Perceived Bank Competition: Operational Decision-Making and Bank Stability

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February 2013

* We thank Mike Minnis, Stephan Ryan, Derrald Stice, Larry Wall, Jieying Zhang (discussant), and workshop participants at Duke/UNC Fall Camp, HKUST Accounting Symposium, and Singapore Management University SOAR Accounting Conference for helpful comments. We thank Feng Li for help in computing the competition metric. Bushman thanks Kenan-Flagler Business School, University of North Carolina at Chapel Hill. Hendricks thanks the Paton Accounting Fellowship and the Deloitte Foundation Doctoral Fellowship and Williams thanks the PriceWaterhouseCoopers – Norm Auerbach Faculty Fellowship for financial support.

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Abstract

Assessing how competition affects bank performance is an important issue for regulators, credit rating agencies and investors. In this paper, we utilize a bank-specific measure that extracts a bank's perception of its competitive environment from a textual analysis of its 10-K filing. We show that this measure is related to future operating performance and bank decision-making in ways that suggest it captures real competitive pressure on banks. Specifically, banks facing higher perceived competition exhibit lower interest margins and loan growth, shift operations towards greater reliance on non-interest sources of income, and place greater emphasis on cost-cutting measures. Consistent with competition pressuring banks to lower underwriting standards, new loans made by banks confronting relatively higher perceived competition exhibit higher future loan charge-offs. Further, higher competition is associated with banks arranging syndicated loans for riskier borrowers, reducing the number of covenants in loan contracts and setting interest spreads that are less sensitive to borrowers' default risk. Competition is also shown to influence accounting choices, where the timely recognition of expected loan losses is shown to decrease with perceived competition. Finally, higher competition is associated with individual banks facing a higher risk of severe balance sheet contraction and contributing more to system-wide risk.

1. Introduction

How competition affects firm performance is a central question of economics. While the forces of competition are fundamental to all sectors of an economy, an issue of particular interest to bank regulators and policy-makers is the potential link between bank competition and the financial stability of banks. That is, does bank competition promote financial stability or undermine it by creating incentives for excessive risk-taking?[1] A large body of prior research has failed to resolve this important question (e.g., Allen & Gale [2004], Claessens [2009], Beck et al. [2011]). Further, assessing the influence of bank competition on risk-taking behavior is of critical importance to financial analysts, credit rating agencies and investors who seek to forecast banks' future prospects. This task is perhaps more difficult in banking relative to other industries, given the wide-spread perception that banks are unusually opaque (Flannery and Kwan [2013]).

In this paper, we utilize a bank-specific measure that extracts a bank's perception of its competitive environment from a textual analysis of its 10-K filing (Li, Lundholm and Minnis, [2012]). The premise is that bank managers' perceptions of their competitive environments significantly influence their operating and risk-taking decisions. We show that the perceived competition measure is related to future operating performance and banks' decisions with respect to pursuing non-interest sources of income, choosing the riskiness of loan portfolios, and designing loan contracts in ways that suggest it captures real competitive forces exerting pressure on banks. We find that competition also influences banks' accounting choices, documenting that higher perceived competition is associated with less timely recognition of expected loan losses. Finally, we provide evidence that competition impacts bank stability, showing that higher

[1] In the wake of the recent financial crisis a number of experts have argued that competition among banks was a major driver of the crisis. For example, Joseph Stiglitz notes that the Gramm-Leach-Bliley Act of 1999 helped to create the crisis. This act was intended to "enhance competition in the financial services industry" by removing the remaining barriers preventing the merger of banks, stock brokerage companies, and insurance companies that were originally enacted as part of the Glass-Steagall Act of 1933. See: http://abcnews.go.com/print?id=5835269

competition is associated with individual banks having a higher risk of severe balance sheet contraction and contributing more to systemic risk.

A large body of prior research measures bank competition using industry concentration measures, such as Herfindahl indices. The use of industry concentration to capture competition generally relies on the structure-conduct-performance hypothesis, which predicts that there is an increasing relationship between the level of market concentration and market power. However, it is not clear whether market structure determines bank behavior or market structure is the result of performance (e.g., Shaffer [1993], Claessens & Laeven [2004], Berger et al. [2004]). Further, concentration measures only capture "industry" structure and do not consider potential entry or existing competition from outside the defined industry. This is particularly important in banking settings where banks face significant competition from non-banks comprising the shadow banking system.

The literature also directly estimates deviations from a competitive equilibrium by examining relationships between output and input prices. Included here are the Panzar-Rosse H-statistic and the Lerner Index (e.g., Claessens & Laeven [2004], Bikker and Spierdijk [2007], Beck et al. [2011]), among others. While circumventing certain limitations associated with concentration, these measures face estimation and interpretation challenges.[2] For example, the H-statistic requires the strong assumption that the market is operating in equilibrium to provide correct inferences, and estimates of the H-statistic are sensitive to the empirical specification used (e.g., Bikker et al. [2012]). Overall, there is no consensus on a single correct way to measure competition (Beck [2008]).

[2] The Panzar-Rosse H-statistic is difficult to estimate at the bank level due to data limitations, and so is typically estimated at the industry level. The Lerner Index can be computed at the bank level by combining bank-specific measures of operating income with marginal costs computed using industry-level estimates of cost function parameters. See Appendix A for a description of these measures and how we estimate them.

In this paper, we contribute to the literature by investigating whether information contained in annual 10-K filings can be utilized to produce a measure that can serve as a useful complement to existing measures of competition in investigating the impact of competition on bank decision-making and stability. We follow the method outlined in Li et al. [2012] and employ textual analysis to exploit the SEC's recommendation that firms include a discussion of their competitive position within the annual 10-K filing. The measure produced incorporates managers' perceptions of the competitive environment facing their particular bank in any given year, and allows for differences in competition across banks within a year, and for competition to vary for individual banks across years. We show that our financial statement-based measure of competition possesses significant, incremental explanatory power in that all results in our paper hold *after* controlling for traditional measures of bank competition (i.e., Herfindahl, H-Statistic and Lerner Index).

Li et al. [2012] focus on non-financial firms and provide substantive evidence that managements' discussion of their competitive environments in the 10-K captures valuable information about the actual competitive pressures that they are facing. In particular, they find that, consistent with a central tenet of competition, more discussion of competition by management is associated with a faster rate of diminishing returns on both new and existing investment.[3] We complement Li et al. [2012] by providing evidence that their method for measuring competition extends to capturing competitive pressures facing managers in the financial sector. We also extend Li et al. [2012] substantially by using the competition measure based on their method to perform a textured analysis of how bank competition impacts key aspects of banks' operational decision-making and bank stability.

[3] Li et al. [2012] results show that managements' disclosures regarding their competitive environment consist of much more than boilerplate disclosures. They also provide some evidence that the results in their paper are not driven by strategic disclosure incentives of firm managers.

We begin the assessment of the construct validity of our measure by correlating it with traditional measures of bank competition (i.e., Lerner Index, Herfindahl, and H-Statistic). While our measure is related to these traditional proxies, there is substantial variation unrelated to the traditional measures. This unrelated variation may capture detailed aspects of the competitive environment known to bank managers and reflected in their 10-K discussions, but not fully captured in the traditional measures due to researchers' inability to accurately define the sources of competition across all dimensions (e.g. potential entrants, shadow banking, different product markets, geographic areas, etc.). We also show that higher competition as measured by our bank-specific measure is associated with important manifestations of highly competitive environments including lower net interest margins, loan growth and rates charged on loans, and with higher funding costs.

Two competing hypotheses on the relation between bank competition and financial stability have emerged in the literature. The competition-fragility hypothesis views banks as choosing the risk of their loan portfolios, positing that highly competitive environments create downward pressure on bank profits, which in turn creates incentives for banks to take excessive risks (e.g., Keeley [1990]). In contrast, the competition-stability hypothesis views borrowers as choosing the riskiness of investments undertaken with bank loans. The model in Boyd and De Nicolo [2005] suggests that banks unfettered by competition will set high interest rates on loans. As a result, borrowers facing these high interest rates will invest in riskier projects, resulting in a higher probability of loan default and increased bank fragility.[4] Wagner [2010] argues that, while borrowers may determine the riskiness of their firms, it is banks who decide how much risk they ultimately want to take on. Wagner [2010] extends Boyd and De Nicolo [2005] by also

[4] Martinez- Miera and Repullo [2010] extends Boyd and De Nicolo [2005] by allowing for imperfect correlation in loan defaults, showing that the relationship between competition and risk is U-shaped. Hence, the impact of an increase in competition can go either way, depending on other factors.

allowing for banks to select among different types of borrowers, showing that a bank may find it optimal to switch to financing riskier projects, thus overturning the Boyd and De Nicolo [2005] result. A central objective of our paper is to examine how perceived competition, as measured using data from banks' financial reports, impacts bank managers' operational decision-making, particularly with respect to their risk choices.

We first examine whether banks respond to competitive pressure by increasing their reliance on non-interest sources of revenue. A number of papers have found that bank risk, measured in various ways, is higher for banks who earn a higher proportion of their profits from non-interest income relative to interest income (e.g., Stiroh [2004], Demirguc-Kunt and Huizinga [2010], Brunnermeier et al. [2012]). We find that banks facing relatively higher competition seek out alternative sources of revenue as captured by a higher proportion of revenues deriving from non-interest sources. We also find that banks facing higher competition seek to increase operational efficiency as reflected in improved efficiency ratios and burden rates.[5]

As competition increases pressure on profits, potentially lowering a bank's charter value, the bank's owners rationally increase the risk of its chosen asset portfolio (e.g., Keely [1990]). Extensive anecdotal evidence suggests that bank managers alter the risk level of their asset portfolios through modifications to their underwriting standards.[6] Accordingly, we investigate whether underwriting standards are declining in the level of the bank's perceived competitive environment. A potential implication of lower underwriting standards due to competition is that new loans issued by the bank will embed lower credit quality that will be reflected in poor future

[5] The burden rate is computed as non-interest expense minus non-interest income divided by lagged total assets, while the efficiency ratio is non-interest expense divided by the sum of net interest income and non-interest income. Smaller burden rates and efficiency ratios indicate that the bank is operating more efficiently with respect to overhead costs (i.e. non-interest expenses).

[6] For example, the 2012 Survey of Credit Underwriting Practices conducted by the Office of the Comptroller of the Currency (OCC) indicates that competition is the most prevalent reason that lenders ease their underwriting standards (Refer to Figures 3 and 4 of the survey at: http://www.occ.treas.gov/publications/publications-by-type/survey-credit-underwriting-practices-report/pub-survey-cred-under-2012.pdf).

performance of these loans. Consistent with this implication, we show that the observed loan growth of banks facing higher competition is associated with higher future loan charge-offs relative to loan growth of banks facing lower competition.

We then drill down deeper on this issue by examining the characteristics of borrowers and loan contracts for which the bank serves as lead arranger in the syndicated loan market. We find evidence that the credit quality of borrowers as measured by Altman's Z and expected default frequency at the time of loan origination is decreasing in the competitiveness of the bank's operating environment (e.g., Broecker [1990]). Further, we find that the interest spread charged on a loan is less sensitive to a borrower's credit quality as the level of competition increases (e.g., Boot & Thakor [2000]).[7] Finally, we show that banks write less restrictive loan contracts in competitive environments where the number of covenants attached to new loan originations is decreasing in the bank's level of competition (e.g., Allen et al. [2011]). Overall, these results combine to suggest that banks relax underwriting standards as managers' assessments of their competitive environments increase (e.g., Gorton and He [2008]).

Having established a connection between a bank's level of competition and the risk choices of bank managers, we next examine the extent to which competitive pressure creates incentives for managers to exploit available accounting discretion to manage loan loss accruals.[8] We find that the extent to which banks delay the recognition of expected loan losses in their loan loss provisions is increasing in the bank's competitive environment. However, we also find that this earnings management is partially offset when the bank is audited by a Big 5 auditor (e.g., DeAngelo [1981]).

[7] A result of Boot & Thakor [2000] is that price competition among lenders causes the rents earned from both relationship and transaction lending to decrease. Thus, while a borrower's credit quality remains constant, the compensation received by the winning lender is reduced.

[8] We examine banks' accrual choices in regards to their recorded loan loss provision. We select this particular accrual choice as prior research has provided evidence that management has significant discretion over this accrual which they can use to manage earnings (e.g., McNichols & Wilson [1988]).

While we have shown a strong association between competition and increased risk-taking and earnings management by banks, it does not necessarily imply that competition causes banks to be less stable. It is possible that banks facing more competition hold more capital or hedge more, thus compensating for the higher risk that they are taking (Schaeck and Cihak [2010], Berger et al. [2009]). Our final two analyses investigate how financial stability is impacted by a bank's competitive environment. We find that a bank's level of competition is positively associated with its risk of suffering a severe balance sheet contraction. Further, we identify a positive relationship between a bank's level of competition and its marginal contribution to the systemic risk of the financial system. Thus, our results suggest that a bank is not only at a greater risk of individual contraction as a result of operating in a highly competitive environment, but the risk it presents to the entire banking system is also increasing in the level of competition.

The paper makes several contributions to the literature. Overall, we show that the competition measure based on the Li et al. [2012] method has significant explanatory power beyond the traditional measures of bank competition, and can serve as a useful complement to the existing measures. Because the Li et al. [2012] measure derives from the point of view of a bank's decision-makers, it is plausible that this point of view colors the actual decisions made by the bank's managers. We demonstrate the power of the measure by performing a textured analysis of how bank competition impacts future operating performance and banks' decisions with respect to pursuing non-interest sources of income, choosing the riskiness of loan portfolios, and designing loan contracts. We also extend the literature by providing evidence that competitive pressure creates incentives for bank managers to delay recognition of expected loan losses. This is an important result, as prior banking research has shown that delaying expected

loss recognition has important implications for credit supply (Beatty and Liao [2011]); bank risk shifting (Bushman and Williams [2012a]); and balance sheet contraction risk and systemic risk (Bushman and Williams [2012b]). Finally, we are the first to directly test the effects of competition on individual banks' contributions to systemic risk.

The remainder of the paper proceeds as follows. Section 2 discusses precisely how we construct our measure of competition and provides some descriptive evidence bearing on its construct validity. Section 3 examines bank competition and operational decision-making. Section 4 examines bank competition and accounting choices. Section 5 investigates bank competition and the risk characteristics of banks. Section 6 concludes.

2. Measuring and Calibrating Bank Competition

2.1 Measuring Bank Competition

A vast extant literature examines economic consequences of bank competition. This literature has employed a wide range of different measures to capture the level of competition. As discussed in the introduction, this includes measures of industry concentration (e.g., Herfindahl indices) and measures based on observed relations between banks' output prices and input prices (e.g., Panzar-Rosse H-statistic, Lerner Index). However, each measure of competition faces its own set of estimation and interpretation challenges, resulting in little consensus as to the best way to measure bank competition.[9] Recent research posits that no single measure is likely to reflect all aspects of the competitive environment and adopts a multi-pronged approach that uses a range of competition measures (Demirguc-Kunt et al. [2010]).

We contribute to the banking literature by introducing a new measure of competition which purports to capture a bank's own subjective view of its competitive environment using

[9] Berger et al. [2004] describes the evolution of the literature in some depth.

management's discussion of competition found in the 10-K. The fundamental premise is that managers' perceptions of the competitive environment will directly influence their operating and risk-taking decisions. To the extent this premise is true, our measure of a bank's perceived competitive environment (*BPCE*) should be a powerful measure with which to investigate how bank managers' future operational decisions are conditioned by current competitive pressures on the bank. Note that *BPCE* requires no equilibrium assumptions, and can directly capture the impact of competition from existing domestic banks, potential entrants, foreign banks and non-bank competitors. The fact that it is easily computed for each bank, each year allows for differences in competition across banks within a year, and for competition to vary for an individual bank across years.

Following Li et al. [2012], we compute *BPCE* using textual analysis of the firm's 10-K filing.[10] Specifically, we count the number of occurrences of the words "competition, competitor, competitive, compete, competing," including those words with an "s" appended. We remove all cases where the words "not", "less", "few", or "limited" precedes our competition words by three or fewer words. Given the count nature of our metric, we control for the length of the 10-K by the total number of words in each bank's 10-K, resulting in the following bank-year measure of competition:

$$BPCE = \frac{\#CompWords}{\#TotalWords},$$

where *#CompWords* is the number of occurrences of competition words found in the bank's 10-K and *#TotalWords* is the total number of words in the bank's 10-K. *BPCE* is computed on an annual basis for each bank in the sample. In our primary analysis we use quarterly data and so

[10] We thank Feng Li for helping us implement the textual analysis of the banks' 10-Ks.

we apply our annual *BPCE* measure to the four subsequent quarters.[11] To give more insight into the disclosures used to compute this measure, we include several examples of banks'10-K competition discussions in Appendix B.

While the *BPCE* measure basically accepts managers' 10-K discussions of competition at face value, it is possible that these discussions do not reflect managers' perceptions of competition, but instead are driven by bank managers' strategic disclosure choices that attempt to attribute past poor performance to competition. However, all results in the paper are robust to controlling for past performance using bank ROA and ROE, mitigating concerns that the competition disclosures are merely being used as a tool by management to blame past poor performance (unrelated to competition) on competition. We also include bank fixed effects in our empirical specification, thus controlling for bank specific characteristics such as managerial skill levels.

It is also possible that banks strategically shape their discussion of competition to influence the behavior of potential entrants, given for example, the state-level interstate branching deregulations in the U.S. between 1994 and 2005 (e.g., Rice and Strahan [2010]).[12] However, as we document later in this paper, high levels of *BPCE* reported today by banks are significantly associated with banks' future decisions including their lending to lower quality borrowers, charging lower interest spreads per unit of credit risk, and including less covenants in loan contracts. Thus, banks that report high competition are either currently experiencing high competition, or are strategically disclosing high competition to discourage entry that occurs despite their disclosures, resulting in higher competition in subsequent periods. We do not

[11] As an alternative specification we applied the *BPCE* measure to the same four fiscal quarters as the bank's reported 10-K. Results not reported are robust to this alternative specification.

[12] Li et al. [2012] use their multi-industry dataset to provide evidence that while there might be some strategic disclosure present, the documented relation between a firm's perceived competition and its rates of diminishing marginal returns on new and existing investment is not explained by strategic disclosure.

distinguish between these two alternatives. Further, we find that banks reporting higher levels of *BPCE* today more aggressively manage bank earnings *upward* by delaying recognition of expected loan losses. This behavior does not appear to be consistent with a strategy of deterring potential entrants.

2.2. Sample Selection; Properties and Construct Validity of BPCE

We gather our annual data for *BPCE* from Edgar (10-K filings) and our quarterly data primarily from Y9-C filings, Compustat, Dealscan and CRSP. Our sample is limited to commercial banks and bank holding companies (two digit SIC 60 - 62). We perform several different analyses as part of our study and include all bank-quarter observations that have all the necessary data components for the analysis of interest. We also eliminate quarters in which the bank was involved in an acquisition. The time period of our data spans 1996-2010. Depending on the analysis being performed, our sample ranges from approximately 6,500-19,400 observations.

We examine the construct validity of our *BPCE* measure by correlating it with five traditional measures of competition: Lerner Index (LI), Panzar-Rosse H-Statistic (*H-Stat*), and three separate Herfindahl measures based on total deposits, loans and assets.[13] Based on the nature of the measures, we expect the Panzar-Rosse H-Statistic to be positively associated with competition, while the Lerner Index and all three Herfindahl measures are predicted to be negatively associated with competition. Table 1 panel A reports the Spearman correlations revealing that *BPCE* is significantly correlated with each of the traditional measures in the predicted directions. However the correlations are not large, ranging from a minimum of 0.11 for the Lerner Index to a maximum of 0.23 for the loan Herfindahl. This suggests that while our

[13] See Appendix B for descriptions of the Lerner Index and Panzar-Rosse H-Statistic, and for details of how we estimated these variables in table 1. Herfindahl indices are computed by summing squared market shares across banks. Higher Herfindahl implies a more concentrated industry.

BPCE measure captures some of the same aspects found in prior metrics, it also contains significant variation not captured by the traditional metrics.

To further calibrate the *BPCE* measure, we correlate it with observable bank outcomes that are likely to be sensitive to the level of competition. Specifically, we examine correlation between *BPCE* and banks' net interest margins (*margin*), size (*size*), growth in loan portfolio (*LoanGrowth*), deposit rates (*DepositRates*) and loan rates (*LendingRates*). Table 1 panel B shows that our *BPCE* measure is negatively correlated with *Margin* (-0.346, p-value < 0.01) consistent with competitive pressure reducing the margins that banks earn from interest bearing activities. Further support is provided through the observed negative correlation with *LoanGrowth* and positive (negative) correlation with *DepositRates* (*LendingRates*).

To better understand the nature of *BPCE*, in Table 1 panel C we sort firms into quintiles based on *PBCE* in each year, and map the attrition of firms in each quintile over the subsequent 4-year period. Within the first year, we observe attrition within competition quintiles. For example, 61% of the banks ranked in the high competition quintile at time t are still ranked as high competition one year later. Further migration is observed as the percentage declines to 39%, 23% and 13% respectively, in 2, 3 and 4 years out. A similar pattern holds for banks ranked as low competition at time t. Interestingly, Panel C also provides evidence that there is relatively less attrition of firms in the extreme portfolios (approximately 12% remain in the extreme portfolios after 4 years) when compared to firms in the middle portfolio (range between 0.5-9.1%). Overall, the results suggest that a firm's *BPCE* is continuously evolving and that the persistence of a bank's BPCE is increasing in the extremity of the competition that they face.

3. *BPCE* and Bank Operational Decision-Making

3.1 BPCE and Operations

Our *BPCE* measure reflects managers' own subjective view of their bank's competitive environment, making it a potentially powerful measure with which to investigate how bank managers' future operational decisions are conditioned by current competitive pressures on the bank. In this section, we investigate three aspects of the bank's operations that are likely to be sensitive to competitive pressures. Consistent with the correlations found in Table 1, banks in competitive environments face narrowing margins as the average cost of funds increase and the average rates at which banks can lend decrease. To combat competition induced downward pressure on profitability, banks can seek to diversify into other non traditional revenue activities (revenue mix), cut costs (efficiency) or increase their lending volume through relaxed underwriting standards. Below, we investigate the relation between *BPCE* and each of these three channels that bank managers may use to combat competitive pressures.

In addition to a set of appropriate control variables, all empirical specifications include both bank and time fixed effects (borrower fixed effects also in the syndicated loan analyses). Including bank fixed effect provides a within bank design, alleviating concerns associated with the possibility that competition disclosures may be 'boiler plate' in some respects, and with the fact that we apply annual *BPCE* measure to the subsequent four quarters. The inclusion of time fixed effects controls for time specific outcomes that impact all banks. In particular, this controls for time variation in bank sector Herfindahl indices and Panzar-Rosse H-statistics, as these measures are computed each year for the entire banking sector. In contrast, the Lerner Index is computed for each bank each year, and so is not controlled out with time fixed effects. In untabulated analyses, we re-run all empirical specifications below including bank/year Lerner

indices as a control variable. All results reported below are robust to the inclusion of bank/year Lerner indices.

3.2 BPCE and Non-interest Income

In this section, we examine whether banks respond to competitive pressure in the loan market by aggressively seeking out non-interest sources of revenue. Non-interest sources of income include investment banking, venture capital and trading activities. Prior research has examined whether diversification is beneficial or detrimental to the risk of individual banks. Stiroh [2004, 2006] and Fraser et al. [2002] find that non-interest income is associated with more volatile bank returns. DeYoung and Roland [2001] find fee-based activities are associated with increased revenue and earnings variability. Brunnermeier et al. [2012] find that banks with higher non-interest income have a higher contribution to systemic risk than traditional banking. Examining international banks, Demurgic-Kunt and Huizinga [2010] find that bank risk decreases up to the 25th percentile of non-interest income and then increases, and De Jonghe [2010] finds non-interest income to monotonically increase systemic tail risk. We do not directly examine risk consequences of non-interest income streams, but rather focus on the extent to which high perceived competition drives banks to seek out alternative income sources.

We consider two measures of non-interest revenue: *RevMix*, defined as total non-interest revenue divided by interest revenue, and *FeeMix*, the total non-interest income minus deposit service charges and trading revenue divided by interest revenue We regress both of these measures on *BPCE* and other appropriate control variables using the following OLS specification, clustering standard errors by both time and bank to correct for possible time-series and cross-sectional correlation:

$$RevMixVariable_{t+1} = \beta_0 + \beta_1 BPCE_t + \beta_2 NonIntExp_t + \beta_3 Commercial_t + \beta_4 Consumer + \beta_5 RealEstate_t + \beta_6 Deposits_t + \beta_7 Mismatch_t + \beta_8 Tier1_t + \beta_9 Size_t + \beta_{10} ROA_t + TimeEffects + BankEffects + \varepsilon_{t+1} \quad , \quad (1)$$

where the dependent variable is either total revenue mix (*RevMix*) or fee revenue mix (*FeeMix*). We include *NonIntExp*, defined as total non-interest expense divided by interest revenue, to control for the total overhead carried by the bank. To control for the difference in loan portfolio composition, we include *Commercial, Consumer* and *RealEstate* defined as the percentage of commercial, consumer and real estate loans (respectively) relative to the bank's total loan portfolio. *Deposits,* defined as total deposits scaled by lagged loans, is included to control for differences in bank funding. Following Adrian and Brunnermier [2011], we include the bank's *Mismatch* ((Current liabilities – Cash)/Total liabilities) to control for the bank's reliance on short-term funding sources. The bank's tier 1 capital ratio (*Tier 1*) is included to control for differences in capital adequacy concerns. *Size,* which is defined as the natural logarithm of total assets*,* is included to control for size differences. The bank's return on book value of assets (*ROA*) is included to control for differences in profitability. We also include both time and bank fixed effects.

Note that an observed coefficient of $\beta_1 > 0$ is consistent with competition leading banks to change their mix of revenue sources by seeking out non-interest revenue activities. As reported in Table 3, the estimated coefficient on *BPCE* for *RevMix (FeeMix)* is 0.0153, p-value <0.01 (0.013, p-value < 0.01), indicating that banks operating in more competitive environments change their revenue mix as a way to differentiate themselves from competitors and supplement declining net interest margins.

3.3 BPCE and Cost Structure

An alternative mechanism that banks can use to deal with competitive pressures is to alter their cost structure. By more aggressively managing their costs, banks can become more efficient and create flexibility to compete in pricing while maintaining profitability (Demirguc-Kunt and Huizinga [1999]). We draw on two frequently used cost structure measures: *Burden* and the bank's efficiency ratio (*ER*). *Burden* is defined as non-interest expense minus non-interest income divided by total assets. A bank's efficiency ratio (*ER*) is computed as non-interest expense divided by the sum of net interest margin and non-interest income. Smaller *Burden* and *ER* indicate that the bank is operating more efficiently with respect to overhead costs (i.e. non-interest expenses).

Similar to our revenue mix analysis, we investigate the effects of competition on both *Burden* and *ER* in the following regression, clustering the standard errors by both time and bank to correct for possible time-series and cross-sectional correlation:

$$\begin{aligned} Burden(ER)_{t+1} = {} & \beta_0 + \beta_1 BPCE_t + \beta_2 Commercial_t + \beta_3 Consumer + \beta_4 RealEstate + \\ & \beta_5 Deposits_t + \beta_6 Mismatch_t + \beta_7 Tier1_t + \beta_8 Size_t + \\ & \beta_9 ROA_t + TimeEffects + BankEffects + \varepsilon_{t+1} \end{aligned} \quad . \qquad (2)$$

All variables are defined as above. Results in Table 3 report coefficients of -0.0002 (p-value < 0.01) and -0.0050 (p-value < 0.10) for *BPCE* in the *Burden* and *ER* regressions respectively. This suggests that banks facing high competition respond to the competitive pressures by altering their cost structure to become more efficient.

3.4 BPCE and Lending Characteristics

3.4.1 BPCE, Loan Growth and Future Charge-Offs

Consistent with the negative correlation between *BPCE* and lending rates found in Table 1 panel B, prior theoretical research suggests that competition can lead to price wars within the lending market (Boot & Thakor [2000]). To offset the decreased margins from loans in competitive environments, banks may attempt to increase their lending volume to maintain their profitability levels (Dell'Ariccia [2000]). Prior research suggests that this approach to loan growth generally leads to increased credit risk as the marginal borrower is of lower credit quality (e.g., Sinkey & Greenwalt [1991], Berger & Udell [2004], Laeven & Manjnoni [2003]). Banks can protect themselves against the additional credit risk of the borrower by correctly pricing the incremental credit risk and/or by including stricter restrictions on the borrower through the use of covenants (e.g., Graham et al. [2008]). However, banks that face highly competitive environments may relax these protection mechanisms in an attempt to maintain or increase their relative lending volume (e.g., Broecker [1990], Ruckes [2004]).

We investigate the lending effects of competition by first looking at the effect that competition has on the quality of a bank's loan growth. Specifically, we look at the effect of competition on the relation between *current* period loan growth and *future* charge-offs. To investigate this relation, we estimate the following model using data from Compustat and Y-9 reports, clustering the standard errors by both time and bank to correct for possible time-series and cross-sectional correlation:

$$\begin{aligned} LCO_{iT+n} = {} & \beta_0 + \beta_1 BPCE_{it} * LoanGrowth_{it} + \beta_2 BPCE_{it} + \beta_3 \Delta NPL_{it} + \beta_4 \Delta NPL_{it-1} + \beta_5 \Delta NPL_{it-2} + \\ & \beta_6 LoanGrowth_{it} + \beta_7 Size_{it} + \beta_8 Tier1_{it} + \beta_9 Consumer_{it} + \beta_{10} Commercial_{it} + \\ & \beta_{11} RealEstate + BankEffects + TimeEffects + \varepsilon_{iT+n} \end{aligned} \quad (3)$$

LCO is total loan charge-offs divided by total loans at time t over either the next 12 months (LCO_{12m}) or 24 months (LCO_{24m}). *Loan Growth* is defined as the percentage change in total loans over the quarter. *ΔNPL* is defined as the change in non-performing loans over the quarter, scaled by lagged total loans. All other variables are defined as above.

Results from the estimation of (3) are reported in Table 4. The key result is that the interaction between *BPCE* and *Loan* Growth is positive and significant for future loan charge offs over the following 12 and 24 month periods. This is consistent with banks responding to stiff competition by lending to lower quality borrowers in an effort to maintain loan volume. Table 4 also reveals significant associations between other variables included in our model and future charge-offs over both of the horizon periods. Consistent with our expectations, we find that changes in future loan charge-offs are positively impacted by prior changes in the bank's non-performing loans.

3.4.2 BPCE and Borrower Risk

To better understand how competitive pressure impacts the loans entered into by the bank, we investigate characteristics of actual lending contracts. Specifically, we use loan contracts from Dealscan in which the bank serves as the lead arranger. We hand match the deal information to lender and borrower data in Compustat as well as the YC-9 reports. We follow Chava & Roberts [2008] and Murfin [2012] in our hand matching procedures. Because many of our variables of interest are measured at the package level, we run each of our analyses at that level. When measuring interest spread, we take the average spread over all facilities within the given package.[14]

Our analysis is designed to understand how a bank manager's perception of his bank's competitive environment impacts the bank's underwriting standards. In reference to commercial

[14] In untabulated results we also us the Max spread in the package instead of the mean and results are robust.

loans, Section 2080.1 of the Federal Reserve's Commercial Bank Examination Manual notes that *"[s]ince lenders are subject to pressures related to productivity and competition, they may be tempted to relax prudent credit underwriting standards to remain competitive in the marketplace, thus increasing the potential for risk."* Lenders seemingly confirm this relationship as their responses to the Federal Reserve's quarterly Senior Loan Officer Opinion Survey on Bank Lending Practices regularly identify competition as the primary reason for having eased underwriting standards during the quarter.[15]

The three underwriting standards that we examine are: (1) the quality of borrowers as measured by their risk of default, (2) loan pricing sensitivity to the borrowers' level of risk, and (3) covenant restrictions. To examine whether banks make loans to riskier borrowers in response to increased competition, we compute each borrower's *Z-Score* using Altman's original weighting factors (Altman [1977]), and the borrower's estimated default frequency (*EDF*) as described by Bharath & Shumway [2008]. We also use an indicator variable *ExtremeZ*, that is set equal to 1 if the borrower's *Z-Score* indicates that the firm is in distress at the time of loan origination.[16] We estimate the following pooled regressions with bank, borrower, and year fixed effects, clustering the standard errors by both time and bank to correct for possible time-series and cross-sectional correlation.

$$\begin{aligned} BorrowerRisk_t = {} & \beta_0 + \beta_1 BPCE_t + \beta_2 Lender\ Tier1_t + \beta_3 Lender\ Size_t + \beta_4 Borrower\ Size_t + \\ & \beta_5 Revolver_t + \beta_6 Amount_t + \beta_7 Maturity_t + \beta_8 Spread_t + \beta_9 \#Covenants + \\ & BankEffects + BorrowerEffects + TimeEffects + \varepsilon_t, \end{aligned} \tag{4}$$

[15] For example, the summary included in the July 2012 survey indicates that "[a]lmost all domestic banks that reported having eased standards or terms on C&I loans continued to cite more aggressive competition from other banks and nonbank lenders as a reason." The individual responses in support of this statement are tabulated as part of Question 3, Part B of the survey (http://www.federalreserve.gov/boarddocs/snloansurvey/201208/default.htm.) Also, as noted in footnote 5, the survey conducted by the OCC provides similar support for this relationship.

[16] Z-scores lower than 1.81 are considered to be in a "distress" zone whereas Z-Scores greater than 2.99 are deemed to be "safe" and Z-scores in between 1.81 and 2.99 are said to be in a "grey" zone.

BorrowerRisk is defined as *Z-Score, EDF* or *ExtremeZ*. *Lender Tier 1* is defined as the lender's reported tier 1 capital prior to the date of the loan. *Lender* (*Borrower*) *Size* is the reported natural logarithm of total assets of the lender (borrower) prior to the date of the loan. *Revolver* is an indicator variable if the loan includes a revolver. *Amount* is the natural log of the package amount. *Maturity* is the number of months to maturity. *Spread* is measured as the basis points over LIBOR charged on the loan, and is computed by averaging over all loan facilities within a syndicated loan package. *#Covenants* is the number of financial covenants associated with the package. We use OLS to estimate (4) when using *Z-Score* and *EDF* as the dependent variable. However, we use a probit model to estimate (4) when *ExtremeZ* is used as the dependent variable for borrower risk.

Table 5, panel A reports the results from the estimation of (4). Columns 1 and 2 in Table 5 panel A indicate that the average borrower's level of risk is increasing in the level of competition faced by the bank. Further, Column 3 indicates that the probability that a borrower is in distress at the time of loan origination is also increasing in the level of competition faced by the bank.[17] Thus, Column 3 provides evidence that the result from Columns 1 and 2 is not entirely driven by the bank granting credit to borrowers that are closer to crossing over the distress threshold. Rather, these results provide evidence that the bank is increasing its lending to borrowers that are already below the threshold, borrowers that are in financial distress at the time the loan is originated. Our results are both statistically and economically meaningful as the marginal effect of a one standard deviation change in *BPCE*, holding the other variables at their

[17] Because our probit model includes substantial fixed effects in a fixed panel set, the coefficients reported are potentially biased or inconsistent (e.g., Greene [2004]). Accordingly, we also run this model using OLS and find that the signs and statistical significance of our variable of interest is robust to the use of a linear probability model.

mean values, is associated with nearly a 5% change in the probability that a borrower is already in distress at the time of loan origination.

3.4.3 BPCE and Pricing Borrower Risk

Having shown that banks issue credit to riskier borrowers as a result of increased competition, we next examine whether competition also impacts how banks price the risk of the borrower. In the face of competitive pressures, banks may reduce the sensitivity of interest spreads to risk to maintain their lending volume (Broecker [1990]).[18] To examine this conjecture, we estimate the following OLS pooled regressions with bank, borrower, and year fixed effects, clustering the standard errors by both time and bank to correct for possible time-series and cross-sectional correlation.

$$\begin{aligned} Spread_t = {} & \beta_0 + \beta_1 BPCE_t * BorrowerRisk_t + \beta_2 BPCE_t + \beta_3 Lender\,Tier1_t + \beta_4 Lender\,Size_t + \\ & \beta_5 BorrowerRisk_t + \beta_6 BorrowerSize_t + \beta_7 Revolver_t + \beta_8 Amount_t + \\ & \beta_9 Maturity_t + \beta_{10} \#Covenants_t + BankEffects + BorrowerEffects + \\ & TimeEffects + \varepsilon_t \end{aligned} \tag{5}$$

Spread is measured as the basis points over LIBOR charged on the loan, averaged over all loans in a loan package. We again use three measures of the borrower's risk (*BorrowerRisk*); *Z-Score, EDF, and ExtremeZ.* All other variables are as defined earlier.

The results from estimating equation (5) are included in Table 5, panel B. The main effects relating to how a borrower's risk level (*Z-Score, EDF, ExtremeZ)* impacts loan pricing are all statistically significant and consistent with our predictions where higher borrower risk

[18] We review every annual Survey of Credit Underwriting Practices conducted by the OCC during our sample period and find that the spread is the mechanism most frequently relaxed when more lenders report having eased underwriting standards than tightening them. Covenants is indicated as the second most frequently relaxed mechanism during these periods and will be examined as part of the Section 3.4.4 of this paper.

leads to larger spreads. Meanwhile, our variable of interest relates to the interaction of these borrower variables with the lender's level of competition. We find that each of these interactions is directionally consistent with our predictions and that two of the three measures (*Z-Score* and *ExtremeZ*) are statistically significant. These findings combine with those of panel A to suggest that competitive environments not only result in banks lending to riskier borrowers, but that banks also appear willing to receive less compensation per unit of risk when faced with increased competition.

3.4.4 BPCE and Loan Restrictions

As a final characteristic of contracting, we examine whether a bank's competitive environment impacts the number of covenants embedded in the loan deals that it arranges. Berlin & Mester [1992] suggest that the lender's ability to monitor the loan is increasing in the number of restrictions that it attaches to the loan. However, an increased number of restrictions attached to the loan may reduce the attractiveness of the arrangement from the borrower's perspective (Dell' Ariccia [2000]). Therefore, banks facing a highly competitive environment may relax the restrictions placed on loans in an effort to increase loan volume for the bank. We test this conjecture by estimating the following OLS pooled regressions including bank, borrower, and year fixed effects, clustering the standard errors by both time and bank to correct for possible time-series and cross-sectional correlation.

$$\begin{aligned} \#Covenants_t = {} & \beta_0 + \beta_1 BPCE_t + \beta_2 Lender\,Tier\,1_t + \beta_3 Lender\,Size_t + \beta_4 BorrowerRisk_t + \\ & \beta_5 Borrower\,Size_t + \beta_6 Revolver_t + \beta_6 Amount_t + \beta_8 Maturity_t + \beta_9 Spread_t + \\ & BankEffects + BorrowerEffects + TimeEffects + \varepsilon_t \end{aligned} \qquad (6)$$

#Covenants is our proxy for the activity restrictions associated with the loan and is measured as the total number of financial covenants at the time of origination. All other variables in (6) are as defined previously.

Panel C of Table 5 reveals that the number of covenants attached to loans is decreasing in the lender's competitive environment. This finding is consistent with Skinner [2011] who conjectures that one potential reason that so few covenants are included in debt agreements is due to the "nature of competition in debt markets". To the extent that *#Covenants* captures how restrictive the loan terms are for the borrower, this result provides evidence that banks are willing to relax the restrictiveness of loans when facing increased competition. Results in panel C combine with the evidence provided in Panels A and B of Table 5 to show that banks relax their underwriting standards as they face high levels of competition. While prior analytical literature has modeled this relationship (e.g., Dell'Ariccia [2000], Gorton & He [2008]), we believe that this paper provides the first evidence on a large sample that the lender's level of competition has a significant effect on the characteristics of the contract. Further, these findings provide a mechanism through which bank managers increase the risk of their asset portfolios when faced with high levels of competition as hypothesized by the competition-fragility view of banking. Finally, these results also provide a better understanding as to why competition negatively affects the relationship between current loan growth and future charge-offs.

4. Accounting Decisions

4.1 BPCE and Accounting Decisions

In this section, we examine the extent to which competitive pressure creates incentives for managers to exploit available accounting discretion to manage loan loss accruals. Beatty and Liao [2011] and Bushman and Williams [2012a, b] show that there are cross-sectional differences in the recognition of expected losses in the loan loss provision, with some banks delaying expected losses to future periods. Such a delay provides the current benefits of higher profitability at the expense of lower expected future profitability. In a competitive environment, banks may feel pressure to report strong earnings.[19] To combat the downward pressure on profits, banks may have an incentive to delay the recognition of expected losses. We conjecture that this behavior will lead to competition reducing the timeliness of banks' expected loss recognition.

We test our conjectures that banks use their discretion over the loan loss provision to delay expected loss recognition as competition increases by estimating the following model, clustering standard errors by both bank and time:

$$\begin{aligned} LLP_t = {} & \beta_0 + \beta_1 BPCE_t * \Delta NPL_{t+1} + \beta_2 BPCE_t + \Delta NPL_t + \beta_3 BCE_t + \\ & \beta_4 \Delta NPL_{t+1} + \beta_5 \Delta NPL_t + \beta_6 \Delta NPL_{t-1} + \beta_7 \Delta NPL_{t-2} + \beta_8 Ebllp_t + \beta_9 LoanGrowth_t + \\ & \beta_{10} Size_{t-1} + \beta_{11} Tier1_{t-1} + \beta_{12} Consumer_{t-1} + \beta_{13} Commercial_{t-1} + \beta_{14} RealEstate_{t-1} + \\ & BankEffects + TimeEffects + \varepsilon_t \end{aligned} \tag{7}$$

LLP is defined as loan loss provisions scaled by lagged total loans. *ΔNPL* is defined as the change in non-performing loans over the quarter scaled by lagged total loans. *Ebllp* is defined as

[19] David Walker, Chairman of Barclays, noted that "making quick returns and keeping abreast of competition overtook old fashioned integrity" in his address to British lawmakers as part of their 2012 inquiry into banking standards. Retrieved from (http://articles.chicagotribune.com/2012-09-12/news/sns-rt-banks-britain-update-2l5e8kc6vy-20120912_1_british-bank-barclays-barclays-boss-barclays-chairman.)

earnings before loan loss provisions and tax scaled by lagged total loans. All other variables have been defined previously.

To capture timeliness of expected loan loss recognition, we follow prior research and focus on both the β_4 and β_5 coefficients, where larger values of β_4 and β_5 are indicative of more timely loss recognition (i.e., current loan loss provisions are more sensitive current and future changes in non-performing loans). We then test the effect of competition on the timeliness of a bank's loss recognition by examining the β_1 and β_2 coefficients. As competitive pressures reduce a bank's margins, its incentive to increase profits by delaying its expected losses into future periods is escalated. We conjecture that such pressures will result in $\beta_1 < 0$ and $\beta_2 < 0$ as banks choose to delay the losses until future periods.

Results from the estimation of (7) are reported in Table 6 panel A. Consistent with our conjectures, we find that banks' accrual choices are a function of competition. Specifically, we find that $\beta_1 < 0$ and $\beta_2 < 0$, consistent with decreased timeliness in their recognition of expected losses. These findings suggest that banks use accounting choices to buoy up profits and mask the increased risk of their asset portfolios (Table 4 and 5). This is an important result, as prior banking research has shown that delaying expected loss recognition has important implications for credit supply (Beatty and Liao [2011]); bank risk shifting (Bushman and Williams [2012a]); and balance sheet contraction risk and systemic risk (Bushman and Williams [2012b]).

While competition may increase the pressure on management to manipulate financial reporting, external monitoring may mitigate such pressures. Prior research suggests that auditors provide an external monitoring mechanism that can mitigate opportunistic earnings management (e.g., Watts [1977]). Prior literature also suggests that audit quality is not uniform; specifically Big 5 auditors are thought to monitor and discipline behavior more aggressively than non-Big 5

auditors (e.g., DeAngelo [1981]). As competitive pressure builds to manage earnings, effective auditors should provide resistance to managements' efforts to engage in this type of behavior. To examine the effects of external monitoring we examine whether the presence of a Big 5 auditor mitigates the earnings management effects resulting from the lender's competitive environment. Accordingly, we modify the prior equation to include both an indicator variable representing whether the bank was audited by a Big 5 auditor as well as interactions of the Big 5 variable with each of the variables of interest from Panel A.

Our findings are included as Panel B of Table 6. The results are consistent with the presence of a *Big 5* auditor moderating the effects of competition on the use of accounting discretion. Specifically, the positive coefficients of 0.05 (p-value < 0.05) and 0.0458 (p-value < 0.10) on the interaction of *Big5* with $BPCE*\Delta NPL_t$ and $BPCE*\Delta NPL_{t+1}$, respectively, suggest that the presence of a Big 5 auditor helps to improve the timeliness of loss recognition. While these auditors appear to have a mitigating effect on earnings management, the presence of *Big 5* does not fully offset the effects of competition on accounting choices.

5. Bank Competition, Bank Stability and Systemic Risk

5.1 Bank Competition, Bank Stability and Systemic Risk

The question of whether competition increases or decreases the stability of the banks and the financial system has been of interest to both regulators and policy makers alike (e.g. Allen and Gale [2004]). Results presented above suggest that competition alters both the operational decisions as well as the accounting choices of the bank. From the operational perspective, banks respond to competitive pressures by taking on a more risky portfolio through both lending to higher risk borrowers and by relaxing credit standards. While we have shown a strong

association between competition and increased risk-taking and earnings management by banks, this does not necessarily imply that competition causes banks to be less stable. It is possible that that banks facing more competition may hold more capital or hedge, thus compensating for the higher risk they are taking (e.g., Schaeck and Cihak [2010], Berger et al. [2009]).

In this section, we investigate how financial stability is impacted by a bank's competitive environment. First, we investigate associations between *BPCE* and balance sheet contraction risk at the individual bank level. Following Adrian and Brunnermeier [2011] we analyze a bank's value-at-risk (*VaR*) with respect to the distribution over changes in market-valued total bank assets. Estimated *VaRs* allow us to compare the potential for severe balance sheet contraction across banks.

In addition to increased balance sheet contraction risk, competition induced behavior may also lead to increased contributions to systemic risk. As competitive pressures lead banks to adopt similar operational and accounting strategies, those banks under high competition may behave as a herd as both the operational and accounting strategies produce coordinated behavior across otherwise independent banks. It is this herd-type behavior that leads these banks to contribute more to systemic risk. To investigate this idea, we estimate how competition impacts the contribution of individual banks to the asset contraction risk of the *entire* banking system. We capture the sensitivity of the banking system's asset contraction risk to an individual bank using the *CoVaR* construct from Adrian and Brunnermeier [2011], defined as the *VaR* of the banking system *conditional* on the financial distress of an individual bank.

5.2 Balance Sheet Contraction Risk (VaR) and Competition

Following prior research (Adrian and Brunnermier [2011], Bushman and Williams [2012b]) we measure the risk of balance sheet contraction using the bank's value-at-risk (*VaR*).

We estimate *VaR* with respect to the distribution over percentage changes in market-valued total bank assets. Let X^i represent the percentage change in a bank *i*'s total assets, and *q* represent a given probability threshold. VaR_q^i is then defined implicitly as

$$probability(X^i \leq VaR_q^i) = q \,.$$

We use quantile regression to estimate time varying *VaR*s. With quantile regression, the predicted value for a given quantile (*q*%) can be interpreted as the expected outcome, in our case balance sheet contraction, at the given quantile, making it straightforward to estimate time-varying *VaR*.

Following prior research, we first compute each bank's weekly percentage change in market-valued total assets (*MVA*), defined as:

$$X_t = \frac{MVA_t - MVA_{t-1}}{MVA_{t-1}} = \frac{(MTB_t * BVA_t) - (MTB_{t-1} * BVA_{t-1})}{MTB_{t-1} * BVA_{t-1}}. \qquad (8a)$$

MTB is the weekly market to book ratio and *BVA* is the weekly book value of assets. Because book value of equity and book value of assets are only reported on a quarterly basis, we linearly interpolate the book value over the quarter on a weekly basis.

To compute time-varying *VaR* at the *q*-percentile, we estimate the following quantile regression over the bank's full weekly time series, requiring a minimum of 260 observations:

$$X_t^i = \alpha^i + \beta^i M_{t-1} + \varepsilon_t^i \,. \qquad (8b)$$

M in (8b) is a vector of macro state variables including: 1) *VIX,* which captures the implied volatility of the S&P 500 reported by the CBOE. 2) *Liquidity Spread*, defined as the difference

between the 3-month general collateral repo rate and the 3-month bill rate. *Liquidity Spread* is a proxy for short-term liquidity risk in market. We obtain the repo rates from Bloomberg and the bill rates from the Federal Bank of New York. 3) The change in the 3-month T-Bill rate (*Δ3T-Bill*), as it predicts the tails of the distribution better in the financial sector than the level. 4) Δ*Yield Curve Slope*, measured as the yield spread between the 10-year Treasury rate and the 3-month rate. 5) *ΔCredit Spread*, defined as change in the spread between BAA-rated bonds and the Treasury rate with the same 10-year maturity. 6) The weekly value weighted equity market return (Ret_{Mrkt}) and 7) the weekly real estate (SIC code 65-66) sector return in excess of the market return (Ret_{Estate}). The 3-month T-Bill, 10-year Treasury, and spread between BAA-rated bonds and Treasuries are obtained from the Federal Reserve. The market returns are from CRSP. Our conditional weekly time-varying *VaR* at the *q*-percentile is computed as follows, where the coefficients are the estimates from equation (8b):

$$VaR^{i}_{q\%,t} = \hat{\alpha}^{i} + \hat{\beta}^{i} M_{t-1} \,. \tag{8c}$$

We compute a quarterly *VaR* by summing up the weekly $VaR_{q\%}$.

Our first measure of balance sheet contraction risk is the 1% quantile *VaR*. More negative values of $VaR_{1\%}$ indicate the bank has a higher value at risk. Our second measure is the distance from $VaR_{50\%}$ *to* $VaR_{1\%}$, which we term ΔVaR_{Left}. ΔVaR_{Left} captures the expected change in asset change rates when a bank moves from the median state to a distressed state. Larger values of ΔVaR_{Left} indicate that the bank's distribution has a longer left tail. Our third measure ΔVaR_{Right} is the distance from $VaR_{50\%}$ *to* $VaR_{99\%}$ this captures the expected change in asset change rate when a bank moves from the median state to a good state. Larger values of ΔVaR_{Right} indicate that the bank's distribution has a longer right tail.

Using these computed *VaR* variables we estimate the following regression clustering by both bank and time:

$$VaR_{q\%,t+1} = \beta_0 + \beta_1 BPCE_t + \beta_2 Trading_t + \beta_3 Commercial_t + \beta_4 Consumer_t + \beta_5 RealEstate + \beta_6 Mismatch_t + \beta_7 Deposits_t + \beta_8 RevMix_t + \beta_9 ROA_t + \beta_{10} Tier1_t + \beta_{11} Size_t + BankEffects + TimeEffects + \varepsilon_{t+1} \quad (9)$$

Trading is total trading assets divided by total assets, and all other variables were defined previously. Results from the estimation of (9) are reported in Table 7. Consistent with competition increasing the risk of balance sheet contraction, we find a coefficient on *BPCE* in the $VaR_{1\%}$ regression of -0.0627 (p-value < 0.01). Table 7 also provides evidence that while competition lengthens the left tail of the distribution over balance sheet changes, the rest of the distribution is not affected by competition. This suggests that while competition increases the downside risk there is no evidence that it increases the upside risk.

5.3 Systemic Risk and Competition

To investigate contributions of individual banks to systemic risk we use the *CoVaR* construct from Adrian and Brunnermeier [2011]. *CoVaR* is the *VaR* of the banking system conditional on the state of an individual bank, and Δ*CoVaR* captures the marginal contribution of a specific bank to systemic risk. To compute $\Delta CoVaR_q$ we estimate the following quantile regressions equations again using weekly data with *q*% = 1%.

$$X_t^i = \alpha^i + \beta^i M_{t-1} + \varepsilon_t^i \quad (10a)$$

$$X_t^{system} = \gamma_1 + \gamma_2 M_{t-1} + \gamma_3 X_t^i + \varepsilon_t^{system} \quad (10b)$$

Where X^i is bank i's weekly percent asset change rate, X^{system} is the value-weighted asset change rate from the index of all banks in the economy (excluding bank i), and M is the vector of macro state variable defined above. Equation (10a) is the same as equation (8b). Equation (10b) extends (10a) to a portfolio of banks and *conditions* the asset change rate of the portfolio of banks (X^{system}) on the individual bank i's asset changes (X^i).

We estimate (10a) and (10b), where (10a) is estimated at both $q\%$ = 1% and 50%, and (10b) at $q\%$ = 1%. Using the predicted values from (10a) and (10b) we specify

$$VaR^i_{q\%,t} = \hat{\alpha}^i + \hat{\beta}^i M_{t-1} \tag{10c}$$

$$CoVaR_{1\%,t} = \hat{\gamma}_1 + \hat{\gamma}_2 M_{t-1} + \hat{\gamma}_3 VaR^i_{1\% or 50\%,t}\ , \tag{10d}$$

$CoVaR_{1\%,t}$, equation (10d), is the system's time t *VaR* at $q\%$ = 1%, *conditional* on the *VaR* of the individual bank i being at either the 1% or 50% quantile. To capture the sensitivity of the system's conditional $VaR_{1\%}$ to bank i's events, we compute

$$\begin{aligned} \Delta CoVaR_t &= CoVaR_t^{i=VaR_{1\%}} - CoVaR_t^{i=VaR_{50\%}} \\ &= \hat{\gamma}_1 + \hat{\gamma}_2 M_{t-1} + \hat{\gamma}_3 (VaR^i_{1\%,t} - VaR^i_{50\%,t}) \end{aligned} \tag{10e}$$

We sum weekly $\Delta CoVaR$ to obtain a quarterly measure, where *more negative* values of $\Delta CoVaR_q$ indicates that a move of bank i from a median state of asset growth rates to a 'distressed' state produces a larger marginal contribution to overall systemic risk. After computing our measure of systemic risk ($\Delta CoVaR$), we estimate the following equation clustering again by both bank and time.

$$\Delta CoVaR_{1\%,t+1} = \beta_0 + \beta_1 BPCE_t + \beta_2 Trading_t + \beta_3 Commercial_t + \beta_4 Consumer_t + \beta_5 RealEstate + \beta_6 Mismatch_t + \beta_7 Deposits_t + \beta_8 RevMix_t + \beta_9 ROA_t + \beta_{10} Tier1_t + \beta_{11} Size_t + BankEffects + TimeEffects + \varepsilon_{t+1} \quad (11)$$

where all variables were defined previously.

The last column of Table 7 reports the results from the estimation of equation (11). Consistent with competition increasing a bank's contribution to systemic risk, we find a negative and significant coefficient on *BPCE* (-0.0096, p-value < 0.01). While not a direct test of the financial system's stability, these results are suggestive that competition pushes banks to adopt operational and accounting strategies that produce herd-like behavior thereby potentially reducing financial system stability.

6. Summary

In this paper, we utilize a bank-specific measure that extracts a bank's perception of its competitive environment from a textual analysis of its 10-K filing (Li, Lundholm and Minnis [2012]). The premise is that managers' perceptions of the competitive environment influence operating and risk-taking decisions. We show that this measure is related to future operating performance and bank decision-making in ways that suggest it captures real competitive forces exerting pressure on banks.

Specifically, banks facing higher perceived competition have lower interest margins and loan growth, and also increase reliance on non-interest sources of income and improve cost efficiency. We find that loan growth of banks confronting higher competition exhibits higher future loan charge-offs relative to lower competition banks, consistent with competition pressuring banks to lower their underwriting standards,. We further find that higher competition

is associated with banks arranging syndicated loans for riskier borrowers, reducing the number of covenants in loan contracts and setting interest spreads that are less sensitive to borrowers' default risk. Beyond operational decisions, competition also affects accounting choices, where the timely recognition of expected loan losses is shown to decrease with competition.

Finally, we provide evidence that competition undermines bank stability, finding that higher competition is associated with individual banks having a higher risk of balance sheet contraction and contributing more to systemic risk.

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Appendix A

This appendix briefly describes the Panzar-Rosse H-statistic and Lerner Index and how we estimate these measures in the current paper.

H-Statistic (see e.g., Claessens and Laeven [2004] for further discussion)*:*

The Panzar-Rosse model investigates the extent to which a change in factor input prices is reflected in (equilibrium) revenues earned by a specific bank. Under perfect competition, an increase in input prices raises both marginal costs and total revenues by the same amount as the rise in costs. Under a monopoly, an increase in input prices will increase marginal costs, reduce equilibrium output, and consequently reduce total revenues.

The Panzar and Rosse [1987] H-statistic can be interpreted, if viewed under certain restrictive assumptions, as a continuous and increasing measure of the overall level of competition existing in a particular market (where the maximum value H=1 implies perfect competition). For banking, this measure is calculated as follows:

$$\ln(P_{it}) = \alpha + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{2,it}) + \beta_3 \ln(W_{3,it}) + \gamma_1 \ln(Y_{1,it}) + \gamma_2 \ln(Y_{2,it}) + \gamma_3 \ln(Y_{3,it}) + \delta D + \varepsilon_{it}$$

(a)

where P_{it} is the ratio of gross interest revenue to total assets (proxy for output price of loans), $W_{1,it}$ is the ratio of interest expense to total deposits and money market funding (proxy for input price of deposits), $W_{2,it}$ is the ratio of personnel expense to total assets (proxy for input price of labor), $W_{3,it}$ is the ratio of other operating and administrative expenses to total assets (proxy for input price of equipment/fixed capital).

We estimate equation (a) by year, using all banks having the required data. The annual H-statistic, a measure of competition for the industry, is computed as follows:

$$H - statistic = \hat{\beta}_1 + \hat{\beta}_2 + \hat{\beta}_3 .$$

Lerner Index (see e.g., Beck et al. [2011] for further discussion)*:*

The Lerner index attempts to capture the extent to which banks can increase the marginal price beyond the marginal cost. The Lerner Index (*LI*) as follows:

$$Lerner_{it} = \frac{P_{it} - MC_{it}}{P_{it}} \quad , \qquad \text{(b)}$$

where P_{it} is defined as operating income (interest revenue plus non-interest revenue) to total assets.

Using a translog cost function, we estimate the marginal cost of the bank (*MC*) as follows:

$$\ln C_{it} = \beta_0 + \beta_1 \ln Q_{it} + \frac{\beta_2}{2} \ln Q_{it}^2 + \sum_{k=1}^{3} \gamma_{kt} \ln W_{w,it} + \sum_{k=1}^{3} \phi_k \ln Q_{it} \ln W_{k,it} + \sum_{k=1}^{3} \sum_{j=1}^{3} \ln W_{k,it} \ln W_{j,it} + \varepsilon_{it} \ , \quad \text{(c)}$$

where C_{it} are the banks total costs (interest expense plus non-interest operating expenses) scaled by total assets. Q is the banks total output, which is defined as total assets. W_1 is the input price of labor defined as wages divided by total assets; W_2 is the input price of funds and is defined as interest expense to total deposits; W_3 is the input price of fixed capital and is defined as non-interest expenses divided by total assets.

We estimate (c) using all banks with available data in the cross-section each year to attain predicted coefficients for each year. After estimating (c) we compute the marginal cost for each bank-year as:

$$MC_{it} = \frac{C_{it}}{Q_{it}} \left[\hat{\beta}_1 + \hat{\beta}_2 \ln Q_{it} + \sum_{k=1}^{3} \hat{\phi}_k \ln W_{k,it} \right] . \quad \text{(d)}$$

We then insert the resulting bank-year specific measure of *MC* from (d) into (b). This results in a bank-year specific *Lerner Index* measure.

Appendix B

Disclosure Examples from Banks' 10-k that are used in Computing BPCE

During 2006 we saw increased pressure on the pricing of both loans and deposits as the economy continued to expand and **competition** for good business increased. In particular, deposit rates repriced upward at an increasing rate in the latter half of 2005 and first half of 2006, the Federal Reserve continued to raise short-term interest rates, and the **competition** for deposits intensified. (Zions Bancorporation – 2006 10-K)

From a lending perspective, there are a large number of institutions offering mortgage loans, consumer loans and commercial loans, including many mortgage lenders that operate on a national scale, as well as local savings institutions, commercial banks, and other lenders. With respect to those products that we offer, we **compete** by offering **competitive** interest rates, fees and other loan terms and by offering efficient and rapid service. (Flagstar Bancorp – 2009 10-K)

In the fourth quarter of 2004, the continued tight **competition** experienced in the home lending operation resulted in gain on loan sale margins being at an historic low. The depressed sale margins hit 13 basis points versus the 37 basis points recorded for the same period in 2003. In conjunction with these decreased margins and the expected decreased profitability in 2005, we instituted a number of cost-cutting and staffing adjustments. The home lending group also increased certain fees charged to correspondents for support operations. We do not expect to adjust our staff any further. (Flagstar Bancorp – 2004 10-K)

Bank of America and our subsidiaries operate in a highly **competitive** environment. Our **competitors** include banks, thrifts, credit unions, investment banking firms, investment advisory firms, brokerage firms, investment companies, insurance companies, mortgage banking companies, credit card issuers, mutual fund companies and e-commerce and other Internet-based companies. We **compete** with some of these **competitors** globally and with others on a regional or product basis. **Competition** is based on a number of factors including customer service, quality and range of products and services offered, price, reputation, interest rates on loans and deposits, lending limits and customer convenience. (Bank of America – 2008 10-K)

The effective cost of funds was also negatively influenced by significant deposit pricing **competition**. Promotional rates on time deposit and money market products were prevalent in 2008 in Synovus' local markets. These pricing pressures limited the ability to lower rates on these products in line with prime rate decreases. This **competitive** environment additionally resulted in a deposit mix shift to higher cost time deposit and brokered deposits. (Synovus Financial Corporation – 2009 10-K)

The interest rates charged on loans vary with the degree of risk, maturity and amount of the loan, and are further subject to **competitive** pressures, market rates, the availability of funds and legal and regulatory requirements. (Boston Private Financial 2008 10-K)

Table 1 – Characteristics of Competition

BPCE is the number of occurrences of competition-related words per 1,000 total words in the 10-k (Li et al. [2012]). *LI* is the Lerner Index metric. *H-Stat* is the Panzar-Rosse measure of competition. Three Herfindahl index measure are plotted: *HH – Deposits* is the Herfindahl index based on the bank's share of deposits, *HH – Loans* is the Herfindahl index based on the bank's share of loans, and *HH – Assets* is the Herfindahl index based on the bank's share of assets. *Margin* is computed as the net interest margin as a percentage of interest revenue. *Size* is the natural log of total assets. *LoanGrowth* is the percentage change in total loans over the quarter. *FundingRates* is deposit related interest expense divided by total deposits. *LendingRates* is interest revenue divided by total loans.

Panel A: Correlations among Competition Measures (Spearman)

	BPCE	*LI*	*H-Stat*	*HH Deposits*	*HH Loans*
LI	-0.111***				
H-Stat	0.221***	-0.052***			
HH Deposits	-0.226***	0.055***	-0.530***		
HH Loans	-0.234***	0.057***	-0.488***	0.942***	
HH Assets	-0.187***	0.041***	-0.308***	0.895***	0.900***

Panel B: Correlation of BPCE with Firm Characteristics (Spearman)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
(1)BPCE					
(2)Margin	*-0.346****				
(3)Size	*-0.273****	*-0.104****			
(4)LoanGrowth	*-0.120****	*0.027****	*-0.038****		
(5)FundingRates	*0.517****	*-0.810****	*-0.099****	*-0.043****	
(6)LendingRates	*-0.449****	*0.602****	*0.034****	*-0.431****	*-0.566****

Panel C: Evolution of BPCE - Proportion of Firms Remaining the Portfolio

	Years			
BPCE Rank at T	*T+1*	*T+2*	*T+3*	*T+4*
5 (High)	0.611	0.388	0.226	0.127
4	0.639	0.318	0.012	0.005
3	0.413	0.337	0.020	0.014
2	0.382	0.189	0.141	0.091
1 (Low)	0.510	0.389	0.261	0.123

Table 2 – Descriptive Statistics

BPCE is the number of occurrences of competition-related words per 1,000 total words in the 10-k (Li et al. [2012]). *VaR* is defined as the bank's 1 percentile value-at-risk over the quarter. *ΔCoVaR* is our measure of systemic risk which is computed as the market's value-at risk conditional on the bank's value-at-risk. *LLP* is loan loss provision scaled by lagged total loans. *ΔNPL* is the change in nonperforming loans over the quarter scaled by lagged total loans. *EBLLP* is earnings before tax and loan loss provision scaled by lagged total loans. *LCO* is gross charge-offs scaled by lagged loans. *Loan Growth* is the percentage change in total loans over the quarter. *Commercial* is the percentage of the loan portfolio in commercial loans. *Consumer* is the percentage of consumer loans to total loans. *RealEstate* is the percentage of real estate loans to total loans. *Mismatch* is the maturity mismatch. *Trading* is computed as total trading assets divided by total assets. *RevMix* is the ratio of non-interest income to total interest income. *Deposits* is total deposits scaled by lagged total loans. *Tier1* is the bank's tier 1 capital ratio. *Size* is the natural logarithm of total assets. *Borrower Z-Score* is the Altman z-score (Altman [1977]) of the borrower. *Borrower EDF* is the expected default frequency (Bharath and Shumway [2008]). *Borrower Size* is the natural logarithm of the bank's (firm's) lagged total assets. *Spread* is the basis points over Libor on the loan. *#Covenants* is the number of financial and net worth covenants associated with the package. *Revolver* is an indicator variable equal to 1 if the facility is a revolver and 0 otherwise. *Amount* is the natural log of the facility amount. *Maturity* is the number of months to maturity.

Variables	Mean	Median	StdDev
BPCE	0.3524	0.3071	0.2597
VaR	-1.4701	-1.2699	0.8477
ΔCoVaR	-0.2218	-0.1990	0.1595
LLP	0.0013	0.0007	0.0019
ΔNPL	0.0006	0.0001	0.0042
EBLLP	0.0071	0.0068	0.0038
LCO	0.0019	0.0007	0.0031
Loan Growth	0.0341	0.0207	0.1125
Commercial	0.1209	0.1087	0.1157
Consumer	0.0243	0.0000	0.0576
RealEstate	0.4677	0.5949	0.3520
Maturity Mismatch	0.8442	0.8703	0.1043
Trading	0.0011	0.0000	0.0069
RevenueMix	0.1451	0.1267	0.0947
Deposits	1.2166	1.1608	0.3085
Tier 1	0.1113	0.1061	0.0371
Size	7.4284	7.0732	1.5633
Borrower Z-Score	2.8391	2.4628	2.0701
Borrower EDF	5.9444	0.0000	17.9323
Borrower Size	7.2649	7.2618	1.6741
Spread	152.4018	125.0000	102.5396
#Covenants	2.5238	2.0000	1.1128
Revolver	0.8476	1.0000	0.3594
Amount	5.5502	5.6284	1.3282
Maturity	47.5580	59.0000	21.2108

Table 3 – Competition, Revenue Mix and Cost Structure

The below results report pooled OLS regressions where the dependent variables are *RevMix* defined as non-interest revenue divided by interest revenue. *FeeMix* is the total non-interest income minus deposit service charges and trading revenue divided by interest revenue. *Burden* is non-interest expense minus non-interest income divided by lagged total assets. *ER* is non-interest expense divided by the sum of net interest income and non-interest income. *BPCE* is the number of occurrences of competition-related words per 1,000 total words in the 10-k (Li et al. [2012]). *NonInt Exp* is non-interest expense divided by interest revenue. *Commercial* is the percentage of the loan portfolio in commercial loans. *Consumer* is the percentage of consumer loans to total loans. *RealEstate* is the percentage of real estate loans to total loans. *Deposits* is the total deposits scaled by lagged total loans. *Mismatch* is the maturity mismatch. *Tier1* is the bank's tier 1 capital ratio. *Size* is the natural logarithm of total assets. *ROA* is defined as net income divided by total assets. Time and bank fixed effects are included in the regression and standard errors are clustered by time and bank.

	Dependent Variable at T+1			
	Revenue Mix		**Cost Structure**	
Variables	**RevMix**	**FeeMix**	**Burden**	**ER**
BPCE	0.0153***	0.0130***	-0.0002***	-0.0050*
	[0.004]	[0.004]	[0.000]	[0.003]
NonInt Exp	0.4429***	0.2998***		
	[0.028]	[0.029]		
Commercial	0.0229	0.0360	-0.0001	-0.0184
	[0.016]	[0.026]	[0.000]	[0.020]
Consumer	0.0074	0.0536**	0.0009**	-0.0492**
	[0.024]	[0.025]	[0.000]	[0.022]
RealEstate	0.0434***	0.0416***	-0.0002*	0.0057
	[0.008]	[0.014]	[0.000]	[0.006]
Deposits	-0.0084*	-0.0242***	0.0001	0.0411***
	[0.005]	[0.007]	[0.000]	[0.007]
Mismatch	-0.0457***	-0.0242	0.0012***	0.0033
	[0.013]	[0.017]	[0.000]	[0.012]
Tier1	-0.0421	-0.0951	-0.0003	-0.1921***
	[0.051]	[0.068]	[0.001]	[0.059]
Size	0.0069*	0.0139**	-0.0014***	-0.0659***
	[0.004]	[0.006]	[0.000]	[0.004]
ROA	15.5009***	12.6299***	-0.4520***	-49.1119***
	[1.284]	[1.448]	[0.037]	[3.115]
Fixed Effect	Time, Bank	Time, Bank	Time, Bank	Time, Bank
Observations	18,444	10,054	19,419	19,418
R-squared	0.827	0.764	0.705	0.737

***, **, * indicates significance at the 0.01, 0.05, and 010 level respectively.

Table 4 – Competition and Future Charge-offs

The below results report pooled OLS regressions. The dependent variable LCO_{12m} (LCO_{24m}) is defined as gross charge-offs scaled by lagged total loans over the next 12 (24) months. *BPCE* is the number of occurrences of competition-related words per 1,000 total words in the 10-k (Li et al. [2012]). *ΔNPL* is the change in nonperforming loans over the quarter scaled by lagged total loans. *Loan Growth* is the percentage change in total loans over the quarter. *Size* is the natural logarithm of lagged total assets. *Tier 1* is the bank's tier 1 capital ratio at the end of the quarter. *Consumer* is the percentage of consumer loans to total loans. *Commercial* is the percentage of commercial loans to total loans. *Real Estate* is the percentage of real estate loans to total loans. Both time and bank fixed effects are included and the standard errors are clustered by bank and time.

	Dependent Variables	
VARIABLES	**LCO_{12m}**	**LCO_{24m}**
*BPCE*Loan Growth*	0.0102**	0.0178**
	[0.004]	[0.007]
BPCE	0.0018**	0.0029**
	[0.001]	[0.001]
ΔNPL_t	0.5121***	0.7751***
	[0.063]	[0.133]
ΔNPL_{t-1}	0.4510***	0.5715***
	[0.057]	[0.108]
ΔNPL_{t-2}	0.4300***	0.4493***
	[0.063]	[0.092]
Loan Growth	-0.0131***	-0.0188***
	[0.002]	[0.003]
Size	0.0042***	0.0110***
	[0.001]	[0.002]
Tier 1	-0.0009	-0.0507***
	[0.009]	[0.011]
Consumer	-0.0014	-0.0151
	[0.004]	[0.011]
Commercial	0.0160***	0.0236***
	[0.002]	[0.004]
RealEstate	0.0021	-0.0083***
	[0.002]	[0.003]
Fixed Effect	Time, Bank	Time, Bank
Observations	12,845	11,040
R-squared	0.642	0.666

***, **, * indicates significance at the 0.01, 0.05, and 010 level respectively.

Table 5 – Competition and Contracting

The below results report pooled OLS regressions. The dependent variable *Z-Score* is the Altman z-score (Altman [1977]) of the borrower. *EDF* is the borrower's expected default frequency (Bharath and Shumway [2008]). *ExtremeZ* is an indicator variable equal to 1 if the borrower's z-score is below 1.81 and 0 otherwise. *Lender BPCE* is the number of occurrences of competition-related words per 1,000 total words in the 10-k (Li et al. [2012]). *Lender Tier 1* is the bank's tier 1 capital ratio at the end of the quarter. *Lender (Borrower) Size* is the natural logarithm of the bank's (firm's) lagged total assets. *Revolver* is an indicator variable equal to 1 if the package includes a revolver and 0 otherwise. *Amount* is the natural log of the package amount. *Maturity* is the number of months to maturity. *Spread* is the basis points over Libor on the loan. *#Covenants* is the number of financial and net worth covenants associated with the package. Time, Borrower and Lender fixed effects are included and standard errors are clustered by time and lender.

Panel A – Portfolio Risk

		Dependent Variables		
Variables	**Prediction**	Z-Score	EDF	Extreme Z
Lender BPCE	- (Z-Score)	-0.4334**	5.7253**	1.17863**
	+ (EDF/ExtremeZ)	[0.187]	[2.859]	[0.564]
Lender Tier 1 (%)		0.0380	-1.4081***	-0.1590*
		[0.034]	[0.535]	[0.083]
Lender Size		-0.0451	1.4272	0.4841
		[0.119]	[1.327]	[0.301]
Borrower Size		-0.6891***	-0.7354	1.2158***
		[0.088]	[1.090]	[0.113]
Revolver		-0.0950	3.4371***	0.1828
		[0.060]	[1.098]	[0.171]
Amount		-0.0011	0.2433	0.0271
		[0.047]	[0.523]	[0.108]
Maturity		0.0034***	-0.1123***	-0.0071
		[0.001]	[0.021]	[0.005]
Spread		-0.0059***	0.0730***	0.0141***
		[0.000]	[0.007]	[0.001]
#Covenants		-0.0561**	-1.5090***	-0.0908*
		[0.027]	[0.400]	[0.055]
Estimation		OLS	OLS	Probit
Fixed Effect		Bank, Borrower, Time	Bank, Borrower, Time	Bank, Borrower, Time
Observations		6,546	6,546	1,854
R-squared		0.840	0.641	

***, **, * indicates significance at the 0.01, 0.05, and 010 level respectively.

Table 5 – Competition and Contracting

The below results report pooled OLS regressions. The dependent variable *Spread* is the basis points over Libor on the loan. *Lender BPCE* is the number of occurrences of competition-related words per 1,000 total words in the 10-k (Li et al. [2012]). *Lender Tier 1* is the bank's tier 1 capital ratio at the end of the quarter. *Lender (Borrower) Size* is the natural logarithm of the bank's (firm's) lagged total assets. *Borrower Z-Score* is the Altman z-score (Altman [1977]) of the borrower. *Borrower EDF* the expected default frequency (Bharath and Shumway [2008]). *ExtremeZ* is an indicator variable equal to 1 if the borrower's z-score is below 1.81 and 0 otherwise. *Revolver* is an indicator variable equal to 1 if the package includes a revolver and 0 otherwise. *Amount* is the natural log of the package amount. *Maturity* is the number of months to maturity. *#Covenants* is the number of financial and net worth covenants associated with the package. Time, Borrower and Lender fixed effects are included and standard errors are clustered by time and lender.

Panel B – Under Pricing

Variables	**Prediction**	**Dependent Variable: Spread**			
Lender BPCE Z-Score*	+	15.0750***		14.6132***	
		[4.321]		[3.876]	
Lender BPCE EDF*	-		-0.4430	-0.0870	
			[0.685]	[0.651]	
*Lender BPCE*ExtremeZ*	-				-50.7016***
					[18.613]
Lender BPCE		-15.9468	28.0358**	-20.8043	49.5375***
		[18.818]	[13.736]	[18.864]	[13.696]
Lender Tier 1 (%)		2.3144	3.2667	3.5663	2.6899
		[2.393]	[2.410]	[2.253]	[2.431]
Lender Size		-1.8497	-2.3409	-3.1981	-0.9965
		[6.214]	[6.421]	[5.941]	[6.340]
Borrower Z-Score	-	-19.2750***		-16.3988***	
		[1.317]		[1.244]	
Borrower EDF	+		1.3223***	1.0387***	
			[0.160]	[0.154]	
Borrower ExtremeZ	+				58.4934***
					[4.369]
Borrower Size		-25.0786***	-12.9323***	-21.4505***	-21.3105***
		[3.902]	[3.944]	[3.958]	[3.850]
Revolver		-4.0803	-6.7814	-7.1977*	-3.0726
		[4.283]	[4.535]	[4.226]	[4.580]
Amount		-1.3097	-1.5674	-1.4820	-0.8031
		[2.494]	[2.356]	[2.291]	[2.579]
Maturity		0.1736*	0.2574***	0.2724***	0.1353
		[0.097]	[0.097]	[0.093]	[0.104]
#Covenants		11.0501***	14.0856***	11.9850***	12.7146***
		[1.607]	[1.585]	[1.553]	[1.617]
Fixed Effect		Bank, Borrower, Time	Bank, Borrower, Time	Bank, Borrower, Time	Bank, Borrower, Time
Observations		6,546	6,546	6,546	6,546
R-squared		0.825	0.812	0.825	0.805

***, **, * indicates significance at the 0.01, 0.05, and 010 level respectively.

Table 5 – Competition and Contracting

The below results report pooled OLS regressions. The dependent variable *#Covenants* is the number of financial and net worth covenants associated with the package. *Lender BPCE* is the number of occurrences of competition-related words per 1,000 total words in the 10-k (Li et al. [2012]). *Lender Tier 1* is the bank's tier 1 capital ratio at the end of the quarter. *Lender (Borrower) Size* is the natural logarithm of the bank's (firm's) lagged total assets. *Borrower Z-Score* is the Altman z-score (Altman [1977]) of the borrower. *Borrower EDF* the expected default frequency (Bharath and Shumway [2008]). *Revolver* is an indicator variable equal to 1 if the package includes a revolver and 0 otherwise. *Amount* is the natural log of the package amount. *Maturity* is the number of months to maturity. *Spread* is the basis points over Libor on the loan. Time, Borrower and Lender fixed effects are included and standard errors are clustered by time and lender.

Panel C – Relaxed Activity Restrictions

Variables	**Prediction**	**Dependent Variable: #Covenants**		
Lender BPCE	-	-0.2747**	-0.2420**	-0.2526**
		[0.114]	[0.117]	[0.113]
Lender Tier 1 (%)		-0.0445**	-0.0490**	-0.0485**
		[0.021]	[0.022]	[0.022]
Lender Size		-0.0079	-0.0025	-0.0033
		[0.045]	[0.044]	[0.044]
Borrower Z-Score		-0.0139		-0.0209
		[0.020]		[0.019]
Borrower EDF			-0.0030**	-0.0033**
			[0.001]	[0.001]
Borrower Size		0.0511	0.0564	0.0419
		[0.044]	[0.045]	[0.042]
Revolver		0.0208	0.0328	0.0313
		[0.031]	[0.030]	[0.030]
Amount		-0.0129	-0.0119	-0.0120
		[0.018]	[0.018]	[0.018]
Maturity		0.0019*	0.0015*	0.0016*
		[0.001]	[0.001]	[0.001]
Spread		0.0016***	0.0020***	0.0017***
		[0.000]	[0.000]	[0.000]
Fixed Effect		Bank, Borrower, Time	Bank, Borrower, Time	Bank, Borrower, Time
Observations		6,546	6,546	6,546
R-squared		0.771	0.772	0.772

***, **, * indicates significance at the 0.01, 0.05, and 010 level respectively.

Table 6 – Competition and Accrual Choices

The below results report pooled OLS regressions. The dependent variable *LLP* is defined as the loan loss provision scaled by lagged total loans. *BPCE* is the number of occurrences of competition-related words per 1,000 total words in the 10-k (Li et al. [2012]). *ΔNPL* is the change in nonperforming loans over the quarter scaled by lagged total loans. *EBLLP* is earnings before tax and loan loss provision scaled by lagged total loans. *Loan Growth* is the percentage change in total loans over the quarter. *Size* is the natural logarithm of lagged total assets. *Tier 1* is the bank's tier 1 capital ratio at the end of the quarter. *Consumer* is the percentage of consumer loans to total loans. *Commercial* is the percentage of the loan portfolio in commercial loans. *RealEstate* is the percentage of real estate loans to total loans. *Big5* is an indicator variable set equal to 1 if the bank is audited by a big 5 auditor and 0 otherwise. Both time and bank fixed effects are included and the standard errors are clustered by bank and time.

Panel A: Expected Loss Recognition and Smoothing

VARIABLES	**Predictions**	**Dependent Variable: LLP_t**
$BPCE*\Delta NPL_{t+1}$	-	-0.0543***
		[0.017]
$BPCE*\Delta NPL_t$	-	-0.4143***
		[0.072]
BPCE		0.0003***
		[0.000]
ΔNPL_{t+1}		0.0452***
		[0.009]
ΔNPL_t		0.0978***
		[0.011]
ΔNPL_{t-1}		0.0579***
		[0.008]
ΔNPL_{t-2}		0.0533***
		[0.008]
EBLLP		-0.0070
		[0.011]
Loan Growth		0.0000
		[0.000]
Size		0.0003***
		[0.000]
Tier 1		0.0017
		[0.002]
Consumer		0.0010*
		[0.001]
Commercial		0.0006
		[0.000]
RealEstate		0.0001
		[0.000]
Fixed Effect		Time, Bank
Observations		17,693
R-squared		0.485

***, **, * indicates significance at the 0.01, 0.05, and 010 level respectively.

Table 6 – Competition and Accrual Choices (cont…)

Panel B: Auditor Monitoring

VARIABLES	Predictions	Dependent Variable: LLP_t
$Big5*BPCE*\Delta NPL_{t+1}$	+	0.0458*
		[0.028]
$Big5*BPCE*\Delta NPL_t$	+	0.0500**
		[0.029]
Big5		-0.0000
		[0.000]
$BPCE*\Delta NPL_{t+1}$	-	-0.0720***
		[0.025]
$BPCE*\Delta NPL_t$	-	-0.4424***
		[0.095]
BPCE		0.0003**
		[0.000]
ΔNPL_{t+1}		0.0439***
		[0.010]
ΔNPL_t		0.1029***
		[0.010]
ΔNPL_{t-1}		0.0682***
		[0.007]
ΔNPL_{t-2}		0.0650***
		[0.008]
EBLLP		-0.0259**
		[0.012]
Loan Growth		-0.0006*
		[0.000]
Size		0.0004***
		[0.000]
Tier 1		0.0043**
		[0.002]
Consumer		0.0047**
		[0.002]
Commercial		0.0011
		[0.001]
RealEstate		0.0001
		[0.000]
Fixed Effect		Time, Bank
Observations		12,799
R-squared		0.525

***, **, * indicates significance at the 0.01, 0.05, and 010 level respectively.

Table 7 Competition and Risk Outcomes – VaR Distribution & ΔCoVaR

The below results report pooled OLS regressions where the dependent variables are *VaR* and is defined as the bank's 1 percentile value-at-risk over the quarter. *BPCE* is the number of occurrences of competition-related words per 1,000 total words in the 10-k (Li et al. [2012]). *Trading* is the percent of trading revenue divided by interest revenue. *Commercial* is the percentage of the loan portfolio in commercial loans. *Consumer* is the percentage of consumer loans to total loans. *RealEstate* is the percentage of real estate loans to total loans. *Mismatch* is the maturity mismatch. *Deposits* is the total deposits scaled by lagged total loans. *Revenue Mix* is the ratio of non-Interest revenue to total revenue. *Tier1* is the bank's tier 1 capital ratio. *Size* is the natural logarithm of total assets. Time and bank fixed effects are included in the regression and standard errors are clustered by time and bank.

	Dependent Variable at t+1				
Variables	**$VaR_{1\%}$**	**ΔVaR_{left}**	**$VaR_{50\%}$**	**ΔVaR_{Right}**	**ΔCoVaR**
BPCE	-0.0627***	0.0629***	0.0002	0.0408	-0.0096***
	[0.023]	[0.023]	[0.002]	[0.065]	[0.003]
Trading	0.1828	-0.3090	-0.1262	6.7332	0.3862
	[2.108]	[2.108]	[0.135]	[5.436]	[0.283]
Commercial	-0.2485**	0.2303*	-0.0181	0.4679**	-0.0027
	[0.121]	[0.120]	[0.011]	[0.208]	[0.016]
Consumer	0.8360**	-0.7897**	0.0463	-1.0708*	0.1182**
	[0.324]	[0.320]	[0.031]	[0.560]	[0.053]
RealEstate	-0.1424***	0.1560***	0.0136***	0.0972	-0.0287***
	[0.045]	[0.043]	[0.003]	[0.076]	[0.005]
Mismatch	-0.0030	0.0238	0.0208**	-0.2663*	0.0183
	[0.071]	[0.070]	[0.010]	[0.157]	[0.013]
Deposits	-0.0006	-0.0057	-0.0063**	0.0900*	0.0000
	[0.030]	[0.030]	[0.003]	[0.051]	[0.004]
RevenueMix	0.0729	-0.0814	-0.0084	0.0480	0.0211
	[0.221]	[0.218]	[0.013]	[0.313]	[0.023]
ROA	16.0618***	-16.1957***	-0.1339	-23.0061**	0.6885
	[5.948]	[6.069]	[0.181]	[10.835]	[0.439]
Tier1	0.1218	-0.1123	0.0096	0.1605	-0.0762*
	[0.254]	[0.255]	[0.017]	[0.373]	[0.042]
Size	-0.0265	0.0091	-0.0173***	-0.0064	-0.0053
	[0.039]	[0.040]	[0.003]	[0.093]	[0.005]
Fixed Effect	Time, Bank	Time, Bank	Time, Bank	Time, Bank	Time, Bank
Observations	14,028	14,028	14,028	14,028	13,681
R-squared	0.639	0.638	0.315	0.778	0.844

***, **, * indicates significance at the 0.01, 0.05, and 010 level respectively.