Journal of Accounting and Economics 67 (2019) 463–495

Contents lists available at ScienceDirect

Journal of Accounting and Economics

journal homepage: www.elsevier.com/locate/jacceco

Loan loss accounting and procyclical bank lending: The role of direct regulatory actions☆

P. Barrett Wheeler

Tulane University, New Orleans, LA, USA

ARTICLE INFO

Article history:
Received 23 March 2017
Revised 13 December 2018
Accepted 30 January 2019
Available online 22 February 2019

JEL classifications:
G18
G21
G28
M41

Keywords:
Banking
Allowance for loan losses
Loan loss provisions
Regulation
Procyclicality

ABSTRACT

I provide evidence that loan loss accounting affects procyclical lending through its impact on regulatory actions. Regulators are more likely to place banks with inadequate loan loss allowances under enforcement actions that restrict lending, leading these banks to lend less during downturns. Further, I find that banks with lower regulatory ratings lend less when they have more timely provisions, consistent with research theorizing that timely provisions increase transparency and inhibit regulatory forbearance. This regulatory action mechanism expands on prior research that has focused on the effect of loan loss recognition on regulatory capital adequacy during economic downturns.

1. Introduction

In the wake of the financial crisis of 2007–2009, academics and regulators conjectured that existing accounting rules exacerbated procyclical lending by delaying the recognition of credit losses. This delay contributed to "unrecognized loss overhangs" – credit losses that were expected but had not yet been recognized in accounting earnings and thus in regulatory capital. This conjecture is evident in a report by the Financial Stability Forum (2009), which states that "Earlier recognition of loan losses could have dampened cyclical moves in the current crisis." Underlying this notion is the "capital crunch" theory, which predicts that inadequate recognition of loan losses prior to times of economic distress affects bank lending through a *minimum capital ratio* channel. Banks with unrecognized loss overhangs at the start of an economic downturn must recognize these losses during the downturn when it is difficult to raise outside capital. If banks have capital ratios close to the regulatory minimum and cannot raise outside capital, they will attempt to satisfy capital ratio requirements by shrinking their assets via reduced lending.

☆ I thank Wayne Guay (the editor), Gus De Franco, Hanna Lee (discussant), Jeff McMullin, Brian Miller, Gans Narayanamoorthy, Dushyant Vyas, Jim Wahlen, and an anonymous reviewer for helpful feedback in the development of this paper as well as comments received from workshop participants at Indiana University, Tulane University, the 2016 Conference on Financial Economics and Accounting, and the 2014 Midwest Doctoral Conference. Special thanks are due to Leslie Hodder, who advised me during the development of this paper, and Stephen Ryan (the referee), whose detailed suggestions helped me substantially improve the paper.

E-mail address: pwheeler1@tulane.edu

https://doi.org/10.1016/j.jacceco.2019.01.003
0165-4101/

Prior research in accounting provides evidence consistent with banks' loan loss accounting affecting procyclical lending through a minimum capital ratio channel (e.g., Beatty and Liao, 2011; Jayaraman et al., 2017). A critical premise of this channel is that banks reduce lending to avoid violating regulatory capital minimums. Most banks, however, had capital levels well in excess of regulatory minimums at the beginning of the last two recessions. Moreover, Ryan (2017) argues that the incremental impact of more conservative loan loss provisioning on regulatory capital adequacy is relatively small, and thus the impact of loan loss accounting on regulatory capital ratios is unlikely to fully explain an association between loan loss accounting and procyclical lending.

In this paper, I propose regulatory actions as another mechanism through which loan loss accounting can affect procyclical lending. This mechanism consists of two channels. The first is a *safety and soundness* channel, in which regulators consider banks' loan loss allowance adequacy in assigning regulatory "safety and soundness" ratings. All else equal, inadequate loan loss allowances decrease these ratings and result in greater pressure from regulators for banks to improve their solvency. The safety and soundness channel is distinct from the minimum capital ratio channel contemplated in prior accounting research because it relies on actions taken by bank regulators rather than actions taken by bank managers to preserve capital and *prevent* regulatory enforcement actions.

The second is a *transparency* channel, in which timelier loan loss provisions improve bank transparency to outside monitors (e.g., Bushman and Williams, 2012; Bushman, 2014; Gallemore, 2018; Ryan, 2017). Unlike allowance adequacy, regulators do not consider loan loss provision timeliness in determining safety and soundness ratings. Timely loan loss recognition could lead to either *less* procyclical lending via the minimum capital ratio channel by decreasing unrecognized loss overhangs (e.g., Beatty and Liao, 2011) or *more* procyclical lending via the transparency channel by inhibiting regulatory forbearance and increasing the likelihood of regulatory actions (e.g., Gallemore, 2018).[1]

Given these conflicting theories on the effect of loan loss provision timeliness on procyclical lending, I explore whether the effect depends on the incentives of regulators to engage in forbearance, whereby timely provisions mitigate procyclical lending through the minimum capital ratio channel for stronger banks, for which the need to forbear is lower, but lead to *reduced* lending through the transparency channel for weaker banks, for which the incentive to engage in forbearance is higher.

I test the link between loan loss accounting, regulatory actions, and lending using a sample of public and private banks from 1990–2014. Using observed formal enforcement actions that place restrictions on bank lending, I estimate the probability of a formal regulatory action and use this estimated probability as a proxy for *all* regulatory pressure to reduce lending. It is important to proxy for all regulatory pressure because regulatory actions are continuous rather than dichotomous phenomena. While only 2.3% of bank-quarters in my sample are subject to formal lending restrictions, regulators can significantly influence bank behavior through informal actions or threats of action such as memorandums of understanding (MOU). The higher the probability of a formal regulatory action, the more likely it is that regulators have implemented (or have threatened to implement) informal actions intended to improve bank safety and soundness. I refer to formal actions, informal actions, and threats of action collectively as "regulatory pressure."

To validate my use of the probability of formal enforcement as a proxy for regulatory pressure, I hand-collect data for a small sample of banks that voluntarily disclose the existence of a MOU. While informal regulatory actions are not disclosed publicly by bank regulators, banks may voluntarily disclose them, or they may be uncovered by the financial press. Of the 38 banks I find that are placed under an MOU but that are *not* subsequently placed under a formal enforcement action in my sample, 74% fall into the top decile of estimated enforcement probabilities and 89% fall into the top two deciles, supporting my use of the probability of enforcement as a proxy for regulatory pressure.

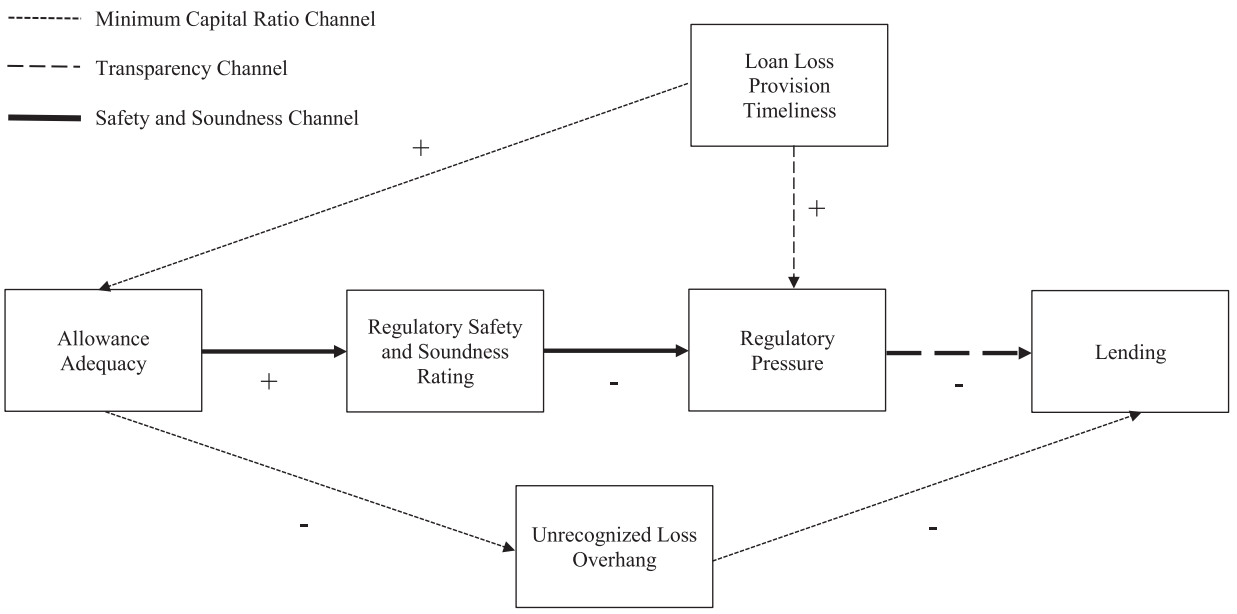
A consistent result across my analyses is that regulatory pressure is strongly negatively associated with loan growth. Using mediation analysis,[2] I find that banks with less adequate allowances have lower loan growth in times of economic distress than banks with more adequate allowances and that this association operates through the increasing effect of less adequate allowances on regulatory pressure, consistent with the safety and soundness channel. I do not find support for the minimum capital ratio channel, however, as the association between allowance adequacy and procyclical lending is insignificant after controlling for regulatory pressure. I conduct several cross-sectional analyses and find that inadequate allowances are negatively associated with procyclical lending through the safety and soundness channel across partitions based on regulatory capital, the proportion of high risk-weight loans, and bank size.

Examining timeliness, I do not find higher loan growth for stronger banks with more timely loan loss provisions as predicted by the minimum capital ratio channel, even when these banks have relatively low levels of capital. However, I find that banks with less favorable safety and soundness ratings have lower loan growth when they record more timely provisions, consistent with the transparency channel. This result holds for banks with both higher and lower levels of risk-weighted loans but does not obtain for banks with the lowest levels of regulatory capital or for larger banks. The latter

[1] I develop my predictions further in Section 3 and provide graphical and tabular depictions of the predicted relationships between allowance adequacy, loan loss provision timeliness, and procyclical lending in Fig. 1A and B.

[2] Mediation analysis seeks to identify the mechanism through which two variables are related by including a third *mediating* variable in the analysis. In this study, I model the association between allowance adequacy and procyclical lending both with and without controlling for regulatory pressure. This allows me to estimate the size and significance of the total effect of allowance adequacy on procyclical lending as well as the minimum capital ratio channel (modeled as the direct effect) and the safety and soundness channel (modeled as the indirect effect).

A



B

		Regulatory Action Channels	
	Minimum Capital Ratio Channel	*Safety and Soundness Channel*	*Transparency Channel*
Allowance Adequacy	H1A	H1B	
Loan Loss Provision Timeliness	H2A		H2B

Fig. 1. Theoretical Framework Linking Allowance Attributes, Regulatory Pressure, and Lending in Times of Economic Distress. This figure shows the channels through which allowance attributes, specifically allowance adequacy and loan loss provision timeliness, are predicted to affect lending during times of economic distress. Figure 1A depicts these relationships visually, while Figure 1B organizes my hypotheses. Note that while Figure 1A depicts relationships during times of economic distress, the association between timeliness and lending predicted in H2B through the transparency channel is not contingent on the state of the economy.

findings suggest that regulators are less willing or able to forebear on banks with lower capital levels and that the impact of timeliness on transparency is diminished for banks with better information environments.

While by design my measure of regulatory pressure is correlated with bank safety and soundness ratings, and thus bank health, I perform several analyses to mitigate concerns that my results are driven by bank health rather than by regulatory pressure. First, I examine the incremental impact of observed lending restrictions on lending after controlling for the probability of enforcement. I find that lending restrictions are incrementally predictive of lower loan growth, suggesting that the portion of enforcements *not* explained by measures of bank health also explain reduced lending.

Second, I substitute observed lending restrictions six quarters ahead for enforcement probabilities as my proxy for regulatory pressure. These results, while expectedly weaker, are consistent with those in my primary tests regarding allowance adequacy. My results regarding loan loss provision timeliness do not obtain when substituting future observed lending restrictions, which I interpret as further support for my predictions, as timeliness should play no role in forbearance in instances where regulators have already elected *not* to forbear.

Third, I perform a matched-sample analysis. Matching banks under high regulatory pressure (defined as those in the top decile of enforcement probability) to banks under lower regulatory pressure, I find results consistent with my full-sample analysis, i.e. that inadequate allowances are indirectly associated with procyclical lending through their association with regulatory enforcement actions and that banks under high regulatory pressure have lower loan growth when they have more timely loan loss provisions, consistent with timely provisions enhancing transparency and inhibiting regulatory forbearance.

This paper contributes to our understanding of the linkage between bank accounting and procyclical lending and should be of interest to academics, bank managers, and bank regulators. First, this paper examines two channels through which accounting can affect bank lending via its impact on the actions of bank regulators, which are more widespread during economic downturns. I provide evidence that inadequate allowances affect lending through their impact on regulatory ratings and that timely provisions affect lending by inhibiting regulatory forbearance. I also help reconcile prior studies that make different predictions for the association between loan loss provision timeliness and procyclical lending. Consistent with the transparency channel and Gallemore (2018), I find that timelier provisions increase the probability of regulatory actions and are associated with lower lending for banks with less favorable safety and soundness ratings. Inconsistent with the minimum capital ratio channel, I do not find that timelier provisions mitigate procyclical lending, even among banks with more favorable safety and soundness assessments. I note that prior research suggests other channels through which loan loss accounting could affect lending. For instance, loan loss provision timeliness could reflect the quality of banks' credit risk modeling (Bhat et al., 2018) and better risk modeling could help banks better understand their loan credit risks, thereby impacting their lending decisions (Ryan, 2017).

Second, my findings contribute to the growing literature on the impact of accounting on the stability of the financial system (e.g., Acharya and Ryan, 2016), including the long-standing debate about the costs and benefits of bank transparency for stability. I do not comment on the optimality of regulators' actions or of regulatory forbearance. While it is possible that regulators' decisions to restrict the lending of certain banks are appropriate and that exercising forbearance is socially non-optimal (e.g., Boot and Thakor, 1993), it is also possible that these restrictions unnecessarily reduce the availability of bank loans to the economy during times of distress (e.g., Morrison and White, 2013).

The next section provides background on banking regulation, lending procyclicality, and loan loss accounting. Section 3 develops my hypotheses. Section 4 discusses my empirical design. Section 5 discusses the results. Section 6 provides several cross-sectional analyses. Section 7 discusses robustness tests. Section 8 concludes.

2. Background

2.1. Loan loss accounting and bank lending procyclicality

A large literature in accounting and finance studies the existence and causes of bank lending procyclicality. Procyclical lending refers to supply-driven changes in lending that amplify the business cycle. That is, procyclical changes in lending are systematic, cyclical changes in lending not explained by changes in the demand for loans. Early research in this area was motivated by the perception of a "credit crunch" believed to have exacerbated the recession in the U.S. in 1990–1991.[3] Several theories for the observed slowdown in lending were proposed, including regulatory capital requirements (Bernanke and Lown, 1991; Berger and Udell, 1994; Furfine, 2001; Peek and Rosengren, 1995b), regulatory enforcement (Berger et al., 2001; Furfine, 2001; Peek and Rosengren, 1995a), voluntary retrenchment (Berger and Udell, 1994; Peek and Rosengren, 1995b), and reduced loan demand caused by deterioration in the economy or the creditworthiness of borrowers (Furfine, 2001; Peek and Rosengren, 1995b).

A 2009 report issued by the Financial Stability Forum addressing the 2007–2009 financial crisis identified loan loss provisioning standards as another potential cause of procyclical lending. The FSF (2009) suggested that existing accounting standards may have resulted in delayed recognition of loan losses, and that "Earlier recognition of loan losses could have dampened cyclical moves in the current crisis." The discussion of provisioning practices as a cause of procyclical lending follows the capital crunch theory (Bernanke and Lown, 1991). This theory predicts that banks that delay recognition of loan losses have greater unrecognized loss overhangs (i.e., allowances that are insufficient to cover expected loan losses) at the beginning of a downturn. Because of inadequate allowances, banks must record capital-decreasing provisions during the downturn, when it is difficult or costly to access the capital markets.

Two recent studies in accounting address the role of bank loan loss allowances in a "capital crunch." First, in a sample of publicly-traded banks with total assets greater than $500 million, Beatty and Liao (2011) find that banks with less timely provisions contract lending during recessionary periods to a greater extent than banks with timelier provisions.[4] Second, Jayaraman et al. (2017) use the emerging markets debt crisis of 1997–1999 as a capital shock that did not affect U.S. borrower demand. They conclude that banks that smooth their earnings using loan loss provisions to a greater extent than other banks (i.e., book larger provisions when pre-provision earnings are high and lower provisions when pre-provision earnings are low) reduce lending less than banks with more cyclical provisions in response to a capital shock.

Several key assumptions underlie the capital crunch theory. It assumes: 1) regulatory capital constraints are binding; 2) banks with inadequate allowances or untimely provisions must record abnormally high loan loss provisions during economic downturns as credit problems become observable and bank managers are no longer able to justify their allowance levels;

[3] For example, see Alan Murray, "Mosbacher Says 'Serious' Credit Crunch Grips U.S., Isn't Limited to Real Estate," *The Wall Street Journal*, June 15, 1990, pg. A3.

[4] Beatty and Liao (2011) also study the association between the ratio of the allowance to nonperforming loans and loan growth. They refer to this as a proxy for timeliness, whereas I use this as a proxy for adequacy.

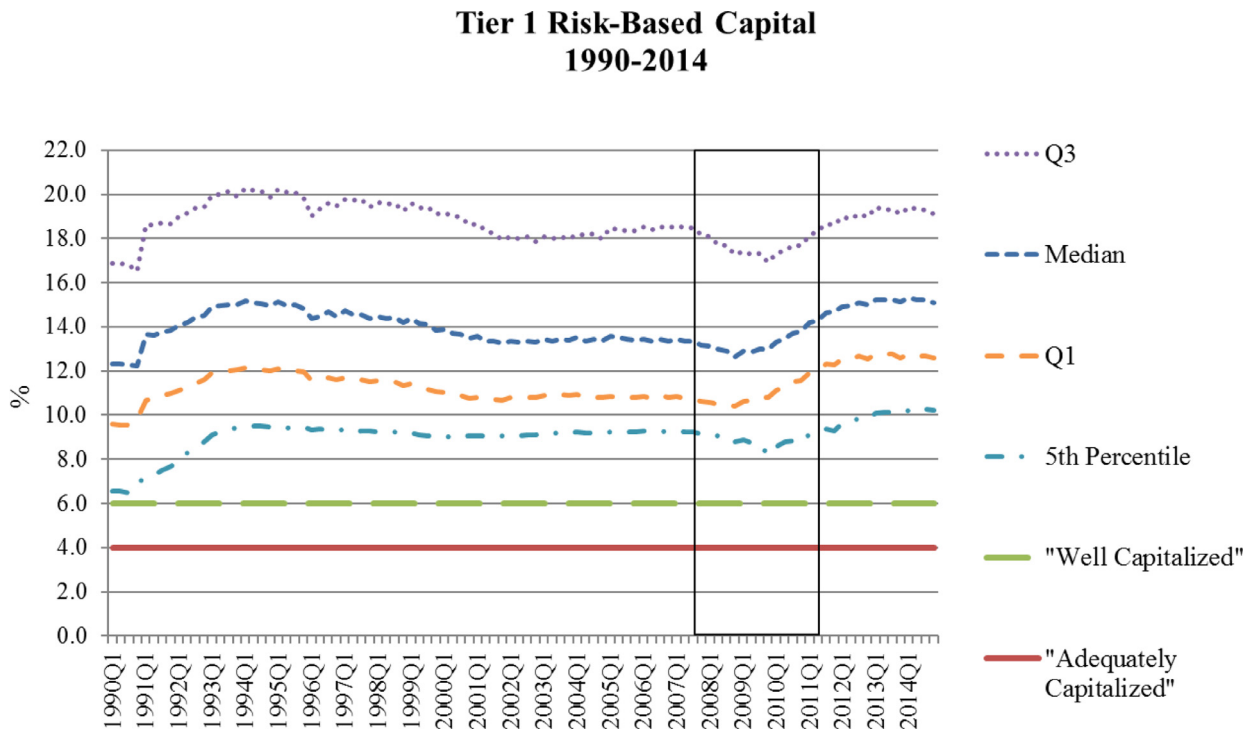


Fig. 2. Tier 1 Risk-Based Capital 1990–2014. This figure plots distributional statistics of Tier 1 risk-based capital levels during my sample period from 1990 to 2014. The figure also notes the level of Tier 1 risk-based capital necessary for a bank to be considered "adequately capitalized" (4%) or "well capitalized" (6%) during this time period. The boxed portion of the figure denotes the financial crisis and its aftermath and shows that, even during this period, most banks had Tier 1 risk-based capital ratios well above the minimum to be considered well capitalized.

and 3) these banks cannot access outside capital or sell non-loan assets on acceptable terms. However, banks historically hold capital at levels well in excess of regulatory requirements (Berger et al., 2008). At the beginning of the last two recessions, regulatory capital minimums were not binding for almost all banks. Regulatory guidelines state that a bank must have a Tier 1 capital ratio of at least 6.00% to be considered "well capitalized."[5] Fig. 2 shows that median Tier 1 capital ratios for commercial banks were 13.50% and 13.35% prior to the last two recessions in Q4 2000 and Q3 2007, respectively, while the 25th percentile ratios were 10.78% and 10.72%, respectively. Moreover, Ryan (2017) argues that the incremental impact on regulatory capital of more conservative loan loss provisioning practices is not likely to be large enough to meaningfully affect regulatory capital adequacy, on average. This suggests that the capital crunch theory may only partially explain procyclical lending, because it does not explain why banks with capital in excess of regulatory minimums would reduce lending in a downturn, holding demand and borrower quality constant.

Given profitable lending opportunities and adequate capital, a decrease in bank lending could also be explained by regulatory restrictions. The role of direct regulatory actions in procyclical lending has not been studied in the accounting literature, though it has received some attention in the finance literature. For instance, studying the lending behavior of New England banks after the recession of the early 1990s, Peek and Rosengren (1995a) find that banks under formal regulatory enforcement actions shrink loan originations at a faster rate than other banks. Furfine (2001) models how banks allocate their portfolios between risky and safe assets and concludes that banks' observed lending behavior during the credit crunch of the early 1990s was attributable to changes in the *intensity* of regulatory enforcement (i.e., the level of pressure exerted by regulators after controlling for financial health). Recent research in accounting shows that regulators often assign low grades for capital adequacy to banks with capital well above the regulatory minimum (Gopalan et al., 2017).

It is possible that procyclical lending is a consequence of bank regulatory enforcement, particularly if regulators restrict lending by banks for which lending would improve financial health. For example, banks may be forced to forgo positive NPV loans that would improve profitability and capital levels. Moreover, because a bank's allowance for loan losses is an important factor in regulatory assessments of safety and soundness, regulatory actions could help explain the relationships between attributes of loan loss accounting and procyclical lending.

[5] Regulatory capital thresholds for U.S. banks were revised in 2013 to align with the requirements of Basel III. The revised Tier 1 capital threshold to be considered "well capitalized" is 8%. This threshold became effective for banks with greater than $250 billion on January 1, 2014 and most other banks on January 1, 2015.

2.2. Bank regulation

Banks are one of the most heavily regulated industries in the United States.[6] Each U.S. bank holding company and bank subsidiary, depending on its charter, is regulated by one or more of the Federal Reserve Board (FRB), the Office of the Comptroller of the Currency (OCC), the Federal Deposit Insurance Corporation (FDIC), or state regulatory bodies. Regulators perform routine on-site examinations of banks under their jurisdiction.

One of bank regulators' main concerns is the safety and soundness of institutions under their jurisdiction. Regulators routinely review various aspects of a bank's operations and loan portfolio in an effort to assess its overall safety and soundness. At the end of each exam, a bank is assigned a safety and soundness rating. Referred to as CAMELS ratings, these ratings are scaled from 1 (best rating) to 5 (worst rating) and are a combination of regulators' assessments of capital (C), asset quality (A), management (M), earnings (E), liquidity (L), and sensitivity to market risk (S). Banks are rated on each of these dimensions and then assigned an overall CAMELS rating.[7]

The dimensions of a bank's CAMELS rating are not mutually exclusive. For instance, the adequacy of a bank's allowance for loan losses is an important consideration in several dimensions of a bank's CAMELS rating, including capital, asset quality, and earnings (OCC, 2013a;2013b). Specifically, in assigning the rating for capital, examiners are instructed to consider the "nature, trend, and volume of problem assets, and *adequacy of the allowance for loan and lease losses (ALLL)* and other valuation reserves" (emphasis added). In assigning the rating for asset quality, examiners are instructed to consider the "adequacy of ALLL and other asset valuation reserves." In assigning the rating for earnings, examiners are instructed to consider the "adequacy of provisions to maintain the ALLL and other valuation allowance accounts." Due to its inclusion in the assessment of multiple dimensions of a bank's CAMELS rating, allowance adequacy is clearly a key factor in regulators' assessment of overall safety and soundness.

2.3. Informal and formal regulatory enforcement

While CAMELS ratings are confidential and disclosed only to bank management, they play a key role in regulators' supervisory strategies, and regulators can take both non-public ("informal") and public ("formal") actions to address identified weaknesses in safety and soundness. Regulatory enforcement typically begins with informal action. According to Section II-8.1 of the FDIC Compliance Manual, "Informal actions represent the final supervisory step before formal enforcement proceedings are initiated." Informal actions are not legally enforceable and typically take the form of a report to a bank's management and board of directors detailing "Matters Requiring Attention" (MRAs) or a Memorandum of Understanding (MOU). MRAs detail specific areas for improvement to which a bank's board or management must respond with a plan for corrective action. MOUs are informal agreements between a bank's board of directors and regulators to address deficiencies. If regulators deem informal actions to be inadequate, they may choose to pursue formal enforcement actions, which are publicly disclosed.

3. Hypothesis development

3.1. Loan loss allowance adequacy and procyclical lending

As noted previously, prior research predicts that allowance adequacy is associated with procyclical lending through a *minimum capital ratio channel*, which is based on the capital crunch theory (Beatty and Liao, 2011; Jayaraman et al., 2017). However, given the emphasis of allowance adequacy described in the previous section in regulators' assessments of safety and soundness and the fact that regulatory enforcement actions are clustered and more severe in times of economic distress (Peek and Rosengren, 1995a; Furfine, 2001), I predict that allowance adequacy is also indirectly associated with procyclical lending through a *safety and soundness* channel. The safety and soundness channel predicts that inadequate allowances decrease regulatory safety and soundness assessments and thus increase the level and severity of regulatory enforcement actions (see Fig. 1A). While both the minimum capital ratio channel and safety and soundness channel predict a negative association between inadequate allowances and procyclical lending, the safety and soundness channel is distinct from the minimum capital ratio channel because it relies on enforcement actions imposed by bank regulators as a cause of procyclical lending rather than on actions taken by bank managers to comply with regulatory capital rules and *prevent* regulatory enforcement actions. Using mediation analysis (explained in detail below in Section 4), I model the minimum capital ratio channel as the *direct* effect of inadequate allowances on procyclical lending and the safety and soundness channel as the *indirect* effect. Accordingly, I make the following predictions:

H1A. There is a negative direct effect of inadequate allowances on lending during times of economic distress.

H1B. There is a negative indirect effect of inadequate allowances on lending during times of economic distress through regulatory actions.

[6] The term "banks" in this paper refers to commercial banks.

[7] Berger et al. (2001) provides a good discussion of the regulatory process and a summary of each dimension of the CAMELS rating system.

3.2. Loan loss provision timeliness and procyclical lending

The association between loan loss provision timeliness and procyclical lending is unclear ex ante. On one hand, the results in Beatty and Liao (2011) are consistent with the minimum capital ratio channel, showing a positive association between timely loan loss provisioning and loan growth during recession quarters. On the other hand, prior research theorizes that timely loan loss provisions increase the transparency of banks to outside monitors (e.g., Bushman and Williams, 2012; Bushman, 2014; Gallemore, 2018; Ryan, 2017). Gallemore (2018) finds that banks with more timely loan loss provisions are *more* likely to receive a formal enforcement action, while studies in finance show that regulatory enforcement is associated with decreased lending (Peek and Rosengren, 1995a; Furfine, 2001). Thus timely loan loss provisions could be either positively associated with procyclical lending through the minimum capital ratio channel or negatively associated with lending through a *transparency* channel.

I assume that regulators have incentives to forbear on weaker banks and predict that the association between timeliness and procyclical lending depends on banks' safety and soundness ratings and the related incentive of regulators to forbear. This assumption is supported by research suggesting that regulators may prefer not to issue a formal action if they believe forbearance would promote the stability of the financial system as a whole (e.g., Brown and Dinç, 2011) and that forbearance can be an optimal regulatory strategy to prevent bank contagion (Morrison and White, 2013). For banks with more favorable safety and soundness ratings, I predict that there is little need to engage in forbearance and thus the minimum capital ratio channel is likely to dominate the transparency channel, suggesting a positive association between timeliness and procyclical lending. In contrast, I predict that the incentive to engage in forbearance is stronger for banks with less favorable safety and soundness ratings, and the transparency channel is more likely to dominate the minimum capital ratio channel for such banks. For these banks, increased transparency inhibits the ability of regulators to engage in forbearance, leading to increased regulatory pressure to reduce lending.[8] Fig. 1A provides a depiction of these two channels, which lead to the following hypotheses:

H2A. For banks with more favorable safety and soundness ratings, loan loss provision timeliness is positively associated with lending during times of economic distress.

H2B. For banks with less favorable safety and soundness ratings, loan loss provision timeliness is negatively associated with lending.

Note that I do not condition on the state of the economy in predicting a negative association between timeliness and lending in H2B, as transparency resulting from timely provisions could inhibit the ability of regulators to engage in forbearance in both good and bad times.[9] Further, it is important to note that both regulators' incentive to forbear and the importance of unrecognized loss overhangs may vary with bank safety and soundness. To the extent that unrecognized loss overhangs are less important for banks with more favorable safety and soundness assessments, it will bias against finding a significant association consistent with H2A. Similarly, to the extent that the effect of unrecognized loss overhangs is more important for banks with less favorable safety and soundness assessments, it will bias against finding a significant association consistent with H2B.

4. Empirical design

4.1. Predicting regulatory enforcement

To examine the relationship between loan loss accounting, regulatory actions, and procyclical lending, I first develop a measure of *regulatory pressure* by estimating a model predicting the likelihood that a bank will be placed under a formal regulatory enforcement action that contains either a direct or indirect lending restriction. The model is as follows:

$$\begin{aligned}\Pr\left(LendRest\right)_{i,q+6} = {} & \varphi_0 + \varphi_1 Adeq_{iq} + \varphi_2 Timeliness_{iq} + \varphi_3 Tier1_{iq} + \varphi_4 NIBP_{iq} + \varphi_5 ALLL_{iq} \\ & + \varphi_6 NPL_{iq} + \varphi_7 SFLoans_{iq} + \varphi_8 CRELoans_{iq} + \varphi_9 ConsLoans_{iq} \\ & + \varphi_{10} LoanYield_{iq} + \varphi_{11} INT_{iq} + \varphi_{12} SGL_{iq} + \varphi_{13} CASH_{iq} + \varphi_{14} |GAP|_{iq} \\ & + \varphi_{15} Size_{iq} + \varphi_{16} TYPE_{iq} + \varphi_{17} REC_q + \varphi_{18} POSTREC_q + \varphi_{19} PUBLIC_{iq} + \varepsilon_{iq} \end{aligned} \quad (1)$$

The dependent variable is an indicator equal to one if a bank was under a formal regulatory enforcement action in quarter q+6 that places either a direct or indirect restriction on lending. I allow a six quarter lag between explanatory variables and observed lending restrictions for two reasons. First, formal enforcement actions are typically the culmination of a period of informal actions, thus enforcement actions are likely not best explained by contemporaneous measures. Second, this lag

[8] An alternative explanation for a negative association between timeliness and procyclical lending for banks with less favorable safety and soundness ratings is that timely provisions make regulators more aware of loan problems. Gallemore (2018) tests this possibility and finds that his results are more consistent with regulatory forbearance than with regulatory awareness.

[9] It is possible, however, that regulators' incentive to forbear is greater in times of distress. I address this below in my empirical specification in Eq. (5).

helps mitigate reverse causality concerns that allowance attributes and other explanatory variables have been influenced by regulatory pressure (e.g., Costello et al., 2019; Nicoletti, 2018). I use the predicted value from this model, denoted *ENFPROB*, as a proxy for *all* regulatory pressure to test whether regulatory pressure helps explain the relationship between loan loss allowance attributes and bank lending.[10]

Following prior literature, I proxy for allowance adequacy (*Adeq*) using the ratio of the allowance for loan losses to nonperforming loans (e.g., Beatty and Liao, 2011). Also following prior literature (e.g., Nichols et al., 2009; Beatty and Liao, 2011; Bushman and Williams, 2015), I measure loan loss provision timeliness (*Timeliness*) as the difference in the adjusted R^2 of the following two regressions:

$$LLP_{iq} = \gamma_0 + \gamma_1 \Delta NPL_{i,q-2} + \gamma_2 \Delta NPL_{i,q-1} + \gamma_3 Tier1_{iq} + \gamma_4 NIBP_{iq} + \varepsilon_{iq} \quad (2)$$

$$LLP_{iq} = \gamma_0 + \gamma_1 \Delta NPL_{i,q-2} + \gamma_2 \Delta NPL_{i,q-1} + \gamma_3 \Delta NPL_{iq} + \gamma_4 \Delta NPL_{i,q+1} + \gamma_5 Tier1_{iq} + \gamma_6 NIBP_{iq} + \varepsilon_{iq} \quad (3)$$

Eqs. (2) and (3) are estimated at the bank level using 12 lagged quarters of data. The difference in the adjusted R^2 of Eqs. (2) and (3) captures the incremental explanatory power of current and future changes in nonperforming loans for current loan loss provisions over prior-quarter changes in nonperforming loans.

Eq. (1) also includes proxies for the components of the CAMELS rating system in order to capture the various financial and operating attributes regulators consider as part of their examinations. I use proxies similar to those found in prior literature (e.g., Kerstein and Kozberg, 2013; Duchin and Sosyura, 2014; Bushman and Williams, 2015). To proxy for the credit quality of a bank's loan portfolio, I include the ratio of the loan loss allowance to loans (*ALLL*), nonperforming loans to loans (*NPL*), and loan yield (*LoanYield*). Each of these proxies serves as a measure of the expected losses in the loan portfolio. Therefore I expect banks with higher values of these proxies to have lower asset quality and a higher likelihood of regulatory enforcement. I also control for loan portfolio composition, including the percentages of single-family mortgage loans (*SFLoans*), commercial real estate loans (*CRELoans*), and consumer loans (*ConsLoans*). For capital, I include the risk-based tier 1 capital ratio (*Tier1*). *Tier1* captures a bank's current ability to absorb losses and should be negatively associated with enforcement. For earnings, I include return on assets before loan loss provisions and income taxes (*NIBP*) as well as the ratio of net interest income to total assets (*INT*) and securities gains and loss to total assets (*SGL*). The latter two ratios capture the extent to which return on assets is from recurring operations (net interest income) versus non-recurring gains and losses, i.e. lower-quality earnings. For liquidity, I include the ratio of cash to total assets (*CASH*). More liquid banks are less likely to be subject to regulatory enforcement. Finally, to proxy for the sensitivity to market risk, I include the absolute value of the interest rate gap (net assets expected to mature or re-price within 1 year) scaled by total assets (|*GAP*|). Banks with larger |*GAP*| are more exposed to changes in interest rates.[11]

In addition to proxies for components of a bank's CAMELS rating, I include the natural logarithm of total assets (*Size*) and indicators for various regulatory asset cutoff thresholds (*TYPE*) as proxies for size. As discussed in Ballew et al. (2017), regulatory requirements differ for banks above and below various total asset thresholds and could impact the likelihood of regulatory intervention. I use the following total asset thresholds: less than $500 million, between $500 million and $10 billion, between $10 billion and $50 billion, between $50 billion and $250 billion, and greater than $250 billion. I also include indicator variables for quarters during a recession (*REC)* or the following two years (*POSTREC*) to capture changes in regulatory *intensity* (Furfine, 2001). Recession quarters are based on the determination of the National Bureau of Economic Research, defined as 1990Q3-1991Q1, 2001Q1–2001Q4, and 2007Q4–2009Q2. Finally, I include an indicator for publicly traded banks (*PUBLIC*) to control for differences in information environments and political pressure not captured by scale variables.

4.2. Identifying lending restrictions

To identify lending restrictions imposed by bank regulators, I begin by obtaining a list of all regulatory enforcement actions from 1990–2014 from S&P Global Market Intelligence ("S&P MI," formerly SNL Financial). Fig. 3 shows the distribution of regulatory enforcement actions by type over the sample period. As noted previously, the number of formal regulatory enforcement actions increases after times of financial distress, with significant increases in enforcement actions in the wake of the recession of the early 1990s and the financial crisis of 2007–2009. The peak during my sample period is 1,796 actions in 2010. Of the 1,796 actions in 2010, 1,253 actions (70%) were against firms rather than individuals. While the significant increase in enforcement actions occurs after recessions have technically ended, it is likely that these formal actions follow increases in informal regulatory pressure in the preceding years.

I use textual analysis software to identify the subset of bank enforcement actions that directly or indirectly restrict lending. I search for specific keywords pertaining to lending activities in enforcement action section subheadings. I extract sections addressing lending and further examine them by searching for specific keywords and phrases to determine whether the actions place direct or indirect restrictions on lending. Appendix B provides details on the keywords used to identify enforcement action subheadings pertaining to lending and then keywords and phrases used to determine if the actions

[10] I discuss a validation of this measure below in Section 5.3.

[11] I do not include a proxy specifically for management quality, as prior research (e.g., DeYoung, 1998) has used return on assets, which is already included in this model, as a proxy for management quality.

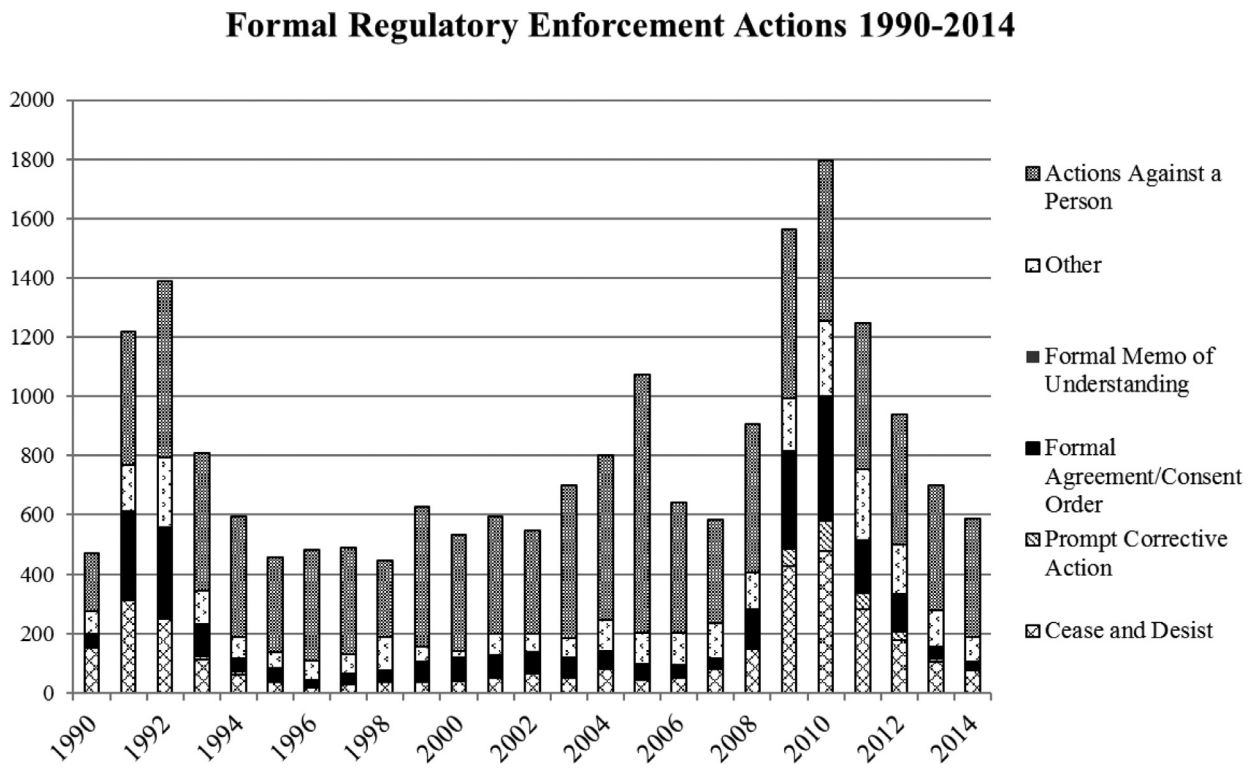


Fig. 3. Formal Regulatory Enforcement Actions 1990–2014. This figure shows the number of regulatory enforcement actions by year during my sample period. The highest peaks occur after the two most significant bank-led recessions in 1992 (following the recession from 1990Q3 to 1991Q1) and 2010 (following the recession from 2007Q4 to 2009Q2).

restrict lending. Broadly speaking, I identify an enforcement action as directly restricting lending if it prohibits an extension of funds to any borrower and as indirectly restricting lending if it requires a bank to reduce problem assets or concentrations of credit.

4.3. Loan loss accounting, regulatory enforcement, and procyclical bank lending

4.3.1. Allowance adequacy

H1A predicts that there is a direct effect of allowance adequacy on procyclical lending through the minimum capital ratio channel, while H1B predicts that adequacy indirectly affects procyclical lending through its impact on regulatory actions. That is, regulatory actions *mediate* the association between allowance adequacy and procyclical lending. To test this, I perform mediation analysis using linear regression based on the approach popularized by Baron and Kenny (1986).[12] In my setting, this approach requires (1) establishing a relationship between allowance adequacy and lending in times of economic distress, (2) establishing that allowance adequacy is correlated with the mediating variable, regulatory pressure, in times of economic distress, and (3) showing that the relationship between adequacy and lending during times of economic distress is attenuated after controlling for regulatory pressure. Full (partial) mediation is supported if the effect of adequacy on lending goes to zero (is significantly attenuated) after controlling for regulatory pressure.

To operationalize the three steps above, I estimate the following three models:

$$Loan\ Growth_{i,q+1,q+4} = \theta_0 + \theta_1 Less\_Adeq_{iq} + \theta_2 Distress_{q+1,q+4} + \theta_3 Distress_{q+1,q+4} \times Less\_Adeq_{iq} + Controls + Region\ FE + Year\ FE + \varepsilon_{i,q+1,q+4} \quad (4A)$$

$$ENF_{i,q+1,q+4} = \alpha_0 + \alpha_1 Less\_Adeq_{iq} + \alpha_2 Distress_{q+1,q+4} + \alpha_3 Distress_{q+1,q+4} \times Less\_Adeq_{iq} + Controls + Region\ FE + Year\ FE + \varepsilon_{i,q+1,q+4} \quad (4B)$$

$$Loan\ Growth_{i,q+1,q+4} = \beta_0 + \beta_1 Less\_Adeq_{iq} + \beta_2 Distress_{q+1,q+4} + \beta_3 ENF_{i,q+1,q+4} + \beta_4 Distress_{q+1,q+4} \times Less\_Adeq_{iq} + Controls + Region\ FE + Year\ FE + \varepsilon_{i,q+1,q+4} \quad (4C)$$

[12] David Kenny maintains a thorough discussion of mediation analysis on his personal website: http://davidakenny.net/cm/mediate.htm.

where the subscript *q+1,q+4* denotes the four quarters after quarter *q*. The dependent variable, *Loan Growth*, denotes loan growth in period *q+1,q+4* for bank *i* scaled by loans outstanding at the beginning of the quarter *q*. *Less_Adeq* denotes an indicator variable equal to 1 for bank-quarters with below-median *Adeq* (i.e., the ratio of the allowance to nonperforming loans) at the end of quarter *q* and 0 otherwise.[13] I measure allowance adequacy and other bank-specific controls at the end of quarter *q* and examine loan growth over the succeeding four quarters because both the minimum capital ratio channel and the safety and soundness channel predict that lending is affected by past loan loss provisioning behavior. Moreover, this approach helps mitigate endogeneity concerns that could arise due to the potential effect of loan growth on a contemporaneous measure of allowance adequacy. *Distress* is an indicator variable equal to 1 if any quarter during period *q+1,q+4* is in a recessionary or post-recessionary period. My proxy for regulatory pressure, *ENF*, is the square root of average *ENFPROB* (the predicted value from estimating Eq. (1)) in period *q+1,q+4*.[14] As discussed previously, I use this measure as a proxy for *all* regulatory pressure related to lending.

Through estimating Eqs. (4A), (4B), and (4C), I am able to calculate the total effect, the direct effect, and the *indirect effect* of allowance adequacy on procyclical lending. The total effect is captured by θ_3 and has been the focus of prior research. The direct effect is captured by β_4, which H1A predicts will be negative through the minimum capital ratio channel. The indirect effect, which H1B predicts will be negative through the safety and soundness channel, is calculated as θ_3 minus β_4.[15] To estimate the statistical significance of the indirect effect, I estimate the Sobel test statistic (Sobel, 1982) suggested in Baron and Kenny (1986).[16,17]

4.3.2. Loan loss provision timeliness

H2A and H2B predict that regulatory actions moderate the association between loan loss provision timeliness and lending. To test these predictions, I extend Eq. (4C) to include timeliness:

$$\begin{aligned} Loan\ Growth_{i,q+1,q+4} = {} & \mu_0 + \mu_1 Less\_Adeq_{iq} + \mu_2 More\_Timely_{iq} + \mu_3 Distress_{q+1,q+4} \\ & + \mu_4 ENF_{i,q+1,q+4} + \mu_5 Distress_{q+1,q+4} \times Less\_Adeq_{iq} + \mu_6 Distress_{q+1,q+4} \times More\_Timely_{iq} \\ & + \mu_7 Distress_{t+1} \times ENF_{i,q+1,q+4} + \mu_8 ENF_{i,q+1,q+4} \times More\_Timely_{iq} \\ & + \mu_9 Distress_{q+1,q+4} \times ENF_{i,q+1,q+4} \times More\_Timely_{iq} + Controls + Region\ FE \\ & + Year\ FE + \varepsilon_{i,q+1,q+4} \end{aligned} \tag{5}$$

where *More_Timely* denotes an indicator variable equal to 1 for bank-quarters with above-median *Timeliness* and 0 otherwise. Other variables are as defined previously.

Through the minimum capital ratio channel, H2A predicts a positive coefficient μ_6 on the association between provision timeliness and lending during times of economic distress for banks under lower regulatory pressure. Through the transparency channel, H2B predicts a negative coefficient μ_8 on the association between timeliness and lending for banks under higher regulatory pressure. While H2B is not specific to periods of financial distress, I include the triple interaction *Distress x ENF x More_Timely* for completeness and examine the individual significance of coefficients μ_8 and μ_9 as well as their combined significance.

In Eqs. (4A), (4B), (4C), and (5), I control for variables intended to capture bank financial health, including asset quality (*NPL*) and profitability (*NIBP*). To capture capital adequacy, I include an indicator variable, *HighCap*, set equal to 1 if a bank has a capital ratio about their target ratio, 0 otherwise. I discuss bank target capital ratios below in Section 6.1.1. I also include the interaction term *HighCap x Distress* so that the effect of adequacy and timeliness are incremental to the capital level during times of distress. I also control for size (the natural logarithm of total assets or *Size)* and portfolio composition (*SFLoans, CRELoans,* and *ConsLoans*). To mitigate concerns that my results are driven by changes in loan demand, I control for macroeconomic conditions, including the change in the national unemployment rate ($\Delta UNEMP$) and the change in U.S. GDP (ΔGDP) and each bank's Federal Reserve district (*REGION*), as banks in similar geographic areas should be subject to similar economic conditions affecting loan demand (e.g., Berger et al., 2001).

---

[13] I use continuous measures of adequacy and timeliness in predicting regulatory enforcement actions, as it likely that regulators use absolute rather than relative measures of these constructs in assessing bank safety and soundness. However, I use quarterly indicator variables for above/below median timeliness and adequacy in lending tests to mitigate concerns that my results are driven by trends in these measures.

[14] A plot of average *ENFPROB* in period *q+1,q+4* and $LoanGrowth_{i,q+1,q+4}$ reveals that this relationship is non-linear. I thus employ a square root transformation of this average probability, denoted *ENF*, for the remainder of my analysis.

[15] The indirect effect can equivalently be calculated as the product of the coefficients capturing the indirect path, $\alpha_3{}^*\beta_3$.

[16] Using coefficients from Eq. (4B) and (C) and their standard errors, the Sobel test statistic is calculated as: $(\alpha_3 * \beta_4)/\sqrt{(\beta_4^2 * s_{\alpha_3}^2) + (\alpha_3^2 * s_{\beta_4}^2) + (s_{\alpha_3}^2 * s_{\beta_4}^2)}$

[17] The Sobel test is known to be conservative because it relies on the normal distribution when the sampling distribution of the indirect path is typically skewed (Hayes, 2009). An alternative method for testing mediation with higher power is bootstrapping. In untabulated analysis, I estimate the statistical significance of each effect using standard errors estimated based on a bootstrapping method with 1,000 observations. All results are robust to the use of bootstrapped standard errors.

5. Sample and results

5.1. Sample

I obtain bank-level data from S&P MI for quarters between the first quarter of 1990 to the fourth quarter of 2014. S&P MI compiles these data from banks' Call Reports, which allows me to include both public and private banks in my sample. After deleting observations with missing values necessary to estimate Eq. (1), including *Timeliness*, which requires 12 lagged quarters, my sample consists of 408,601 bank-quarters for 6,980 individual commercial banks from the third quarter of 1994 to the second quarter of 2014. After estimating Eq. (1), my final sample for tests of procyclical lending consists of 342,530 bank-quarters for 6,774 banks.

5.2. Descriptive statistics

Descriptive statistics for variables necessary to estimate Eq. (1), which predicts regulatory lending restrictions, are found in Panel A of Table 1. This panel shows that 2.3% of sample bank-quarters are subject to a regulatory action that places a restriction on lending. The mean (median) ratio of the allowance to nonperforming loans (*Adeq*) is 4.49 (1.18) while mean (median) *Timeliness* is 0.059 (0). Table 1 also shows that banks have a mean (median) Tier 1 capital ratio of 15.9% (13.8%), suggesting that banks, on average, have Tier 1 capital significantly in excess of the regulatory minimum (4% to be considered adequately capitalized). The mean (median) allowance for loan losses is 1.6% (1.4%) of gross loans, and the mean (median) ratio of nonperforming loans to gross loans is 1.9% (1.2%). Table 1 also shows that 14.3% of bank-quarters fall during recessionary periods, 21.0% fall during the two years after a recession has technically ended, and 7.1% of the bank-quarters in my sample are for publicly-traded banks.

Correlations are presented in Panel B of Table 2, which shows that *Adeq* and *Timeliness* are negatively correlated, consistent with these two measures capturing different constructs. As expected, loan loss allowance adequacy is negatively associated with regulatory actions while loan loss provision timeliness is positively associated with regulatory actions.

5.3. Predicting regulatory lending restrictions

The results of estimating the likelihood of formal regulatory enforcement from Eq. (1) are reported in Table 2. As expected, the probability of a lending restriction in quarter q+6 decreases as capital and earnings increase. Further, the probability of an enforcement action is significantly associated with asset quality, as the coefficients on the level of nonperforming loans ($t = 18.88$, $p < 0.01$) and loan yield ($t = 3.86$, $p < 0.01$) are both positive and significant.

Consistent with regulators considering allowance adequacy in their assessments of bank safety and soundness, I find that *Adeq* is negatively associated with the likelihood of a formal enforcement action ($t = -3.74$, $p < 0.01$). In terms of economic significance, an increase of one in *Adeq* (e.g., from an allowance equal to two times nonperforming loans to three times nonperforming loans) is associated with a 3.3% decrease in the likelihood of enforcement, all else equal. Consistent with Gallemore (2018) and with timely provisions inhibiting regulatory forbearance, I find a positive association between formal regulatory enforcement actions and *Timeliness* ($t = 3.78$, $p < 0.01$). In terms of economic significance, a one standard deviation increase in *Timeliness* is associated with a 9.6% increase in the likelihood of enforcement, all else equal.

Table 3 and Fig. 4 provide analysis of the predicted values from Eq. (1) (*ENFPROB*). Panel A of Table 3 shows average probability by decile, with bank-quarters in the lowest decile having only a 0.1% likelihood of being placed under a regulatory lending restriction, while banks in the top decile have an average likelihood of 13.1%. In subsequent tests, I create an indicator variable called *High_Pressure* that is set equal to 1 if a bank is in the top decile of enforcement probability and 0 otherwise. Fig. 4A displays the receiver-operator characteristic (ROC) curve for Eq. (1). The area under the curve of 86.6% indicates that the model has strong predictive power for lending restrictions.[18] Fig. 4B graphs observed lending restrictions as well as mean enforcement probabilities and *High_Pressure* through the sample period. By construction, the trends in these measures precede those of observed lending restrictions, with peaks in banks under *High_Pressure* observed in Q1 2001 and Q2 2009 vs. peaks in observed enforcement actions in Q4 2004 and Q4 2010. However, while observed lending restrictions had peaks of 1.7% (Q4 2004) and 7.8% of banks (Q4 2010), I classify 21% (Q1 2001) and 49% (Q2 2009) of banks as being under high pressure to reduce lending.

Panels B and C of Table 3 provide descriptive statistics and correlations for bank-quarters used in my procyclical lending tests. Panel B splits between *High_Pressure* bank-quarters and non-*High_Pressure* banks quarters. Banks under high regulatory pressure to reduce lending have zero loan growth in period *q+1,q+4* compared to positive mean loan growth of 8.5% for other banks. These banks also have less adequate loan loss allowances (75.3% have below-median allowance to nonperforming loan ratios), more timely provisions (55.0% have above-median *Timeliness*), lower capital (11.3% *Tier 1* vs. 14.8%), higher nonperforming loans (4.6% of loans vs. 1.7% of loans), and lower pre-provision income (0.2% of total assets vs. 0.4% of total assets). Loan portfolio composition varies significantly for banks under high regulatory pressure, who hold significantly

[18] The area under an ROC curve can be interpreted as the likelihood that a randomly-chosen treated observation will be ranked as having a higher probability of treatment than a non-treated observation (Fawcett, 2006). In this instance, then, a randomly-chosen bank-quarter subject to a lending restriction has an 86.8% chance of receiving a higher *ENFPROB* than a randomly-chosen bank-quarter with no restriction.

Table 1
Descriptive statistics. Panel A presents descriptive statistics for the variables used in estimating the lending restriction model in Eq. (1). Panel B presents correlations between these variables. Spearman (Pearson) correlations appear above (below) the diagonal and correlations in bold are significant at the 5% level or lower. $LendRest_{q+6}$ is an indicator variable taking a value of 1 if a bank is under a formal enforcement action directly or indirectly constraining lending in quarter $q+6$ and 0 otherwise. *Timeliness* is a measure of loan loss provision timeliness. Additional detail about the calculation of *Timeliness* is provided in the text and in Appendix A. *Adeq* is the ratio of the allowance for loan and lease losses to nonperforming loans. *Tier1* is the Tier 1 risk-based capital ratio. *NIBP* is the ratio of net income before taxes and loan loss provisions to total assets. *ALLL* is the ratio of the allowance for loan and lease losses to total loans. *NPL* is the ratio of nonperforming loans to total loans. *SFLoans* is the ratio of single-family loans to total loans. *CRELoans* is the ratio of commercial real estate (i.e., non-single-family real estate) loans to total loans. *ConsLoans* is the ratio of consumer loans to total loans. *LoanYield* is annually de-meaned total interest income on loans divided by average consolidated loans. *INT* is net interest income divided by total assets. *SGL/TA* is realized securities gains and losses divided by total assets. *CASH* is cash divided by total assets. |*GAP*| is the absolute value of interest-bearing assets that mature or reprice within a year minus interest-bearing liabilities that mature or reprice within a year, divided by total assets. *Size* is the natural logarithm of total assets. *Type* is an indicator variable denoting various regulatory asset thresholds. Thresholds are $500 million, $10 billion, $50 billion, and $250 billion. *REC* is an indicator variable equal to 1 if a quarter falls in 2001Q1 – 2001Q4 or 2007Q4 – 2009Q2, 0 otherwise. *POSTREC* is an indicator variable equal to 1 if a quarter falls within eight quarters following a recession and 0 otherwise. *PUBLIC* is an indicator variable equal to 1 if a bank has publicly-traded equity and 0 otherwise. Additional details on variables are provided in Appendix A.

Panel A: Descriptive statistics – lending restriction model

	N	Mean	Std	Min	Q1	Median	Q3	Max
$LendRest_{t+6}$	408,601	0.023	0.150	0.000	0.000	0.000	0.000	1.000
Loan loss accounting attributes								
Adeq	408,601	4.492	12.528	0.134	0.599	1.184	2.789	96.722
Timeliness	408,601	0.059	0.320	−0.506	−0.152	0.000	0.211	1.082
Proxies for variables used in regulatory safety and soundness assessments								
Tier1	408,601	0.159	0.075	0.065	0.113	0.138	0.180	0.953
NIBP	408,601	0.004	0.003	−0.008	0.003	0.004	0.005	0.017
ALLL	408,601	0.016	0.008	0.004	0.011	0.014	0.018	0.060
NPL	408,601	0.019	0.023	0.000	0.005	0.012	0.025	0.132
SFLoans	408,601	0.274	0.160	0.000	0.156	0.256	0.369	0.783
CRELoans	408,601	0.357	0.178	0.000	0.224	0.340	0.476	0.827
ConsLoans	408,601	0.110	0.105	0.000	0.038	0.081	0.148	0.672
LoanYield	408,601	0.001	0.011	−0.024	−0.006	−0.001	0.005	0.046
INT	408,601	0.010	0.002	0.003	0.008	0.010	0.011	0.017
SGL	408,601	0.000	0.000	−0.001	0.000	0.000	0.000	0.002
CASH	408,601	0.058	0.052	0.008	0.028	0.041	0.066	0.340
|*GAP*|	408,601	0.272	0.142	0.006	0.165	0.273	0.373	0.626
Additional variables								
Size	408,601	11.754	1.320	7.569	10.890	11.611	12.406	21.417
Type	408,601	1.133	0.394	1.000	1.000	1.000	1.000	5.000
REC	408,601	0.143	0.350	0.000	0.000	0.000	0.000	1.000
POSTREC	408,601	0.210	0.407	0.000	0.000	0.000	0.000	1.000
PUBLIC	408,601	0.071	0.256	0.000	0.000	0.000	0.000	1.000

(*continued on next page*)

Table 1
(*continued*)

Panel B: Correlations - Lending restriction model

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1)	$LendRest_{i,q+6}$	−0.13	0.02	−0.10	0.10	0.15	−0.04	0.10	−0.10	−0.02	−0.12	−0.06	0.02	0.00	0.00	0.05	0.02	0.08	0.07	0.01	
(2)	$Adeq_{iq}$	−0.04		−0.03	−0.01	−0.01	−0.93	−0.03	−0.03	0.05	−0.01	0.17	0.08	−0.05	−0.04	−0.02	0.02	0.00	−0.07	−0.10	0.03
(3)	$Timeliness_{iq}$	0.02	−0.01		−0.02	0.03	0.03	−0.02	0.02	−0.03	−0.02	−0.02	−0.02	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.01
(4)	$Tier1_{iq}$	−0.07	0.03	0.00		0.15	0.05	0.15	−0.31	0.25	0.09	0.02	−0.03	−0.02	0.11	0.09	−0.32	−0.21	−0.09	−0.05	−0.20
(5)	$NIBP_{iq}$	0.13	−0.02	0.02	0.18		0.34	−0.18	0.06	−0.06	0.08	−0.03	0.01	0.03	0.15	−0.05	−0.01	0.07	−0.08	0.07	0.02
(6)	$ALLL_{iq}$	0.21	−0.25	0.04	0.05	0.44		−0.04	0.04	−0.07	0.05	−0.17	−0.07	0.05	0.09	0.00	−0.02	0.03	0.03	0.11	−0.02
(7)	NPL_{iq}	−0.04	−0.02	−0.03	0.10	−0.18	−0.07					−0.07	−0.07	0.02	−0.05	0.24	0.00	−0.07	−0.02	0.00	0.00
(8)	$SFLoans_{iq}$	0.11	0.01	0.02	−0.27	0.05	0.10	−0.32		−0.63	−0.09	−0.10	−0.13	0.06	−0.01	−0.04	0.43	0.17	0.06	0.09	0.12
(9)	$CRELoans_{iq}$	−0.06	−0.03	−0.02	0.22	0.05	−0.05	0.02	−0.56		0.26	0.16	0.25	−0.06	0.05	0.04	−0.38	−0.18	−0.05	−0.08	−0.11
(10)	$ConsLoans_{iq}$	−0.02	−0.02	−0.01	0.08	0.11	0.02	−0.13	−0.11	0.30		0.21	0.48	−0.02	0.12	−0.13	−0.27	−0.21	−0.05	0.19	−0.14
(11)	$LoanYield_{iq}$	−0.13	0.04	−0.02	0.05	−0.03	−0.20	−0.08	−0.12	0.21	0.27		0.52	0.01	−0.14	−0.12	0.10	0.08	−0.07	−0.05	0.08
(12)	INT_{iq}	−0.06	0.01	−0.02	−0.04	0.03	−0.09	−0.09	−0.12	0.27	0.52	0.51		−0.11	0.03	−0.23	−0.22	−0.14	−0.09	−0.08	−0.05
(13)	SGL_{iq}	0.03	−0.02	0.00	−0.01	0.05	0.08	0.01	0.06	−0.05	0.00	0.05	−0.10		−0.01	0.11	0.13	0.08	0.04	0.10	0.04
(14)	$CASH_{iq}$	0.01	0.01	0.01	0.12	0.17	0.14	−0.06	0.04	0.00	0.06	−0.17	−0.11	0.01		−0.12	−0.14	−0.07	−0.09	0.08	−0.08
(15)	$\lvert GAP\rvert_{iq}$	0.00	−0.01	0.00	0.06	−0.04	0.00	0.24	−0.05	0.05	−0.10	−0.10	−0.22	0.08	−0.14		0.16	0.10	0.04	0.08	0.04
(16)	$Size_{iq}$	0.04	−0.04	0.01	−0.26	0.01	−0.01	−0.02	0.33	−0.19	−0.22	0.13	−0.20	0.06	−0.08	0.15		0.56	0.05	0.07	0.34
(17)	$TYPE_{iq}$	0.02	−0.04	0.01	−0.15	0.08	0.03	−0.06	0.11	−0.04	−0.15	0.10	−0.13	0.03	−0.02	0.08	0.75		0.02	0.03	0.44
(18)	REC_q	0.08	−0.02	0.02	−0.06	−0.07	0.02	−0.02	0.06	−0.05	−0.07	−0.07	−0.09	0.01	−0.07	0.03	0.05	0.02		−0.21	0.02
(19)	$POSTREC_q$	0.07	−0.03	0.02	−0.04	0.07	0.12	0.00	0.08	−0.08	0.25	−0.05	−0.08	0.10	0.08	0.08	0.06	0.02	−0.21		0.01
(20)	$PUBLIC_{iq}$	0.01	−0.02	0.01	−0.15	0.01	−0.02	0.00	0.12	−0.06	−0.11	0.06	−0.05	0.01	−0.06	0.04	0.42	0.42	0.02	0.01	

Table 2
Predicting formal lending restrictions. This table presents the results of estimating Eq. (1) predicting regulatory enforcement actions that directly or indirectly restrict lending six quarters ahead. All variables are defined in Table 1. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered by bank.

Dependent variable: $LendRest_{i,q+6}$	Predicted sign	Coefficient	*z*-stat
Intercept		−5.30	−9.74***
$Adeq_{iq}$	−	−0.03	−3.74***
$Timeliness_{iq}$	+	0.26	3.78***
$Tier1_{iq}$	−	−9.66	−8.97***
$ALLL_{iq}$	+	32.73	10.06***
NPL_{iq}	+	17.90	18.88***
$SFLoans_{iq}$	+/−	−0.04	−0.14
$CRELoans_{iq}$	+/−	1.56	5.42***
$ConsLoans_{iq}$	+/−	0.32	0.57
$LoanYield_{iq}$	+	11.08	3.86***
$NIBP_{iq}$	−	−118.99	−11.68***
INT_{iq}	−	6.62	0.31
SGL_{iq}	+	107.45	1.96**
$CASH_{iq}$	−	−3.44	−5.16***
$\|GAP\|_{iq}$	+	−0.43	−1.78*
$Size_{iq}$	+/−	0.12	2.55**
$TYPE_{iq}$	+/−	−0.22	−1.82*
REC_q	+	1.49	25.60***
$POSTREC_q$	+	1.06	18.26***
$PUBLIC_{iq}$	+/−	−0.31	−2.24**
N		408,601	
Pseudo R^2		0.234	

more non-single-family real estate loans and fewer consumer loans. *High_Pressure* banks are also larger, on average, and banks are more likely to be under high pressure during times of economic distress with rising unemployment and low GDP growth.

To validate that predicted enforcement probabilities capture the construct of regulatory pressure, I hand collect data on banks that are subject to informal regulatory agreements but that are not (at least during my sample period) placed under formal regulatory enforcement. While disclosure of informal enforcement actions is not required, banks may voluntarily disclose them (often when they are replaced with a formal action) or, on occasion, the financial press may uncover them.[19] To identify informal agreements, I search news articles on the S&P MI database during my sample period. I limit my search to U.S. banks and search for the keywords "memorandum of understanding," "MOU," "matters requiring attention," and "MRA." I identify 63 instances where an MOU is publicly-disclosed. Of these 63 observations, 38 are for banks not classified as subsequently being placed under a formal action in my sample period. Panel D of Table 3 presents information about these informal actions, including the predicted enforcement probability from Eq. (1) and *ENFPROB* at the time the MOU was issued. As shown in Panel C, of the 38 sample banks, 89% are in the top two deciles of *ENFPROB* and 74% are in the top decile, supporting *ENFPROB* as a measure of informal regulatory pressure which is likely to be unobserved in most instances.

5.4. Tests of allowance attributes and procyclical lending

Before estimating Eqs. (4A), (4B), and (4C), I first estimate a simplified version of Eq. (5) separately during times of economic distress and stable times for banks classified as *High_Pressure* and those not so classified. I test the statistical significance of differences across partitions using seemingly unrelated regression. The results are presented in Table 4 and provide initial evidence supporting H1B and H2B. First, I find a significantly negative association between adequacy and loan growth for the full sample. While I find this association across partitions of *High_Pressure* and *Distress*, it is strongest for banks under high regulatory pressure ($X^2 = 13.31$, $p < 0.01$). In stable times, the negative coefficient is larger for *High_Pressure* banks, but the difference is not statistically significant ($X^2 = 2.06$, $p > 0.10$). In times of distress, however, the coefficient is significantly more negative for *High_Pressure* banks ($X^2 = 9.90$, $p < 0.01$), consistent with H1B. Comparing banks with lower regulatory pressure (*High_Pressure* = 0), the coefficient on *Less_Adeq* is slightly more negative in *stable* times rather than in times of distress, inconsistent with H1A. Second, I find that *High_Pressure* banks have lower loan growth when they have timelier provisions regardless of the state of the economy, consistent with the transparency channel (H2B). I do not find support for the minimum capital ratio channel (H2A), as the association between timeliness and loan growth for other banks during times of economic distress is significantly negative ($t = -2.08$, $p < 0.05$).

[19] For example, on June 6, 2008, the Wall Street Journal reported that National City Bank, a subsidiary of National City Corporation, had entered into a memorandum of understanding with the OCC (Mehta, 2008). In a statement made on June 10, National City Corporation Chairman, President, and CEO confirmed the MOU (Gorski, 2008).

Table 3
Analysis and Validation of Predicted Enforcement Probabilities. Panel A presents mean enforcement probabilities (*ENFPROB* = the predicted values from estimating Eq. (1)) by decile of probability. Panel B presents descriptive statistics for the sample used in tests of procyclical lending, including a comparison of bank-quarters with *High_Pressure* = 1 to those with *High_Pressure* = 0. *High_Pressure* is an indicator variable equal to 1 for banks in the top decile of average enforcement probability (*ENFPROB*) in the four quarters after quarter *q* and 0 for banks in the bottom nine deciles. *LoanGrowth* is loan growth over the four quarters following quarter *q*, calculated as the change in loans over the four quarters following quarter *q* scaled by loans outstanding at the end of quarter *q*. *More_Timely* is an indicator variable equal to 1 if a bank has above-median *Timeliness* in a quarter and 0 otherwise. *Less_Adeq* is an indicator variable equal to 1 if a bank has below-median *Adeq* in a quarter and 0 otherwise. $\Delta Unemp$ is the change in the national unemployment rate per the Bureau of Labor Statistics. ΔGDP is the percentage change in GDP in billions of chained 2009 dollars from the Bureau of Economic Analysis. *Distress* is an indicator variable equal to 1 if any quarter in the four quarters after quarter *q* are in a recessionary (*REC*) or post-recessionary (*POSTREC*) period. Other variables are as defined in Table 1. *** denote significance at 1% level of *t*-tests of differences in means. Panel C presents correlations between variables used in tests of procyclical lending. *ENF* is the square root transformation of the average *ENFPROB* over the four quarters after quarter *q*. Spearman (Pearson) correlations appear above (below) the diagonal and correlations in bold are significant at the 5% level or lower. Panel D presents the predicted probability of enforcement and *ENFPROB* decile of a sample of banks placed under informal regulatory actions but that are not designated as receiving a formal action in my sample. These banks were identified through a news keyword search using S&P Global Market Intelligence (formerly SNL Financial) using the terms "memorandum of understanding," "MOU," "matters requiring attention," and "MRA."

Panel A: Average probability of a lending restriction by decile

ENFPROB Decile	Mean *ENFPROB*	N
1	0.0009	40,860
2	0.0026	40,860
3	0.0040	40,860
4	0.0055	40,860
5	0.0073	40,860
6	0.0097	40,861
7	0.0138	40,860
8	0.0214	40,860
9	0.0355	40,860
10	0.1311	40,860
Total	0.0232	408,601

Panel B: Univariate comparison: High pressure vs. low pressure bank quarters

	Full Sample		*High_Pressure* = 1		*High_Pressure* = 0		
	N	mean	N	mean	N	mean	Difference
$LoanGrowth_{i,q+1,q+4}$	342,530	0.076	35,002	0.000	307,528	0.085	−0.085***
$Less\_Adeq_{iq}$	342,530	0.520	35,002	0.753	307,528	0.493	0.260***
$More\_Timely_{iq}$	342,530	0.499	35,002	0.550	307,528	0.493	0.057***
$Ln(Tier1)_{iq}$	342,530	−1.938	35,002	−2.180	307,528	−1.910	−0.270***
NPL_{iq}	342,530	0.020	35,002	0.046	307,528	0.017	0.029***
$NIBP_{iq}$	342,530	0.004	35,002	0.002	307,528	0.004	−0.002***
$Size_{iq}$	342,530	11.794	35,002	12.282	307,528	11.739	0.544***
$SFLoans_{iq}$	342,530	0.277	35,002	0.217	307,528	0.284	−0.067***
$CRELoans_{iq}$	342,530	0.354	35,002	0.522	307,528	0.334	0.188***
$ConsLoans_{iq}$	342,530	0.113	35,002	0.058	307,528	0.119	−0.061***
$\Delta Unemp_{q+1,q+4}$	342,530	0.029	35,002	0.203	307,528	0.009	0.194***
$\Delta GDP_{q+1,q+4}$	342,530	0.024	35,002	0.005	307,528	0.026	−0.021***
$Distress_{q+1,q+4}$	342,530	0.458	35,002	0.899	307,528	0.408	0.492***

Panel C: Correlations – lending model

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1)	$LoanGrowth_{i,q+1,q+4}$		−0.15	−0.02	−0.18	−0.17	−0.08	−0.29	0.15	0.02	−0.02	−0.04	0.08	−0.03	0.16
(3)	$Less\_Adeq_{iq}$	−0.12		0.01	0.17	−0.01	0.03	0.75	−0.11	−0.10	0.01	−0.03	0.01	0.00	0.00
(2)	$More\_Timely_{iq}$	−0.01	0.01		0.04	0.00	−0.01	0.02	−0.01	0.01	−0.02	0.00	−0.01	0.00	0.00
(4)	$ENF_{i,q+1,q+4}$	−0.21	0.19	0.04		0.62	−0.51	0.33	−0.24	0.25	−0.20	0.46	−0.36	0.43	−0.47
(5)	$Distress_{q+1,q+4}$	−0.14	−0.01	0.00	0.49		−0.12	0.07	−0.10	0.11	−0.03	0.14	−0.12	0.60	−0.51
(6)	$Ln(Tier1)_{iq}$	−0.05	0.03	−0.01	−0.41	−0.11		0.09	0.03	−0.32	0.17	−0.30	0.26	−0.08	0.09
(7)	NPL_{iq}	−0.25	0.55	0.02	0.48	0.06	0.05		−0.17	−0.07	−0.06	0.03	−0.07	−0.04	−0.03
(8)	$NIBP_{iq}$	0.11	−0.11	−0.01	−0.29	−0.09	0.07	−0.20		0.11	−0.07	−0.09	0.16	−0.01	0.17
(9)	$Size_{iq}$	0.03	−0.08	0.02	0.18	0.10	−0.30	−0.04	0.13		0.00	0.43	−0.37	0.00	−0.19
(10)	$SFLoans_{iq}$	−0.03	0.01	−0.02	−0.18	−0.03	0.15	−0.08	−0.08	−0.02		−0.28	0.16	−0.02	0.04
(11)	$CRELoans_{iq}$	−0.02	−0.02	0.01	0.44	0.13	−0.30	0.09	−0.11	0.32	−0.33		−0.63	0.00	−0.25
(12)	$ConsLoans_{iq}$	0.05	0.01	−0.01	−0.26	−0.11	0.22	−0.06	0.20	−0.20	0.03	−0.56		0.02	0.25
(13)	$\Delta Unemp_{q+1,q+4}$	−0.03	0.00	0.00	0.39	0.57	−0.08	−0.05	−0.05	0.05	−0.03	0.07	−0.05		−0.58
(14)	$\Delta GDP_{q+1,q+4}$	0.10	0.01	0.00	−0.41	−0.50	0.09	−0.02	0.13	−0.15	0.05	−0.22	0.18	−0.84	

(*continued on next page*)

Table 3
(*continued*)

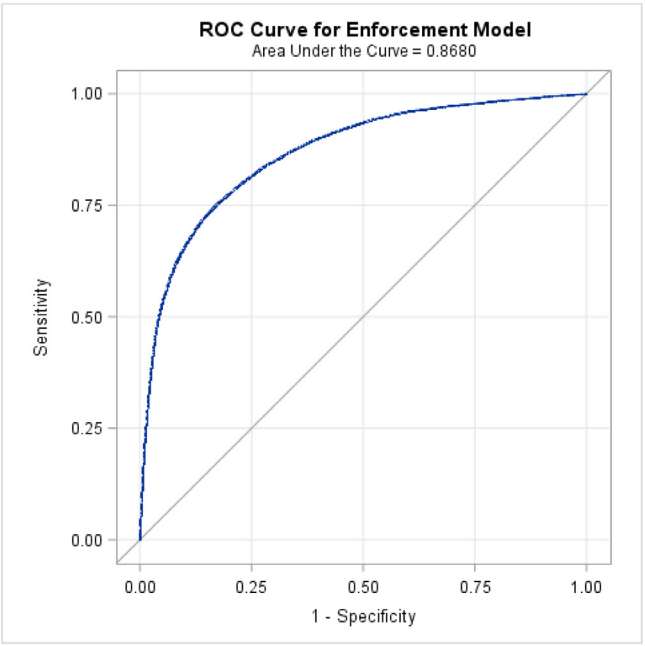
Panel D: Hand-collected sample of banks placed under informal regulatory agreements that never receive a formal action

RSSDID	*Bank Name*	*Agreement type*	*Year*	*Quarter*	*ENFPROB*	*ENFPROB Quarter*	*ENFPROB Decile*
166803	The Merchants Bank	MOU	1995	Unspecified	0.1166	1995 Q2	10
259518	National City Bank	MOU	2008	Q2	0.0906	2008 Q1	10
193461	First Private Bank & Trust	MOU	2008	Q2	0.9108	2008 Q2	10
820048	First National Bank, Ames, Iowa	MOU	2008	Q3	0.1583	2008 Q3	10
275116	First National Bank Of Greencastle	MOU	2008	Q3	0.0045	2007 Q2	3
1349890	Imperial Capital Bank	MOU	2008	Q3	0.1375	2008 Q1	10
671464	Center Bank	MOU	2008	Q4	0.0681	2008 Q4	10
476810	Citibank, N.A.	MOU	2008	Unspecified	0.2333	2008 Q4	10
2796615	Bank Of Florida - Southwest	Proposed MOU	2009	Q2	0.1266	2008 Q3	10
3116274	Bank Of Florida - Southeast	Proposed MOU	2009	Q2	0.1228	2008 Q3	10
3287325	Bank Of Florida - Tampa Bay	Proposed MOU	2009	Q2	0.0707	2008 Q3	10
480228	Bank Of America, National Association	MOU	2009	Q2	0.0780	2009 Q2	10
846619	Cortland Savings & Banking Co	MOU	2009	Q2	0.1105	2009 Q2	10
2372774	Summit Community Bank Inc.	MOU	2009	Q3	0.0573	2009 Q3	10
728742	Farmers Bank & Capital Trust Company	MOU	2009	Q4	0.0434	2009 Q4	9
3138146	Alliance Bank Of Arizona	MOU	2009	Q4	0.0599	2009 Q4	10
3185485	Tidelands Bank	MOU	2009	Q4	0.0490	2009 Q4	10
595869	Cathay Bank	MOU	2009	Q4	0.0923	2009 Q4	10
844343	Merchants And Farmers Bank	MOU	2009	Q4	0.2294	2009 Q4	10
23812	First National Bank Of Chester County	MOU	2009	Q4	0.0548	2009 Q1	10
2197098	Bank Of Nevada	MOU	2009	Unspecified	0.4371	2009 Q1	10
352772	Banner Bank	MOU	2010	Q1	0.0852	2010 Q1	10
29104	Union Center National Bank	MOU	2010	Q1	0.0310	2010 Q1	9
735768	American River Bank	MOU	2010	Q1	0.0406	2010 Q1	9
401148	United Bank & Trust	MOU	2010	Q1	0.1293	2010 Q1	10
802110	National Penn Bank	MOU	2010	Q1	0.0341	2009 Q4	9
3445769	First NBC Bank	MOU	2010	Q1	0.0242	2010 Q1	8
1411032	Inland Northwest Bank	MOU	2010	Q2	0.1025	2010 Q2	10
3277241	Empire State Bank	MOU	2010	Q2	0.0449	2010 Q2	9
139740	West Bank	MOU	2010	Q2	0.0150	2010 Q2	7
2839790	First Reliance Bank	MOU	2010	Q3	0.1305	2010 Q3	10
1017939	United Community Bank	MOU	2010	Q3	0.3475	2010 Q3	10
292524	Four Oaks Bank & Trust Co.	MOU	2010	Unspecified	0.3471	2010 Q4	10
395238	Synovus Bank	MOU	2010	Unspecified	0.2319	2010 Q2	10
2596785	Heartland Community Bank	MOU	2010	Unspecified	0.0779	2010 Q3	10
382667	Wilshire Bank	MOU	2011	Q2	0.1113	2011 Q2	10
2736291	Popular Bank	MOU	2011	Q3	0.0420	2011 Q3	9
876634	Capital City Bank	Expected MOU	2012	Q1	0.0122	2012 Q1	7
	Total sample banks			38			
	Sample banks in top decile of enforcement probability			28			
	Percent of sample banks in top decile of enforcement probability			74%			
	Sample banks in top two deciles of enforcement probability			34			
	Percent of sample banks in top two deciles of enforcement probability			89%			

The results of my formal mediation analysis for the full sample are presented in Table 5. In column (1), I find a significantly negative total effect of adequacy on procyclical lending consistent with prior research (e.g., Beatty and Liao, 2011), as the coefficient on the interaction term $Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$ is significantly negative (-0.0042, $p < 0.05$). However, I do not find a significantly negative *direct* effect of allowance adequacy on procyclical lending through the minimum capital ratio channel as predicted by H1A ($t = 0.39$, $p > 0.10$). Rather, I find that the total effect is driven by a significantly negative *indirect* effect of allowance inadequacy on procyclical lending through regulatory pressure as predicted by the safety and soundness channel and H1B (Sobel $t = -8.20$, $p < 0.01$). Column (3) shows that the coefficient on $Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$ becomes indistinguishable from zero after controlling for regulatory pressure, suggesting full mediation.

Columns (4) and (5) of Table 5 provide the results for H2A and H2B. After including the interaction term $ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$, the coefficient for the interaction term $Distress_{q+1,q+4}$ x $More\_Timely_{iq}$ becomes positive but is statistically insignificant and thus does not support H2A. However, the coefficient for $ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$ is negative and statistically significant in column (5), supporting the transparency channel predicted by H2B (-0.0331, $p < 0.01$). In column (6), I allow the coefficient on $ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$ to vary between distressed and non-distressed periods. The incremental coefficient for $Distress_{q+1,q+4}$ x $ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$ is not statistically significant, while the sum of the coefficients for $ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$ and $Distress_{q+1,q+4}$ x $ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$ is significantly negative ($F = 5.96$, $p < 0.05$). This is consistent with transparency inhibiting regulatory forebearance and leading to reduced loan growth regardless of the state of the economy.

A



B

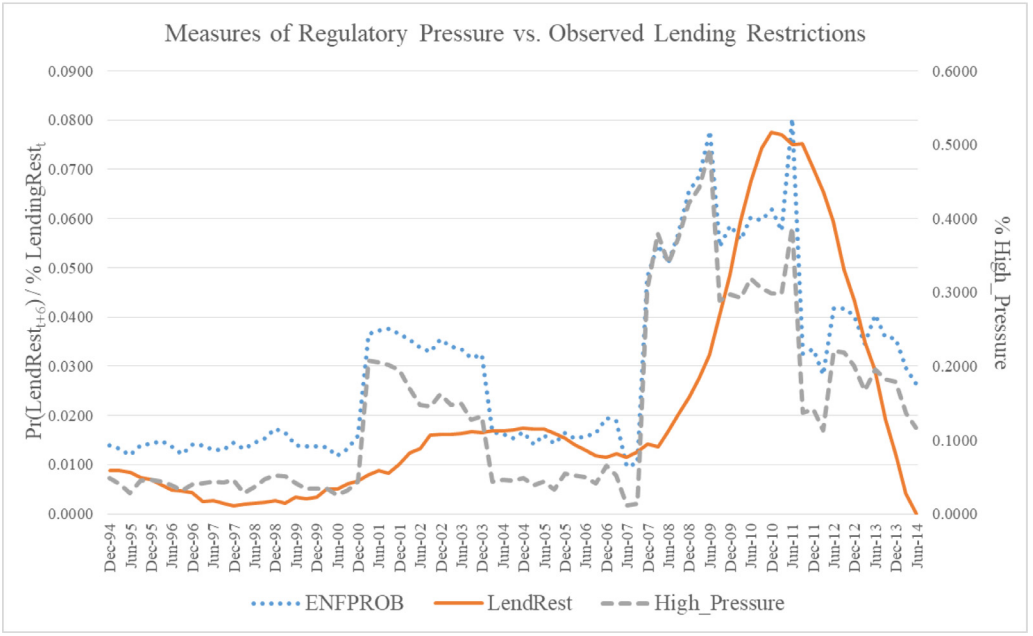


Fig. 4. Analysis of Enforcement Action Prediction Model. This figure provides analysis of the enforcement action prediction model in Eq. (1). Figure 4A displays the receiver-operator characteristic (ROC) curve. The area under the curve of 86.6% indicates that the model has strong predictive power for lending restrictions. Fig. 4B plots the predicted values of Eq. (1) (*ENFPROB*), which represents the probability of a bank being placed under a formal enforcement order in quarter q+6. It also plots the percentage of banks that are either under a formal enforcement order (*LendRest*) or in top decile of *ENFPROB* each period (*HighPressure*).

Table 4
Allowance attributes and lending. This table presents the results of estimating a simplified version of Eq. (5), excluding variables for regulatory pressure, *Distress*, and their interactions, for the full sample of bank-quarters as well as separately for banks with *High_Pressure*=0 and *High_Pressure*=1 in periods where *Distress*=0 and *Distress*=1. All variables are defined in Tables 1 and 3. *t*-statistics appear in parentheses and are based on standard errors are clustered by bank and year-quarter. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:				$Distress_{q+1,q+4}=0$		$Distress_{q+1,q+4}=1$	
$LoanGrowth_{q+1,q+4}$	Full Sample	High_Pressure = 0	High_Pressure = 1	High_Pressure = 0	High_Pressure = 1	High_Pressure = 0	High_Pressure = 1
$Less\_Adeq_{iq}$	−0.0040	−0.0060	−0.0223	−0.0064	−0.0349	−0.0053	−0.0196
	(−3.37)***	(−5.39)***	(−5.07)***	(−4.61)***	(−1.76)*	(−3.77)***	(−4.48)***
$More\_Timely_{iq}$	−0.0030	−0.0016	−0.0090	−0.0012	−0.0153	−0.0023	−0.0078
	(−4.11)***	(−2.17)**	(−3.73)***	(−1.25)	(−1.85)*	(−2.08)**	(−3.12)***
$HighCap_{iq}$	−0.0199	−0.0234	−0.0041	−0.0240	0.0240	−0.0221	−0.0068
	(−19.87)***	(−21.82)***	(−1.31)	(−15.74)***	(3.39)***	(−17.25)***	(−2.10)**
NPL_{iq}	−1.1642	−0.8330	−0.7115	−0.8389	0.0183	−0.8100	−0.8259
	(−24.48)***	(−17.17)***	(−10.66)***	(−13.88)***	(0.12)	(−10.53)***	(−12.20)***
$NIBP_{iq}$	0.3602	−1.5133	2.3474	−1.6202	3.5240	−1.2868	2.0168
	(0.82)	(−3.60)***	(3.01)***	(−3.05)***	(2.23)**	(−2.40)**	(2.30)**
$Ln(TA)_{iq}$	0.0055	0.0070	0.0013	0.0091	−0.0011	0.0039	0.0015
	(6.61)***	(9.05)***	(0.69)	(11.24)***	(−0.22)	(3.35)***	(0.74)
$SFLoans_{iq}$	−0.0333	−0.0314	−0.0242	−0.0163	0.1372	−0.0545	−0.0460
	(−4.40)***	(−4.03)***	(−1.25)	(−1.65)*	(2.48)**	(−5.76)***	(−2.35)**
$CRELoans_{iq}$	0.0275	0.0540	0.0202	0.0620	0.0909	0.0416	0.0102
	(2.47)**	(5.50)***	(0.95)	(5.32)***	(2.63)***	(2.80)***	(0.45)
$ConsLoans_{iq}$	−0.0203	−0.0168	0.0468	−0.0090	0.2337	−0.0321	0.0243
	(−1.82)*	(−1.49)	(1.30)	(−0.64)	(2.20)**	(−2.31)**	(0.74)
$\Delta Unemp_{q+1,q+4}$	−0.0180	−0.0322	0.1806	−0.0634	0.0681	−0.0533	0.1695
	(−0.90)	(−1.82)*	(4.13)***	(−2.10)**	(0.61)	(−2.77)***	(3.62)***
$\Delta GDP_{q+1,q+4}$	−0.2407	−0.1895	0.7664	0.3978	1.6532	−0.5466	0.6677
	(−1.36)	(−1.15)	(2.03)**	(2.07)**	(1.96)**	(−3.31)***	(1.62)
Intercept	0.1028	0.0832	0.0554	0.0347	−0.1056	0.1209	0.0615
	(7.53)***	(6.50)***	(1.50)	(2.46)**	(−1.34)	(7.16)***	(2.05)**
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	342,539	307,529	35,010	182,199	3,538	125,330	31,472
Adjusted R^2	0.1318	0.1036	0.1926	0.0957	0.1405	0.0934	0.1898

Comparison of coefficients for $Less\_Adeq_{iq}$	Difference	X2	*p*-value
High Pressure = 1 - High Pressure = 0	−0.0163	13.31	0.0003***
Distress = 0: High Pressure =1 - High_Pressure = 0	−0.0285	2.06	0.1516
Distress = 1: High Pressure =1 - High_Pressure = 0	−0.0143	9.90	0.0016***
Comparison of coefficients for $More\_Timely_{iq}$	Difference	X2	*p*-value
High Pressure = 1 - High Pressure = 0	−0.0074	8.33	0.0039***
Distress = 0: High Pressure =1 - High_Pressure = 0	−0.0141	2.86	0.0909*
Distress = 1: High Pressure =1 - High_Pressure = 0	−0.0055	3.98	0.0459**

Table 5
Allowance attributes, regulatory pressure, and procyclical lending. This table presents the results of estimating Eq. (4) for the full sample testing the predicted mediating role of *ENF* in the association between *Less_Adeq* and *LoanGrowth* in times of distress and the unrecognized loss overhang and transparency channels linking *More_Timely* and *LoanGrowth*. All variables are defined in Tables 1 and 3. Column (1) establishes examines loan growth in times of distress prior to controlling for bank-specific factors. Column (2) includes allowance attributes and control variables but excludes *ENF*. Column (3) excludes *Less_Adeq* and *Distress x Less_Adeq* but includes *ENF*. Column (4) includes both *Distress x Less_Adeq* and *ENF*. Columns (5) and (6) include interactions between *More_Timely* and *ENF*. *t*-statistics appear in parentheses and are based on standard errors are clustered by bank and year-quarter. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	H1: Mediation analysis			H2	
	(1)	(2)	(3)	(4)	(5)
Dependent variable:	$LoanGrowth_{i,q+1,q+4}$	$ENF_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$
$Less\_Adeq_{iq}$	−0.0022	−0.0200	−0.0067	−0.0070	−0.0070
	(−1.44)	(−7.85)***	(−4.32)***	(−4.40)***	(−4.40)***
$More\_Timely_{iq}$				0.0017	0.0025
				(1.26)	(1.27)
$Distress_{q+1,q+4}$	−0.0086	0.0205	−0.0040	−0.0022	−0.0015
	(−2.15)**	(5.31)***	(−1.14)	(−0.40)	(−0.26)
$ENF_{i,q+1,q+4}$			−0.2249	−0.1823	−0.1772
			(−12.65)***	(−4.45)***	(−3.94)***
$Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$	−0.0042	0.0221	0.0008	0.0017	0.0017
	(−2.08)**	(10.44)***	(0.39)	(0.82)	(0.82)
$Distress_{q+1,q+4}$ x $More\_Timely_{iq}$				0.0012	−0.0001
				(0.74)	(−0.03)
$Distress_{q+1,q+4}$ x $ENF_{i,q+1,q+4}$				−0.0274	−0.0340
				(−0.62)	(−0.68)
$ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$				−0.0331	−0.0431
				(−3.02)***	(−1.96)**
$Distress_{q+1,q+4}$ x $ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$					0.0127
					(0.50)
$HighCap_{iq}$	−0.0219	−0.0072	−0.0235	−0.0233	−0.0233
	(−16.23)***	(−7.22)***	(−17.10)***	(−16.64)***	(−16.64)***
$Distress_{q+1,q+4}$ x $HighCap_{iq}$	0.0042	−0.0071	0.0026	0.0024	0.0024
	(2.30)**	(−3.66)***	(1.50)	(1.32)	(1.32)
NPL_{iq}	−1.1622	1.8272	−0.7514	−0.7629	−0.7631
	(−24.42)***	(17.65)***	(−15.16)***	(−16.67)***	(−16.68)***
$NIBP_{iq}$	0.3559	−6.2122	−1.0410	−1.0130	−1.0134
	(0.81)	(−14.26)***	(−2.58)***	(−2.53)**	(−2.53)**
$Ln(TA)_{iq}$	0.0055	0.0076	0.0072	0.0072	0.0072
	(6.53)***	(12.21)***	(9.22)***	(9.22)***	(9.21)***
$SFLoans_{iq}$	−0.0330	−0.0256	−0.0387	−0.0386	−0.0386
	(−4.35)***	(−7.09)***	(−4.96)***	(−4.89)***	(−4.89)***
$CRELoans_{iq}$	0.0277	0.1600	0.0637	0.0627	0.0627
	(2.50)**	(15.55)***	(7.09)***	(6.99)***	(6.99)***
$ConsLoans_{iq}$	−0.0202	0.0246	−0.0146	−0.0148	−0.0149
	(−1.80)*	(4.14)***	(−1.28)	(−1.30)	(−1.30)
$\Delta Unemp_{q+1,q+4}$	−0.0095	0.0858	0.0098	0.0098	0.0098
	(−0.44)	(5.46)***	(0.49)	(0.49)	(0.49)
$\Delta GDP_{q+1,q+4}$	−0.1567	−0.0587	−0.1699	−0.1701	−0.1701
	(−0.85)	(−0.45)	(−0.97)	(−0.97)	(−0.97)
Intercept	0.0999	−0.0348	0.0920	0.0898	0.0894
	(7.21)***	(−3.49)***	(7.00)***	(6.70)***	(6.68)***
Effect of $Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$ on $LoanGrowth_{q+1,q+4}$:					
Total effect			−0.0042**		
Direct effect			0.0008		
Indirect effect through $ENF_{i,q+1,q+4}$			−0.0050***		
Sobel test statistic			−8.09		
$ENF_{iq+1,q+4}$ x $More\_Timely_{iq}$ + $Distress_{q+1,q+4}$ x $ENF_{iq+1,q+4}$ x $More\_Timely_{iq}$					−0.0304
F-statistic					5.96**
Year Fixed Effects	Y	Y	Y	Y	Y
Region Fixed Effects	Y	Y	Y	Y	Y
Observations	342,539	342,539	342,539	342,539	342,539
Adjusted R^2	0.1319	0.6535	0.1394	0.1396	0.1396

Overall, the results in Table 5 support regulatory pressure as a mechanism through which loan loss accounting affect procyclical bank lending. While I do not find an association between either adequacy or timeliness and lending through the minimum capital ratio channel, I find that adequacy is indirectly associated with procyclical lending through the safety and soundness channel and that timeliness is associated with lower lending through the transparency channel.

6. Additional analysis

6.1. Cross-sectional tests

While I do not find support for an association between either adequacy or timeliness and procyclical lending via the minimum capital ratio channel for the full sample, I perform several cross-sectional analyses in settings where the minimum capital ratio channel is expected to be strongest to further investigate the direct and indirect effects of adequacy and timeliness on procyclical lending. I split banks based on their level of regulatory capital, proportion of 100% risk-weighted loans, and size.

6.1.1. Level of regulatory capital

In my first cross-sectional test, I split banks based on their level of regulatory capital as the minimum capital ratio channel should be strongest for banks close to regulatory capital targets. I separate banks into four capital strata that take into account both statutory minimum capital requirements and potential bank-specific target capital ratios. As noted previously, most banks have capital ratios well in excess of statutory capital minimums, including at the beginning of the last two recessions. However, bank managers may wish to maintain a capital ratio greater than the regulatory minimum. Berger et al. (1995) discuss the capital "requirement" of equity holders in the absence of regulatory capital minimums. While one would expect the minimum capital ratio channel to be strongest for banks nearing statutory capital minimums, attempts to maintain target capital ratios could also result in a direct effect of allowance adequacy and procyclical lending. I calculate bank-specific target capital ratios as each bank's mean Tier 1 risk-based capital ratio over the prior three years. I then place banks into the following four groups (an illustration is provided in Appendix D):

- Stratum 1: Banks with Tier 1 ratios below the mid-point of 8% and their bank-specific target capital ratios.[20]
- Stratum 2: Banks between the mid-point of 8% and their target capital ratio.
- Stratum 3: Banks with a Tier 1 capital within 2% above their target capital ratio.
- Stratum 4: Banks with Tier 1 capital ratios more than 2% greater than their target capital ratios.

The results of estimating Eqs. (4A), (4B), (4C), and (5) by capital strata are presented in Table 6. Consistent with the full-sample results, I find a significantly negative indirect effect of inadequate allowances on procyclical lending through the safety and soundness channel. While the sign of the direct effect is negative in Strata 1 and 4, the direct effect is insignificant in all capital strata, again consistent with the full-sample results. These results support the safety and soundness channel but not the minimum capital ratio channel as a mechanism through which allowance adequacy affects procyclical lending.

Table 6 also shows that banks in Strata 2–4 under high regulatory pressure have lower loan growth when they have more timely provisions, while this association is insignificant for banks in Stratum 1. This is consistent with the argument that timeliness inhibits forbearance. That this result does not hold for banks in Stratum 1 that are closest to regulatory capital minimums is consistent with regulators being unwilling or unable to forbear on the weakest banks regardless of their transparency to outside monitors.

6.1.2. Proportion of 100% risk-weighted loans

In my second cross-sectional test, I perform a median split based on the estimated level of loans that receive a 100% weight in the calculation of risk-based capital. While reducing lending can improve a bank's capital ratio by simultaneously reducing assets and liabilities, the effect of reducing loans on regulatory capital is more pronounced under risk-based capital rules. Under these rules, riskier assets increase risk-weighted assets, the denominator of the risk-based capital ratio, more than safer assets, and banks can boost their risk-based capital ratios by replacing high-risk-weight assets with low-risk-weight assets. For example, most loan types (e.g., commercial real estate, consumer, and commercial and industrial) increase the denominator at a 1-to-1 ratio (100% risk weight), while first-lien single and multi-family mortgage loans typically receive a risk weight of 50%. Thus, banks specializing in loans with 100% risk-weights should receive the greatest regulatory capital boost from reducing lending and reinvesting loan proceeds in assets with lower risk weights (Berger and Udell, 1994). I estimate 100% risk-weight loans as total loans minus single-family and multi-family loans.

[20] Additional stratification reveals that only 2,599 bank-quarters have Tier 1 capital ratios below 8%, and only 758 are below the 6% level considered "well capitalized." For parsimony, I pool these in Strata 1.

Table 6
Disaggregation by level of regulatory capital. This table presents the results of re-estimating the main analysis from Table 5 by stratum of regulatory capital. Banks are separated into four strata, where the lowest stratum contains banks closest to regulatory capital minimums and the highest stratum contains banks with the highest capital ratios. See Appendix D for detail on Tier 1 capital ratio cutoffs used to create the four strata. *t*-statistics appear in parentheses and are based on standard errors are clustered by bank and year-quarter. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Strata 1				Strata 2			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	$LoanGrowth_{i,q+1,q+4}$	$ENF_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$ENF_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$
$Less\_Adeq_{iq}$	0.0027	−0.0264	−0.0043	−0.0042	−0.0022	−0.0157	−0.0057	−0.0061
	(1.02)	(−8.66)***	(−1.58)	(−1.56)	(−1.08)	(−7.22)***	(−2.80)***	(−3.01)***
$More\_Timely_{iq}$				0.0017				0.0003
				(0.70)				(0.18)
$Distress_{q+1,q+4}$	−0.0021	0.0196	0.0031	0.0021	−0.0056	0.0194	−0.0013	0.0025
	(−0.43)	(3.98)***	(0.78)	(0.32)	(−1.36)	(4.48)***	(−0.36)	(0.45)
$ENF_{i,q+1,q+4}$			−0.2644	−0.2645			−0.2235	−0.1550
			(−12.90)***	(−5.64)***			(−10.88)***	(−3.17)***
$Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$	−0.0058	0.0212	−0.0002	−0.0006	−0.0002	0.0183	0.0039	0.0053
	(−1.57)	(8.41)***	(−0.06)	(−0.18)	(−0.07)	(9.44)***	(1.49)	(2.02)**
$Distress_{q+1,q+4}$ x $More\_Timely_{iq}$				−0.0009				0.0018
				(−0.28)				(0.87)
$Distress_{q+1,q+4}$ x $ENF_{i,q+1,q+4}$				0.0140				−0.0543
				(0.29)				(−1.07)
$ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$				−0.0209				−0.0345
				(−1.49)				(−2.35)**
Mediation analysis of $Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$:								
Total effect			−0.0058				−0.0002	
Direct effect			−0.0002				0.0039	
Indirect effect through $ENF_{i,q+1,q+4}$			−0.0056***				−0.0041***	
Sobel test statistic			−7.03				−7.12	
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Region Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	90,190	90,190	90,190	90,190	85,035	85,035	85,035	85,035
Adjusted R^2	0.1332	0.6773	0.1445	0.1446	0.1161	0.7333	0.1324	0.1326

(*continued on next page*)

Table 6
(*continued*)

	Strata 3				Strata 4			
Dependent variable:	(5) $LoanGrowth_{i,q+1,q+4}$	(6) $ENF_{i,q+1,q+4}$	(7) $LoanGrowth_{i,q+1,q+4}$	(8) $LoanGrowth_{i,q+1,q+4}$	(9) $LoanGrowth_{i,q+1,q+4}$	(10) $ENF_{i,q+1,q+4}$	(11) $LoanGrowth_{i,q+1,q+4}$	(12) $LoanGrowth_{i,q+1,q+4}$
$Less\_Adeq_{iq}$	−0.0048	−0.0169	−0.0082	−0.0087	−0.0046	−0.0181	−0.0076	−0.0080
	(−2.29)**	(−7.11)***	(−3.95)***	(−4.10)***	(−2.37)**	(−8.61)***	(−3.77)***	(−3.77)***
$More\_Timely_{iq}$				0.0041				0.0018
				(2.30)**				(0.73)
$Distress_{q+1,q+4}$	−0.0092	0.0172	−0.0058	−0.0022	−0.0078	0.0123	−0.0057	−0.0049
	(−2.93)***	(4.70)***	(−2.00)**	(−0.44)	(−2.03)**	(4.78)***	(−1.60)	(−0.95)
$ENF_{i,q+1,q+4}$			−0.2012	−0.1339			−0.1672	−0.1122
			(−10.43)***	(−3.08)***			(−6.82)***	(−2.58)***
$Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$	−0.0015	0.0203	0.0026	0.0040	−0.0060	0.0231	−0.0022	−0.0011
	(−0.63)	(9.44)***	(1.02)	(1.48)	(−2.08)**	(9.42)***	(−0.70)	(−0.34)
$Distress_{q+1,q+4}$ x $More\_Timely_{iq}$				0.0016				0.0033
				(0.71)				(1.09)
$Distress_{q+1,q+4}$ x $ENF_{i,q+1,q+4}$				−0.0511				−0.0311
				(−1.09)				(−0.68)
$ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$				−0.0417				−0.0514
				(−2.83)***				(−2.15)**
Mediation analysis of $Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$:								
Total effect			−0.0015				−0.0060**	
Direct effect			0.0026				−0.0022	
Indirect effect through $ENF_{iq+1,q+4}$			−0.0041***				−0.0038***	
Sobel test statistic			−7.00				−5.42	
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Region Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	86,371	86,371	86,371	86,371	82,243	82,243	82,243	82,243
Adjusted R^2	0.1069	0.7279	0.1198	0.1199	0.0753	0.6989	0.0837	0.0842

The results in Table 7 show that the total effect of adequacy on procyclical lending is significant for banks with higher levels of 100% risk-weight loans but insignificant for loans with lower levels of 100% risk-weight loans, consistent with the capital crunch theory. However, the mediation analysis shows that, consistent with the full sample, this association is driven by the safety and soundness channel rather than the minimum capital ratio channel, as the total effect is fully explained by the indirect effect (−0.0066, $p < 0.01$), while the direct effect is again insignificant (0.0001, $p > 0.10$). For banks with lower levels of 100% risk-weight loans, the indirect effect is smaller but still significantly negative (−0.0043, $p < 0.01$). Consistent with the full sample, I find that the interaction $ENF_{i,q+1,q+4}$ *x* $More\_Timely_{iq}$ is negative in both subsamples, consistent with the transparency channel.

6.1.3. Small vs. large banks

In my third cross-sectional test, I split banks based on size. Acharya and Ryan (2016) note that the effect of banks' accounting choices on loan supply via their impact on regulatory capital should be strongest amongst smaller, less well-capitalized, and less liquid banks because these banks are less able to substitute between sources of lendable funds in response to a funding shock.[21] Thus the minimum capital ratio channel should be strongest for smaller banks.

The results of estimating Eq. (4) for small and large banks (defined as banks with below or above median total assets in a quarter) are presented in Table 8 and show that a significantly negative total effect of less adequate allowances on procyclical lending obtains only for smaller banks, as the coefficient for $Distress_{q+1,q+4}$ *x* $Less\_Adeq_{iq}$ is negative and significant ($t = -2.64$, $p < 0.01$), while the total effect is insignificant for larger banks ($t = -1.29$, $p > 0.10$). This would seem to support the capital crunch theory at first glance. However, mediation analysis again shows that the negative total effect is driven by the indirect effect through the safety and soundness channel, which is significantly negative (−0.0046, $p < 0.01$), while the direct effect is negative but statistically indistinguishable from zero (−0.0016, $p > 0.10$). The indirect is also significant (and similar in magnitude) for large banks (−0.0048, $p < 0.01$).

Interestingly, I find that a significantly negative coefficient on $ENF_{i,q+1,q+4}$ *x* $More\_Timely_{iq}$, i.e. the transparency channel, obtains only for smaller banks (−0.0376, $p < 0.01$). For large banks, this coefficient is negative but not statistically significant (−0.0230, $p > 0.10$). While this result was not predicted, *ex ante*, it is consistent regulators being unable or unwilling to forebear on larger banks regardless of differences in the level of transparency associated with loan loss provision timeliness, perhaps because these banks are more transparent to outside monitors for other reasons, e.g. they may have better information environments. In untabulated analysis, I estimate Eq. (5) for private vs. public banks. I find a significant result for the transparency channel for private banks but not public banks, suggesting that the result for large banks may be driven by publicly-traded banks.

7. Robustness

One potential concern with my analyses is that my primary measure of regulatory pressure, $ENF_{q+1,q+4}$, is, by construction, correlated with several variables related to bank health (i.e., safety and soundness). Hence my results could be explained by bank health rather than by pressure from bank regulators. While I control for many of these factors in my tests of bank lending, I also conduct several additional analyses to mitigate this concern.

7.1. The incremental predictive power of observed enforcements

First, I examine whether lending restrictions have explanatory power for lending after controlling for the probability of enforcement. That is, do lending restrictions explain decreases in lending after controlling for variables associated with bank safety and soundness? The results, presented in Table 9, provide evidence that they do, as the coefficient on $LendRest_{i,q+6}$ is negative and significant ($t = -13.18$, $p < 0.01$).

7.2. Replacing ENF with observed lending restrictions

Second, I substitute an indicator variable for observed future lending restrictions ($LendRest_{i,q+6}$ – the dependent measure in Eq. (1)) for $ENF_{i,q+1,q+4}$. I expect these tests to be weaker because the tests will have lower power (significantly fewer bank-quarters are under lending restrictions) and because using only observed lending restrictions does not capture the impact of informal regulatory pressure that does not result in a public action. Results for the minimum capital ratio channel and safety and soundness channel are qualitatively similar when making this substitution. The results in Table 10 show

[21] Acharya and Ryan (2016) note that the effect on lending of accounting choices that impact bank regulatory capital should be similar to the effect of changes in monetary policy on bank lending. The literature on the bank lending channel of monetary policy generally finds that tightening monetary policy has the largest impact on the lending of smaller banks (e.g., Kashyap and Stein, 2000).

Table 7
Disaggregation by level of Loans Receiving a 100% Risk Weight. This table presents the results of re-estimating the main analysis from Table 5 separately for banks with high and low levels of loans that receive a 100% risk weight as part of regulatory calculation of risk-weighted capital. High (Low) Risk-Weight Loan banks are defined as banks with above (below) median estimated 100% risk-weight loans in a quarter. 100% risk-weight loans are estimated as total loans minus loans secured by single-family or multi-family real estate. *t*-statistics appear in parentheses and are based on standard errors are clustered by bank and year-quarter. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	High risk-weight loans				Low risk-weight loans			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	$LoanGrowth_{i,q+1,q+4}$	$ENF_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$ENF_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$
$Less\_Adeq_{iq}$	0.0006	−0.0213	−0.0048	−0.0053	−0.0047	−0.0187	−0.0083	−0.0085
	(0.26)	(−7.01)***	(−2.26)**	(−2.42)**	(−2.77)***	(−8.38)***	(−4.67)***	(−4.73)***
$More\_Timely_{iq}$				0.0005				0.0025
				(0.25)				(1.47)
$Distress_{q+1,q+4}$	−0.0075	0.0214	−0.0021	0.0017	−0.0094	0.0191	−0.0058	−0.0049
	(−1.98)**	(5.52)***	(−0.61)	(0.29)	(−2.19)**	(4.93)***	(−1.52)	(−0.87)
$ENF_{i,q+1,q+4}$			−0.2525	−0.2094			−0.1902	−0.1440
			(−14.15)***	(−5.08)***			(−8.68)***	(−2.84)***
$Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$	−0.0066	0.0265	0.0001	0.0014	−0.0024	0.0183	0.0011	0.0018
	(−2.31)**	(9.82)***	(0.06)	(0.55)	(−1.09)	(10.13)***	(0.45)	(0.71)
$Distress_{q+1,q+4}$ x $More\_Timely_{iq}$				−0.0010				0.0029
				(−0.42)				(1.24)
$Distress_{q+1,q+4}$ x $ENF_{i,q+1,q+4}$				−0.0346				−0.0277
				(−0.77)				(−0.55)
$ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$				−0.0227				−0.0404
				(−1.85)*				(−2.41)**
Mediation analysis of $Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$:								
Total effect			−0.0066**				−0.0024	
Direct effect			0.0001				0.0011	
Indirect effect through $ENF_{iq+1,q+4}$			−0.0067***				−0.0035***	
Sobel test statistic			−8.31				−6.61	
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Region Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	168,848	168,848	168,848	168,848	173,691	173,691	173,691	173,691
Adjusted R^2	0.1286	0.6464	0.1388	0.1391	0.1389	0.6626	0.1437	0.1438

Table 8
Disaggregation by size. This table presents the results of re-estimating the main analysis from Table 5 separately for small and large banks. Small (Large) banks are defined as banks with below (above) median total assets in a quarter. *t*-statistics appear in parentheses and are based on standard errors are clustered by bank and year-quarter. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Small				Large			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	$LoanGrowth_{i,q+1,q+4}$	$ENF_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$ENF_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$
$Less\_Adeq_{iq}$	0.0023	−0.0185	−0.0018	−0.0018	−0.0030	−0.0245	−0.0077	−0.0082
	(1.36)	(−8.19)***	(−1.08)	(−1.10)	(−1.48)	(−8.66)***	(−3.48)***	(−3.66)***
$More\_Timely_{iq}$				0.0036				−0.0007
				(2.28)**				(−0.35)
$Distress_{q+1,q+4}$	−0.0058	0.0167	−0.0021	−0.0021	−0.0100	0.0230	−0.0055	−0.0029
	(−1.42)	(4.00)***	(−0.59)	(−0.45)	(−2.42)**	(6.01)***	(−1.47)	(−0.45)
$ENF_{i,q+1,q+4}$			−0.2212	−0.2005			−0.1947	−0.1457
			(−11.38)***	(−5.85)***			(−8.98)***	(−2.72)***
$Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$	−0.0062	0.0207	−0.0016	−0.0015	−0.0031	0.0248	0.0017	0.0030
	(−2.64)***	(10.72)***	(−0.71)	(−0.69)	(−1.29)	(9.35)***	(0.68)	(1.20)
$Distress_{q+1,q+4}$ x $More\_Timely_{iq}$				0.0000				0.0022
				(0.01)				(0.86)
$Distress_{q+1,q+4}$ x $ENF_{i,q+1,q+4}$				−0.0003				−0.0387
				(−0.01)				(−0.76)
$ENF_{i,q+1,q+4}$ x $More\_Timely_{iq}$				−0.0376				−0.0239
				(−3.04)***				(−1.59)
Mediation analysis of $Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$:								
Total effect			−0.0062***				−0.0031	
Direct effect			−0.0016				0.0017	
Indirect effect through $ENF_{iq+1,q+4}$			−0.0046***				−0.0048***	
Sobel test statistic			−7.83				−6.41	
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Region Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	164,406	164,406	164,406	164,406	178,133	178,133	178,133	178,133
Adjusted R^2	0.1027	0.6037	0.1107	0.1108	0.1528	0.7071	0.1578	0.1580

Table 9
The Incremental Explanatory Power of Observed Lending Restrictions for Loan Growth. This table presents the results of a regression examining the incremental explanatory power of observed (i.e., formal) enforcement actions for loan growth. All variables are defined in Tables 1 and 3. *t*-statistics appear in parentheses and are based on standard errors are clustered by bank and year-quarter. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable: $LoanGrowth_{i,q+1,q+4}$	Coeff. (t-stat)
$ENF_{i,q+1,q+4}$	−0.2611
	(−17.27)***
$LendRest_{iq+6}$	−0.0548
	(−13.18)***
$Tier1_{iq}$	−0.0353
	(−9.86)***
NPL_{iq}	−0.6990
	(−16.73)***
$NIBP_{iq}$	−1.3520
	(−3.33)***
$Ln(TA)_{iq}$	0.0047
	(5.63)***
$SFLoans_{iq}$	−0.0365
	(−4.64)***
$CRELoans_{iq}$	0.0594
	(6.55)***
$ConsLoans_{iq}$	−0.0067
	(−0.58)
$\Delta Unemp_{q+1,q+4}$	0.0126
	(0.69)
$\Delta GDP_{q+1,q+4}$	−0.1834
	(−1.13)
Intercept	0.0414
	(3.01)***
Region Fixed Effects	Y
Year Fixed Effects	Y
Observations	342,530
Adjusted R^2	0.1420

that, consistent with the results in Table 5, the direct effect of allowance adequacy on procyclical lending is insignificant (−0.0020, $p > 0.10$) while the indirect effect is significant (−0.0022, $p < 0.01$). I do not find support for the transparency channel when substituting observed lending restrictions, consistent with regulators having already elected *not* to forebear on these banks.

7.3. Matched sample

Third, to further mitigate concerns that my results are driven purely by bank health rather than regulatory actions, I performed matched sample testing. Using 1-to-1 coarsened exact matching (CEM), I match banks classified as *High_Pressure* (i.e., those in the top decile of average enforcement probability over quarter *q+1,q+4*) to banks not so classified based on size, Tier 1 capital, nonperforming loans, pre-provision income, and quarter.[22]

The results are presented in Table 11. In Panel A, I replicate the analysis presented in Table 4 using the matched sample with qualitatively similar results. Again, the negative association between less adequate allowances and lending is strongest for *High_Pressure* banks. This difference is statistically significant for the full sample ($X^2 = 3.70$, $p < 0.10$). I do not find statistically significant differences when partitioning on *Distress*, potentially due to lower power. Consistent with H2B, timeliness is negatively associated with lending only for banks under high regulatory pressure, although I do not find that the differences are statistically significant.

Panel B of Table 11 presents the results of replicating the main analysis from Table 5 using the matched sample. The results are consistent with the full sample and support the safety and soundness channel for adequacy and the transparency channel for timeliness.

[22] See Iacus et al. (2017) for a discussion of the theory and mechanics of coarsened exact matching and Blackwell et al. (2009) for a discussion of its implementation in Stata. I match on size using total asset cutoffs of $250 million, $500 million, $10 billion, and $50 billion; Tier 1 capital using cutoffs of 10%, 11%, 12%, 13%, 14%, 15%, 16%, 17%, and 18%; pre-the quarterly decile of pre-provision earnings; the quarterly decile of nonperforming loans; and quarter.

Table 10
Substituting Observed Lending Restrictions for the Estimated Probability of Enforcement. This table presents the results of re-estimating the analysis from Table 5 after substituting formal lending restrictions ($LendRest_{i,q+6}$) for the estimated average probability of enforcement ($ENF_{i,q+1,q+4}$). *t*-statistics appear in parentheses and are based on standard errors are clustered by bank and year-quarter. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	H1: Mediation analysis			H2	
	(1)	(2)	(3)	(4)	(5)
Dependent variable:	$LoanGrowth_{i,q+1,q+4}$	$LendRest_{i,q+6}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$	$LoanGrowth_{i,q+1,q+4}$
$Less\_Adeq_{iq}$	−0.0024	−0.0181	−0.0037	−0.0037	−0.0037
	(−1.56)	(−6.98)***	(−2.51)**	(−2.53)**	(−2.53)**
$More\_Timely_{iq}$				−0.0012	−0.0012
				(−1.26)	(−1.31)
$Distress_{q+1,q+4}$	−0.0089	−0.0030	−0.0091	−0.0079	−0.0080
	(−2.28)**	(−0.88)	(−2.41)**	(−2.08)**	(−2.09)**
$LendRest_{i,q+6}$			−0.0748	−0.0746	−0.0778
			(−21.03)***	(−9.02)***	(−7.38)***
$Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$	−0.0042	0.0287	−0.0020	−0.0020	−0.0020
	(−2.07)**	(7.39)***	(−1.03)	(−1.01)	(−1.01)
$Distress_{q+1,q+4}$ x $More\_Timely_{iq}$				−0.0026	−0.0025
				(−1.93)*	(−1.82)*
$Distress_{q+1,q+4}$ x $LendRest_{i,q+6}$				0.0036	0.0078
				(0.48)	(0.74)
$LendRest_{i,q+6}$ x $More\_Timely_{iq}$				−0.0054	0.0007
				(−1.08)	(0.06)
$Distress_{q+1,q+4}$ x $LendRest_{i,q+6}$ x $More\_Timely_{iq}$					−0.0078
					(−0.65)
$HighCap_{iq}$	−0.0221	0.0002	−0.0221	−0.0221	−0.0221
	(−16.26)***	(0.28)	(−16.15)***	(−16.15)***	(−16.14)***
$Distress_{q+1,q+4}$ x $HighCap_{iq}$	0.0043	−0.0088	0.0036	0.0036	0.0036
	(2.32)**	(−3.75)***	(1.99)**	(1.99)**	(1.99)**
NPL_{iq}	−1.1675	1.1853	−1.0788	−1.0769	−1.0770
	(−24.39)***	(10.00)***	(−22.54)***	(−22.47)***	(−22.46)***
$NIBP_{iq}$	0.2055	−4.6254	−0.1407	−0.1459	−0.1453
	(0.47)	(−7.49)***	(−0.32)	(−0.34)	(−0.33)
$Ln(TA)_{iq}$	0.0054	0.0034	0.0057	0.0057	0.0057
	(6.38)***	(3.72)***	(6.82)***	(6.86)***	(6.86)***
$SFLoans_{iq}$	−0.0328	0.0045	−0.0325	−0.0326	−0.0326
	(−4.36)***	(0.78)	(−4.31)***	(−4.33)***	(−4.33)***
$CRELoans_{iq}$	0.0294	0.0610	0.0340	0.0339	0.0339
	(2.65)***	(5.05)***	(3.16)***	(3.15)***	(3.15)***
$ConsLoans_{iq}$	−0.0190	0.0238	−0.0173	−0.0174	−0.0174
	(−1.72)*	(2.61)***	(−1.56)	(−1.58)	(−1.58)
$\Delta Unemp_{q+1,q+4}$	−0.0083	0.0043	−0.0080	−0.0080	−0.0080
	(−0.39)	(0.73)	(−0.38)	(−0.37)	(−0.37)
$\Delta GDP_{q+1,q+4}$	−0.1498	−0.0274	−0.1518	−0.1517	−0.1517
	(−0.81)	(−0.41)	(−0.84)	(−0.83)	(−0.83)
Intercept	0.1011	−0.0466	0.0976	0.0980	0.0980
	(7.29)***	(−3.51)***	(7.21)***	(7.24)***	(7.24)***
Effect of $Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$ on $LoanGrowth_{q+1,q+4}$:					
Total effect			−0.0042**		
Direct effect			−0.0020		
Indirect effect through $LendRest_{i,q+6}$			−0.0022***		
Sobel test statistic			−8.09		
$LendRest_{i,q+6}$ x $More\_Timely_{iq}$ + $Distress_{q+1,q+4}$ x $LendRest_{i,q+6}$ x $More\_Timely_{it}$					−0.0071
F-statistic					1.78
Year Fixed Effects	Y	Y	Y	Y	Y
Region Fixed Effects	Y	Y	Y	Y	Y
Observations	349,210	349,210	349,210	349,210	349,210
Adjusted R^2	0.1307	0.0691	0.1368	0.1369	0.1369

Table 11
Matched Sample Analysis. This table presents the results of re-estimating the analyses in Table 4 and Table 5 using a matched sample where banks in the top decile of $ENF_{i,q+1,q+4}$ (i.e., *High_Pressure* = 1) are matched to banks in the bottom nine deciles (i.e., *High_Pressure* = 0). Panel A presents the results of re-estimating the analysis from Table 4, separately estimating a simplified version of Eq. (5) for banks classified with *High_Pressure* = 1 and *High_Pressure* = 0 both in times of distress and in stable times. Panel B presents the results of re-estimating the main analysis from Table 5 using the matched sample. *t*-statistics appear in parentheses and are based on standard errors are clustered by bank and year-quarter. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: High_pressure = 1 vs. high_pressure = 0 in stable times and times of distress

Dependent variable:				$Distress_{q+1,q+4} = 0$		$Distress_{q+1,q+4} = 1$	
$LoanGrowth_{q+1,q+4}$	Full Sample	High_Pressure = 0	High_Pressure = 1	High_Pressure = 0	High_Pressure = 1	High_Pressure = 0	High_Pressure = 1
$Less\_Adeq_{iq}$	−0.0108	−0.0102	−0.0207	−0.0140	−0.0430	−0.0096	−0.0165
	(−2.85)***	(−2.67)***	(−4.08)***	(−0.85)	(−1.88)*	(−2.43)**	(−3.19)***
$More\_Timely_{iq}$	−0.0085	−0.0036	−0.0103	−0.0046	−0.0236	−0.0034	−0.0073
	(−4.06)***	(−1.52)	(−3.01)***	(−0.70)	(−1.98)**	(−1.35)	(−2.09)**
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33,373	16,738	16,635	2,031	2,033	14,707	14,602
Adjusted R^2	0.1236	0.1120	0.1480	0.1318	0.1365	0.1054	0.1423

Comparison of coefficients for $Less\_Adeq_{iq}$	Difference	X^2	*p*-value
High Pressure = 1 - High Pressure = 0	−0.0067	3.70	0.0544*
Distress = 0: High Pressure = 1 - High_Pressure = 0	−0.019	0.82	0.3645
Distress = 1: High Pressure = 1 - High_Pressure = 0	−0.0039	1.52	0.2169
Comparison of coefficients for $More\_Timely_{iq}$	Difference	X^2	*p*-value
High Pressure = 1 - High Pressure = 0	−0.0105	2.51	0.1131
Distress = 0: High Pressure = 1 - High_Pressure = 0	−0.029	2.09	0.1487
Distress = 1: High Pressure = 1 - High_Pressure = 0	−0.0069	0.74	0.3910

(*continued on next page*)

Table 11
(*continued*)

Panel B: Replication of Main Analysis

	H1: Mediation analysis			H2	
Dependent variable:	(1) $LoanGrowth_{i,q+1,q+4}$	(2) $High\_Pressure_{i,q+1,q+4}$	(3) $LoanGrowth_{i,q+1,q+4}$	(4) $LoanGrowth_{i,q+1,q+4}$	(5) $LoanGrowth_{i,q+1,q+4}$
$Less\_Adeq_{iq}$	0.0030	−0.2762	−0.0049	−0.0097	−0.0098
	(0.24)	(−8.95)***	(−0.38)	(−0.77)	(−0.78)
$More\_Timely_{iq}$				−0.0140	−0.0049
				(−1.88)*	(−0.74)
$Distress_{q+1,q+4}$	0.0386	−0.1308	0.0348	0.0071	0.0120
	(2.88)***	(−3.87)***	(2.64)***	(0.52)	(0.89)
$High\_Pressure_{i,q+1,q+4}$			−0.0287	−0.0567	−0.0470
			(−6.53)***	(−6.26)***	(−3.97)***
$Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$	−0.0144	0.1841	−0.0091	−0.0052	−0.0051
	(−1.09)	(5.50)***	(−0.70)	(−0.41)	(−0.40)
$Distress_{q+1,q+4}$ x $More\_Timely_{iq}$				0.0120	0.0016
				(1.51)	(0.22)
$Distress_{q+1,q+4}$ x $High\_Pressure_{i,q+1,q+4}$				0.0363	0.0253
				(3.91)***	(1.96)*
$High\_Pressure_{i,q+1,q+4}$ x $More\_Timely_{iq}$				−0.0071	−0.0255
				(−1.66)*	(−1.70)*
$Distress_{q+1,q+4}$ x $High\_Pressure_{i,q+1,q+4}$ x $More\_Timely_{it}$					0.0209
					(1.31)
Mediation analysis of $Distress_{q+1,q+4}$ x $Less\_Adeq_{iq}$:					
Total effect			−0.0144		
Direct effect			−0.0091		
Indirect effect through $High\_Pressure_{i,q+1,q+4}$			−0.0053***		
Sobel test statistic			−4.19		
$High\_Pressure_{iq+1,q+4}$ x $More\_Timely_{it}$ + $Distress_{q+1,q+4}$ x $High\_Pressure_{iq+1,q+4}$ x $More\_Timely_{it}$					−0.0046
F-statistic					1.02
Controls	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y
Region Fixed Effects	Y	Y	Y	Y	Y
Observations	33,377	33,377	33,377	33,377	33,377
Adjusted R^2	0.1238	0.2721	0.1298	0.1320	0.1321

8. Conclusion

Motivated by recent concerns that loan loss accounting practices contributed to procyclical lending behavior by banks during the most recent financial crisis, I examine whether regulatory actions help explain the link between banks' loan loss accounting and procyclical lending. I examine two channels through which bank loan loss accounting could affect procyclical lending via its impact on regulatory actions: a safety and soundness channel and a transparency channel. First, I find that inadequate allowances affect lending during times of economic distress through their impact on regulatory actions. Prior research theorizes that an association between inadequate allowances and procyclical lending is due to unrecognized loss overhangs that forces bank managers to reduce lending in times of distress in an effort to increase regulatory capital ratios. However, statutory minimum capital requirements were not binding for the vast majority of banks. My results suggest regulatory actions as an alternative mechanism for this association.

Second, I provide evidence that timeliness is associated with reduced loan growth for banks under greater regulatory pressure to reduce lending through a transparency channel. This is consistent with prior research in accounting theorizing that timely loan loss provisions enhance transparency to outside monitors (e.g., Bushman and Williams, 2012; Bushman, 2014; Gallemore, 2018; Ryan, 2017) and particularly with Gallemore (2018), who theorizes that this enhanced transparency inhibits regulators from engaging in selective forbearance. In contrast, I do not find support for the minimum capital ratio channel (e.g., Beatty and Liao, 2011), which predicts that timely provisions mitigate procyclical lending by easing capital inadequacy concerns.

This study contributes to the literature on bank lending procyclicality by furthering our understanding of the relationship between loan loss accounting practices and bank lending by considering the impact of accounting on regulatory actions. Because of the authority that bank regulators have over banks' operating decisions, it is important to consider regulatory actions when studying the consequences of banks' accounting. Further, it contributes to the literature on the costs and benefits of transparency for financial stability, which weighs the benefits of transparency for outside monitoring against the potential that such transparency could induce instability, e.g., through bank runs (see Acharya and Ryan, 2016 for a review). While I do not study the behavior of outside monitors, my results suggest that transparency to outside monitors can affect the actions taken by bank regulators. The optimality of regulators' decisions to restrict the lending of certain banks, both for those banks and for the broader economy, remains an open question for future research.

Appendix A. Variable descriptions

Adeq	*ALLL* divided by *NPL*.
ALLL	The allowance for loan and lease losses (S&P MI Keyfield 215372).
CASH	Total of noninterest-bearing balances and currency and coin, and interest-bearing balances (including time certificates not held for trading) (S&P MI Keyfield 206096).
ConsLoans	Consumer loans. Includes all loans to individuals for household, family, and other personal expenditures that are not secured by real estate, whether direct loans or purchased paper, for the fully consolidated institution (S&P MI Keyfield 215813).
CRELoans	Non-single-family real estate loans. Total real estate loans (S&P MI Keyfield 216892) excluding single-family real estate loans (S&P MI Keyfield 215797).
$Distress_{t+1}$	An indicator variable equal to 1 if any quarter in the four quarters following quarter q fall in recessionary periods or the 2 years following a recessionary period (i.e., $REC = 1$ or $POSTREC = 1$) and 0 otherwise.
$ENF_{i,t+1}$	The square root of average *ENFPROB* in the four quarters after quarter q.
ENFPROB	The expected value from Eq. (1) representing the probability that a bank will be subject to a formal enforcement action directly or indirectly restricting lending six quarters ahead.
GAP	The gap between rate-sensitive assets and liabilities, calculated as rate-sensitive assets (assets that are expected to mature or reprice within 1 year) less rate-sensitive liabilities (liabilities that are expected to mature or reprice within 1 year) (S&P MI Keyfield 205982).
GDP	Gross domestic product in billions of chained 2009 dollars from the Bureau of Economic Analysis (http://www.bea.gov/).
HighCap	An indicator variable set equal to 1 for bank-quarters with *Tier1* greater than the bank-specific target capital ratio, calculated as average *Tier1* over the prior 3 years.
INT	Total interest income less total interest expense (S&P MI Keyfield 206220).
Less_Adeq	An indicator variable equal to 1 if a bank has a below-median *Adeq* (allowance for loan losses to nonperforming loans ratio) in a given quarter, and 0 otherwise.
LendRest	Indicator variable equal to 1 if a bank is subject to a formal regulatory enforcement action that directly or indirectly restricts lending in the quarter, and 0 otherwise.
LLP	Provision for loan and lease losses. Calculated as the total of the provision for loan losses and the provision for allocated transfer risk, if the institution is required to maintain an allocated transfer reserve by the International Lending Supervision Act of 1983 (S&P MI Keyfield 215420).
$LoanGrowth_{i,t+1}$	$\frac{Loans_{i,q+4} - Loans_{iq}}{Loans_{iq}}$
LoanYield	Annually de-meaned total interest income on loans (excludes lease income) divided by average consolidated loans (S&P MI Keyfield 205952).
Loans	Total loans and leases excluding loans held for sale (S&P MI Keyfield 215830).
More_Timely	An indicator variable equal to 1 if a bank has above-median *Timeliness* in a given quarter, and 0 otherwise.

(*continued on next page*)

NIBP	Net income before taxes and loan loss provisions. Calculated as net income before tax and extraordinary items (S&P MI Keyfield 215435) plus the loan loss provision (S&P MI Keyfield 215420).
NPL	Loans and leases that are nonaccrual status plus loans and leases that are 90 or more days past due, upon which the bank continues to accrue interest (including loans guaranteed by the U.S. government, agency, or sponsored entity).
POSTREC	An indicator variable equal to 1 if a quarter falls in the eight calendar quarters following a recession, defined below, 0 otherwise.
PUBLIC	An indicator variable equal to 1 if a bank is publicly-traded bank, 0 otherwise.
REC	An indicator variable equal to 1 if a quarter falls in 1990Q3-1991Q1, 2001Q1 – 2001Q4, or 2007Q4 – 2009Q2, and 0 otherwise.
REGION	A bank's Federal Reserve district.
SFLoans	Single-family loans. Includes revolving and permanent loans secured by real estate as evidenced by mortgages or other liens secured by 1–4 family residential property, for U.S. offices only. Includes liens on: nonfarm property containing 1–4 dwelling units or more than 4 dwelling units if each is separated from other units by dividing walls that extend from ground to roof, mobile homes where (a) state laws define the purchase or holding of a mobile home as the purchase of real property and where (b) the loan to purchase the mobile home is secured by that mobile home as evidenced by a mortgage or other instrument on real property, individual condominium dwelling units and loans secured by an interest in individual cooperative housing units, even if in a building with 5 or more dwelling units, vacant lots in established single-family residential sections or areas set aside primarily for 1–4 family homes, housekeeping dwellings with commercial units combined where use is primarily residential and where only 1–4 family dwelling units are involved (S&P MI Keyfield 215797).
SGL	Net gain realized during the calendar year-to-date from the sale, exchange, redemption, or retirement of all securities reported as held to maturity securities and available-for-sale securities. The realized gain or loss on a security is the difference between the sales price (excluding interest at the coupon rate accrued since the last interest payment date, if any) and its amortized cost (S&P MI Keyfield 206250).
Size	The natural log of *TA*.
TA	Total assets. Calculated as the total of cash and balances due from depository institutions, interest and noninterest-bearing and currency and coin; securities; federal funds sold and securities purchased under agreements to resell; loans and lease financing receivables, net of unearned income, allowance for loan and lease losses, and allocated transfer risk reserve where applicable; assets held for trading; premises and fixed assets; other real estate owned; investments in unconsolidated subsidiaries and associated companies; customers' liability to the reporting bank on acceptances outstanding; intangible assets; other assets (S&P MI Keyfield 215382).
*Tier*1	Tier 1 capital as a percent of risk-adjusted assets (S&P MI Keyfield 215628).
Timeliness	The difference between the adjusted R^2 of the following equations: $LLP_{iq} = \alpha_0 + \alpha_1 \Delta NPL_{i,q-2} + \alpha_2 \Delta NPL_{i,q-1} + \alpha_3 Tier1_{iq} + \alpha_4 NIBP_{iq} + \varepsilon_{iq}$ $LLP_{iq} = \alpha_0 + \alpha_1 \Delta NPL_{i,q-2} + \alpha_2 \Delta NPL_{i,q-1} + \alpha_3 \Delta NPL_{iq} + \alpha_4 \Delta NPL_{i,q+1} + \alpha_5 Tier1_{iq} + \alpha_6 NIBP_{iq} + \varepsilon_{iq}$
TYPE	1 = TA < \$500 million 2 = \$500 million ≤ TA < \$10 billion 3 = \$10 billion ≤ TA < \$50 billion 4 = \$50 billion ≤ TA < \$250 billion 5 = \$250 billion ≤ TA
UNEMP	The unemployment rate per the Bureau of Labor Statistics (www.bls.gov/data).

Appendix B. Identifying lending restrictions

I employ textual analysis to identify direct and indirect lending restrictions in publicly-disclosed regulatory enforcement actions (obtained from S&P Global Market Intelligence) using a two-step process:

Step 1

I first identify whether an enforcement action addresses lending practices generally. I take advantage of semi-consistent formatting used by bank regulators and use a Python script to identify subheadings within each enforcement action. Subheadings containing the following are identified as pertaining to lending:

Actions Issued by the Office of the Comptroller of the Currency: loan, lending, criticized, classified, problem, credit, asset quality, underwriting, nonaccrual, non-accrual, real estate, reo, foreclose, concentration, collateral, risk

Actions Issued by the Federal Deposit Insurance Corporation: loan, lending, criticized, classified, problem, special mention, substandard, doubtful, credit, asset quality, underwriting, nonaccrual, non-accrual, real estate, concentration, risk (does not contain 'division'), restriction

Actions Issued by the Federal Reserve: loan, lending, classified, credit, asset, underwriting, real estate, concentration, risk, portfolio, asset improvement

Step 2

Sections pertaining to lending are extracted and separately analyzed. Based on a key word search, actions are classified as directly or indirectly restricting lending if they contain the following words or phrases:

Direct Restrictions

- shall not extend
- shall not, directly or indirectly, extend

- shall not make, renew
- shall not make or renew
- shall not originate
- shall not lend

Indirect Restrictions

- reduce
- concentration
- eliminate the basis of criticism

Appendix C. Lending restriction examples

The following provide examples of regulatory language that indirectly or directly restrict lending activities.

Old Southern Bank – 9/17/2009 (indirect restriction):

Concentrations of credit

2. Within 60 days of this Agreement, the Bank shall submit to the Reserve Bank and the OFR an acceptable written plan to strengthen the Bank's management of commercial real estate ("CRE") concentrations, including steps to reduce the risk of concentrations in light of current market conditions. The plan shall be consistent with the Interagency Guidance on Concentrations in Commercial Real Estate Lending, Sound Risk Management Practices, dated December 12, 2006 (SR 07- 1), and, at a minimum, address, consider, and include:

(a) Establishment of concentration of credit risk tolerances or limits by types of loan products, geographic locations, and other common risk characteristics or sensitivities;
(b) Ongoing risk assessments;
(c) Enhanced underwriting procedures for CRE loans;
(d) Strategic planning regarding risks associated with CRE concentrations, including steps to control and mitigate such risks;
(e) Enhanced stress testing of loans and portfolio segments; and
(f) Enhanced periodic reporting to management and the board of directors.

Community Bankshares, Inc. – 3/25/2009 (direct restriction):

Asset improvement

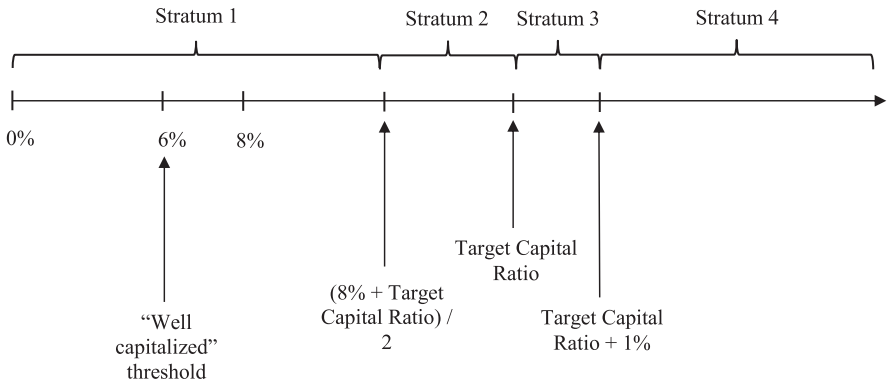
4. (a) The Bank shall not, directly or indirectly, extend or renew any credit to or for the benefit of any borrower, including any related interest of the borrower, who is obligated to the Bank or any affiliate of the Bank in any manner on any extension of credit or portion thereof that has been charged off by the Bank or any affiliate of the Bank or classified, in whole or in part, "loss" in the Report of Examination or Report of Inspection, or in any subsequent report of examination or report of inspection, as long as such credit remains uncollected.

(b) The Bank shall not, directly or indirectly, extend or renew any credit to or for the benefit of any borrower, including any related interest of the borrower, whose extension of credit has been classified as "doubtful" or "substandard" in the Report of Examination or Report of Inspection or in any subsequent report of examination or report of inspection, without the prior approval of the board of directors. The board of directors shall document in writing the reasons for the extension of credit or renewal, specifically certifying that: (i) the extension of credit is necessary to protect the Bank's interest in the ultimate collection of the credit already granted or (ii) the extension of credit is in full compliance with the Bank's written loan policy, is adequately secured, and a thorough credit analysis has been performed indicating that the extension or renewal is reasonable and justified, all necessary loan documentation has been properly and accurately prepared and filed, the extension of credit will not impair the Bank's interest in obtaining repayment of the already outstanding credit, and the board of directors reasonably believes that the extension of credit or renewal will be repaid according to its terms. The written certification shall be made a part of the minutes of the board of directors meetings, and a copy of the signed certification, together with the credit analysis and related information that was used in the determination, shall be retained by the Bank in the borrower's credit file for subsequent supervisory review. For purposes of this Agreement, the term "related interest" is defined as set forth in Section 215.2(n) of Regulation O of the Board of Governors of the Federal Reserve System (the "Board of Governors") (12 C.F.R. § 215.2(n)).

Appendix D

Capital strata by tier 1 risk-based capital ratio

The figure below visually depicts my disaggregation of banks by level of regulatory capital. I calculate bank-specific target capital ratios as the mean Tier 1 risk-based capital ratio over the prior 3 years.



References

Acharya, V.V., Ryan, S.G., 2016. Banks' financial reporting and financial system stability. J. Account. Res. 54 (2), 277–340.
Ballew, H.B., Iselin, M., Nicoletti, A., 2017. Regulatory Asset Thresholds and Real Activities in the Banking Industry Working Paper.
Baron, R.M., Kenny, D.A., 1986. The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J. Pers. Soc. Psychol. 51 (6), 1173.
Beatty, A., Liao, S., 2011. Do delays in expected loss recognition affect banks' willingness to lend? J. Account. Econ. 52 (1), 1–20.
Berger, A.N., Udell, G.F., 1994. Did risk-based capital allocate bank credit and cause a "credit crunch" in the United States? J. Money, Credit Bank. 26 (3), 585–628.
Berger, A.N., Herring, R.J., Szegö, G.P., 1995. The role of capital in financial institutions. J. Bank. Finance 19 (3), 393–430.
Berger, A.N., Kyle, M.K., Scalise, J.M., 2001. Did US bank supervisors get tougher during the credit crunch? Did they get easier during the banking boom? Did it matter to bank lending? Prudential Supervision: What Works and What Doesn't. University of Chicago Press, pp. 301–356.
Berger, A.N., DeYoung, R., Flannery, M.J., Lee, D., Öztekin, Ö., 2008. How do large banking organizations manage their capital ratios? J. Financ. Serv. Res. 34 (2-3), 123–149.
Bernanke, B.S., Lown, C., 1991. The credit crunch. Brookings Pap. Econ. Activity 1992 (2), 205–239.
Bhat, G., Ryan, S.G., Vyas, D., 2018. The implications of credit risk modeling for banks' loan loss provision timeliness and loan origination procyclicality. Manage. Sci. (forthcoming).
Blackwell, M., Iacus, S.M., King, G., Porro, G., 2009. CEM: coarsened exact matching in Stata. Stata J. 9 (4), 524 546.
Boot, A.W., Thakor, A.V., 1993. Self-interested bank regulation. The American Economic Review 206–212.
Brown, C.O., Dinç, I.S., 2011. Too many to fail? Evidence of regulatory forbearance when the banking sector is weak. Rev. Financ. Stud. 24 (4), 1378–1405.
Bushman, R.M., Williams, C.D., 2012. Accounting discretion, loan loss provisioning, and discipline of banks' risk-taking. J. Account. Econ. 54 (1), 1–18.
Bushman, R.M., 2014. Thoughts on financial accounting and the banking industry. J. Account. Econ. 58 (2-3), 384–395.
Bushman, R.M., Williams, C.D., 2015. Delayed expected loss recognition and the risk profile of banks. J. Account. Res. 53 (3), 511–553.
Costello, A.M., Granja, J., Weber, J., 2019. Do Strict Regulators Increase the Transparency of Banks? J. Account. Res.. 10.1111/1475-679X.12255.
DeYoung, R., 1998. Management quality and X-inefficiency in national banks. J. Financ. Serv. Res. 13 (1), 5–22.
Duchin, R., Sosyura, D., 2014. Safer ratios, riskier portfolios: banks' response to government aid. J. Financ. Econ. 113 (1), 1–28.
Fawcett, T., 2006. An introduction to ROC analysis. Pattern Recognit. Lett. 27 (8), 861–874.
Financial Stability Forum, 2009. Report of the Financial Stability Forum on Addressing Procyclicality in the Financial System.
Furfine, C., 2001. Bank portfolio allocation: the impact of capital requirements, regulatory monitoring, and economic conditions. J. Financ. Serv. Res. 20 (1), 33–56.
Gallemore, J., 2018. Bank Financial Reporting Opacity and Regulatory Intervention. Chicago Booth Working Paper.
Gopalan, Y., Kalda, A., Manela, A., 2017. Hub-and-Spoke Regulation and Bank Leverage Working Paper.
Gorski, N., 2008. National City Confirms MOUs. S&P Global Market Intelligence.
Hayes, A.F., 2009. Beyond Baron and Kenny: statistical mediation analysis in the new millennium. Commun. Monogr. 76 (4), 408–420.
Iacus, S.M., King, G., Porro, G., 2017. A Theory of Statistical Inference for Matching Methods in Causal Research. Working Paper.
Jayaraman, S., Schonberger, B., Wu, J.S., 2017. Good Buffer, Bad Buffer. Working Paper.
Kashyap, A.K., Stein, J.C., 2000. What do a million observations on banks say about the transmission of monetary policy? Am. Econ. Rev. 90 (3), 407–428.
Kerstein, J., Kozberg, A., 2013. Using accounting proxies of proprietary FDIC ratings to predict bank failures and enforcement actions during the recent financial crisis. J. Account. Audit. Financ. 28 (2), 128–151.
Mehta, P., 2008. WSJ: National City Under MOU. S&P Global Market Intelligence.
Morrison, A.D., White, L., 2013. Reputational contagion and optimal regulatory forbearance. J. Financ. Econ. 110 (3), 642–658.
Nichols, D.C., Wahlen, J.M., Wieland, M.M., 2009. Publicly traded versus privately held: implications for conditional conservatism in bank accounting. Rev. Account. Stud. 14 (1), 88–122.
Nicoletti, A., 2018. The Effects of Bank Regulators and External Auditors on Loan Loss Provisions Working Paper.
Office of the Comptroller of the Currency, 2013a. Community bank supervision. Comptroller's Handbook.
Office of the Comptroller of the Currency, 2013b. Large bank supervision. Comptroller's Handbook.
Peek, J., Rosengren, E., 1995a. Bank regulation and the credit crunch. J. Bank. Financ. 19 (3), 679–692.
Peek, J., Rosengren, E., 1995b. The capital crunch: neither a borrower nor a lender be. J. Money Credit Bank. 27 (3), 625–638.
Ryan, Stephen G., 2017. Do the effects of accounting requirements on banks' regulatory capital adequacy undermine financial stability? Annu. Rev. Financ. Econ. 9, 1–20.
Sobel, M.E., 1982. Asymptotic confidence intervals for indirect effects in structural equation models. Sociol. Methodol. 13, 290–312.