levels of efficiency, presumably because inefficiently managed banks offer great opportunities for improvement under new management. Kohers, Huang and Kohers (2000) also finds inefficient banks to be preferred acquisition targets, as event period abnormal returns are higher when the efficiency spread is larger between bidder and target.

I group banks by year and size to control for time variant factors and to ensure that banks are benchmarked against reasonable peers. I group the largest 100 banks within each year and calculate the DEA procedure separately for the largest banks and all other banks.[26] I then maximize Equation (7) for each bank relative to the other banks in the sample. This involves solving for the weights, *u*'s and *v*'s, such that each bank is assigned bank-specific values for each *u* and *v* that maximize its own efficiency score relative to all other banks if those weights are applied. Weights are constrained to be non-negative as each bank input (resource) and output (revenue) are valuable. After each bank has been assigned unique optimal weights, the ratio-based efficiency scores are

[26] Prior research documents the unique role of large banks in the economy (Janicki and Prescott, 2006; Khan, 2010). I assign 100 banks to the largest tier for each year to ensure an adequate sample size for the DEA to estimate the efficient frontier.

calculated by multiplying the optimal weights by the inputs and outputs. Efficiency scores are scaled by the highest score in the group. Thus efficiency scores range from zero to one with higher scores representing more efficient banks.[27]

The Inputs and Outputs for Bank Efficiency

In spite of or perhaps due to the sizeable DEA banking literature, no singular agreed-upon measure of bank managerial efficiency or ability exists (Luo, 2003). My objective is to measure the efficiency with which a bank manager converts its resources into revenues. Revenues include both interest and non-interest income, which make up the entire income stream for banks.

For bank's resources I model a set of inputs associated with funds available for investment and acquired intangibles as these accounts are influenced by management and impact management's ability to generate revenue. I vary the inputs between the DEA procedure for the largest 100 banks in each year and for the remaining banks. For the largest banks I include deposits, short-term borrowings, and advances from government regulatory agencies (FHLB advances and Fed Funds purchased). The mix between different resources can have a considerable impact on the nature of the investments that bank managers will select when investing. Thus I include each source of funds as a separate input in the DEA model. For the banks not in the largest 100 in each year I include deposits and only one borrowings measure equal to the sum of the three

[27] For a more detailed discussion of the intuition behind the DEA procedure see Section 1 of Banker, Charnes and Cooper (1984).

borrowing variables reference above (short-term borrowings, FHLB advances and Fed Funds purchased) as a more granular breakdown is not widely available.

For both DEA models I also include Goodwill, other acquired intangibles, such as core deposits, and derivative exposure, as these transactions represent investments that should generate future incomes and can restrict resources for other ventures. Finally for only the largest 100 banks I also include the amount of loans sold over the year (generally in the form of securitizations), as loans sales are at the discretion of management and free up resources for use in other projects. I only include this variable for the top 100 banks because loan sales either do not occur or occur in small percentage for the vast majority of average and small banks.[28]

For the largest 100 banks I optimize:

$$\text{Max}_{u,\,v}\ \theta = (u_1\text{Interest Revenue}_{i,t} + u_2\text{Non-interest Revenue}_{i,t}) / (v_1\text{Deposits}_{i,t} + v_2\text{FHLB Advances}_{i,t} + v_3\text{Fed Funds Purchased}_{i,t} + v_4\text{Other Short Term Borrowings}_{i,t} + v_5\text{Goodwill}_{i,t} + v_6\text{Other Acquired Intangibles}_{i,t} + v_7\text{Derivatives}_{i,t} + v_8\text{Loans Sales}_{i,t}) \quad (1a)$$

For average and small banks I optimize:

$$\text{Max}_{u,\,v}\ \theta = (u_1\text{Interest Revenue}_{i,t} + u_2\text{Non-interest Revenue}_{i,t}) / (v_1\text{Deposits}_{i,t} + v_2\text{Borrowings}_{i,t} + v_3\text{Goodwill}_{i,t} + v_4\text{Other Acquired Intangibles}_{i,t} + v_5\text{Derivatives}_{i,t}) \quad (1b)$$

[28] I estimate numerous variations of the model above including more and less aggregated inputs, combining the two revenue measures, and dropping individual inputs. The inferences of the study remain unchanged across the different DEA specifications.

The eight input variables are measured at the beginning of year *t* with the exception of Loan Sales which is estimated over the course of the year. I run the DEA procedure separately for each year in the sample to allow the efficient frontier to customize to the economic trends and opportunities available to bank managers during the year.

Converting Bank Efficiency to Managerial Efficiency

After creating the bank efficiency measure, I purge the measure of bank characteristics that affect efficiency but are outside of the control of management. I regress the bank efficiency measure on five such characteristics: bank size, bank age, cash availability, leverage and auditor type, similar to Demerjian et al. (2012). I expect large banks to operate more efficiently as they have greater negotiating power concerning rates and economies of scale concerning fixed costs. I proxy for bank size using both the natural log of total assets, as well as the natural log of the number of bank employees. I expect older, more established banks (measured as bank age) to benefit from reputational capital allowing them greater access to investment opportunities and greater negotiating power when entering into contracts, thus greater efficiencies. I expect banks with free cash flows to have few constraints in pursuing investment opportunities, but a highly levered bank would potentially be less efficient because leverage concerns could restrict management's investment choices. I include an indicator for Big N auditor as a proxy for governance or scrutiny. I expect better governed firms with Big N auditors to operate more efficiently due to the policies in place to guide the firm regardless of management decisions.

By regressing the DEA bank efficiency measure on the firm characteristics that may affect efficiency but are outside of management's control, the residual captures the efficiency that is not related to these firm characteristics. I label the residual bank managerial ability (BMA). I use a Fama-Macbeth specification of the following regression:

$$\text{Bank Efficiency}_{i,t} = \alpha + \beta_1 \ln(\text{Total Assets})_{i,t} + \beta_2 \ln(\text{Employees})_{i,t} + \beta_3 \text{Free Cash Flow Indicator}_{i,t} + \beta_4 \ln(\text{Bank Age})_{i,t} + \beta_5 \text{Leverage}_{i,t} + \beta_6 \text{BigN}_{i,t} + \text{BMA}_{i,t} \quad \text{(2 repeated)}.$$

As noted in Demerjian et al. (2011) this regression approach likely understates the ability measure as the variables used in the regression above could be influenced by managerial ability or could influence the hiring of a manager (i.e. large firms hiring better managers). But conservatively attributing some managerial ability to the characteristics of the firm increases the likelihood that the residual captures only efficiency related to bank managerial ability and works against finding results in this study.

Table A1 presents results from the Equation (2) regression. The log of total assets and employees as well as the Big N auditor indicator estimates are statistically significant with p-values well below 0.05. The coefficient on bank age was marginally significant at the 10% level, and free cash flow and leverage were directionally consistent with predictions though not statistically significant. Several of the factors chosen here differ from those chosen by Demerjian et al. (2012) because of the nature of the banking industry. However, the factors used in this second stage regression by both papers exhibit similar coefficients. Finding significant correlations in Equation (2) supports the

notion that the firm characteristics impact the efficiency measure and suggests that they should indeed be removed to create a managerial efficiency measure. Following this logic, I use the residual from Equation (2) as my bank managerial ability measure.

APPENDIX C

Validation of DEA-based BMA Measure

In addition to DEA-based bank managerial ability and control variables I calculate four alternative measures of bank managerial efficiency put forth by prior research: historical stock return, historical return on assets (ROA), CEO total cash compensation, and CEO tenure. These four alternative measures of managerial ability are included in the validation tests for comparison purposes. Historical stock return is the buy-and-hold return from the beginning of year t-5 to the end of year t-1. Historical ROA is the five-year return on assets calculated as cumulative income before extraordinary items scaled by average total assets over the years t-5 to t-1. CEO total cash compensation is the salary and cash bonus paid by the firm to the CEO during year t. CEO tenure is the number of years an executive has served as the CEO as listed on Execucomp.

Table A2 presents descriptive statistics for the bank efficiency, DEA-based bank managerial ability measure and alternative managerial ability measures. One of the advantages of the DEA measure is that it can be calculated for each firm-year, or manager-year, observation without needing explicit CEO data, a long time-series of data, or particular events like CEO turnovers. As such I am able to calculate bank efficiency and bank managerial ability measures for 19,426 firm-year observations or manager-year observations in my sample. Alternative measures of managerial ability yield smaller sample sizes due to data availability. By design the bank efficiency measure ranges from 0 to 1, least efficient to most efficient, with a mean of 0.532 and a median of 0.486. Bank

managerial ability, a residual, has an inter-quartile range of 0.209 and ranges from -0.381 to 0.463. Higher values of BMA correspond to higher quality managers. Because BMA is a residual, BMA can take a negative value. I interpret this as lower quality or below average managers. The distributions of bank efficiency and BMA are similar to those of the comparable variables in Demerjian et al. (2012). Banks in the sample on average exhibit a buy-and-hold return from year t-5 to year t-1 of roughly 70%, pay their CEO's roughly $1.4 million in cash each year, and employ CEO's with an average tenure of nine years. Banks offered higher returns and employed higher paid and more tenured CEO's than non-financial firms studied by Demerjian et al. (2012).

Comparison to Other Bank Managerial Ability Measures

I compare my DEA-based measure of bank efficiency to a simple-regression-based measure using the same inputs and outputs. Simple regression analysis can be used to generate residuals that compare the efficiency of a firm to the average efficiency, but the non-parametric nature of the DEA procedure allows a relative ranking compared to the frontier. Therefore, I regress bank income (interest income + noninterest income) on my collection of inputs (deposits, short-term borrowings, goodwill, etc.) and deem the residual as an alternative to bank efficiency. I then compare this OLS-residual to the DEA measure and find a meager Spearman correlation of 0.052. Such a small correlation suggests the nature of the DEA and OLS measures are considerably different.

Next, I correlate the potential measures of bank managerial ability, as well as the bank efficiency measure to evaluate the association between the measures. Table A3

contains the univariate Pearson and Spearman correlations. The correlation between bank efficiency and bank managerial ability is moderate (Spearman correlation of 0.521). One should expect this correlation to be moderate given that managerial ability is a component of bank efficiency and may also signify that banks with more inherent efficiencies also hire more efficient managers. Most importantly, the DEA-based measure of managerial ability is not highly correlated (all less than 0.050 or negative) with any other measures of bank managerial ability used in prior literature. Thus the DEA measure cannot be approximated by any of the other more easily calculable measures. Further none of the four traditional measures exhibit high correlations (all below 0.400) implying that, as a group, these measures provide at best a very noisy approximation for managerial ability.

Explaining Market Reaction to CEO Turnovers with Managerial Ability Measures

To test the validity of my DEA-based BMA measure, I assess its ability to predict short-window stock returns around CEO turnovers. Hayes and Schaefer (1999) and Demerjian et al. (2011) both show that the stock market considers the ability of outgoing managers when pricing the firm around a CEO turnover. The market reacts negatively to a CEO turnover when the outgoing CEO was of high ability but positively to a CEO turnover when the outgoing CEO was of low ability. Therefore, if the DEA-based measure is valid, I expect a significantly negative relation between BMA and short-window stock returns around a CEO turnover. To test the validity and usefulness of my measure I regress the short-window return on BMA and the alternative measures. If

BMA exhibits a negative and statistically significant relation to market reactions to CEO turnovers but other measures of managerial ability do not, then one could conclude that BMA better captures managerial ability.

I calculate short term stock returns over a 7 day window (-5, +1) from 8-K filing dates announcing CEO turnovers.[29] Including five days prior to announcement accounts for both a lag between actual market announcement of the CEO prior to the 8-K filing date and/or information leak prior to announcement. Table A4 reports the results. I separately regress the short-window returns on each ability measure reporting estimated coefficients, t-stats and the marginal effect of a one standard deviation change in the measure. For BMA I find a statistically significant relation (p-value less than 0.05) in the predicted direction suggesting that BMA can explain some portion of market responses to CEO turnovers. However, for each of the alternative measures I am unable to find a statistically significant result. Thus Table A4 provides evidence that BMA is more closely aligned with market perceptions of managerial ability than the alternative measures.[30]

Bank Managerial Ability and Future Loan Losses

[29] Audit Analytics provides the filing date for 8-K filings announcing the CEO turnover. The majority of the 8-K's are simply copies of press releases released on the same day as the filing. I use a 7 day window (-5,+1) to estimate the short term return to allow for some variance between filing day and actual announcement day. Audit Analytics data coverage for my sample begins in 2001.

[30] Since different measures require different types of data, each regression results in different sample sizes. I run the regressions of short-window returns on BMA for only the samples available for each of the other measures. I find stronger results for BMA within the Historical return and Historical ROA samples than had been exhibited by the previous measure. The extremely small samples of the CEO compensation and tenure variables do not show results for any measure.

"Prudent bank managers devise loan policies that discriminate credit worthy borrowers from those in danger of default (Barr, Seiford and Siems, 1993)." As my final validation test, I determine the relation between my BMA measure and the economics of banks' loan loss behavior. Specifically I examine the association between my BMA measure and future loan charge-offs. I estimate the following regression equation:

$$\text{Charge-offs}_{i,t+1} = \alpha + \beta_1 \text{BMA}_{i,t} + \beta_2 \text{Charge-offs}_{i,t} + \beta_3 \text{NPL}_{i,t} + \varepsilon_{i,t} \quad (9)$$

where $\text{Charge-offs}_{i,t+1}$ represents the loans charged-off by bank *i* during year *t* +1 scaled by total gross loans at the beginning of year *t* + 1, $\text{BMA}_{i,t}$ is the bank managerial ability measure discussed in section 3.1 for bank *i* during year *t*, $\text{NPL}_{i,t}$ represents non-performing loans for bank *i* during year *t* scaled by total gross loans at the beginning of year *t*. Once again current charge-offs and non-performing loans serve as controls for future charge-offs consistent with prior literature (e.g. Wahlen, 1994).

Table A5 reports the results for the regression of Equation (9) for both a levels and changes specification. Control variables used in prior literature are statistically significant in the expected direction. Most importantly the estimated coefficient on BMA is -0.009 in then levels analysis and -0.002 in the changes analysis. Both are statistically significant at the 5% level (two-tailed tests). Additionally both are economically significant. The average charge-off in the sample is 0.41% of loans and 32% of income before extraordinary items. A one standard deviation change in BMA corresponds to a 0.14% change the percent of loans charged-off. That change would represent a greater than one third increase to charge-offs and an 11% hit to profits. The significant negative

relation between BMA and future loan charge-offs suggests high BMA managers experience lower future loan losses.

APPENDIX D

Table 1

Descriptive Statistics

	N	Mean	Median	Std. Dev.	25%	75%
Bank Efficiency	10,971	0.535	0.484	0.587	0.343	0.651
BMA	10,971	-0.018	-0.044	0.157	-0.125	0.070
Abs|$\varphi_{i,t}$|						
ALL	10,971	0.401	0.230	0.584	0.117	0.407
FVSec	2,265	0.459	0.225	0.770	0.089	0.468
Total Assets ($M)	10,971	$2,143	$360	$8,014	$178	$852
Loan Growth	10,971	10.92%	8.23%	15.87%	1.29%	17.07%
Deposit Growth	10,971	10.54%	7.31%	14.52%	1.80%	15.39%
ALL	10,971	1.39%	1.24%	0.73%	1.00%	1.54%
Charge-offs	10,971	0.42%	0.15%	0.84%	0.04%	0.39%
NPL	10,971	1.43%	0.60%	2.44%	0.21%	1.51%
COVol	10,971	0.78%	0.68%	1.06%	0.35%	1.13%
CommLoans	10,971	32.28%	29.10%	21.02%	14.62%	47.34%
FVSec	2,265	0.002%	0.002%	0.015%	-0.005%	0.010%
RealizedGLSec	2,265	0.020%	0.006%	0.880%	0.000%	0.191%

This table reports descriptive statistics for the variables used in hypothesis test regressions and other variables of interest. Bank Efficiency is the result of the DEA procedure estimated for Equation (1) discussed in Section 3.1 in year *t*. BMA is the residual from Equation (2) described in Section 3.1 in year *t*. Abs|$\varphi_{i,t}$| is the proxy for Accounting Quality directly measured as the absolute value of the estimated residual to equation set (3) depending on the type of the accounting estimate in year *t* described in section 3.2. Total Assets is the total book value of assets at the end of year *t* (here no logarithm is taken for ease of interpretation). LoanGrowth is the percent change in loans from the beginning of year *t* to the end of year *t*. DepositGrowth is the percent change in deposits from the beginning of year *t* to the end of year *t*. ALL is the allowance for loan losses scaled by total gross loans at the beginning of year *t*. Charge-offs is the net loans charged-off (written-off as uncollectable) scaled by total gross loans at the beginning of year *t*. NPL is non-performing loans (loans over 90 days past due but not deemed uncollectible by the bank) scaled by total gross loans at the beginning of year *t*. $COVol_t$ is the standard deviation of Charge-offs at the bank over the three years culminating in year *t*. $CommLoans_t$ is the percentage of the loan portfolio outstanding to commercial lenders at the beginning of year *t*. FVSec is the sum of the unrealized gain or loss from AFS securities held by the bank (previously defined as FVAFSSec) and the difference between the disclosed fair value of securities and the book value of securities (previously defined as FVHTMSec) scaled by the book value of securities at the end of year *t*. RealizedGLSec is the realized gain or loss related to securities recognized for accounting purposes scaled by total securities cost at the beginning of year *t*. Variables are winsorized at the 1% and 99% level.

Table 2

Univariate Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Bank Efficiency		**0.551**	**-0.201**	**-0.163**	0.127	0.015	**0.103**	**-0.162**	**-0.207**	**-0.156**	**0.183**	0.019	**0.047**	**0.150**
(2) BMA	**0.547**		**-0.251**	**-0.259**	0.091	0.074	**0.188**	**-0.195**	**-0.301**	**-0.318**	-0.002	-0.015	**0.054**	**0.122**
(3) Abs|$\varphi_{i,t}$| - ALL	**-0.176**	**-0.217**		**0.316**	0.004	**-0.179**	**-0.058**	**0.212**	**0.132**	**0.156**	**0.116**	**0.178**	**0.103**	0.074
(4) Abs|$\varphi_{i,t}$| - FVSec	**-0.107**	**-0.186**	**0.277**		**0.058**	**-0.063**	**-0.072**	**0.089**	**0.130**	**0.150**	-0.011	0.037	**-0.157**	-0.086
(5) Total Assets	0.173	0.070	**0.044**	0.010		**-0.100**	**-0.077**	0.057	**0.123**	**0.086**	**-0.256**	**-0.049**	**-0.008**	**0.051**
(6) Loan Growth	0.014	**0.107**	**-0.171**	**-0.053**	**-0.043**		**0.616**	**-0.237**	**-0.363**	**-0.385**	-0.001	0.005	**-0.126**	**-0.084**
(7) Deposit Growth	**0.037**	**0.189**	**-0.082**	**-0.066**	**-0.022**	**0.741**		**-0.100**	**-0.183**	**-0.221**	**0.035**	**0.031**	-0.014	0.010
(8) ALL	**-0.124**	**-0.149**	**0.277**	0.024	0.070	**-0.258**	**-0.137**		**0.452**	**0.420**	**0.035**	**0.306**	**0.190**	**0.129**
(9) Charge-offs	**-0.232**	**-0.252**	**0.220**	**0.060**	**0.106**	**-0.320**	**-0.168**	**0.622**		**0.572**	**-0.125**	**0.180**	**0.167**	**0.169**
(10) NPL	**-0.118**	**-0.206**	**0.160**	**0.083**	0.017	**-0.316**	**-0.178**	**0.612**	**0.674**		**0.026**	**0.135**	**0.168**	**0.158**
(11) COVol	**0.043**	0.006	**0.032**	0.015	**-0.066**	**0.028**	**0.039**	**0.025**	**0.027**	**0.052**		**0.060**	**0.028**	-0.014
(12) CommLoans	0.020	0.029	**0.130**	-0.004	-0.003	0.012	**0.031**	**0.249**	**0.144**	**0.141**	**0.033**		**0.051**	**0.025**
(13) FVSec	**0.062**	**0.073**	0.009	0.008	0.004	0.000	0.005	0.019	0.007	0.009	0.002	0.019		**0.289**
(14) RealizedGLSec	**0.100**	**0.111**	0.018	-0.062	0.009	0.008	**0.020**	**0.055**	**0.049**	**0.052**	0.009	0.013	**0.219**	

Emboldened numbers are statistically significant at the 5% level.

This table reports univariate correlations for the variables of interest used in this study from 1994-2010. Bank Efficiency is the result of the DEA procedure estimated for Equation (1) discussed in Section 3.1 in year *t*. BMA is the residual from Equation (2) described in Section 3.1 in year *t*. Abs|$\varphi_{i,t}$| is the proxy for Accounting Quality directly measured as the absolute value of the estimated residual to equation set (3) depending on the type of the accounting estimate in year *t* described in section 3.2. Total Assets is the total book value of assets at the end of year *t* (here no logarithm is taken for ease of interpretation). LoanGrowth is the percent change in loans from the beginning of year *t* to the end of year *t*. DepositGrowth is the percent change in deposits from the beginning of year *t* to the end of year *t*. ALL is the allowance for loan losses scaled by total gross loans at the beginning of year *t*. Charge-offs is the net loans charged-off (written-off as uncollectable) scaled by total gross loans at the beginning of year *t*. NPL is

Table 2 (Continued)

non-performing loans (loans over 90 days past due but not deemed uncollectible by the bank) scaled by total gross loans at the beginning of year *t*. $COVol_t$ is the standard deviation of Charge-offs at the bank over the three years culminating in year *t*. $CommLoans_t$ is the percentage of the loan portfolio outstanding to commercial lenders at the beginning of year *t*. FVSec is the sum of the unrealized gain or loss from AFS securities held by the bank (previously defined as FVAFSSec) and the difference between the disclosed fair value of securities and the book value of securities (previously defined as FVHTMSec) scaled by the book value of securities at the end of year *t*. RealizedGLSec is the realized gain or loss related to securities recognized for accounting purposes scaled by total securities cost at the beginning of year *t*. Pearson correlations are presented in the lower left, and Spearman correlations are presented in the upper right. Variables are winsorized at the 1% and 99% level.

Table 3

Bank Managerial Ability and Accounting Quality of the Allowance for Loan Losses – Residual Model

$Abs|\varphi_{i,t}| = \alpha + \beta_1 BMA_{i,t} + \beta_2 ln(Total\ Assets)_{i,t} + \beta_3 LoanGrowth_{i,t} + \beta_4 DepositGrowth_{i,t} + \beta_5 BigN_{i,t} + \beta_6 COVol_{i,t} + \beta_7 CommLoans_{i,t} + \varepsilon_{i,t}$

Dependent Variable: Inverse Accounting Quality (Abs|φ|)	Alt. Hyp. Predicted Sign	Levels Model (I)	Changes Model (II)	Small and Average Banks (III)	Largest 100 Banks (IV)
Intercept		0.104	0.091**	0.135	-0.114
		(1.28)	(1.85)	(1.30)	(-0.30)
BMA	-	-0.159**	-0.177***	-0.164***	-0.140**
		(-2.47)	(-2.69)	(-2.97)	(-2.22)
Ln(Total Assets)	+/-	-0.039*	0.002	-0.035	-0.066*
		(-1.91)	(0.05)	(-1.47)	(-1.75)
LoanGrowth	+	-0.732***	-0.271**	-0.737***	-0.592***
		(-3.79)	(-2.31)	(-3.63)	(-3.55)
DepositGrowth	+	0.339**	0.204**	0.337**	0.133
		(2.45)	(1.91)	(2.19)	(0.93)
BigN	-	-0.102**	-0.041**	-0.085**	-0.240**
		(-2.27)	(-2.02)	(-2.04)	(-2.46)
COVol	+	0.020***	0.014***	0.016***	0.115***
		(3.95)	(2.63)	(3.41)	(3.08)
CommLoans	+	0.003***	0.001	0.003***	0.004**
		(6.22)	(1.19)	(5.98)	(2.06)
Adj R^2		0.1586	0.1007	0.1596	0.1784
N		10,971	9,897	9,962	1,009

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports results of the residual model described in sub-section 3.3 which regresses accounting quality for the allowance for loan losses on current period bank managerial ability and controls from 1994-2010. These regression equation and results shown below correspond to Equation (4a) in the text. While I present my hypotheses in null form, I provide a column titled "Alt. Hyp. Expected Sign" in both this table and throughout the paper that notes the expected sign if results are consistent with the "skills transfer" intuition discussed in the paper. I do this for the sake of clarity given the complexity of the tests used in the study. Columns (I) and (II) report both levels and changes analysis for the allowance for loan losses. Columns (III) and (IV) divide the sample on size into the two subsamples used separately in the DEA procedure described in sub-section 3.1 and examines the allowance for loan losses. The regression results are presented separately for the largest 100 banks in each year and for all other banks. $Abs|\varphi_{i,t}|$ is the proxy for Accounting Quality directly measured as the absolute value of the estimated residual to equation set (3) in year *t* described in section 3.2. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1 in year *t*. Ln(Total Assets) is the natural log of total assets at the end of year *t*. $LoanGrowth_t$ is the percent change in loans from the beginning of year *t* to the end of year *t*. $DepositGrowth_t$ is the percent change in deposits from the beginning of year *t* to the end of year *t*. $BigN_t$ is an indicator equal to 1 when the bank uses a Big N auditor in year *t* and zero otherwise. $COVol_t$ is the standard deviation of Charge-offs at the bank over the three years culminating in year *t*. $CommLoans_t$ is the percentage of the loan portfolio outstanding to commercial lenders at the beginning of year *t*. The "Levels" columns present the dependent variables at time *t+1* regressed on independent variables at time *t*. The "Changes" columns present the change in dependent variable from time *t+1* to time *t+2*, regressed on the change in independent variables from time *t* to time *t+1*. Variables are winsorized at the 1% and 99% level. The table reports OLS regressions coefficient estimates as well as t-statistics (t-statistics in parentheses) based on standard errors that have been adjusted for clustering by firm and year.

Table 4

Bank Managerial Ability and Accounting Quality of the Fair Values of Securities – Residual Model

$Abs|\varphi_{i,t}| = \alpha + \beta_1 BMA_{i,t} + \beta_2 ln(Total\ Assets)_{i,t} + \beta_3 LoanGrowth_{i,t} + \beta_4 DepositGrowth_{i,t} + \beta_5 BigN_{i,t} + \varepsilon_{i,t}$

Dependent Variable: Inverse Accounting Quality (Abs|φ|)	**Alt. Hyp. Predicted Sign**	**Levels Model (I)**	**Changes Model (II)**	**Small and Average Banks (III)**	**Largest 100 Banks (IV)**
Intercept		-0.465***	0.006	-.400**	-0.626***
		(-4.26)	(0.59)	(-4.12)	(-5.26)
BMA	-	-0.254***	-0.292**	-0.255***	-0.293***
		(-3.38)	(-2.99)	(2.62)	(-2.99)
Ln(Total Assets)	+/-	0.042***	0.006***	0.033***	0.072***
		(2.92)	(5.86)	(2.63)	(4.51)
LoanGrowth	+	0.233*	0.112	0.048	0.378**
		(1.94)	(0.66)	(0.13)	(2.01)
DepositGrowth	+	0.520***	-0.191	-0.071	-0.053
		(3.19)	(-0.43)	(-0.84)	(-0.19)
BigN	-	-0.117	-0.165***	-0.095	-0.077
		(-1.28)	(-3.58)	(-1.01)	(-0.14)
Adj R^2		0.1551	0.1001	0.1084	0.1956
N		2,447	2,160	2,148	299

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports results of the residual model described in sub-section 3.3 which regresses accounting quality for the allowance for loan losses on current period bank managerial ability and controls from 1999-2010. These regression equation and results shown below correspond to Equation (4b) in the text. While I present my hypotheses in null form, I provide a column titled "Alt. Hyp. Expected Sign" in both this table and throughout the paper that notes the expected sign if results are consistent with the "skills transfer" intuition discussed in the paper. I do this for the sake of clarity given the complexity of the tests used in the study. Columns (I) and (II) report both levels and changes analysis for the fair values of securities. Columns (III) and (IV) divide the sample on size into the two subsamples used separately in the DEA procedure described in sub-section 3.1 and examines the fair values of securities. The regression results are presented separately for the largest 100 banks in each year and for all other banks. $Abs|\varphi_{i,t}|$ is the proxy for Accounting Quality directly measured as the absolute value of the estimated residual to equation set (3) in year *t* described in section 3.2. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1 in year *t*. Ln(Total Assets) is the natural log of total assets at the end of year *t*. $LoanGrowth_{,t}$ is the percent change in loans from the beginning of year *t* to the end of year *t*. $DepositGrowth_{,t}$ is the percent change in deposits from the beginning of year *t* to the end of year *t*. $BigN_t$ is an indicator equal to 1 when the bank uses a Big N auditor in year *t* and zero otherwise. The "Levels" columns present the dependent variables at time *t+1* regressed on independent variables at time *t*. The "Changes" columns present the change in dependent variable from time *t+1* to time *t+2*, regressed on the change in independent variables from time *t* to time *t+1*. Variables are winsorized at the 1% and 99% level. The table reports OLS regressions coefficient estimates as well as t-statistics (t-statistics in parentheses) based on standard errors that have been adjusted for clustering by firm and year.

Table 5

Bank Managerial Ability and Accounting Quality – Interaction Model

$Charge\text{-}offs_{i,t+1} = \alpha + \beta_1 ALL_{i,t} + \beta_2 BMA_{i,t} + \beta_3 ALL_{i,t}*BMA_{i,t} + \beta_4 Charge\text{-}offs_{i,t} + \beta_5 NPL_{i,t} + \varepsilon_{i,t}$

$RealizedGLSec_{i,t+1} = \alpha + \beta_1 FVSec_{i,t} + \beta_2 BMA_{i,t} + \beta_3 FVSec_{i,t}*BMA_{i,t} + \beta_4 RealizedGLSec_{i,t} + \varepsilon_{i,t}$

Dependent Variable: Charge-offs or RealizedGLSec	**Alt. Hyp. Predicted Sign**	**Allowance for Loan Losses (I)**	**Predicted Sign**	**Fair Values of Securities (II)**
Intercept		-0.001		-0.001
		(-1.42)		(0.54)
ALL (FVSec)	+	0.147***	+	0.271**
		(3.07)		(2.47)
BMA	-	-0.004**	+	0.002*
		(-2.22)		(1.89)
ALL*BMA (FVSec*BMA)	+	0.131***	+	0.010
		(3.24)		(1.48)
Charge-offs	+	3.10***		
		(6.86)		
NPL	+	0.135***		
		(5.24)		
RealizedGLSec			+	0.027***
				(2.84)
Adj R^2		0.4166		0.1031
N		17,991		5,683

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports results of the interaction model described in sub-section 3.4, which regresses accounting quality on the allowance for loan losses, current period bank managerial ability, the interaction of the allowance for loan losses and BMA, and controls from 1994-2010. The regression equation and results shown below correspond to equation set (5) in the text. While I present my hypotheses in null form, I provide a column titled "Alt. Hyp. Expected Sign" in both this table and throughout the paper that notes the expected sign if results are consistent with the "skills transfer" intuition discussed in the paper. I do this for the sake of clarity given the complexity of the tests used in the study. ALL is the allowance for loan losses scaled by total gross loans at the beginning of year *t*. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1 in year t. Charge-offs is the net loans charged-off (written-off as uncollectable) scaled by total gross loans at the beginning of year *t*. NPL is non-performing loans (loans over 90 days past due but not deemed uncollectible by the bank) scaled by total gross loans at the beginning of year *t*. FVSec is the sum of the unrealized gain or loss from AFS securities held by the bank (previously defined as FVAFSSec) and the difference between the disclosed fair value of securities and the book value of securities (previously defined as FVHTMSec) scaled by the book value of securities at the end of year *t*. RealizedGLSec is the realized gain or loss related to securities recognized for accounting purposes scaled by total securities cost at the beginning of year *t*. Variables are winsorized at the 1% and 99% level. The table reports OLS regressions coefficient estimates as well as t-statistics (t-statistics in parentheses) based on standard errors that have been adjusted for clustering by firm and year.

Table 6

BMA and Accounting Quality During the Financial Crisis of 2007-2009

$Abs|\varphi_{i,t}| = \alpha + \beta_1 BMA_{i,t} + \beta_2 FC_{i,t} + \beta_3 BMA*FC_{i,t} + \beta_4 ln(Total\ Assets)_{i,t} + \beta_5 LoanGrowth_{i,t} + \beta_6 DepositGrowth_{i,t} + \beta_7 BigN_{i,t} + \beta_8 COVol_{i,t} + \beta_9 CommLoans_{i,t} + \varepsilon_{i,t}$

Dependent Variable: Inverse Accounting Quality (Abs|φ|)	**Alt. Hyp. Predicted Sign**	**Allowance for Loan Losses (I)**	**Fair Values of Securities (II)**
Intercept		0.141**	-0.436***
		(1.92)	(-4.87)
BMA	-	-0.163**	-0.335***
		(-2.40)	(-3.53)
FC	+	0.224**	0.301***
		(2.33)	(2.62)
BMA*FC	+/-	-0.208***	-0.412***
		(-2.66)	(-2.77)
Ln(Total Assets)	+/-	0.020	0.077***
		(1.43)	(4.89)
LoanGrowth	+	-0.699***	0.208**
		(-4.86)	(2.04)
DepositGrowth	+	0.321***	0.293**
		(5.23)	(2.37)
BigN	-	-0.037	-0.046
		(-1.49)	(-0.11)
COVol	+	0.015***	
		(3.73)	
CommLoans	+	0.003***	
		(6.65)	
Adj R^2		0.1908	0.1907
N		10,971	2,447

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports results of regressing accounting quality on current period bank managerial ability and controls, as shown in the equations below. Regressions were performed on the sample of all banks-years during the financial crisis (independent variables measured in 2006 to 2009). Years 2006-2009 are used so that all years of data where either the accounting estimate or the economic realization falls during the 2007-2009 crisis period are included in the analysis. While I present my hypotheses in null form, I provide a column titled "Alt. Hyp. Expected Sign" in both this table and throughout the paper that notes the expected sign if results are consistent with the "skills transfer" intuition discussed in the paper. I do this for the sake of clarity given the complexity of the tests used in the study. $Abs|\varphi_{i,t}|$ is the proxy for Accounting Quality measured as the absolute value of the estimated residual to equation set (3) in year *t* described in section 3.2. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1 in year *t*. FC_t is an indicator variable equal to one when the bank-year is in the financial crisis and zero otherwise. $Size_t$ is the natural log of total assets at the end of year *t*. $LoanGrowth_{,t}$ is the percent change in loans from the beginning of year *t* to the end of year *t*. $DepositGrowth_{,t}$ is the percent change in deposits from the beginning of year *t* to the end of year *t*. $BigN_t$ is an indicator equal to 1 when the bank uses a Big N auditor in year *t* and zero otherwise. $COVol_t$ is the standard deviation of Charge-offs at the bank over the three years culminating in year *t*. $CommLoans_t$ is the percentage of the loan portfolio outstanding to commercial lenders at the beginning of year *t*. Variables are winsorized at the 1% and 99% level. The table reports OLS regressions coefficient estimates as well as t-statistics (t-statistics in parentheses) based on standard errors that have been adjusted for clustering by firm and year.

Table 7

BMA and Accounting Quality under Binding Capital Constraints

$Abs|\varphi_{i,t}| = \alpha + \beta_1 BMA_{i,t} + \beta_2 CapTight_{i,t} + \beta_3 BMA*CapTight_{i,t} + \beta_4 ln(Total\ Assets)_{i,t} + \beta_5 LoanGrowth_{i,t} + \beta_6 DepositGrowth_{i,t} + \beta_7 BigN_{i,t} + \beta_8 COVol_{i,t} + \beta_9 CommLoans_{i,t} + \varepsilon_{i,t}$

Dependent Variable: Inverse Accounting Quality (Abs|φ|)	**Alt. Hyp. Predicted Sign**	**Allowance for Loan Losses (I)**	**Fair Values of Securities (II)**
Intercept		0.131*	-0.447***
		(1.67)	(-4.17)
BMA	-	-0.139**	-0.230***
		(-2.36)	(-3.78)
CapTight	+	0.109***	-0.088
		(2.46)	(-0.56)
BMA*CapTight	+/-	0.167***	0.168
		(2.92)	(1.22)
Ln(Total Assets)	+/-	0.032*	0.087***
		(1.72)	(4.44)
LoanGrowth	+	-0.751***	0.223**
		(-3.79)	(2.46)
DepositGrowth	+	0.316**	0.179**
		(2.23)	(2.08)
BigN	-	-0.099**	-0.070
		(-2.27)	(-0.17)
COVol	+	0.020***	
		(3.85)	
CommLoans	+	0.003***	
		(6.09)	
Adj R^2		0.1637	0.1507
N		10,971	2,447

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports results of regressing accounting quality on current period bank managerial ability and controls for the subsample of banks with Tier 1 capital ratios in the lowest quintile of banks from 1994-2010 [1999-2010 for the securities analysis]. While I present my hypotheses in null form, I provide a column titled "Alt. Hyp. Expected Sign" in both this table and throughout the paper that notes the expected sign if results are consistent with the "skills transfer" intuition discussed in the paper. I do this for the sake of clarity given the complexity of the tests used in the study. $Abs|\varphi_{i,t}|$ is the proxy for Accounting Quality directly measured as the absolute value of the estimated residual to equation set (3) in year *t* described in section 3.2. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1 in year *t*. $CapTight_t$ is an indicator variable equal to one when the bank-year is in lowest quintile of tier 1 capital in year t and zero otherwise. $Size_t$ is the natural log of total assets at the end of year *t*. $LoanGrowth_{,t}$ is the percent change in loans from the beginning of year *t* to the end of year *t*. $DepositGrowth_{,t}$ is the percent change in deposits from the beginning of year *t* to the end of year *t*. $BigN_t$ is an indicator equal to 1 when the bank uses a Big N auditor in year *t* and zero otherwise. $COVol_t$ is the standard deviation of Charge-offs at the bank over the three years culminating in year *t*. $CommLoans_t$ is the percentage of the loan portfolio outstanding to commercial lenders at the beginning of year *t*. Variables are winsorized at the 1% and 99% level. The table reports OLS regressions coefficient estimates as well as t-statistics (t-statistics in parentheses) based on standard errors that have been adjusted for clustering by firm and year.

Table 8

Bank Managerial Ability and Accounting Bias

$\varphi_{i,t} = \alpha + \beta_1 BMA_{i,t} + \beta_2 \ln(\text{Total Assets})_{i,t} + \beta_3 LoanGrowth_{i,t} + \beta_4 DepositGrowth_{i,t} + \beta_5 BigN_{i,t} + \beta_6 COVol_{i,t} + \beta_7 CommLoans_{i,t} + \varepsilon_{i,t}$

Dependent Variable: Accounting Bias (φ)	**Predicted Sign**	**Allowance for Loan Losses (I)**	**Predicted Sign**	**Fair Value of Securities (II)**
Intercept		-0.096		-0.101***
		(-0.43)		(-2.74)
BMA	-	-0.086*	+	-0.178**
		(-1.67)		(-2.42)
Ln(Total Assets)	?	0.099***	?	0.061***
		(3.81)		(2.59)
LoanGrowth	?	-0.388	?	-0.297*
		(-1.36)		(-1.91)
DepositGrowth	?	0.025	?	0.289**
		(1.10)		(2.32)
BigN	-	-0.228***	-	0.056
		(-3.26)		(0.70)
COVol	+	0.005		
		(0.63)		
CommLoans	+	0.001		
		(1.35)		
Adj R^2		0.1315		0.0541
N		10,971		2,447

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports the results of regressing BMA and controls on the signed residual to equation set (3), $\varphi_{i,t}$. $\varphi_{i,t}$ is a proxy for the accounting bias directly measured as the signed value of the estimated residual to equation set (3) in year t described in section 3.2. The "Predicted Sing" columns correspond to the sing predicted by the alternative Explanation discussed in section 5.4. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1 in year *t*. Ln(Total Assets) is the natural log of total assets at the end of year *t*. $LoanGrowth_{,t}$ is the percent change in loans from the beginning of year *t* to the end of year *t*. $DepositGrowth_{,t}$ is the percent change in deposits from the beginning of year *t* to the end of year *t*. $BigN_t$ is an indicator equal to 1 when the bank uses a Big N auditor in year *t* and zero otherwise. $COVol_t$ is the standard deviation of Charge-offs at the bank over the three years culminating in year *t*. $CommLoans_t$ is the percentage of the loan portfolio outstanding to commercial lenders at the beginning of year *t*. Variables are winsorized at the 1% and 99% level. The table reports OLS regressions coefficient estimates as well as t-statistics (t-statistics in parentheses) based on standard errors that have been adjusted for clustering by firm and year.

Table 9

Bank Managerial Ability and Accounting Quality under Weak Reporting Incentives

$Abs|\varphi_{i,t}| = \alpha + \beta_1 BMA_{i,t} + \beta_2 ln(Total\ Assets)_{i,t} + \beta_3 LoanGrowth_{i,t} + \beta_4 DepositGrowth_{i,t} + \beta_5 BigN_{i,t} + \beta_6 COVol_{i,t} + \beta_7 CommLoans_{i,t} + \varepsilon_{i,t}$

Dependent Variable: Inverse Accounting Quality (Abs|φ|)	**Alt. Hyp. Predicted Sign**	**Allowance for Loan Losses (I)**	**Fair Value of Securities (II)**
Intercept		0.152**	0.757***
		(1.98)	(3.18)
BMA	-	-0.177**	-0.249***
		(-2.35)	(-2.82)
Ln(Total Assets)	+/-	0.011	-0.052***
		(0.85)	(-3.20)
LoanGrowth	+	-0.507***	0.241*
		(-4.85)	(1.85)
DepositGrowth	+	0.466**	0.313***
		(2.22)	(2.93)
BigN	-	-0.054	-0.022
		(-1.36)	(-1.16)
COVol	+	0.018***	
		(2.47)	
CommLoans	+	0.005***	
		(8.67)	
Adj R^2		0.2007	0.1091
N		1,817	342

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports results of regression equation set (4) only in the subsample of banks in the top quintile of Tier 1 Capital. While I present my hypotheses in null form, I provide a column titled "Expected Sign" in both this table and throughout the paper that notes the expected sign if results are consistent with the "skills transfer" intuition discussed in the paper. I do this for the sake of clarity given the complexity of the tests used in the study. $Abs|\varphi_{i,t}|$ is the proxy for Accounting Quality directly measured as the absolute value of the estimated residual to equation set (3) in year *t* described in section 3.2. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1 in year *t*. Ln(Total Assets) is the natural log of total assets at the end of year *t*. $LoanGrowth_{,t}$ is the percent change in loans from the beginning of year *t* to the end of year *t*. $DepositGrowth_{,t}$ is the percent change in deposits from the beginning of year *t* to the end of year *t*. $BigN_t$ is an indicator equal to 1 when the bank uses a Big N auditor in year *t* and zero otherwise. $COVol_t$ is the standard deviation of Charge-offs at the bank over the three years culminating in year *t*. $CommLoans_t$ is the percentage of the loan portfolio outstanding to commercial lenders at the beginning of year *t*. Variables are winsorized at the 1% and 99% level. The table reports OLS regressions coefficient estimates as well as t-statistics (t-statistics in parentheses) based on standard errors that have been adjusted for clustering by firm and year.

Table A1: Converting Bank Efficiency to Bank Managerial Ability

Dependent Variable = Bank Efficiency				
	Predicted Sign	Coefficient (Fama-MacBeth t-statistic)	Percent with Predicted Sign	Percent Significant with Predicted Sign
Intercept		0.06***		
		(3.54)		
Ln (Total Assets)	+	0.047***	85.7%	71.4%
		(3.22)		
Ln (Employees)	+	0.057***	90.5%	71.4%
		(4.11)		
Free Cash Flow Indicator	+	0.004	76.2%	28.6%
		(1.16)		
Ln (Bank Age)	+	0.018*	71.4%	38.1%
		(1.65)		
Leverage	-	-0.002	85.7%	28.6%
		(-1.43)		
BigN	+	0.030**	90.5%	52.4%
		(2.11)		
Year Fixed Effects		Included		
N		19,426		
Adjusted R^2		0.4197		

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports the estimated coefficients and Fama-Macbeth t-statistics for Equation (2) from 1994-2010. Residuals from this estimation are my Bank Managerial Ability measure, BMA. Bank Efficiency is the result of the DEA procedure estimated on Equation (1) as described in section 3.1. Total Assets is the book value of total assets at the end of year *t*. Employees is the number of full time equivalent employees employed by the bank at the end of year *t*. Free Cash Flow Indicator is an indicator variable equal to 1 when a bank reports non-negative cash from operations on its Statement of Cash Flows in year t. Bank Age is the number of years the bank has been listed in SNL at the end of year *t*. Leverage is the ratio of liabilities to equity at the bank at the end of year t. Big N is an indicator variable equal to 1 when the bank is audited by a BigN auditor during year t and 0 otherwise. Variables are winsorized at the 1% and 99% level.

Table A2

Descriptive Statistics for Validation Test

Panel A

Data Available to Calculate (from 1980 to 2010):	Bank Managerial Ability	Historical Return	Historical ROA	Ln(CEO Cash Comp.)	Ln(CEO Tenure)
Unique Banks	2,422	1,325	1,963	173	148
Unique Bank-Year Observations	19,426	8,918	10,869	1,116	983
CEO Turnover Dates Available from Audit Analytics:					
Unique Banks	142	133	140	24	23
Unique Bank-Year Observations	162	154	161	30	29

Panel B

Variable	**Observations**	**Mean**	**Std. Dev.**	**Min.**	**25%**	**Median**	**75%**	**Max.**
Bank Efficiency	19,426	0.532	0.222	0.155	0.367	0.486	0.652	1.000
Bank Managerial Ability	19,426	-0.007	0.161	-0.381	-0.120	-0.031	0.089	0.463
Alternative Measures of Ability								
Historical Return	8,918	0.728	1.120	-0.888	0.000	0.449	1.172	5.311
Historical ROA	12,437	0.041	0.026	-0.065	0.029	0.044	0.056	0.098
CEO Cash Compensation (Thousands)	1,116	$1,436.19	$1,665	$262.75	$643.38	$957.36	$1,544.84	$11,400.9
CEO Tenure (years)	983	8.709	6.989	1.000	3.000	7.000	12.000	34.000

Panel A provides a summary of the sample size for each of the possible managerial ability measures from 1994-2010, including the subsamples with CEO turnover dates used in validation tests. Panel B reports descriptive statistics for the variables of interest used in this study. Bank Efficiency is the result of the DEA procedure estimated on Equation (1) as described in section 3.1. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1. Historical Return is the buy-and-hold stock return from the beginning of year *t-5* to the end of year *t-1*. Historical ROA is the five-year return on assets calculated as cumulative income before extraordinary items scaled by average total assets over the years *t-5* to *t-1*. CEO total cash compensation is the salary and cash bonus paid by the firm to the CEO during year *t*. CEO tenure is the number of years an executive has served as the CEO as listed on Execucomp. Variables are winsorized at the 1% and 99% level.

Table A3

Univariate Correlations

	Bank Efficiency	Bank Managerial Ability	Historical Return	Historical ROA	Ln(CEO Cash Comp.)	Ln(CEO Tenure)
Bank Efficiency		0.521***	0.129***	0.208***	0.120***	-0.017
Bank Managerial Ability	0.544***		-0.035***	0.038***	-0.348***	-0.019
Historical Return	0.171***	0.003		0.379***	0.104***	0.049
Historical ROA	0.203***	0.033***	0.341***		0.095***	0.035
Ln (CEO Cash Comp.)	0.070**	-0.298***	0.095**	0.092***		0.095***
Ln (CEO tenure)	-0.043	-0.022	-0.006	0.024	-0.080**	

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports univariate correlations for the variables of interest used in this study from 1994-2010. Bank Efficiency is the result of the DEA procedure estimated on Equation (1) as described in section 3.1. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1. Historical Return is the buy-and-hold stock return from the beginning of year *t-5* to the end of year *t-1*. Historical ROA is the five-year return on assets calculated as cumulative income before extraordinary items scaled by average total assets over the years *t-5* to *t-1*. CEO total cash compensation is the salary and cash bonus paid by the firm to the CEO during year *t*. CEO tenure is the number of years an executive has served as the CEO as listed on Execucomp. Pearson correlations are presented in the lower left, and Spearman correlations are presented in the upper right. Variables are winsorized at the 1% and 99% level.

Table A4

Explaining Market Reactions to CEO Turnovers with Managerial Ability Measures

CEO Turnover Announcement Return = $\alpha + \beta_1$Measures of Managerial Ability$_{i,t} + \varepsilon_{i,t}$

Independent Variable	Bank Managerial Ability	Historical Return	Historical ROA	Ln(CEO Cash Comp.)	Ln(CEO Tenure)
Return	-0.132**	-0.060	0.883	0.00	-0.002
T-stat	(-2.50)	(-1.36)	(0.63)	(0.32)	(-0.68)
Marginal Effect	-0.021	-0.067	0.023	0.004	-0.014
Observations	162	154	161	30	29

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports results of regressing short-window returns surrounding the announcement of CEO turnovers on the different potential managerial ability measures from 1994-2010. Announcement Return is the buy-and-hold return over the seven day period (-5,+1) where day (0) represents the filing date of the 8-K announcing the CEO turnover. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1. Historical Return is the buy-and-hold stock return from the beginning of year *t-5* to the end of year *t-1*. Historical ROA is the five-year return on assets calculated as cumulative income before extraordinary items scaled by average total assets over the years *t-5* to *t-1*. CEO total cash compensation is the salary and cash bonus paid by the firm to the CEO during year t. CEO tenure is the number of years an executive has served as the CEO as listed on Execucomp. Variables are winsorized at the 1% and 99% level. Marginal Effect is the resulting difference in the dependent variable of a one standard deviation change in the independent variable.

Table A5

Bank Managerial Ability and Future Loan Losses (Economic Analysis)

$$\text{Charge-offs}_{i,t+1} = \alpha + \beta_1 \text{BMA}_{i,t} + \beta_2 \text{Charge-offs}_{i,t} + \beta_3 \text{NPL}_{i,t} + \varepsilon_{i,t}$$

Dependent Variable: Charge-offs$_{t+1}$	**Predicted Sign**	**Levels Model (I)**	**Changes Model (II)**
Intercept		0.0009***	0.000***
		(3.17)	(0.96)
BMA	-	-0.009**	-0.002***
		(-2.01)	(-2.98)
Charge-offs	+	0.405***	-0.299***
		(10.12)	(-6.90)
NPL	+	0.143***	0.178***
		(8.69)	(4.72)
Adj R^2		0.4532	0.1322
N		17,994	15,132

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

This table reports results of regressing future loan charge-offs on current period bank managerial ability and controls, as shown in the equation below [corresponding to equation (10) in Appendix C] from 1994-2010. Charge-offs$_{t+1}$ is the amount of charged-off loans in year *t+1*. Bank Managerial Ability is the residual from Equation (2) described in Section 3.1 in year t. Charge-offs$_t$ is the amount of charged-off loans in year *t*. NPL$_t$ is the amount of non-performing loans at the end of year *t*. The "Levels" column presents the dependent variables at time *t+1* regressed on independent variables at time *t*. The "Changes" presents the change in dependent variable from time *t+1* to time *t+2*, regressed on the change in independent variables from time *t* to time *t+1*. Variables are winsorized at the 1% and 99% level. The table reports OLS regressions coefficient estimates as well as t-statistics (t-statistics in parentheses) based on standard errors that have been adjusted for clustering by firm and year.

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