The Unintended Consequences of Bank Stress Tests

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ABSTRACT

Stress tests are assessments conducted by regulators to determine whether banks have sufficient capital buffers to withstand severe recessions. Unlike ordinary bank examinations, stress tests involve forward-looking scenarios and their results are publicly disclosed. This paper is the first study to show the consequences of bank stress tests. My estimates indicate that there is a negative causal impact of capital adequacy requirements on managerial decisions in the U.S. banking system. Managers make real decisions regarding restructuring problematic loans or removing them completely from their books. Stress-tested banks reduce net loan charge-offs and keep problematic loans on their books to a greater extent than banks in a non-tested group to meet the capital ratio requirements. Managers increase the level of non-performing loans in the aftermath of stress tests announcement. Stress-tested banks with greater exposure to the housing market change the classification of loan losses to a greater extent than other banks. The study's results remain robust using mid-sized banks that have been subject to the latest rounds of stress tests.

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I Introduction

"The Fed's stress tests add risk to the financial system. Banks have a powerful incentive to get the results the Fed wants and ignore other potential dangers." Wall Street Journal, March 19, 2013. It is now evident that in the years preceding the recent financial crisis, banks took excessive risks that were not disclosed and regulators intervened only after panic spread across the financial system. Some have argued that capital requirements enhance market discipline by allowing outsiders to better price banks' risks and prevent bank insiders from engaging in the excessive risk-taking behavior (Tarullo [2010], Bernanke [2013]). However, in promoting financial stability, capital requirements may exacerbate bank-specific inefficiencies and encourage managers to act strategically, taking action to inflate short-term performance (Goldstein and Sapra [2015]).

The 2008 financial crisis highlighted critical deficiencies in the risk management practices and resiliency of financial institutions. In the wake of the crisis, regulators devised a new type of bank examination, known as stress tests, which quickly rose to the top of the agenda of policymakers and regulators. The purpose of these tests is to make sure that banks have enough capital to continue lending even in adverse economic conditions. To determine the vulnerability of financial institutions, regulators introduced such stress tests in the U.S. on October 15, 2008, and have conducted them regularly since then. Unlike ordinary banking examinations, stress tests are forward-looking assessments of capital adequacy under a variety of stressful scenarios. Moreover, these tests are unusually transparent, and banks must disclose their results to the public. European banking authorities also conducted a series of stress-testing exercises during the financial crisis.[1]

The key feature of stress tests is that the Federal Reserve relies extensively on self-reported information from banks to run hypothetical scenarios. Bank managers have considerable discretion in the way in which they record losses on their loans. These managers determine whether to classify a past due loan as non-performing. They make real decisions regarding whether to restructure problematic loans or remove them completely from their books. They also have discretion regarding the amount of money they set aside as a cushion in case any of the loans has not paid back. A critical question then is whether stress tests adversely affect managerial decisions as managers try to meet their capital requirements. The hypothesis this question suggests is that seeking capital adequacy induces managers to classify loan losses so as appear healthier and increase their capital. Such managerial actions raise concerns over the requirements of bank stress tests.

In this paper, I empirically examine the causal impact of capital adequacy requirements

[1] In contrast to the U.S. bank stress tests, the 2009 European stress exercises did not require banks to publish bank-specific results. In 2010 and 2011, however, stress test results for individual banks were published.

on managerial actions. I test this hypothesis using the Federal Reserve's criterion for determining which banks are to be stress-tested. The criterion for being tested was to have at least $100 billion in assets in the last quarter of 2008. Based on this criterion, not all banks were included in the stress tests. I, therefore, exploit the cross-sectional variation in bank managerial actions before and after the time of the policy change using a difference-in-differences approach. I choose banks with assets close to but below $100 billion in the last quarter of 2008 as a control group. In later rounds, stress tests were conducted in mid-sized banks with assets of between $10 and $50 billion as well as in larger banks with assets above $50 billion in the last quarter of 2013. To make certain that banks in my sample are comparable, I matched banks subject to the tests with non-tested banks before the tests, based on observable characteristics.

An important regulatory capital ratio is the sum of Tier 1 and Tier 2 capital adjusted by risk-weighted assets.[2] The primary component of Tier 1 capital is shareholder equity, while Tier 2 capital primarily consists of loan loss reserves and subordinated debt.[3] I find that regulatory capital was exactly identical in the stress-tested and non-tested groups prior to the stress tests, with differences between two groups emerging just at the time the stress tests were announced and these differences have remained relatively constant since then. I graphically show point estimates of total capital ratio with 95% confidence intervals in the quarters before and after the announcement of the stress tests (see Figure 1). The difference is 3.5% on average, which is considerable in magnitude. Stress-tested banks evidently achieve a higher capital ratio only after learning of the tests' requirements. Managers of stress-tested banks were capable of reaching such high capital ratios during the financial crisis. Normally one would think that these higher capital ratios reflect financial health of these banks. But this makes it important to understand what these banks do to meet the capital requirements and how managers pass the stress tests.

I find that managers in stress-tested banks find a way to meet their capital targets through decisions they make regarding loan losses. Managers in stress-tested banks dramatically reduced net loan charge-offs after the announcement. They chose to keep problematic loans on their books instead of removing them. Through this action, managers run a risk that assets continue to deteriorate, and recoveries will be further delayed into the future. As a result of that the percentage of non-performing loans increased in stress-tested banks. Such restructuring helps them appear healthier so stress-tested banks increase loan loss provisions and reduce net loan charge-offs to increase their capital ratio requirements.

[2]The International Basel Committee requires a minimum limit of 4% for a Tier 1 capital ratio, and 8% for total capital ratio

[3]Loan loss reserves account for at most 1.25% of risk-weighted assets. But in the first two quarters after the implementation of SFAS 166 and 167 in November 2009, a bank under certain conditions, was permitted to include without limit in Tier 2 capital the full amount of the loan loss reserves.

Managers in the stress-tested group increase their total capital ratio by .66 of one standard deviation from the mean. Stress tests also induce managers to reduce net loan charge-offs by .27 of one standard deviation and increase non-performing loans by .39 of one standard deviation. This action causes large increases of .29 and .43 of one standard deviation in loan loss provisions and loan loss reserves, respectively. Moreover, stress-tested banks with greater exposure to the housing market reduce net loan charge-offs and increase restructuring to a greater extent than banks with less exposure. This is because these banks were in worse financial health when the stress tests began; forcing managers to do more to reach their capital targets. My results show that stress-tested banks manage loan losses and not securities presumably because securities are priced by the market and are easily verifiable.

There are multiple channels of capital adjustment. Managers can increase retained earnings, a corporation's internally generated capital, by increasing profitability or reducing dividends. They can also issue new equity, sell assets, or reduce their risk-weighted assets. I show that the primary way that stress-tested banks increase their capital ratios is by the way they manage loan losses. My findings only reveal that stress-testing induced banks to keep more problematic loans on their books causing them to raise their loan loss reserves as a result. Of course, this risky course of action turned out well, ex post, because the housing and other markets recovered, rather than faltered further. The key point is that from a policy perspective, the merits of stress-testing that induce banks to retain more non-performing loans need to be evaluated on an ex ante basis, rather than an ex post one.

To separate the effects of stress tests from the confounding effects of other policies that are triggered by asset size, I consider the later rounds of stress tests that followed a change in the asset criterion. The Dodd-Frank Act stress tests (DFAST) introduced in 2014 include mid-sized banks with assets of between $10 and $50 billion as well as banks with at least $50 billion in assets. The change in the asset threshold enables me to distinguish the possible confounding effects of bank size, as banks that were part of the Supervisory Capital Assessment Program (SCAP) tests in 2009 and the Comprehensive Capital Analysis and Review (CCAR) tests in 2011 and 2012 tests had greater assets. I find behavior in mid-sized banks that is similar to that of large ones, but the effects of this behavior are less severe, most likely reflecting the improved overall financial health of banks, which has reduced the need to manage losses to the same extent.

The focus of prior research on financial accounting in banks is mostly on the correlation between accounting methods and behavior such as lending choices and investment. The literature examines whether banks use financial reporting discretion to circumvent capital adequacy requirements or to smooth earnings (Ahmed et al. [1999],Beatty et al. [2002]). Findings by King and Levine [1993],Jayaratne and Strahan [1998] and Beck et al. [2000]

imply that any factor, including bank opacity, that interferes with the governance of banks can distort capital allocation and slow growth. Huizinga and Laeven [2012] show that banks overstated the value of distressed assets and their regulatory capital during the U.S. mortgage crisis, and Jiang et al. [2014] show that deregulation that enhances competition in the banking industry improves disclosure quality. Mariathasan and Merrouche [2014] and Begley et al. [2015] show that banks significantly under-report the risks in their trading books when they have less equity capital. This paper is the first study to show the causal impact of capital adequacy requirements on managerial actions using bank stress tests as a policy change.

The paper proceeds as follows. Section 2 presents the institutional background of stress tests. Section 3 describes data, construction of the main outcome variables. Section 4 provides the empirical strategy and matching method. Section 5 shows summary statistics and pre-regulation distribution tests. Section 6 illustrates the validity of the approach. Section 7 presents the main results. Section 8 provides an overall picture of paper and policy implications.

II Institutional Background

Many observers link the 2008 financial crisis to bank opacity. According to Gorton (2008) "the ongoing panic is due to a loss of information." The reason is bank counterparties and investors cannot evaluate bank solvency as well as bank insiders. The 2008 financial crisis highlighted concerns about asymmetric information and illiquidity in the U.S. banking system, which induced panic in the financial system. The government responded to the crisis with unprecedented actions, including bank stress tests, liquidity provision, debt and deposit guarantees, large-scale asset purchases and direct assistance. Bank stress tests began annually in 2009 with the Supervisory Capital Assessment Program (SCAP) tests and followed by the Comprehensive Capital Analysis and Review (CCAR) tests in 2011 and 2012 and Dodd-Frank Act (DFAST) tests in 2013 and 2014. There was no stress test in 2010.

Stress tests were an unprecedented event in scope, as well as the range of information that is made public about the forecasted losses and capital positions of the tested banks. The first rounds of tests require the largest U.S. bank holding companies to undergo simultaneous, forward-looking examinations to determine if they would have adequate capital to continue lending in adverse economic conditions. In the first year of implementation, the criterion for bank holding companies to be included in stress tests was to have at least $100 billion in assets in the last quarter of 2008. Nineteen bank holding companies were selected based on this criterion and included in yearly stress tests since 2009. Although the number

of banks subject to stress tests is not large, these bank holding companies represent about two-thirds of the U.S. banking assets and more than half of loans in the U.S. Each year, stress tests examine the likelihood that these nineteen U.S. bank holding companies would remain solvent under serious economic distress. The Federal Reserve reported results of bank stress tests since May 7, 2009.

Stress tests differ from ordinary bank examinations in three key dimensions (Hirtle et al. [2009]). First, stress-tested banks are subject to simultaneous examinations with the same underlying assumptions about economic conditions and loan losses and the same quantitative techniques. In contrast, ordinary examinations are bank by bank with little simultaneous comparison across banks. Second, stress tests are forward-looking to assess banks' future capital needs and examine forecasted loan losses years into the future. In contrast, ordinary examinations focus on banks' current conditions. While researchers have found that results of ordinary examinations have little or no predictive power for bank performance after accounting for market indicators (Berger et al. [2000]), the forward-looking nature of stress tests held the promise that stress tests' results might inform the market. Third, stress tests are unusually transparent. Outputs such as losses and capital buffers as well as inputs, the modeling assumptions and the processes involved in producing the outputs are disclosed. In contrast, ordinary examinations are opaque, including confidential inputs and outputs.

The goal of stress tests is to return confidence to market investors. Regulators identify disclosure of results as a key component of stress tests' success. For instance, on May 6, 2010, Ben S. Bernanke states[4] that *"we now can see that stress assessment, in fact, met its objectives of reducing uncertainty about losses and ensuring sufficient capital in the largest banking firms, and that the public disclosure was an important reason for its success. The release of detailed information enhanced the credibility of the exercise by giving outside analysts the ability to assess the findings, which helped restore investor confidence in the banking system."* The Federal Reserve believes that disclosure of stress test results provides valuable information to market participants and enhances transparency. However, the tests are not transparent enough. If the tests were transparent, managers could not improve their financial health and meet the capital ratio requirements through managing losses. I show that the design of stress tests does not take misaligned incentives of managers into account.

I employ the Federal Reserve's criterion in selecting banks to be included in stress tests as an exogenous source of variation to estimate models. All domestic bank holding companies with assets exceeding $100 billion in the last quarter of 2008 are required to participate in stress tests and are considered as a treated group. In the last quarter of each year, asset values of banks are examined relative to $100 billion to determine whether they

[4]Speech at the 46th Annual Conference on Bank Structure and Competition

need to be included in the next year's stress tests. To define the treated group, I use asset values as an exogenous source of variation in the last quarter of 2008. The reason is in the first year of stress tests, banks were unaware of the Federal Reserve's criterion and cannot manipulate assets to avoid the tests. Following 2009, all nineteen banks subject to the first year's stress test participate in the later rounds of stress tests.

To separate the effects of stress tests from possible confounding effects of other policies that are triggered by asset size, I exploit a second natural experiment in the size of the asset threshold. This experiment is Dodd-Frank Act stress test of 2014 (DFAST 2014), which began on October 1, 2013. The Federal Reserve has conducted supervisory stress tests on all BHCs with $50 billion or more in total consolidated assets as of December 31, 2013, a total of 30 BHCs, using scenarios that the Federal Reserve designed. These BHCs were also required to conduct company-run stress tests under the supervisory scenarios. Mid-sized banks with assets of between $10 and $50 billion are also required to conduct an annual company-run stress test. As a result, an additional 45 BHCs conduct the Dodd-Frank Act stress tests under this rule.

Under DFAST, mid-sized banks are required to assess their capital, using a minimum of three macroeconomic scenarios provided by the Federal Reserve. The scenarios are baseline, adverse and severely adverse scenarios. Each scenario includes economic variables, including unemployment, exchange rates, prices, incomes and interest rates. The adverse and severely adverse scenarios are not forecasted, but rather hypothetical scenarios designed to assess the strength of financial institutions. The scenarios are the same for both the over $50 billion and $10 billion to $50 billion size institutions.

III Data, Key Outcome Variables and Model Specifications

This section presents data sources and describes the construction of key variables. I use net loan charge-offs, non-performing loans, loan loss provisions and loan loss reserves as key outcome variables.

A Data

The main data source is from the Consolidated Financial Statements for Bank Holding Companies (FRB Y-9C) quarterly filings with the Federal Reserve System. The data includes all publicly traded bank holding companies headquartered in the U.S. and operating from January 2005 to March 2015. To obtain missing accounting information of banks, I use the Compustat quarterly database. To link FRB data with the Compustat, I first use

a matching dataset to link FRB data with CRSP [5]. Then, I obtain accounting information by linking CRSP dataset to Compustat.

B Key Outcome Variables

Banks bear a risk of the possibility that the borrower will fail to repay as promised. The two major assets in which banks invest funds are securities and loans. Losses on loans are substantial. Bank managers have considerable discretion in the way in which they record loan losses. Loan loss reserves (LLR) absorb loan losses both from loans the bank can currently identify as bad loans and from apparently good loans that will later prove to be uncollectible. The reserve for loan loss account is maintained by charges against earnings. The charges show up as an expense category named loan loss provisions (LLP) on the income statement.

Bank managers determine whether to classify a past due loan as non-performing (NPL), a loan carried on the bank's balance sheet that no longer accrues interest. They make real decisions regarding whether to restructure problematic loans or remove them completely from their financial statements. They also have discretion regarding the amount of money they set aside as a cushion in case any of the loans has not paid back. When a bank decides that some portion of a loan will not be collected so must be charged-off, the amount of loss is deducted from the asset category loans and also from loan losses reserves. Net loan charge-offs (NCO), which subtracts loan recoveries from written-off loans, would reduce loan loss reserves. Bank managers can increase loan loss reserves by increasing loan loss provisions or reducing net loan charge-offs (equation 1).

$$LLR_{it} = LLR_{it-1} + LLP_{it} - NCO_{it} \tag{1}$$

The way that the Federal Reserve relies extensively on self-reported information from banks to run hypothetical scenarios of stress tests is problematic. The main requirement of stress tests is to meet an important regulatory capital ratio, which is the sum of Tier 1 and Tier 2 capital adjusted by risk-weighted assets. The Tier 1 capital consists of shareholder equity, perpetual preferred stock and minority interest in consolidated subsidiaries. Tier 2 capital include limited-life preferred stock, subordinated debt, loan loss reserves up to 1.25% of risk-weighted assets. The primary component of Tier 1 capital is shareholder equity, while Tier 2 capital primarily consists of loan loss reserves and subordinated debt, with the restriction that loan loss reserves are limited to 1.25% of risk-weighted assets.

Bank managers increase loan loss reserves through increasing loan loss provisions and

[5] A data set matching Call Report and CRSP identifiers is available at `http://www.newyorkfed.org/research/banking_research/datasets.html`

decreasing net loan charge-offs. An increase in loan loss reserves can increase regulatory capital. Loan loss provisions increase the total capital ratio by the tax rate times the provision amount. Net loan charge-offs have a slightly different effect relative to loan loss provisions. Since charge-offs do not affect the shareholders equity, the sole effect of a reduction in charge-offs would be to increase Tier 2 capital, and therefore total regulatory capital. Therefore, managers meet the capital ratio requirements through increasing loan loss provisions and reducing net loan charge-offs. Bank managers make real decisions regarding restructuring problematic loans or removing them completely from their books. Hence, managers find a way to meet the capital adequacy requirements through managing loan losses. The main outcome variables in my empirical analysis are net loan charge-offs, non-performing loans, loan loss provisions, loan loss reserves and total capital ratio in banks.

Financial accounting information plays a fundamental corporate governance role, supporting monitoring by boards of directors, outside investors and regulators (Bushman and Smith [2001]). Informational transparency of banks promotes market discipline in which market participants monitor excessive risk-taking by banks' managers. Therefore, a key building block of market discipline is the availability of consistent and reliable information on banks' financial performance and risk exposures provided by financial accounting (Stephanou [2010]). Loan loss provisions are the largest accrual for most banks. Bank managers use loan loss provisions to reflect expected future losses on their loan portfolios. Despite extensive regulatory oversight, bank managers have considerable discretion in how they recognize and record the provision for loan losses. Loan loss provisions are extensively used by bank managers to manipulate reported earnings (Collins et al. [1995], Liu and Ryan [1995], Kim and Kross [1998], Beatty et al. [2002], Kanagaretnam et al. [2003], Kanagaretnam et al. [2004] and Fonseca and Gonzalez [2008]).

By using a loan loss provision, a bank makes sure that it has enough capital to survive defaulted loans. The size of the provision should reflect the riskiness of loans that bank has offered and the overall strength of the economy. However, managerial discretion is a double-edged sword (Dechow and Skinner [2000]). While increased discretion may facilitate incorporation of more information about future expected losses into loan provisioning decisions, it also increases potential for misguided behavior by managers that can degrade bank transparency and lead to negative consequences (Walland and Koch [2000]).

IV Empirical Strategy and Matching Method

This section describes the empirical strategy to test the hypotheses of the paper. I employ a difference-in-differences approach[6] to examine the impact of capital adequacy on managerial decisions. I also describe the matching method used in the second experiment to choose banks with characteristics similar to those subject to stress tests.

A Empirical Strategy

The empirical strategy has two different components: First, stress tests were an unprecedented event in response to the recent financial crisis and were not driven by an individual bank's performance. Second, the criterion for inclusion in the stress tests was not determined by bank holding companies (BHCs), but rather was exogenously defined by the Federal Reserve. Thus, considering an exogenous source of variation in the asset size, I classify banks into two separate groups. Banks subject to stress tests as the treated group and banks with asset sizes close to the treated one as the control group.

I determine the best comparable group to the banks subject to stress tests based on a ranking of asset values. I sort on asset values in the last quarter of 2008 to determine the control group and select the next nineteen large banks with asset values below the $100 billion threshold. Banks close to the $100 billion threshold have similar observable characteristics except their assets' value. I examine the impact of capital adequacy requirements on managerial actions using a difference-in-differences approach. I use loan losses as outcome variables to estimate the model.

$$Y_{it} = \alpha_i + \delta_t + \beta_1 Treated_i * Post_t + \varepsilon_{it} \tag{2}$$

Using quarterly data of BHCs, I estimate equation (2), where $Treated_i$ is a bank subject to the stress tests, $Post_t$ is an indicator variable with a value of one for quarters beginning with 2008Q4, the time of the first stress tests announcement. δ_t is the year fixed effect. Y_{it} represents outcome variables such as net loan charge-offs, non-performing loans, loan loss provisions, loan loss reserves, discretionary loan loss provisions and discretionary realizations of gains and losses on securities. I include bank and year fixed effects. Standard errors have clustered at the bank level.

Equation (2) is the main specification of the model. The coefficient of interest is β_1 which is the interaction term between the banks subject to the stress tests and post year 2008Q4 that refers to the announcement time of stress tests. This coefficient shows the impact of capital adequacy requirements on managerial decisions. The hypothesis is managers in

[6] I tried using the regression discontinuity method, but having too few bank observations around the threshold prevents me from proceeding with this identification strategy.

stress-tested banks reduce net loan charge-offs, increase non-performing loans, loan loss provisions and loan loss reserves to meet the capital ratio requirements. In particular, setting specific targets for banks induce managers to inflate their short-term performance to pass the tests. Also, banks have higher discretion over loan loss provisions in response to stress tests announcement.

The hypothesis is stress-tested bank reduce net loan charge-offs and increase non-performing loans, loan loss provisions and loan loss reserves to meet the capital ratio requirements. Therefore, I expect to observe a significant negative sign of β_1 for net loan charge-offs and a significant positive sign of β_1 for non-performing loans, loan loss provisions, loan loss reserves and total capital ratios. Bank managers in the stress-tested group can increase Tier 2 capital by decreasing net loan charge-offs and increasing loan loss provisions.

The second hypothesis is that banks with large shares of real-estate loans have greater incentives to manage losses to meet the capital ratio targets. The reason is that real-estate loans have been particularly affected by recent house price decline and managers in these banks were in poor financial health when the stress tests began.

$$Y_{it} = \alpha_i + \delta_t + \beta_2 Treated_i * Post_t + \beta_3 RealEstateShare_{it-1} * Treated_i + \beta_4 RealEstateShare_{it-1} * Treated_i * Post_t + \varepsilon_{it} \quad (3)$$

Using quarterly data of BHCs, I estimate equation (3), where $Treated_i$ is a bank subject to the stress tests, $Post_t$ is an indicator variable with value of one for the periods of 2008Q4 and after and $RealEstateShare_{it}$ denotes the exposure to housing market that is real-estate loans divided by total loans. δ_t is the year fixed effect. Y_{it} represents outcome variables such as net loan charge-offs, non-performing loans, loan loss provisions, loan loss reserves, realizations of gains and losses on securities and discretionary loan loss provisions. I include bank and year fixed effects. Standard errors have clustered at the bank level.

Equation (3) tests the second hypothesis. I include the real-estate variable to test whether banks subject to stress test with greater exposure to the housing market behave differently from the treated banks with less exposure to house price declines. The net impact of housing market exposure is β_3 plus β_4, which includes banks subject to the stress test, the share of real-estate and post year 2008Q4 that refers to the announcement of stress tests. The hypothesis predicts that the net effect should be negative for net loan charge-offs and positive for non-performing loans, loan loss provisions and loan loss reserves.

The reason is banks with a higher volume of real-estate loans in their portfolios have more incentives to manage losses post the tests announcement. Thus, greater exposure to housing market induce managers of the treated banks to reduce net loan charge-offs, and

increase non-performing loans, loan loss provisions and loan loss reserves to a greater extent. To mitigate concerns over asset size, I focus on the Dodd-Frank Act tests implemented in 2014. In the later rounds of stress tests, mid-sized banks were also included as part of the tests. Therefore, to be certain that the results are not driven by asset size, I also focus on mid-sized banks. I define treated banks as those with assets of between \$10 and \$50 billion, which are required to perform company-run stress tests. $Post_t$ is an indicator variable with a value of one for the periods of 2014Q1 and after to reflect the quarters after the announcement of Dodd-Frank Act tests in 2014Q1. Overall, I re-estimate equation (2) using a newly treated group of mid-sized banks.

B Matching Method

Using 2014 Dodd-Frank Act tests as a policy change, I choose comparable banks with close characteristics to those subject to stress tests through a propensity matching method. To construct the control group, I match banks subject to DFAST 2014 in the last quarter of 2013 with a comparable bank regarding observables. The banks in the control group are all publicly traded bank holding companies headquartered in theU.S. and have assets below \$10 billion. For each matched pair of banks in the sample, I compute the following propensity score based on equation (4).

$$\sum_{i=1}^{5}\left(\frac{x_i^T - x_i^C}{(x_i^T + x_i^C)/2}\right)^2 \tag{4}$$

Where, x_i is one of the five characteristics including total assets, change in total loans divided by lagged total loans, change in non-performing loans divided by lagged total loans, total risk-adjusted capital ratio and return on assets. Also, the superscripts T and C refer to treated and control banks, respectively. For each bank in the treated group, I choose a bank with the smallest score and eliminate the matched bank from the sample following a no replacement process. Overall, the matching process creates the closest match to each treated bank subject to DFAST 2014.

C Model Specifications

Following the accounting literature on banking, I model banks account for provisions based on certain observable bank characteristics that have plausible explanatory power for loan loss provisions; any unexplained loan loss provision captures bank management discretion. I focus on the deviation of loan loss provisions from their expected value driven by observables. To measure bank financial reporting discretion, I follow Beatty and Liao [2014] and specify a model of loan loss provisions using observable characteristics of banks as

explanatory variables. To assess the associations of the model with reporting discretion, I use residuals of an estimation as proxies for discretionary loan loss provisions.

I specify the following model as in equation 5, where LLP_{it} is loan loss provisions scaled by lagged of total loans, $LnAsset_{it}$ is the natural log of total assets, ΔNPL_{it} is change in non-performing loans divided by lagged of total loans, $\Delta Loan_{it}$ is change in total loans divided by lagged total loans.

$$LLP_{it} = \alpha_i + \beta_1 LnAsset_{it-1} + \beta_2 \Delta NPL_{it-2} + \beta_3 \Delta NPL_{it-1} + \beta_4 \Delta NPL_{it} + \beta_5 \Delta NPL_{it+1} + \beta_6 \Delta Loan_{it} + \varepsilon_{it} \quad (5)$$

The model includes all variables from Bushman and Williams [2012] and Liu and Ryan [1995]. I include ΔNPL_{it+1} and ΔNPL_{it} in the model to reflect the possibility that some banks may use forward-looking information on non-performing loans that are less discretionary and more timely in estimating loan loss provisions. ΔNPL_{it-1} and ΔNPL_{it-2} are included to represent the fact that some banks use past non-performing loan information to estimate loan loss provisions. I control for bank size ($LnAsset_{it-1}$), because banks of different sizes may be subject to different levels of regulatory scrutiny or monitoring. Finally, I control for loan growth ($\Delta Loan_{it}$) because loan loss provisions may be higher when the bank lends to low-quality customers.

The fitted value of the above equation represents normal loan losses based on the observables, and the residuals of the regression are taken as the abnormal or discretionary component of loan loss provisions. Both the size and sign of discretionary loan loss provisions are subject to manager's judgment. Managerial discretion in the use of accruals can make it harder for outsiders to evaluate the true performance of banks. The discretionary loan loss provisions reflect the quality of disclosure in banks. In other words, higher discretionary loan loss provisions show the low quality of financial reporting by banks.

To find discretionary realizations of gains and losses on securities, I again follow Beatty et al. [2002]. I estimate the following regression using realized gains and losses on securities ($Gains_{it}$) as a fraction of total assets as an outcome variable. I estimate equation 6 using the natural log of total assets and unrealized security gains and losses ($Ugains_{it}$) as explanatory variables.

$$Gains_{it} = \alpha_i + \beta_1 LnAsset_{it} + \beta_2 Ugains_{it} + \varepsilon_{it} \quad (6)$$

The residuals from this estimation are considered as the discretionary component of realized security gains and losses. Note that higher levels of realized securities gains and losses increase earnings.

V Variables and Pre-Regulation Distribution Tests

This section first provides summary statistics of main banking variables consists of general balance sheet information, loan portfolio, loan losses, risk and profitability measures. I report the summary statistics of two different types of banks, including large and mid-sized companies. Then, I show relevant distribution tests in the absence of regulation to assess the comparison between banks subject to stress tests and the control group regarding observable characteristics.

A Variables

The general variables included in the analysis are total assets, deposits, and liquid assets. The category of loan portfolio includes total loans and its components, such as loans secured by real estate, commercial and industrial loans, loans to depository institutions, agricultural loans, consumer loans and total foreign loans. The category of loan loss and delinquency measures consist of loan loss provisions, loan loss allowance, non-performing loans, net loan charge-off, realized and unrealized gains. The risk measures are the capital-asset ratio, total risk-adjusted capital ratio, Tier 1 risk-adjusted capital ratio and Tier 1 leverage ratio. Finally, the profitability measures include return on equity, return on assets and interest margin. Table 1 provides definitions of variables used in the model based on the Federal Reserve's codes. I list the name of banks subject to stress tests and banks in a control group in Table2 and 3.

[Table 1 about here]

[Table 2 about here]

[Table 3 about here]

B Pre-Regulation Distribution Tests

To assess the differences between banks subject to stress tests and the control group, I perform a pre-regulation mean test for the sample of large and mid-sized banks. I remove four of the largest banks in the treated group and four of the smallest banks in the control group. I observe large banks subject to stress tests are different from the ones not part of the stress tests prior to the tests announcement regarding asset size and loan loss provisions (Table 4). But, stress-tested banks are the same as the non-tested group prior to the tests announcement regarding net loan charge-offs, non-performing loans and loan loss reserves.

[Table 4 about here]

I assess the differences between mid-sized banks subject to stress tests and the non-tested group prior to the DFAST in 2014. Stress-tested banks and non-tested group are

different regarding asset size and loan loss reserves. The average value of assets is $5 billion in the control group, while $20 billion in the treated group. But stress-tested banks are the same as the non-tested group regarding net loan charge-offs, non-performing loans and loan loss provisions prior to the stress tests announcement (Table 5).

[Table 5 about here]

I show the results of mean and change in mean tests prior to stress tests announcement between the first quarter of 2005 and the third quarter of 2008. The level of variables are different between treated and control groups but on average their changes are the same 6-Panel A). I illustrate average of assets, net loan charge-offs, non-performing loans, loan loss provisions, loan loss reserves, total capital ratio, total deposits, total loans, and return on equity between stress-tested and non-tested groups prior to the stress test announcement. Banks subject to stress tests are similar to the control group regarding the changes in these characteristics before the tests announcement.

[Table 6 about here]

Using mid-sized banks as treated group, I evaluate the quality of matching through performing the mean test and change in the mean between the first quarter and the third quarter of 2013, in the absence of stress tests. Here, I consider treated banks with assets between $10 and $50 billion in the last quarter of 2013 as the treated group. Treated and control banks are different regarding various observable characteristics such as assets, loan loss reserves, deposits and loans but they are the same in a change of these variables (Table 6-Panel B).

VI Validity of the Approach

In this section, I assess the validity of the empirical strategy with regards to changes in net loan charge-offs, non-performing loans, loan loss provisions and loan loss reserves prior to the stress tests announcement. Moreover, I present the main results regardings the impact of capital adequacy on managerial decisions in both large and mid-sized banks. Drawing valid inferences from these estimations require that the change in outcome variables in banks subject to stress tests and control group would have been the same in the absence of stress tests.

For instance, if the trend in non-performing loans differs between banks subject to stress tests and the control group, then the empirical results would be biased. To justify that empirical results of the paper are not simply driven by a trend, I test the parallel trend assumption for each outcome variables. The results of an event study illustrate that stress-tested banks are not different from the non-tested group regarding net loan charge-offs, non-performing loans, loan loss provisions and loan loss reserves, prior to the tests

announcement. The differences between the treated and control groups emerge just at the time the stress tests were announced. Furthermore, examining other observables in banks, again show same results. Stress-tested banks are the same as the non-tested group regarding loans, deposits and discretionary loan loss provisions prior to the tests announcement.

It is essential to confirm that the treated banks, which are subject to stress tests, are not systematically different from the control group prior to the stress tests announcement. I specify the evolution of loan loss variables in quarters before and after the introduction of the tests. I begin by setting time zero to be the last quarter of 2008 when stress tests announced and then one-quarter before stress tests is shown by -1 and one-quarter after the tests is shown by +1.

$$Y_{it} = \alpha_i + \beta_1 Q_t^{-16} * Treated_i + \beta_2 Q_t^{-15} * Treated_i + ... + \beta_{30} Q_t^{+14} * Treated_i + \beta_{31} Q_t^{+15} * Treated_i + \varepsilon_{it} \quad (7)$$

The mode is estimated using quarters before and after stress tests announcement, where the quarter dummy variable Q_t^{-n} equals one for banks in the nth quarter before the stress tests announcement, and the quarter dummy variable Q_t^{+n} equals one for banks in the nth quarter after stress tests initiation. I use bank fixed effect in my estimations. I consider a 30-quarter window, spanning from fifteen quarters before and after the tests announcement. I then plot the estimated coefficients on the interaction term in 95% confidence interval.

Total capital ratio was exactly identical in the stress-tested and non-tested groups prior to the stress tests, with differences between two groups emerging just at the time the stress tests were announced. These differences have remained relatively constant since then. I graphically show point estimates of total capital ratio with 95% confidence intervals in the quarters before and after the announcement of the stress tests (Figure 1-Panel a). A large proportion of total capital ratio can be explained by loan loss reserves (Figure 1-Panel b), showing that managers use this channel to make capital adjustments.

[Figure 1 about here]

The graphical results of point estimates illustrate that the change in net loan charge-offs, non-performing loans, loan loss provision and loan loss reserves are the same between the treated and control groups prior to the stress tests announcement. More importantly, the impact of capital adequacy requirements on loan loss variables emerges just in the aftermath of stress tests announcement in the last quarter of 2008 (Figure 2). The announcement time of stress test is shown by a blue vertical line. Stress-tested banks significantly reduce net loan charge-offs and begin to keep troubled loans on their books after the announcement of the tests. Through this action, managers run a risk that assets continue to deteriorate, and recoveries will be further delayed into the future. Stress-tested banks reduce net loan

charge-offs for seven quarters and then levels of net loan charge-offs start to increase but still less than the control group (Figure 2-Panel a).

Consequently, stress-tested banks have a higher level of non-performing loans starting in the last quarter of 2008 and add up their troubled loans during that time. Banks in the stress-tested group have a higher level of non-performing loans for six quarters, and then the level decreases but still much higher than banks in the control group (Figure 2-Panel b). Regarding loan loss provisions, managers in the stress-tested group over report loan loss provisions just at the time of the tests announcement. Then they unwind their action for one quarter and again they increase loan loss provisions for three quarters (Figure 2-Panel c). Stress-tested banks increase loan loss reserves at the time of the tests announcement as a result of a reduction in net loan charge-offs and an increase in loan loss provisions (Figure 2-Panel d). Similar to non-performing loans, managers in stress-tested banks increase loan loss reserves for six quarters and then the level of reserves decreases but still higher than the control group.

[Figure 2 about here]

Moreover, results of the event-study show that stress-tested banks are similar to the non-tested group regarding securities, discretionary loan loss provisions, total loans, and deposits prior to the tests announcement. The significant differences between the treated and control group emerge regarding discretionary loan loss provisions when the tests were announced. Regarding realizations of gains and losses on securities, there are no differences between the treated and control group prior or after the stress tests announcement. Managers do not use this channel to manage losses, since securities are tied to the market price and are easier to verify. Stress-tested banks cut back lending and have an increase in deposits after the tests announcement.

[Figure 3 about here]

Examining mid-sized banks, I test the validity of the approach to confirm that empirical results are not simply driven by a trend. I estimate equation 7 using mid-sized banks as the treated group in DFAST 2014. I set year zero to be the first quarter of 2014 when DFAST was announced. Then, one-quarter before stress tests is shown by -1 and one-quarter after the tests is shown by +1. Results show that treated banks are the same as a control group regarding changes in loan loss variables in the absence of stress tests.

The graphical results illustrate the change in net loan charge-offs, non-performing loans, loan loss provisions, loan loss reserves and discretionary loan loss provisions, are similar prior to the stress tests announcement. However, it is not the case that the differences between treated and control groups emerge after DFAST in 2014. The reason might be associated to a small number of quarters passed after DFAST or the fact that banks have higher profitability in 2014 comparing to the time of the crisis. Therefore, mid-sized banks

manage loan losses in general but not evident specifically in each quarter after the test.

VII Main Results

This section provides the empirical results in testing the impact of capital adequacy on managerial decisions. The results provide strong evidence supporting the hypotheses that banks manage loan losses through reducing net loan charge-offs, keeping problematic loans on their books and having more non-performing loans. Moreover, banks subject to stress tests with greater exposure to the housing market manage losses more than banks with a lower share of real-estate loans in their portfolios. Banks subject to stress tests exert higher discretion over loan loss provisions. Using DFAST 2014 as a policy change on mid-sized banks supports the main results and reveals that bank size does not drive the results.

A Results of Stress Tests on Large Banks (SCAP 2009, CCAR 2011 and CCAR 2012)

A.1 Managerial Decisions in Large Banks

Table 7 presents results of using loan loss variables as an outcome of (2). Estimates imply that banks subject to stress tests keep troubled loans in their portfolio more than banks not subject to the tests. The net loan charge-offs are lower for banks subjected to the tests relative to the control group (Table 7-Column (1)). Also, the magnitude of the effect is large, the average of net loan charge-off is -.26 while the coefficient is -.097. Writing fewer loans off their balance sheet, stress-tested banks have a higher level of non-performing loans (Table 7-Column (2)). The magnitude of the effect is .77, which is large comparing to the average of non-performing loans, which is 2.24. Stress-tested banks have higher loan loss provisions and loan loss reserves as well (Table 7-Column (3) and (4)). The coefficients are significant and positive in line with the hypotheses of the paper.

[Table 7 about here]

As expected, I did not find any impact of capital adequacy on securities. The reason is securities are priced by the market and easily verifiable. Stress-tested banks cut back lending and the level of deposits increased after the stress tests announcement. Regarding discretionary loan loss provisions, estimates of equation (2) show that banks subject to the tests have higher discretionary loan loss provisions after the announcement of the tests in the last quarter of 2008. The magnitude of effect on discretionary loan loss provisions is .26 of one standard deviation (Table 8-Column (1) and (4)).

[Table 8 about here]

Managers in the stress-tested group increase their total capital ratio by .66 of one

standard deviation from the mean. Stress tests also induce managers to reduce net loan charge-offs by .27 of one standard deviation and increase non-performing loans by .39 of one standard deviation. This action causes increases of .29 and .43 of one standard deviation in loan loss provisions and loan loss reserves, respectively. Moreover, stress-tested banks with greater exposure to the housing market reduce net loan charge-offs and increase restructuring to a greater extent than banks with less exposure. This is because these banks were in poor financial health when the stress tests began; this gave managers greater incentives to manage losses. My results show that stress-tested banks manage loan losses and not securities because securities are priced by the market and are easily verifiable.

I investigate the consequences of stress tests and how actually managers were able to meet the capital ratio requirements. I estimate equation (2) using loan losses measures as outcome variables. Banks subject to stress tests have lower net charge-offs and higher non-performing loans, loan loss provisions and loan loss reserves in response to the capital requirements. Overall, the larger magnitude of the effect is related to loan loss reserves and then non-performing loans with a magnitude of .43 and .39 of one standard deviation, respectively. Therefore, there are significant differences between banks subject to stress tests and the control group regarding loan loss variables. Note that here I consider years from 2005 to 2011 and not 2012. The reason is banks were less healthy between 2009 to 2011 and much healthier in 2012. Incentives to meet the targets are stronger when banks are more in trouble. However, the results are robust including 2012 into the sample but slightly smaller in magnitude.

A.2 The Exposure to the Housing Market in Large Banks

Further, I investigate how stress-tested banks' exposure to real-estate affect managerial decisions. The hypothesis is banks with a greater share of real-estate loans in their portfolio are less healthy than the other banks with less exposure to the housing market. Therefore, one expects to see more managing of loan losses from troubled banks. Table 9 presents results of using loan loss variables as an outcome of equation (3). Using net loan charge-offs as outcome variables, the results is statistically and economically significant. Stress-tested banks with greater exposure to the housing market prior to stress tests reduce net loan charge-offs .08 of one standard deviation than the control group (Table 9-Column (1)).

[Table 9 about here]

This shows that less healthy banks manage net loan charge-offs and non-performing loans to inflate the capital ratio. The results of loan loss provisions and loan loss reserves are insignificant. Estimates imply that stress-tested banks with a higher share of real-estate loans have a lower net loan charge-offs and higher non-performing loans in the aftermath of the tests announcement. But stress-tested banks with greater exposure to the housing

market have lower total capital ratio after the stress tests announcement. This shows troubled banks try to meet the capital requirements but still could not achieve it.

B Results of Stress Tests on Mid-Sized Banks (DFAST 2014)

Next, I investigate the impact of capital adequacy on managerial decisions using DFAST 2014 as a policy change on mid-sized banks. The reason for examining mid-sized banks is to show that asset size does not drive results of estimations. In the later rounds of stress tests, banks with a smaller value of assets are subject to the tests. Estimates imply that capital adequacy requirements of stress test induce managers to manage loan losses to meet the capital ratio requirements.

B.1 Managerial Decisions in Mid-Sized Banks

Using banks of assets between $10 and $50 billion in the last quarter of 2013 as treated group in DFAST 2014, I examine the impact of capital adequacy on measures of loan loss and securities. Table 10 presents results of using loan loss variables as an outcome of equation (2). Estimates indicate that banks subject to stress tests have higher levels of non-performing loans and loan loss reserves and consequently discretionary loan loss provisions after the test announcement in 2014Q1. Stress-tested banks increase non-performing loans by .13 of one standard deviation (Table 10-Column(2)). The magnitude of effect in mid-sized banks is smaller than the impact of stress tests in large banks, which was .39 of one standard deviation.

[Table 10 about here]

Moreover, stress-tested banks in DFAST 2014 increase loan loss reserves by .17 of one standard deviation relative to the control group. The result on net loan charge-offs is insignificant for mid-sized banks. The reason is related to the quality of data on loan charge-off, which has many missing values after 2013. Further, I investigate the impact of stress tests on the total capital ratio in mid-sized banks. The result is positive but insignificant. The reason can be attributed to the implementation time of stress tests on mid-sized banks, which is 2014. In this year, banks are much healthy than banks in 2009 and, as a result, perform less managing of loan losses.

[Table 11 about here]

Therefore, in the first round of stress tests during the time of crisis, banks have greater incentives to manage losses and meet the Federal stress tests' requirements. Also, stress-tested banks also increase discretionary loan loss provisions and securities. In general, mid-sized banks in the later rounds of stress tests still manage losses to meet the capital ratio requirements.

VIII Conclusion

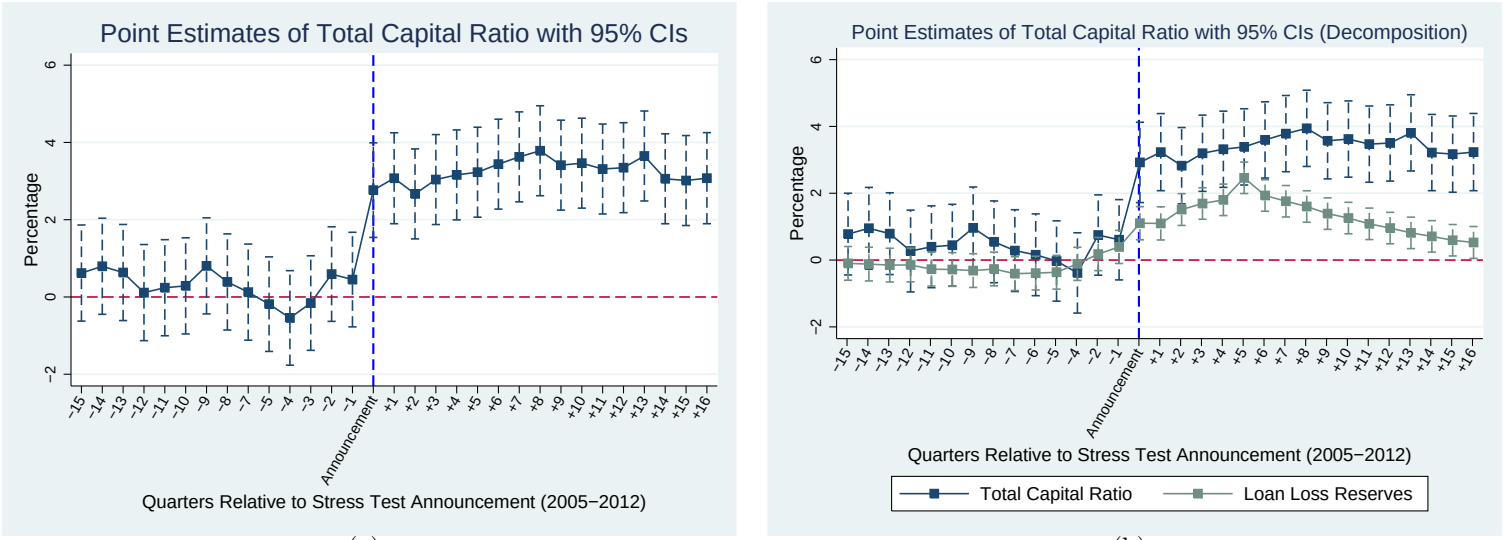
To summarize, policymakers enacted a large set of financial reforms in the U.S. banking system in response to the recent financial crisis. In this paper, I focus on stress tests, a new set of banking examinations used to determine whether banks have adequate capital to sustain lending to the economy even in the most severe future recessions. Stress tests differ from regular banking examinations in several dimensions. First, stress tests are simultaneous, forward-looking tests to assess banks' future capital needs and to forecast loan losses. Second, stress tests are unusually transparent in all inputs, process and outputs of models and results of stress tests are disclosed to the public. Bank managers have incentives to meet the Federal Reserve's requirements at the expense of losing long-term performance. In particular, bank managers manage loan losses by keeping more problematic loans on their balance sheet and delaying the reporting of loan losses.

This paper examines the impact of capital adequacy on managerial decisions. The hypothesis is banks subject to stress tests meet the capital ratio requirements through managing loan losses. The recent stress test in the banking system is a compelling policy change to test this hypothesis. The reason is stress tests are an unprecedented event in scale and scope, as well as the range of information that made public on the projected losses and capital positions of the tested banks. Moreover, the Federal Reserve's criterion to include a bank as part of the stress tests was initially unknown and not driven by an individual bank's performance. Banks subject to stress tests reduce net loan charge-offs, have higher non-performing loans and loan loss reserves relative to banks with similar characteristics but not part of the tests. Managers perform real manipulation and not accounting manipulation to meet the tests requirements. Moreover, stress-tested banks have managed losses of loans but not securities. The reason is securities are tied to the market price and are easier to verify.

I employ the Federal Reserve's criterion as an exogenous source of variation in banks to investigate the impact of capital adequacy on managerial decisions. Using a difference-in-difference approach and matching method, this paper demonstrates that banks subject to stress tests manage loan losses. The troubled banks with greater exposure to the housing market have more incentives to manage losses and meet the capital ratio requirements. This paper documents that to meet the capital ratio targets, managers reduce net loan charge-offs and increase loan loss provisions, non-performing loans and loan loss reserves. This helps banks to look better and enhances their performance in the short-term at the cost of losing credibility of information. The results are robust using mid-sized banks being tested in the latest rounds of stress tests in 2014, known as Dodd-Frank Act stress tests. Stress-tested banks have a higher level of non-performing loans and loan loss reserves,

although the magnitude of the effects is smaller comparing to the earlier rounds of stress tests. This may be due to the better financial health of banks in the later years relative to the time of the financial crisis.

In general, this paper provides evidence on consequences of stress tests in the banking system. From a policy perspective, the merits of stress-testing that induce banks to retain more non-performing loans need to be evaluated. Policymakers should be mindful of the limitations of market discipline and consider the costs of regulation as well as its benefits. In an economy with multiple imperfections, removing just one does not necessarily improve total welfare. The implications of this paper are particularly relevant for the debate on whether loan loss reserves should be considered as part of Tier 2 capital. Also, equity issuance should become mandatory as part of the requirements of capital adequacy in the stress tests. In promoting financial stability, regulators should consider the misaligned managerial incentives caused by capital adequacy policies.



(a) (b)

Figure 1: This figure shows point estimate of differences between stress-tested banks and non-tested group using total capital ratio and loan loss reserves as outcome variables. The y-axis represents outcome variables. The x-axis is the interaction term between each quarter and treated banks. Point estimates are reported within 95% confidence intervals. The announcement time of stress tests is in the last quarter of 2008, shown by a blue vertical line.

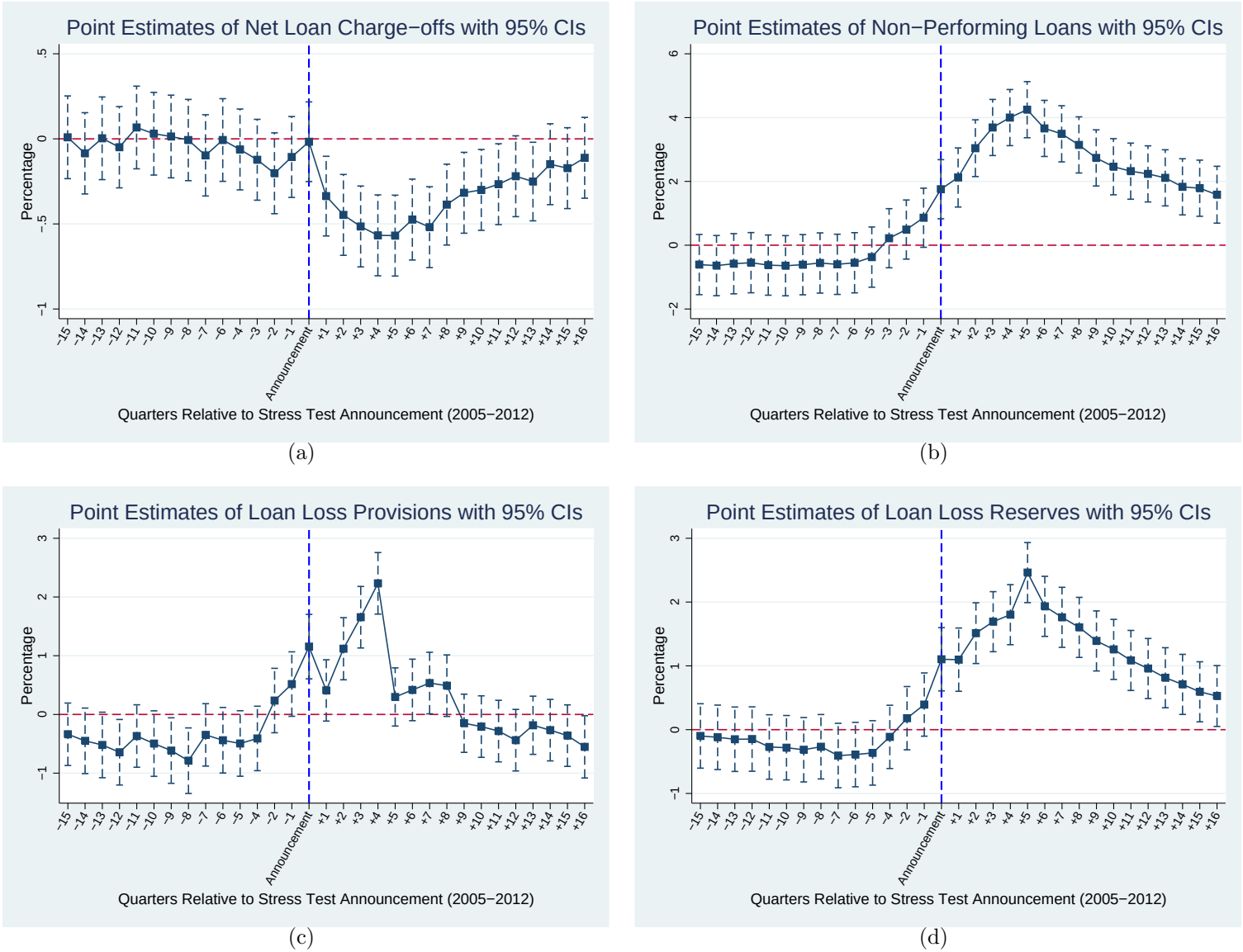


Figure 2: This figure shows point estimate of differences between stress-tested banks and non-tested group using net loan charge-offs, non-performing loans, loan loss provisions and loan loss reserves as outcome variables. The y-axis represents outcome variables. The x-axis is the interaction term between each quarter and treated banks. Point estimates are reported within 95% confidence intervals. The announcement time of stress tests is in the last quarter of 2008, shown by a blue vertical line.

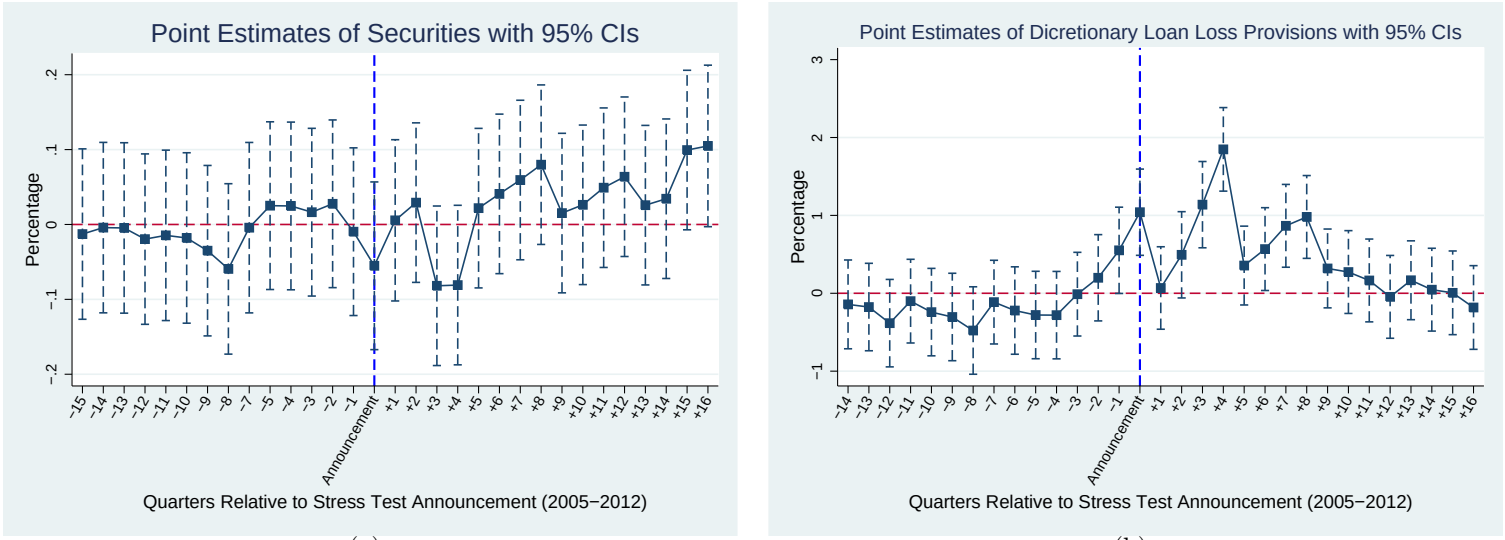


Figure 3: This figure shows point estimate of differences between stress-tested banks and non-tested group using securities, discretionary loan loss provisions, total loans and deposits as outcome variables. The y-axis represents outcome variables. The x-axis is the interaction term between each quarter and treated banks. Point estimates are reported within 95% confidence intervals. The announcement time of stress tests is in the last quarter of 2008, shown by a blue vertical line.

Table 1: Definitions of Variables

Categories	Name of Variables	FRB Code
General	Total Assets	bhck2170
	Total Deposits	bhdm6631 + bhdm6636 + bhfn6631 + bhfn6636
	Liquid Assets	bhck0081 + bhck0395 + bhck0397 + bhck1754 + bhck1773
Loan Portfolio Measures	Total Loans	bhck2122
	Loans Secured by Real Estate	bhck1410
	Commercial and Industrial Loans	bhck1763+bhck1764
	Loans to Depository Institutions	bhck1288
	Agricultural Loans	bhck1590
	Consumer Loans	bhckb538+bhck2011
	Total Foreign Loans	bhck1764+bhck1296+bhck2081
Loan Loss and Delinquency Measures	Loan Loss Provisions	bhck4230
	Loan Loss Allowance	bhck3123
	Realized Gains	bhck3196+bhck3521
	Unrealized Gains	bhck2221
	Non-Performing Loans	bhck5525+bhck5526
	Net Loan Charge-offs	bhbc6061
Risk Measures	Capital Asset Ratio	bhck3210/bhck2170
	Total Risk-Adjusted Capital Ratio	bhck7205
	Tier1 Risk-Adjusted Capital Ratio	bhck7206
	Tier1 Leverage Capital Ratio	bhck7204
Profitability Measures	Return on Equity	bhck4340/bhck3210
	Return on Assets	bhck4340/bhck2170
	Interest Margin	bhck4074/bhck2170

Table 2: List of Large Bank Names
This table presents the name of banks with assets of at least $100 billion dollars and banks with similar charactristics and below this asset threshold. The sample consists of bank holding companies observations from the first quarter of 2005 to last quarter of 2008. See Table 1 for variable definitions.

Treated	Control
Bank of America	BOK Financial Corporation
Wells Fargo and Company	Unionbancal Corporation
GMAC LLC	TCF FC
Citigroup	Webster Financial Corporation
Regions Financial Corporation	Marshall & Ilsley Corporation
Suntrust Banks	M&T Bank Corporation
Keycorp	Northern Trust Corporation
Morgan Stanley	Commerce Bancshares
Fifth Third Bancorp	Zion Bancorporation
PNC BC	Compus Bankshares
American Express	New York Community Bancorp
Bank of New York Mellon Corporation	Associated Banc-corp
BB&T FC	Comerica Incorporated
Capital One Corp	Centura banks
Goldman Sachs BK	Huntington Bancshares Incorporated
JP Morgan Chase & Co	First Horizon National Corporation
Metlife	Synovus Financial Corporation
State Street Boston Corp	Bancwest Corporation
U.S. Bancorp	Colonial bancgroup

Table 3: List of Mid-Sized Bank Names
This table presents the list of treated banks with assets between $10 to $50 billion dollars and the matched control group. The list is ranked based on highest to lowest asset sizes.

Treated	Matched Control
Cit Group Inc.	Glacier Bancorp, Inc.
New York Community Bancorp Inc.	Wesbanco, Inc.
ETrade Financial Corporation	Carver Bancorp, Inc.
Hudson City Bancorp Inc.	Hf Financial Corp.
First Niagara Financial Group Inc.	United Bankshares, Inc.
People's United Financial Inc.	Berkshire Hills Bancorp, Inc
City National Corporation	Western Alliance Bancorporation
BOK Financial Corporation	1st Source Corporation
SVB Financial Group	Nara Bancorp, Inc.
Synovus Financial Corp.	Capital Bank Financial Corp.
East West Bancorp Inc.	Independent Bank Corp.
Cullen/Frost Bankers Inc.	Cvb Financial Corp.
Associated Banc-Corp	Boston Private Financial Holdings, Inc.
Firstmerit Corporation	Old National Bancorp
First Horizon National Corporation	Columbia Banking System, Inc.
Commerce Bancshares Inc.	Chemical Financial Corporation
Raymond James Financial Inc.	Sandy Spring Bancorp, Inc.
First Citizens Bancshares Inc.	First Commonwealth Financial Corporation
Webster Financial Corporation	Community Bank System, Inc.
Hancock Holding Company	First Midwest Bancorp, Inc.
Prosperity Bancshares Inc.	First Merchants Corporation
Susquehanna Bancshares Inc.	Lakeland Bancorp, Inc.
TCF Financial Corporation	Park National Corporation
Wintrust Financial Corporation	Flushing Financial Corp
Everbank Financial Corp	Northwest Bancshares Inc.
Umb Financial Corporation	Bancfirst Corporation
Fulton Financial Corporation	Taylor Capital Group, Inc.
Valley National Bancorp	Mb Financial, Inc.
Astoria Financial Corporation	Charter Financial Corp
Franklin Resources Inc.	Pacwest Bancorp
Investors Bancorp Mhc	Heartland Financial Usa, Inc.
Bankunited Inc.	First Nbc Bank Holding Co
Washington Federal Inc.	Bank Of The Ozarks Inc.
Bank Of Hawaii Corporation	Nbt Bancorp Inc.
Privatebancorp Inc.	S & T Bancorp, Inc.
F.N.B. Corporation	Lakeland Financial Corporation
Firstbank Holding Company	Pinnacle Financial Partners, Inc.
Iberiabank Corporation Bancorpsouth Inc.	Bnc Bancorp
Bancorpsouth, Inc.	Provident Financial Services, Inc.
International Bancshares Corporation	Tompkins Financial Corporation
Trustmark Corporation	Union First Market Bankshares Corporation
Texas Capital Bancshares Inc.	Independent BK Grp Inc.
Umpqua Holdings Corporation	First Bancorp
Cathay General Bancorp	Great Southern Bancorp, Inc.
Sterling Financial Corporation	Rockville Financial, Inc.

Table 4: Pre-Regulation Mean Test for Large Banks

This table presents the mean and change in the mean of the control and treated groups prior to the stress tests announcement. The sample consists of large bank holding companies observations after removing four largest banks in the treated group and four smallest banks in the control group. The sample includes quarterly data from the first quarter of 2005 to the third quarter of 2008. See Table 1 for variable definitions.

	Means-Level			
	Control	Treated	Difference	*P-Value*
Assets (in billion)	43.07	284.7	-241.6	5.7e-30
Net Loan Charge-offs/Total Loans(%)	-.08694	-.09861	.01166	.4408
Non-Performing Loans/Total Loans(%)	.8269	.8303	-.00344	.9638
Loan Loss Provisions/Total Loans(%)	.2546	.3916	-.1371	.01088
Loan Loss Reserves/Total Loans(%)	1.195	1.247	-.05252	.4076

Table 5: Pre-Regulation Mean Test for Mid-sized Banks

This table presents the mean and change in the mean of the control and treated group prior to the stress tests announcement. The sample consists of mid-sized bank holding companies observations from the first quarter of 2013 to third quarter of 2013. See Table 1 for variable definitions.

	Means-Level			
	Control	Treated	Difference	*P-Value*
Assets(in billion)	5.358	20.49	-15.13	0
Net Loan Charge-offs/Total Loans(%)	-.0776	-.06571	-.01189	.4996
Non-Performing Loans/Total Loans(%)	2.14	2.011	.1289	.5339
Loan Loss Provisions/Total Loans(%)	.1079	.1086	-.0007	.9757
Loan Loss Reserves/Total Loans(%)	1.616	1.407	.2097	.00178

Table 6: Pre-Regulation Mean Test

This table presents the mean and change in the mean of the control and treated groups prior to the stress tests announcement. The sample consists of bank holding companies observations from the first quarter of 2005 to third quarter of 2008. Panel A. includes large banks as a treated group. Panel B. includes mid-sized banks as a treated group. See Table 1 for variable definitions.

Panel A.	Means-Level				Means-Change			
	Control	Treated	Difference	*P-Value*	Control	Treated	Difference	*P-Value*
Assets (in billion)	37.47	512.6	-475.1	0	.02361	.0309	-.00729	.3736
Net Loan Charge-offs/Total Loans(%)	-.08507	-.123	.03796	.00709	-.0191	-.0051	-.014	.4089
Non-Performing Loans/Total Loans(%)	.7773	.9978	-.2204	.00061	.1492	.152	-.00276	.9264
Loan Loss Provisions/Total Loans(%)	.2431	.4885	-.2454	1.3e-07	.08448	.09869	-.01421	.7184
Loan Loss Reserves/Total Loans(%)	1.181	1.338	-.1577	.00221	.06942	.08946	-.02004	.2384
Total Risk-Adjusted Capital Ratio	11.86	12.34	-.4748	.00677	.00131	.00455	-.00324	.562
Total Deposits/Total Assets	.6722	.5456	.1266	2.8e-23	.01272	.01929	-.00657	.2533
Total Loans/Total Assets	.6876	.5368	.1507	1.2e-21	.01662	.01628	.00034	.9437
Return on Equity	.07029	.07972	-.00944	.06114	-.08798	-.0583	-.02968	.6447

Panel B.	Means-Level				Means-Change			
	Control	Treated	Difference	*P-Value*	Control	Treated	Difference	*P-Value*
Assets (in billion)	5.358	20.49	-15.13	0	.01596	.01206	.0039	.5737
Net Loan Charge-offs/Total Loans(%)	-.0776	-.06571	-.01189	.4996	.02767	.03399	-.00632	.8784
Non-Performing Loans/Total Loans(%)	2.14	2.011	.1289	.5339	-.1689	-.136	-.03286	.5104
Loan Loss Provisions/Total Loans(%)	.1079	.1086	-.0007	.9757	-.1294	-.0983	-.03108	.5289
Loan Loss Reserves/Total Loans(%)	1.616	1.407	.2097	.00178	-.02506	-.02707	.00201	.8624
Total Risk-Adjusted Capital Ratio	15.26	16.27	-1.011	.1483	.0001	-.00563	.00573	.4858
Total Deposits/Total Assets	.7822	.7163	.06596	.00044	.00908	.00814	.00094	.8682
Total Loans/Total Assets	.6801	.6092	.07095	1.4e-05	.01394	.01021	.00373	.3905
Return on Equity	.04233	.04208	.00025	.9327	-.0248	-.08076	.05596	.6014

Table 7: The Impact of Capital Adequacy on Loan Loss Variables

This table presents the results of estimation in equation (2) using net loan charge-offs, non-performing loans, loan loss provisions, loan loss reserves and total capital ratio as outcome variables. The variable *Treated* has value of one for the banks with asset value of at least $100 billion in the last quarter of 2008. The variable *Post* is an indicator variable with value of one in 2008q4 and after and zero otherwise. All estimates include bank and year fixed effects. Standard errors are reported in parentheses and adjusted for clustering at the bank level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Net Loan Charge-offs	Non-Performing Loans	Loan Loss Provisions	Loan Loss Reserves	Total Capital Ratio
Treated*Post	-0.0977***	0.7769***	0.3223***	0.5309***	1.8164***
	(0.0345)	(0.1148)	(0.0978)	(0.0726)	(0.1733)
ysd	0.3659	1.9777	1.1054	1.2325	2.7164
ymean	-.2612	2.247	.8	1.895	13.49
ar2	.506	.7985	.5317	.7925	.6989
N	738	954	954	954	960
Bank Fixed Effect	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes

Table 8: The Impact of Capital Adequacy on Other Variables

This table presents the results of estimation in equation (2) using securities, total loans, deposits and $|discretionaryloanlossprovisions|$ as outcome variables. The variable *Treated* has value of one for the banks with asset value of at least $100 billion in the last quarter of 2008. The variable *Post* is an indicator variable with value of one in 2008q4 and after and zero otherwise. All estimates include bank and year fixed effects. Standard errors are reported in parentheses and adjusted for clustering at the bank level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Realized Gains (Losses) on Securities	Loans	Deposits	$\lvert DiscretionaryLoanLossProvisions\rvert$
Treated*Post	0.0102	-0.0121***	0.0192***	0.1977**
	(0.0176)	(0.0041)	(0.0044)	(0.0864)
ysd	0.1675	0.2023	0.1788	0.7501
ymean	-.0092	.5906	.6086	.6783
ar2	.1836	.9698	.9562	.221
N	960	960	956	936
Bank Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes

Table 9: The Impact of Capital Adequacy on Loan Loss Variables with Real-Estate's Exposure

This table presents the results of estimation in equation (3) using net loan chrage-offs, non-performing loans, loan loss provisions, loan loss reserves and total capital ratio as outcome variables. The variable *Treated* has value of one for the banks with asset value of at least $100 billion in the last quarter of 2008. Variable *Real-Estate Share* includes share of lagged real-estate loans from total loans. The variable *Post* is an indicator variable with value of one in 2008q4 and after and zero otherwise. All estimates include bank and year fixed effects. Standard errors are reported in parentheses and adjusted for clustering at the bank level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Net Loan Charge-offs	Non-Performing Loans	Loan Loss Provisions	Loan Loss Reserves	TotalCapital Ratio
Treated*Post	0.1697**	-0.1854	0.2138	0.4443***	2.0199***
	(0.0812)	(0.2405)	(0.2071)	(0.1537)	(0.3663)
Real-Estate*Treated	.3469	-2.154***	-1.977***	-1.242***	-3.624***
	(.2585)	(.6325)	(.5446)	(.4042)	(.9632)
Real-Estate Share*Treated*Post	-.3753**	1.984***	.2559	.2128	-2.45***
	(.1465)	(.4268)	(.3675)	(.2727)	(.6499)
ysd	0.3663	1.9704	1.0986	1.2255	2.7121
ymean	-.2614	2.242	.7952	1.893	13.46
ar2	.5366	.8056	.5363	.7948	.762
N	736	947	947	947	947
Bank Fixed Effect	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes

Table 10: The Impact of Capital Adequacy on Loan Loss Variables

This table presents the results of estimation in equation (2) using net loan charge-offs, non-performing loans, loan loss provisions, loan loss reserves and total capital ratio as outcome variables. The variable *Treated* has value of one for the banks with assets of between $10 and $50 billion in the last quarter of 2013. The variable *Post* is an indicator variable with value of one in 2014q1 and after and zero otherwise. All estimates include bank and year fixed effects. Standard errors are reported in parentheses and adjusted for clustering at the bank level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Net Loan Charge-offs	Non-Performing Loans	Loan Loss Provisions	Loan Loss Reserves	Total Capital Ratio
Treated*Post	0.0139	0.2280**	0.0059	0.0879***	0.3234
	(0.0129)	(0.0918)	(0.0156)	(0.0204)	(0.2200)
ysd	0.0797	1.6645	0.1745	0.4966	5.0062
ymean	-.0443	1.668	.0982	1.362	15.39
ar2	.8728	.8509	.6059	.9173	.9243
N	167	798	798	798	633
Bank Fixed Effect	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes

Table 11: The Impact of Capital Adequacy on Other Variables

This table presents the results of estimation in equation (2) using securities, total loans, deposits and $|discretionaryloanlossprovisions|$ as outcome variables. The variable *Treated* has value of one for the banks with assets of between $10 and $50 billion in the last quarter of 2013. The variable *Post* is an indicator variable with value of one in 2014q1 and after and zero otherwise. All estimates include bank and year fixed effects. Standard errors are reported in parentheses and adjusted for clustering at the bank level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Realized Gains and Losses on Securities	Loans	Deposits	$\lvert DiscretionaryLoanLossProvisions\rvert$
Treated*Post	0.0224***	-0.0045	0.0045	0.0230*
	(0.0083)	(0.0031)	(0.0028)	(0.0139)
ysd	0.0732	0.1312	0.1238	0.1280
ymean	.0183	.6579	.7534	.1209
ar2	.3695	.9725	.9832	.4895
N	799	799	567	706
Bank Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes

References

Ahmed, A. S., C. Takeda, and S. Thomas (1999). Bank loan loss provisions: a reexamination of capital management, earnings management and signaling effects. *Journal of Accounting and Economics 28*(1), 1–25.

Beatty, A. and S. Liao (2014). Financial accounting in the banking industry: A review of the empirical literature. *Journal of Accounting and Economics 58*(2-3), 339–383.

Beatty, A. L., B. Ke, and K. R. Petroni (2002). Earnings management to avoid earnings declines and losses across publicly and privately held banks. *The Accounting Review 77*(3), 547–570.

Begley, T., A. Purnanandam, and K. Zheng (2015). The strategic under-reporting of bank risk. *Working Paper*.

Berger, A. N., S. M. Davies, and M. J. Flannery (2000). Comparing Market and Supervisory Assessments of Bank Performance: Who Knows What When? *Journal of Money, Credit and Banking 32*(3), 641.

Bernanke, B. S. (2013). Stress Testing Banks: What Have We Learned? In *Maintaining Financial Stability: Holding a Tiger by the Tail*.

Bushman, R. M. and A. J. Smith (2001). Financial accounting information and corporate governance. *Journal of Accounting and Economics 32*, 237–333.

Bushman, R. M. and C. D. Williams (2012). Accounting discretion, loan loss provisioning, and discipline of Banks risk-taking. *Journal of Accounting and Economics 54*(1), 1–18.

Collins, J. H., D. A. Shackelford, and J. M. Wahlen (1995). Bank Differences in the Coordination of Regulatory Capital, Earnings, and Taxes. *Journal of Accounting Research 33*(2), 263.

Dechow, P. M. and D. J. Skinner (2000). Earnings management: reconciling the views of accounting academics, practitioners, and regulators. *Accounting Horizons 14*(2), 235–250.

Fonseca, A. R. and F. Gonzalez (2008). Cross-country determinants of bank income smoothing by managing loan-loss provisions. *Journal of Banking & Finance 32*(2), 217–228.

Goldstein, I. and H. Sapra (2015). Should Banks' Stress Test Results Be Disclosed? An Analysis of the Costs and Benefits. *Foundations and Trends in Finance Forthcoming*.

Hirtle, B., T. Schuermann, and K. J. Stiroh (2009). Macroprudential supervision of financial institutions: lessons from the SCAP. *FRB of New York Staff Report* (409).

Huizinga, H. and L. Laeven (2012). Bank valuation and accounting discretion during a financial crisis. *Journal of Financial Economics 106*(3), 614–634.

Jayaratne, J. and P. E. Strahan (1998). Entry restrictions, industry evolution, and dynamic efficiency: Evidence from commercial banking. *JL & Econ. 41*, 239.

Jiang, L., R. Levine, and C. Lin (2014). Competition and Bank Opacity. Technical report, National Bureau of Economic Research.

Kanagaretnam, K., G. J. Lobo, and R. Mathieu (2003). Managerial incentives for income smoothing through bank loan loss provisions. *Review of Quantitative Finance and Accounting 20*(1), 63–80.

Kanagaretnam, K., G. J. Lobo, and D.-H. Yang (2004). Joint Tests of Signaling and Income Smoothing through Bank Loan Loss Provisions. *Contemporary Accounting Research 21*(4), 843–884.

Kim, M.-S. and W. Kross (1998). The impact of the 1989 change in bank capital standards on loan loss provisions and loan write-offs. *Journal of Accounting and Economics 25*(1), 69–99.

King, R. G. and R. Levine (1993). Finance and Growth: Schumpeter Might Be Right. *The Quarterly Journal of Economics 108*(3), 717–737.

Liu, C.-C. and S. G. Ryan (1995). The Effect of Bank Loan Portfolio Composition on the Market Reaction to and Anticipation of Loan Loss Provisions. *Journal of Accounting Research 33*(1), 77.

Mariathasan, M. and O. Merrouche (2014). The manipulation of basel risk-weights. *Journal of Financial Intermediation 23*, 300–321.

Stephanou, C. (2010). Rethinking market discipline in banking: lessons from the financial crisis. *World Bank Policy Research Working Paper Series*.

Tarullo, D. (2010). Lessons from the crisis stress tests. In *Remarks Made to the International Research Forum on Monetary Policy, Washington DC*.

Walland, L. D. and T. W. Koch (2000). Bank Loan-Loss Accounting: A Review of Theoretical and Empirical Evidence. In *Economic Review*. Federal Reserve Bank of Atlanta.