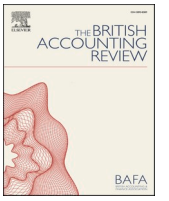
The British Accounting Review 56 (2024) 101486

Contents lists available at ScienceDirect

The British Accounting Review

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



Deposit insurance and credit union earnings opacity

Lemonia M. Rempoutsika [a], Dimitris K. Chronopoulos [b], Linh Nguyen [b], John O.S. Wilson [b,*]

[a] Open University Business School, The Open University, UK
[b] Centre for Responsible Banking & Finance, Department of Finance, University of St Andrews Business School, UK

ARTICLE INFO

JEL classification:
G21
G28
M41
M48
L31

Keywords:
Deposit insurance
Earnings opacity
Credit unions
Discretionary loan loss provisions
Emergency Economic Stabilization Act

ABSTRACT

This study examines the impact of deposit insurance coverage on credit union earnings opacity. For identification, we employ the provisions outlined in Section 136 of the Emergency Economic Stabilization Act, which raised the upper limit of deposit insurance coverage from $100,000 to $250,000. Using variation in insured deposits brought about by the differential impact of the change to deposit insurance arrangements and a difference-in-differences approach, we find that credit unions experiencing a substantial rise in insured deposits tend to exercise more discretion over loan loss provisions, leading to an increase in earnings opacity. This is most evident for small and medium sized credit unions.

1. Introduction

Deposit insurance is an essential part of financial safety net arrangements around the globe. Well-designed deposit insurance schemes can prevent liquidity shortages, bank runs, and ensure financial stability. On the negative side deposit insurance schemes can induce moral hazard, by reducing the monitoring incentives of depositors, which could lead to banks making riskier investments and increasing their default risk. Prior evidence suggests that the design and coverage of deposit insurance schemes play an important role in driving the asset composition and quality at financial institutions (Anginer & Demırgüç-Kunt, 2019; Eisenbeis & Kaufman, 2014). As illustrated aptly in March 2023, upon the failure of Silicon Valley Bank and other large US regional banks, financial disclosures and the design and impact of deposit insurance have relevance for market discipline and the overall stability of the financial system (Acharya et al., 2023).

Enhanced financial (earnings) disclosures can mitigate information asymmetries and enable effective external monitoring of performance and risk by regulators, auditors, and other industry stakeholders (Bushman & Smith, 2001; Beatty et al., forthcoming). In this study, we complement and augment prior research to examine how deposit insurance affects the level of earnings opacity of US credit unions.

As not for profit, member-based cooperative financial institutions, credit unions play a significant role within the US retail financial

* Corresponding author. Centre for Responsible Banking & Finance, Department of Finance, Business School, Gateway Building, University of St Andrews, KY16 9RJ, St Andrews, UK.
E-mail addresses: lemonia.rempoutsika@open.ac.uk (L.M. Rempoutsika), dc45@st-andrews.ac.uk (D.K. Chronopoulos), lhn2@st-andrews.ac.uk (L. Nguyen), jsw7@st-andrews.ac.uk (J.O.S. Wilson).

https://doi.org/10.1016/j.bar.2024.101486
Received 28 March 2024; Received in revised form 27 August 2024; Accepted 3 September 2024
Available online 5 September 2024

services industry (Van Rijn, 2022). In 2023, there were 4,604 federally insured credit unions, serving approximately 139 million members, with total assets of $2.26 trillion, total loans of $1.6 trillion, and total insured shares and deposits of $1.72 trillion (NCUA, 2023). Traditionally, credit unions focused on serving the financial needs of individuals on lower incomes (Liñares-Zegarra & Wilson, 2018). More recently, credit unions compete in many retail market segments with mainstream commercial banks in offering deposit, lending and payments services to individuals across the entire income and wealth distribution. Given their large membership (customer) base, credit unions' opacity and depositor monitoring have important implications for the stability of the financial system and real economy (Van Rijn, 2022; Van Rijn et al., 2023; Li & Van Rijn, 2024). This is a major reason why credit unions are subject to similar prudential regulations as banks, including deposit insurance and associated National Credit Union Share Insurance Fund (NCUSIF).

Our focus on credit unions is also motivated by their unique governance characteristics and diffuse ownership structures, which differentiate them from banks. Credit unions operate on a one-member-one-vote principle and are bound by a common bond of association, making members both depositors and owners. Unlike banks, credit unions are prohibited typically from raising external equity capital (Goddard et al., 2016), and thus are not subject to capital market discipline. Second, the common bond fosters a relational banking dimension, and a sense of cohesiveness among members, making them less likely to withdraw deposits suddenly during periods of financial stress (Gómez-Biscarri et al., 2022). These features can exacerbate moral hazard, given that relative to counterparts at commercial banks, managers at credit unions do not face market discipline and the sudden risk of deposit withdrawals. The presence of deposit insurance could further intensify this moral hazard, providing an additional layer of security that may encourage riskier behaviour and lead to increased opacity at credit unions.[1]

Alternatively, credit unions with a greater proportion of insured deposits might be forced to decrease earnings opacity in order to produce more transparent financial statements. From a regulatory perspective, the National Credit Union Association (NCUA) may supervise credit unions with higher insured deposits more strictly in order to: protect the value of the deposit insurance fund (National Credit Union Share Insurance Fund, NCUSIF); and maintain overall financial stability. Stricter supervision by the NCUA is likely to cause credit unions to become more transparent. Prior evidence (for commercial banks) suggests that supervisory strictness increases bank transparency. For example, Manganaris et al. (2017) find that since the global financial crisis of 2007–2009, a stricter regulatory environment has led banks to become more transparent by adopting more conservative and timely financial reporting practices. Costello, Granja, and Weber (2019) provide evidence that regulatory identification of accounting discrepancies compels banks to restate capital and retained earnings more accurately.

Considering the contrasting points discussed earlier, it is unclear whether and how raising the upper limit for deposit insurance coverage will affect the earnings opacity of credit unions, thus the link between deposit insurance coverage and the opaqueness of credit union earnings is ultimately an empirical question that warrants further investigation.

In order to evaluate the effect of deposit insurance on credit union earnings opacity we take advantage of the regulatory change in the insured deposit coverage for US credit unions. This change occurred in October 2008, coinciding with the peak of the global financial crisis. In accordance with Section 136 of the Emergency Economic Stabilization Act (EESA), the ceiling for deposit insurance coverage offered by the National Credit Union Share Insurance Fund (NCUSIF) was raised from $100,000 to $250,000. Given the heterogeneity across credit unions in deposit funding structures, the change in deposit insurance protection generated varying impacts on insured deposits of different credit unions. Some witnessed a more significant growth in insured deposits than others. Our research design takes advantage of this variation to investigate how deposit insurance coverage impacts earnings opacity.

Our quarterly financial statement data of credit unions spans the period from 2007Q1 to 2010Q4, which includes 2008Q4 when the expansion of deposit insurance coverage took place (i.e., October 2008). In line with prior literature, we compute the difference in insured deposits to total assets before and after the adjustment in deposit insurance coverage (Johari et al., 2020; Lambert et al., 2017; Nguyen et al., 2022). We then create two distinct groups of credit unions based on the extent to which they are affected by Section 136 of the EESA 2008. Credit unions significantly affected by this provision are identified as those with a difference in insured deposits to total assets before and after its implementation falling within the top quartile. In contrast, credit unions relatively unaffected by the provision are those with differences in the bottom quartile.

To evaluate how the modification in the maximum deposit insurance level affects earnings opacity, we employ a difference-in-differences methodology. The estimation compares the change in earnings opacity, measured by discretionary loan loss provision, between affected and unaffected credit unions before and after the policy change. We utilize a propensity score matching approach to reduce estimation biases caused by dissimilarities between affected (treated) and unaffected (control) credit unions prior to the regulatory change. In line with previous literature, discretionary loan loss provision is derived from the absolute value of residuals estimated via a model that enables us to disentangle discretionary and non-discretionary components of loan loss provisions. Our empirical analysis uses the discretionary component of loan loss provisions to measure earnings opacity, which is the outcome variable.

The results of our difference-in-differences analysis suggest that credit unions affected by the rise in the maximum deposit insurance level tend to increase discretionary loan loss provisions compared to credit unions not affected by the change. This increase is also economically significant, indicating that in comparison to unaffected credit unions, those influenced by the implementation of Section 136 of the EESA 2008 exhibit lower transparency. This result supports our conjecture that the increase in deposit insurance

[1] It is also important to note that credit unions, similar to banks, rely heavily on deposits to fund their assets. Aggregate information from NCUA shows that deposits account for 83.4% of credit union's funding (NCUA, 2023), which is consistent with a matched sample used in our study (75% and 83% deposits of total assets for pre- and post-treatment period, respectively).

coverage reduces the incentive for credit union depositors to monitor managerial behaviour. Additional analysis reveals that the increase in earnings opacity (discretionary loan loss provisioning) is more pronounced among small and medium-sized credit unions.

To ensure robustness of our main findings, we evaluate both the internal validity and the robustness of our main results. In order to evaluate the internal validity of our findings, we carry out an examination to compare the differential growth of discretionary loan loss provisions between credit unions influenced by the change and those unaffected in the period preceding the treatment, an event study analysis and a placebo test. The results of these assessments do not reveal any sign of anticipatory impacts through adjustments in credit union earnings opacity. Finally, we verify the reliability of our estimations by using alternative model specifications; and variance-covariance estimators. All results confirm the causal interpretation of the baseline estimations.

Our study is related to two main strands of literature. First, we contribute to research on depositor monitoring incentives and moral hazard. The concept of moral hazard is well-established theoretically in the banking literature. However, measuring moral hazard empirically remains somewhat challenging (Danisewicz et al., 2021). Building on prior evidence that deposit insurance increases risk taking (Lambert et al., 2017; Nguyen et al., 2022), we use an exogeneous increase in deposit insurance coverage to measure moral hazard and establish an appropriate setting to investigate the link between moral hazard and earning opacity at credit unions, an issue not studied previously in the literature. We show that moral hazard, induced by weakened incentives to monitor credit unions by depositors, leads to higher opacity. Our findings complement prior insights of Danisewicz et al. (2021), who show that exposing non-depositors to greater potential losses in the event of bankruptcy reduces bank opacity. This impact is stronger for banks with a higher proportion of non-deposit funding. A more recent study by Pugachev et al. (2024) shows that banks affected by increased deposit insurance coverage over-provision for potential loan losses, and thus increase opacity.

Second, our study contributes to research investigating the impacts of regulatory interventions on the financial reporting quality and transparency of depository institutions. Altamuro and Beatty (2010) provide evidence that banks subject to internal control requirements (mandated by the Federal Deposit Insurance Corporation Act) became more transparent. Chronopoulos et al. (2023) find that a provision of the Dodd-Frank Act that mandated banks to separate audit and risk committees led to improved (increased) financial reporting quality (transparency). Jiang et al. (2016), show that heightened competition resulting from industry deregulation reduced bank opacity. Given the importance of accounting disclosures in communicating accurate information to various stakeholders, our findings suggest that enhanced deposit insurance coverage has implications for industry stakeholders and regulators. Specifically, the enactment of measures (such as enhanced deposit insurance coverage) to ensure the stability of the financial system have the unintended consequence of increasing opacity, and thus limit the extent to which auditors, creditors and supervisors can assess credit union earnings and future cash flows accurately.

The rest of the paper is structured as follows. Section 2 provides a review of the research evidence on credit union earnings opacity. Section 2 also reviews research that investigates how credit unions respond to deposit insurance. In Section 3, we discuss the identification strategy, the empirical specification and the dataset used, while Section 4 presents the results of our empirical analysis. Section 5 presents the results for a series of additional tests. Section 6 concludes.

2. Literature review

In this section, we present a selective review of the relevant literature. Section 2.1 presents an overview of the earnings opacity literature for credit unions. In Section 2.2, we describe the evolution of deposit insurance for US credit unions, and we present a summary of the literature concerning the effect of deposit insurance on credit unions.

2.1. Earnings opacity

Loan loss provisions are the most substantial form of accrual for credit unions, a similarity they share with banks. However, given their not-for-profit unlisted status and the simplicity of their operation, little attention is paid to earnings opacity and the potential use of discretion in loan loss provisions. Gomez-Biscarri et al., 2020 investigate the prevalence of earnings management in the credit union industry. Using a sample of US credit unions with total assets exceeding $50 million for the period 1994–2015, they provide evidence (in line with the banking literature) that credit union managers have a significant degree of flexibility when it comes to managing loan loss provisions through practices like income smoothing, big-bath accounting, loss avoidance, and capital management. Using hurricane Katrina as an exogenous shock, the authors provide causal evidence that credit unions that manage earnings have attributes consistent with being saver-oriented, and consequently are able to deliver higher remuneration to members, owners, and employees in the medium-to-long run.[2]

Taking advantage of the 2005 congressional hearings regarding the efficacy of the federal tax-exempt status of US credit unions, Brushwood et al. (2022) investigate the prevalence of earnings management via discretionary loan loss provisions as a means of

[2] "Saver-oriented" credit unions will set high loan rates to maximize surplus and then will use the surplus to pay dividends to their depositors at the highest rate possible. On the other hand, "borrower-oriented" credit unions will set low rates on loans in order to increase access to loans, which will lower dividend rates as well. Given that members prefer "saver-oriented" type, credit unions need to balance the interests of borrowing and saving members.

reducing reported income and resultant political scrutiny.[3] Using a combined sample of US credit unions and banks from 2002 to 2007, the authors find that credit unions manage earnings downwards (through an increase in discretionary loan loss provisions) in the quarters prior to and around the US congressional hearings on the credit union tax exemption. They conclude that credit unions have incentives to manage earnings downward in order to understate the revenue raising potential of repealing the federal tax exemption.

2.2. Deposit insurance

In 1934, Congress passed the Federal Credit Union Act. This Act allowed credit unions to establish Federal Charters across US as a means of providing financial services to those of limited means. As part of this Act, the Bureau of Federal Credit Unions was formed as the precursor to the National Credit Union Administration (NCUA) to charter and regulate federal credit unions. Credit unions organized under state charters were supervised primarily by state regulators. The NCUA, which had its primary objective to charter and supervise federal credit unions was established as a federal independent agency in 1970. Credit unions lacked access to federal deposit insurance until 1970, at which point the National Credit Union Share Insurance Fund (NCUSIF) was created and placed under the oversight of the NCUA. During this time, insurance premiums were imposed on credit unions that were federally insured, whether they were state- or federally chartered. In state-chartered credit unions, the process is determined by state requirements. In some states, a requirement of deposit insurance followed the establishment of the NCUSIF in 1970 while in other states insurance requirements were not required until later in the decade. While some states encouraged credit unions to choose between private and federal deposit insurance by 1980 most states required credit unions to have federal deposit insurance (Clair, 1984; Getter, 2014; Karels & McClatchey, 1999).

In the wake of the global financial crisis, many countries introduced or enhanced deposit insurance schemes (Demirgüç-Kunt et al., 2015).[4] In the US, on October 3rd, 2008, Congress implemented the Emergency Economic Stabilization Act. This Act incorporated Section 136, which temporarily raised the maximum amount of deposit insurance protection for credit union members offered by the NCUA, from $100,000 to $250,000 per depositor. Similar arrangements were introduced for commercial banks. The increase in deposit insurance coverage was temporary until December 31st, 2009. Nevertheless, in May 2009, the Helping Families Save Their Homes Act prolonged the extension of insured deposits until December 31st, 2013. This arrangement was modified by Section 335 of the Dodd-Frank Wall Street Reform and Consumer Protection Act in July 2010, resulting in a permanent increase of the deposit insurance limit from $100,000 to $250,000.

Until now, there has been a scarcity of clear and consistent evidence concerning how deposit insurance affects the behaviour of credit unions. Black and Dugger (1981) show that US federally insured credit unions increase their risk taking following the introduction of deposit insurance in 1971. Similarly, Clair (1984) shows that the implementation of deposit insurance for federally insured credit unions (in 1971) led to an increase in risk taking, evidenced by lower capital ratios, higher loan delinquency and higher loan-to-deposit ratios. Kane and Hendershott (1996) find that the performance of the US credit union deposit insurance fund outperformed that of commercial banks, and savings and loans schemes during the 1980s. This, in turn, offers limited support for the presence of moral hazard in credit unions. Based on an assessment of the NCUSIF's solvency, they suggest that over the 1980s it outperformed both bank and savings and loan insurance funds. They conclude that as part of the NCUSIF's reform in 1984, all insured credit unions are responsible for resolving any shortfalls in the fund. Consequently, this means that credit unions insured by the National Credit Union Share Insurance Fund Act as co-insurers of one another. Similarly, a study by Karels and McClatchey (1999) provides only modest support for the presence of moral hazard in credit unions following the implementation of federal deposit insurance. The authors find that risk-taking behaviour in the post-insurance period decreases despite the introduction of softer capital regulations in 1970 and 1977. According to the authors, the common bond requirement restricts the ability of managers to invest in high-risk loans or grow rapidly. For the years following the financial crisis, Van Dalsem (2017) finds that uninsured depositors and excess share insurers perform an important monitoring role in preventing management from taking excessive risks. They also provide evidence that credit unions with more uninsured deposits are less liquid, hold less capital and report lower loan default. Using Section 136 of the EESA 2008, which increased the deposit insurance coverage from $100,000 to $250,000, Nguyen et al. (2022) show that improved deposit insurance arrangements incentivised credit unions to take on more risk by increasing their overall and unsecured lending, resulting in a deterioration in loan quality. Beyond the effect of the deposit insurance coverage on credit union performance, Gómez-Biscarri, López-Espinosa, and Mesa Toro (2022) investigate the market discipline that credit unions face from depositors. They provide evidence that credit union members exert discipline, albeit this is moderated by deposit insurance.

3. Identification strategy, empirical specification and data

3.1. Research design

To investigate how deposit insurance affects the transparency of earnings, our study focuses on the implementation of Section 136 of the EESA in October 2008, which occurred during the peak of the global financial crisis. Section 136 increased the maximum insured

[3] Federal credit unions are exempt from federal income tax under the Federal Credit Union Act of 1934, whereas state-chartered credit unions are exempt from federal income tax under the Revenue Act of 1916 (Goddard et al., 2023; Tatom, 2005). Outside the US, other countries providing tax exemptions to not-for-profit financial cooperatives include Estonia, Ireland, Mexico and Romania (McKillop et al., 2020).

[4] Kyei (1995) and Garcia (2000) provide a historical review for the implementation of deposit insurance around the world.

amount per depositor from $100,000 to $250,000. The implementation of the EESA 2008 (Section 136) can be viewed as an external factor causing a shift in the degree of deposit insurance coverage for credit unions, depending on their total amount of insured deposits. We rely on the differences in the amount of insured deposits among credit unions before and after the implementation of Section 136 to classify credit unions as affected (treated) and unaffected (control) following prior literature (Johari et al., 2020; Lambert et al., 2017; Nguyen et al., 2022).

First, we compute the ratio of insured deposits to assets and then take the difference between the ratio before (when deposit insurance was set at $100,000) and after the increase in deposit insurance coverage (when it was raised to $250,000). Credit unions are then divided into treated and control group based on the difference. The treated group comprises credit unions where the difference in deposit-to-asset before and after the implementation of Section 136 falls within the top quartile, while the control group consists of credit unions where this difference lies in the bottom quartile.

We calculate discretionary loan loss provisions by isolating both the discretionary and non-discretionary elements within the total loan loss provisions following a model suggested by Beatty and Liao (2014). Specifically, the discretionary loan loss provisions are represented by the absolute magnitudes of the residuals produced from Equation (1).

$$LLP_{it} = \beta_0 + \beta_1 \Delta NPA_{it+1} + \beta_2 \Delta NPA_{it} + +\beta_3 \Delta NPA_{it-1} + \beta_4 \Delta NPA_{it-2} + \beta_5 SIZE_{it-1} + \beta_6 \Delta LOANS_{it} + \beta_7 HPI_{it} + \beta_8 \Delta GSP_{it} + \beta_9 \Delta UNEMP_{it} + \varepsilon_{it} \quad (1)$$

where i, indexes credit union and t indexes time. LLP_{it} represents total loan loss provisions divided by lagged total loans. ΔNPA_{it} indicates the change in total non-performing loans between quarter t and t-1 divided by lagged total loans. We also include the two-period lag, ΔNPA_{it-2} , the last-period, ΔNPA_{it-1}, and the forward-period, ΔNPA_{it+1}.[5] $SIZE_{it-1}$ is the natural logarithm of total assets in quarter t-1. $\Delta LOANS_{it}$ is the change in total loans between quarter t and t-1 scaled by lagged total loans. We also account for macroeconomic state-specific factors that could influence loan loss provisions via the inclusion of HPI_{it} (the return on the Home Price Index), ΔGSP_{it} (the change in gross state product), and $\Delta UNEMP$ (the change in the rate of state unemployment) in the model. Comprehensive definitions of the mentioned variables and summary statistics can be found in Table A1, whereas the outcomes of estimating Equation (1) are displayed in Table A2. ε_{it} is the residual term of Equation (1). It reflects the discretionary component of loan loss provisions, and it is the outcome variable we use for our empirical analysis. Because residuals can be positive or negative, we employ the absolute values to measure the extent of discretionary loan loss provisions.

To evaluate the effect of deposit insurance on the level of earnings opacity, we employ a difference-in-differences methodology. This involves comparing the disparity in earnings opacity between credit unions experiencing significant change in insured deposits (affected) and counterparts where there was only a relatively small change in insured deposits (unaffected) in the pre- and post-event periods. We estimate a model of the form:

$$Y_{i,t} = \beta_1 (Affected_i * Post\ Event_t) + \delta X_{i,t-1} + \nu_i + \gamma_t + \varepsilon_{i,t}, \quad (2)$$

where i indexes credit union and t indexes time. $Y_{i,t}$ represents the absolute value of the residuals obtained from Equation (1), which is our earnings opacity measure reflecting discretionary loan loss provisions. $Affected_i$ is a binary variable with a value of one indicating whether a credit union was impacted by the expansion of deposit insurance coverage in 2008Q4, and zero if not. $Post\ Event_t$ is a binary variable denoting the post-treatment period, taking the value of one for quarters starting from 2008Q4 onwards and zero otherwise. $Affected_i * Post\ Event_t$ is an interaction term that equals one if the credit union was affected by the increase in deposit insurance coverage during the post-event period and zero otherwise. The primary variable of interest is the interaction term $Affected_i * Post\ Event_t$. The coefficient assigned to this interaction term, denoted as β_1, denotes the estimated impact of changes in the maximum deposit insurance coverage level on the earnings opacity of credit unions. If this coefficient is positive and statistically significant, it implies that affected credit unions become less transparent subsequent to the adjustment in the maximum deposit insurance coverage threshold.

$X_{i,t-1}$ denotes a group of credit union-specific control variables that have been previously identified as significant factors influencing credit union performance. (Bauer, 2008; Esho et al., 2005; Goddard et al., 2002, 2008, 2009, 2014; Karels & McClatchey, 1999). These control variables include credit union size, liquidity, total deposits, net worth, profitability and total loans. To control for differences in earnings opacity, we also include the one-quarter lag of loan loss provisions.[6] In order to avoid simultaneity, all credit union specific control variables enter the model lagged by one period. A full list of variables and their corresponding definitions incorporated in the model are provided in Table 1. Equation (2) incorporates time fixed effects denoted as γ_t, and credit union fixed effects, ν_i, which help account for unobservable variations among credit unions. Standard errors are clustered at the credit union level to address potential autocorrelation.

3.2. Data and summary statistics

We compile our credit union level dataset from several sources. We retrieve financial data pertaining to US credit unions from the S&P Global Market Intelligence database. Our data collection spans 16 quarters, commencing in 2007Q1 and concluding in 2010Q4.

[5] Previous research indicates that banks use past and future changes in non-performing loans to determine current period loan loss provisions (Bushman & Williams, 2012).

[6] Prior evidence suggests that past information on loan loss provisions is associated with earnings opacity (Danisewicz et al., 2021; Jiang et al., 2016; Kanagaretnam et al., 2010).

Table 1
Definition of variables.

Variable name	Description	Source
Dependent variable		
Discretionary loan loss provisions	The absolute value of the residuals obtained from Equation (1) modelling total loan loss provisions on its normal components.	S&P Global Market Intelligence
Discretionary loan loss provisions Positive	The positive value of the residuals obtained from Equation (1) modelling total loan loss provisions on its normal components.	S&P Global Market Intelligence
Discretionary loan loss provisions Negative	The negative value of the residuals obtained from Equation (1) modelling total loan loss provisions on its normal components.	S&P Global Market Intelligence
Control variables		
Affected	A binary variable that equals one if a change in the ratio of insured deposits to total assets of a credit union following the increase in deposit insurance coverage lies in the top quartile and zero if the change is in the bottom quartile.	Authors' calculations
Post Event	A binary variable that equals one for quarters after 2008Q4 as the event quarter of deposit insurance coverage increase and zero otherwise	Authors' calculations
Size	Natural logarithm of total assets	S&P Global Market Intelligence
Liquidity	Ratio of cash and cash equivalents to total assets	S&P Global Market Intelligence
Total deposits	Ratio of total deposits to total assets	S&P Global Market Intelligence
Net worth	Ratio of net worth to total assets	S&P Global Market Intelligence
Profitability	Ratio of net income to total assets	
Loan loss provisions	Ratio of loan loss provisions to lagged total loans	S&P Global Market Intelligence
Total loans	Ratio of total loans to total assets	S&P Global Market Intelligence

Note: This table provides definition for all variables used in main analysis and data source.

This timeframe encompasses the shift in deposit insurance coverage that occurred in October 2008. State-level macroeconomic data are collected from the Bureau of Economic Analysis, the Bureau of Labour Statistics, and the Federal Housing Finance Agency. Our initial sample comprises 8,065 credit unions that existed at the end of the third quarter of 2008. We exclude credit unions located in unincorporated territories given that macroeconomic data for these regions are unavailable. This leaves us with a sample of 8,031 credit unions. Further, our identification strategy only considers credit unions in the top quartile (treatment group) or lowest quartile (control group) of reported changes in insured deposits. This reduces our sample to 2,582 credit unions.

Table 2 offers a summary of the key variables' descriptive statistics for credit unions in both the treatment and control groups, covering the period from 2007Q1 through 2010Q4. Descriptive statistics are presented in Panels A and B for the period before and after the enactment of the Emergency Economic Stabilization Act, respectively. In contrast, Panels C and D outline the changes in the outcome variable during the periods before and after the treatment. Panel A of Table 2 shows that during the pre-treatment period, affected credit unions are larger, hold more deposits, grant more loans and make greater provision for loan losses than unaffected counterparts. However, affected credit unions are less liquid and less profitable than unaffected credit unions. Furthermore, affected credit unions experience a smaller increase in discretionary loan loss provisions growth relative to credit unions assigned to the control group.

One of the major concerns is that the process of assigning credit unions into treated and control groups might not be certainly unpredictable. If affected credit unions differ from unaffected credit unions in the pre-treatment period across a number of observable characteristics, they may exhibit different trends in the earnings opacity in the post-treatment period, even if Section 136 of the Emergency Economic Stabilization Act was not a factor. It is possible, therefore, that variations in credit union earnings opacity following the enactment of Section 136 of the Emergency Economic Stabilization Act may be primarily attributed to pre-existing disparities within each group rather than alterations in deposit insurance regulation. To alleviate these concerns (and following prior literature), we use a propensity score matching method to construct a matched sample of credit unions (Lambert et al., 2017; Nguyen et al., 2022). Specifically, we employ a one-to-one matching approach in which we pair credit unions in the treated group with their corresponding counterparts in the control group, utilizing the fundamental attributes of credit unions as the criteria for matching. These characteristics include size, liquidity, total deposits, net worth, non-performing loans, profitability, and total loans. We additionally incorporate state fixed effects to account for the geographical locations of credit unions. For every credit union, we calculate the probability model from which the propensity scores are generated using the mean values of the explanatory variables from 2007Q1 to 2008Q3 (pre-treatment period). This matching is performed without replacement such that one credit union from the control group can act as the closest match for one credit union from the treated group on one occasion. We use calliper at the level of 1% to ensure that the selection of a credit union from the control group aligns with the appropriate propensity score range, establishing it as an optimal partner for a treated credit union.

Table 2
Summary statistics of the full sample.

Variables	Affected Credit Unions			Unaffected Credit Unions			Diff	*p*-value
	Obs.	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Panel A: Pre-treatment period (2007Q1 –2008Q3)								
Insured deposits	9,031	0.7511	0.0765	9,037	0.8169	0.0643	−0.0658	0.00
Discretionary loan loss provisions	8,940	0.0014	0.0030	8,951	0.0016	0.0036	−0.0002	0.00
Discretionary loan loss provisions Positive	3,155	0.0019	0.0048	3,031	0.0024	0.0056	−0.0005	0.00
Discretionary loan loss provisions Negative	5,785	−0.0011	0.0011	5,920	−0.0012	0.0017	0.0001	0.00
Size	9,031	11.1679	1.6985	9,037	9.5538	1.1205	1.6140	0.00
Liquidity	9,031	0.1020	0.0861	9,037	0.1307	0.0936	−0.0287	0.00
Total deposits	9,031	0.8549	0.0479	9,037	0.8334	0.0622	0.0215	0.00
Net worth	9,031	0.1244	0.0393	9,037	0.1559	0.0619	0.0315	0.00
Profitability	9,030	0.0013	0.0032	9,037	0.0014	0.0033	−0.0001	0.10
Loan loss provisions	8,940	0.0014	0.0034	8,951	0.0012	0.0040	0.0002	0.00
Total loans	9,031	0.6375	0.1677	9,037	0.5802	0.1631	0.0573	0.00
Panel B: Post-treatment period (2008Q4 – 2010Q4)								
Insured deposits	11,426	0.8375	0.0660	11,319	0.8437	0.0668	−0.0062	0.00
Discretionary loan loss provisions	11,336	0.0025	0.0049	11,221	0.0026	0.0053	−0.0001	0.05
Discretionary loan loss provisions Positive	4,200	0.0036	0.0074	3,376	0.0041	0.0085	−0.0005	0.00
Discretionary loan loss provisions Negative	12,921	−0.0015	0.0017	13,765	−0.0016	0.0024	0.0001	0.00
Size	11,426	11.3045	1.7212	11,319	9.6728	1.1499	1.6317	0.00
Liquidity	11,426	0.1032	0.0864	11,319	0.1338	0.0959	−0.0306	0.00
Total deposits	11,426	0.8656	0.0551	11,319	0.8472	0.0639	0.0184	0.00
Net worth	11,426	0.1116	0.0432	11,319	0.1420	0.0628	−0.0304	0.00
Profitability	11,426	−0.0005	0.0149	11,319	−0.0007	0.0066	0.0002	0.15
Loan loss provisions	11,390	0.0031	0.0063	11,294	0.0022	0.0068	0.0009	0.00
Total loans	11,426	0.5985	0.1732	11,319	0.5251	0.1656	0.0734	0.00
Panel C: Pre-trend growth rate								
Discretionary loan loss provisions	9,031	5.1145	4.7982	9,037	28.3510	60.6508	−23.2365	0.00
Panel D: Post-trend growth rate								
Discretionary loan loss provisions	11,426	4.0947	1.6646	11,319	5.2106	5.3277	−1.1159	0.00

Note: This table presents descriptive statistics for our full sample. Panel A and Panel B display descriptive statistics for both affected and unaffected group pre- (2007Q1-2008Q3) and post-treatment period (2008Q4-2010Q4), respectively. Panel C and D present trends in the pre- and post-treatment period and the mean comparison of these trends between affected and unaffected credit unions for the outcome variable. Columns (7) and (8) report the differences and p-values for the difference in means test (*t*-test) between affected and unaffected credit unions. The definitions of the variables are given in Table 1.

3.3. Summary statistics of the matched sample

After matching, the final data set includes 1,194 credit unions, of which 597 constitute our treated group (affected credit unions) and 597 constitute our control group (unaffected credit unions). Table 3 presents the results of the matching procedure, offering descriptive statistics for both the affected and unaffected credit unions' outcome and control variables. Panel A of Table 3 indicates that there is no statistically significant difference in means between the affected credit unions and the matched group of unaffected credit unions for all credit union characteristics. Furthermore, the summary statistics reveal that the pattern of discretionary loan loss provisions is comparable between credit unions that were affected and those that were not affected during the period before the treatment, as observed in the matched sample (Panel C). These results provide evidence in favor of the idea that the parallel trend assumption remains intact in our context (additional formal test results are presented in Section 6). Additionally, Panel D demonstrates that during the post-treatment period, there is a significant increase in the growth of discretionary loan loss provisions for treated credit unions in comparison to control credit unions.

Fig. 1 visually depicts the changes in insured deposits as a percentage of total assets for our treated and control groups of credit unions before and after the introduction of the Emergency Economic Stabilization Act. Starting from the end of the third quarter of 2008, there is a noticeable and abrupt rise in insured deposits for the credit unions affected by the change in maximum deposit insurance coverage, as compared to the group we consider unaffected by this change.

4. Results

4.1. Main findings

Table 4 presents the baseline results derived from estimating Equation (2) with the absolute values of discretionary loan loss

Table 3
Summary statistics of the matched sample.

Variables	Affected Credit Unions			Unaffected Credit Unions			Diff	*p*-value
	Obs.	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Panel A: Pre-treatment period (Q1 2007 – Q3 2008)								
Insured deposits	4,179	0.7537	0.0792	4,179	0.8270	0.0586	0.0733	0.00
Discretionary loan loss provisions	4,145	0.0015	0.0038	4,145	0.0016	0.0041	−0.0001	0.16
Discretionary loan loss provisions Positive	1,471	0.0021	0.0062	1,483	0.0024	0.0069	−0.0003	0.11
Discretionary loan loss provisions Negative	2,674	−0.0011	0.0013	2,662	−0.0011	0.0021	0.0000	0.73
Size	4,179	10.0351	1.3619	4,179	10.0681	1.1745	−0.0330	0.23
Liquidity	4,179	0.1218	0.1066	4,179	0.1236	0.0856	−0.0018	0.40
Total deposits	4,179	0.8481	0.0514	4,179	0.8487	0.0502	−0.0003	0.77
Net worth	4,179	0.1371	0.0465	4,179	0.1382	0.0473	−0.0011	0.27
Profitability	4,179	0.0014	0.0039	4,179	0.0014	0.0039	0.0000	0.87
Loan loss provisions	4,145	0.0012	0.0042	4,145	0.0014	0.0049	−0.0002	0.06
Total loans	4,179	0.6002	0.1781	4,179	0.5985	0.1544	0.0017	0.64
Panel B: Post-treatment period (Q4 2008 – Q4 2010)								
Insured deposits	5,280	0.8353	0.0677	5,245	0.8570	0.0528	−0.2174	0.00
Discretionary loan loss provisions	5,237	0.0028	0.0062	5,199	0.0026	0.0043	0.0002	0.06
Discretionary loan loss provisions Positive	1,761	0.0044	0.0100	1,700	0.0039	0.0063	0.0005	0.06
Discretionary loan loss provisions Negative	3,476	−0.0020	0.0024	3,499	−0.0020	0.0027	0.0000	0.98
Size	5,280	1.01642	1.3932	5,245	10.1956	1.2021	−0.0314	0.21
Liquidity	5,280	0.1234	0.1061	5,245	0.1241	0.0875	−0.0007	0.72
Total deposits	5,280	0.8587	0.0608	5,245	0.8612	0.0526	−0.0025	0.02
Net worth	5,280	0.1246	0.0525	5,245	0.1242	0.0483	0.0004	0.69
Profitability	5,280	−0.0008	0.0213	5,245	−0.0006	0.0059	−0.0002	0.55
Loan loss provisions	5,264	0.0028	0.0080	5,232	0.0026	0.0056	0.0002	0.14
Total loans	5,280	0.5585	0.1820	5,245	0.5508	0.1596	0.0077	0.02
Panel C: Pre-trend growth rate								
Discretionary loan loss provisions	4,179	2.7792	1.7571	4,179	3.7449	2.3427	−0.9657	0.27
Panel D: Post-trend growth rate								
Discretionary loan loss provisions	5,280	4.6148	1.8783	5,245	3.4647	2.6203	1.1501	0.00

Note: This table presents descriptive statistics for our matched sample. Panel A and B display descriptive statistics for the affected and unaffected group pre- (2007Q1-2008Q3) and post-treatment period (2008Q4-2010Q4), respectively. Panel C and D present trends in the pre- and post-treatment period and the mean comparison of these trends between treated and control credit unions for the outcome variable. Columns (7) and (8) report the differences and p-values for the difference in means test (*t*-test) between affected and unaffected credit unions. The definitions of the variables are given in Table 1.

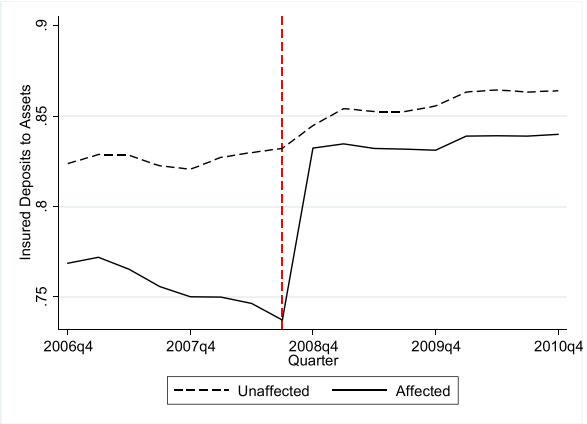


Fig. 1. Evolution of insured deposits from 2007Q1 to 2010Q4. Note: This figure plots the evolution of insured deposits for both treated and control credit unions of the matched sample over the period 2007Q1- 2010Q4. The dashed vertical line marks the end of 2008Q3, three days before the passage of the Emergency Economic Stabilization Act. The average value of affected credit unions is represented by a solid line, and the average values of unaffected credit unions are represented by a dashed line.

provisions as the dependent variable. In Column (1), we observe a positive, and highly significant coefficient at the 1% level, for our main variable of interest (Affected*Post Event). This suggests that following the increase in the deposit insurance coverage, there is a four-basis point increase in the amount of discretionary loan loss provisions at affected credit unions. This increase is also economically significant. Considering that the typical credit union in our dataset has discretionary loan loss provisions of approximately 0.22%, affected credit unions boost their discretionary loan loss provisions by 18.2% (0.0004/0.0022). This implies that in comparison to unaffected counterparts, credit unions most affected by the increase in the maximum deposit insurance coverage are more likely to increase earnings opacity.[7]

We established that deposit insurance coverage increases the opacity of affected credit unions. However, it is unclear from the analysis conducted thus far whether the observed increase in loan loss provisions (higher opacity) is driven by over- or under-provisioning. Understanding this is important because the level of provisioning directly impacts the capital buffers of credit unions. Higher loan loss provisions would reduce available capital, which in turn adversely increases a credit union's likelihood of default. We take a step further to explore whether the increase in the absolute value of discretionary loan loss provisions is driven by under- or over-provisioning. We re-estimate Equation (2) using positive and negative values of discretionary loan loss provisions as the dependent variable. Columns 2 and 3 of Table 4 report the results. Our main variable of interest (Affected*Post Event) enters the regression with a positive and statistically significant coefficient in the case of positive discretionary loan loss provisions, but it is statistically insignificant for negative loan loss provisions. This suggests that the increase in the deposit insurance coverage (which alters credit union depositors' monitoring incentives) leads to over-provisioning for loan losses. The results differ from evidence found for non-depositor monitoring of banks. Danisewicz et al. (2021), for example, demonstrates that increase in non-depositor monitoring (by exposing non-depositors to greater potential losses in the event of bankruptcy) leads to a reduction in bank opacity. However, our results are similar to the findings of a more recent study by Pugachev et al. (2024) which uses an identical research design and shows that banks affected by increased deposit insurance coverage over-provision for potential loan losses, thereby increasing opacity.

4.2. The role of credit union size

In the following analysis, we investigate whether the impact of increased deposit insurance coverage on earnings opacity varies by asset size.[8] Larger and more complex credit unions are likely to attract greater scrutiny from the supervisor (Hillier et al., 2008; Hirtle et al., 2020). As a result, managers of larger credit unions may have incentives to produce more transparent financial statements to maintain their credibility and reputation. Therefore, credit union size could also impact how credit unions modify their disclosure of earnings in response to the regulatory change. Following prior literature (Le et al., 2021), we define *small* credit unions as those with asset size in the bottom tercile of the sample as of 2008Q3 (below $20.7 million). *Medium* credit unions are those in the medium tercile (asset size between $20.7 and $60 million), while *large* credit unions are those in the top tercile (with asset size exceeding $60 million). We introduce the *Small*, *Medium* and *Large* variables and their interactions with (*Affected*Post Event*) in Equation (2). *Small*, *Medium* and *Large* are dummy variables equal to one and zero otherwise when a credit union belongs to the bottom, medium and top tercile, respectively. We find a positive and significant triple interaction coefficient for the group of *small* (*Affected*Post Event*Small*) and *medium* (*Affected*Post Event*Medium*) credit unions as shown in Column (1) of Table 5. Our findings provide evidence that the impact of the regulatory change is more prominent for affected credit unions of *small* and *medium* size. The additional column of Table 5 shows that this result is robust to alternative econometric specification without further control variables (Column 2).

5. Robustness checks

In this section, we provide several tests to validate the internal validity of our main findings and ensure the robustness of our primary conclusions, which suggest that the expansion of deposit insurance coverage prompts affected credit unions to enhance earnings opacity by exercising greater discretion in loan loss provisions.

5.1. Parallel trend assumption

The analysis presented thus far shows that credit unions impacted by the increase in deposit insurance coverage via the implementation of Section 136 of the Emergency Economic Stabilization Act tend to increase earnings opacity.

However, a fundamental assumption behind our method for identifying treatment effects is that, in the absence of the treatment, changes in earnings opacity (via discretionary loan loss provisions) for both treated and control credit unions follow similar patterns, often referred to as the "parallel trend assumption" (Abadie, 2005). We expand our examination of the parallel trend assumption, as described in Section 4 (Table 3 Panel C), by performing two further tests.

First, we visually examine if our hypothesis is valid by utilizing a format similar to an event-study analysis, where we observe the

[7] We also examine the impact of deposit insurance on earnings opacity by comparing credit unions across all quartiles, rather than the first and fourth quartiles considered in our baseline analysis. Unreported results reveal that the impact of deposit insurance on opacity is non-existent in quartiles where credit unions experience a smaller relative increase in the share of insured deposits following the enactment of the EESA. This suggests that the observed results are primarily driven by the subset of credit unions most affected by the treatment.

[8] Prior evidence suggests that large banks are more transparent, while banks with a higher percentage of non-interest income are more opaque (Altamuro & Beatty, 2010; Berger et al., 2018; Delis et al., 2018; Jiang et al., 2016).

Table 4
The impact of deposit insurance increase on credit union's opacity: baseline results.

Dependent variable: Discretionary loan loss provisions			
	(1)	(2)	(3)
	Absolute	Positive	Negative
Affected*Post Event	0.0004***	0.0010**	0.0000
	(0.0001)	(0.0004)	(0.0000)
Size	−0.0023***	−0.0033***	0.0026***
	(0.0008)	(0.0011)	(0.0006)
Liquidity	−0.0012	−0.0035	−0.0014**
	(0.0023)	(0.0044)	(0.0005)
Total deposits	−0.0067***	−0.0054	0.0015
	(0.0026)	(0.0055)	(0.0010)
Net worth	−0.0056	−0.0223	0.0116**
	(0.0068)	(0.0151)	(0.0055)
Profitability	−0.0376*	−0.0249	0.0293*
	(0.0191)	(0.0269)	(0.0174)
Loan loss provisions	0.0636*	0.0930*	−0.0819**
	(0.0335)	(0.0482)	(0.0359)
Total loans	−0.0026**	−0.0056**	0.0003
	(0.0013)	(0.0023)	(0.0006)
Credit Union fixed effects	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes
Observations	18,521	6,333	12,188
No. of credit unions	1,194	1,060	1,177
R-squared	0.045	0.052	0.117

Note: This table presents the main findings. Column 1 examines the impact of the increase in deposit insurance following the introduction of EESA using the absolute value of discretionary loan loss provisions as the dependent variable. The variable of interest is Affected*Post Event which indicates the increase in earnings opacity between treated and control credit unions following the increase in deposit insurance coverage. Column 2 uses positive discretionary loan loss provisions to examine the effect of the increase in deposit insurance coverage on credit unions earnings opacity. Column 3 uses negative discretionary loan loss provisions to examine the effect of the increase in deposit insurance coverage on credit unions earnings opacity. Standard errors clustered at credit union level are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. The definitions of variables are available in Table 1.

Table 5
The relevance of credit union size.

	(1)	(2)
Affected*Post Event*Small	0.0008***	0.0009***
	(0.0003)	(0.0003)
Affected*Post Event*Medium	0.0005***	0.0005*
	(0.0002)	(0.0002)
Affected*Post Event*Large	0.0001	0.0000
	(0.0001)	(0.0001)
Control variables	Yes	No
Credit Union fixed effects	Yes	Yes
Quarter fixed effects	Yes	Yes
Observations	18,521	18,521
No. of credit unions	1,194	1,194
R-squared	0.030	0.020

Note: This table reports results on the impact of deposit insurance on credit union earnings opacity for various subsamples of credit unions. The dependent variable is Discretionary loan loss provisions. We split the sample into three subsamples according to the credit union size. In Column 1, we introduce three supplementary interaction terms involving the dummy variables, *Small, Medium* and *Large,* and their interaction terms with *Affected*Post Event*. *Small, Medium* and *Large* are dummy variables which equal one if a credit union belongs to the bottom, medium and top tercile, respectively. Column 2 presents results for a regression without further control variables. Unless otherwise stated, in all regressions, we include a set of control variables similar to the baseline but not reported in the table to maintain conciseness. Standard errors clustered at credit union level are reported in parentheses. ***, **, * denote significance at the 1%, 5% and 10% level, respectively. The definitions of variables are provided in Table 1.

effects of treatment before and after it occurs (Freyaldenhoven et al., 2021). Fig. 2 shows the dynamics of earnings opacity around the introduction of the increase in deposit insurance coverage. In the quarters leading up to the implementation of the expanded deposit insurance coverage in October 2008, we notice that both treated and control credit unions demonstrate comparable trends in the

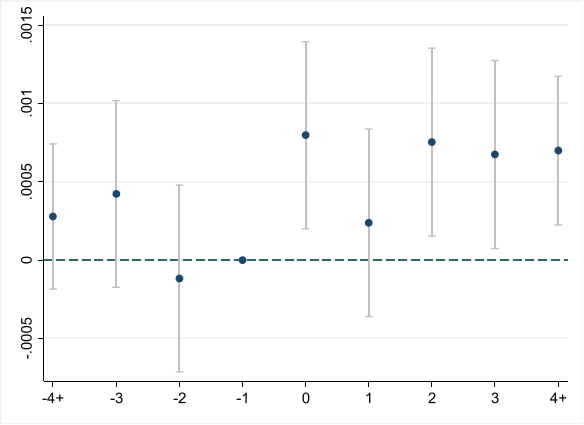


Fig. 2. Dynamic effects of the increase in deposit insurance coverage. Note: This figure shows the impact of the increase in deposit insurance coverage on credit union earnings opacity. The increase was introduced in period 0. The figure plots the coefficients on period dummies with 95-percent confidence intervals, circles represent point estimates from a regression of earnings opacity on a set of time binary variables, while controlling for variables known to affect credit-union performance. We follow the approach by Freyaldenhoven et al. (2021).

growth of earnings opacity. However, following the introduction of the increased deposit insurance coverage, the dynamic effects corroborate that affected credit unions increase earnings opacity in line with the results from our baseline regression reported in Table 4. Second, we conduct a placebo test, where we falsify that the increase in deposit insurance coverage took place in 2007Q4 rather than 2008Q4. The findings from this assessment are presented in Column (1) of Table 6. The coefficient related to the interaction term (Affected*Placebo Post Event) does not exhibit statistical significance. This further demonstrates the parallel trend assumption holds and the effects on earnings opacity we find are more likely to come from the increase in deposit insurance coverage.

5.2. Sensitivity tests

Our baseline analysis incorporates a number of time-varying control variables. However, the inclusion of such variables may bias the estimate of the treatment effect (Atanasov & Black, 2016; Roberts & Whited, 2013). In order to reduce the bias, we rerun the baseline analysis excluding control variables that change over time. The findings, presented in Column (2) of Table 6 reveal that the main coefficient of interest (Affected*Post Event) remains statistically significant, and our primary findings remain valid. Furthermore, we employ a test for coefficient stability to explore potential biases from omitted variables in our estimations. This test, which was suggested by Oster (2019), measures the degree to which the impact of unobserved factors on earnings opacity must be greater than that of observed factors to obtain a difference-in-differences estimate of zero. Our test results imply that the influence of unobserved factors would need to be at least as significant, and usually more significant, than the factors we have included in our analysis for the increase in deposit insurance coverage to have no effect on the earnings opacity of credit unions.[9] Therefore, our findings are not influenced by unobserved characteristics.

The presence of serially correlated standard errors raises doubts about the reliability of a difference-in-differences estimation, potentially biasing reported standard errors downwards. To prevent potential bias and ensure the robustness of our results, we adopt the approach recommended by Bertrand et al. (2004), where we aggregate our dataset into two distinct time periods. More precisely, we calculate the averages of our variables before and after the introduction of the expanded deposit insurance coverage. The outcomes of this examination, presented in Column (3) of Table 6, reveal that the coefficient of interest (Affected*Post Event) retains its magnitude with minimal change. As a result, this confirms that our main conclusions are not affected by concerns associated with serial correlation.

5.3. Alternative model specifications of earnings opacity

We also test how our findings are affected by alternative measures of earnings opacity. Following Beatty and Liao (2014), we re-estimate Equation (2) using modified versions of Equation (1) in order to calculate our dependent variable (discretionary loan loss provisions). Specifically, in Column (1) of Table 7, we re-assess Equation (1), including the one-quarter lag of loan loss allowance. Loan loss allowance is defined as the ratio of loan loss allowance scaled by total loans at the beginning of the quarter. In Column (2), we

[9] We have determined, based on Oster's (2019) terminology, that $\delta = 1.01$. To arrive at this conclusion, we have assumed that the R^2_{max} of a hypothetical regression model that considers all unobserved factors affecting earnings opacity is equal to the R^2 value of the model that includes only observable factors, multiplied by 1.3. In this case, we have utilized the R^2 value of 0.045, as presented in Column (1) of Table 4, to derive a value of $R^2_{max} = 1.3*0.045$.

Table 6
Robustness checks.

	Placebo Event	Covariates Exclusion	Two-period sample
	(1)	(2)	(3)
Affected*Placebo Post Event	0.0001		
	(0.0001)		
Affected*Post Event		0.0004**	0.0003**
		(0.0001)	(0.0001)
Control variables	Yes	No	Yes
Credit Union fixed effects	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	No
Observations	18,521	18,726	2,376
No. of credit unions	1,194	1,194	1,194
R-squared	0.044	0.035	0.661

Note: This table displays the outcomes of tests aimed at confirming the stability and validity of our primary findings, considering various model configurations, sample compositions, and the parallel trend assumption. The dependent variable is *Discretionary loan loss provisions.* In Column (1), we create a hypothetical event one year prior the actual event in 2008Q4. The results are estimated using a sample spanning the period before the introduction of the actual increase in deposit insurance coverage. *Placebo Post Event* is a dummy variable equal to one for all quarters from 2007Q4 onwards and zero otherwise. In Column (2), we eliminate covariates from the baseline model. In Column (3), in accordance with the approach described by Bertrand et al. (2004), we transform our dataset into a two-period panel. To achieve this, we calculate the average of the outcome and control variables before (2007Q1-2008Q3) and after (2009Q1-2010Q4) the increase in deposit insurance coverage in 2008Q4. Unless otherwise stated, we include a set of control variables similar to the baseline but not reported in the table to maintain conciseness. Standard errors, clustered at credit union level, are reported in parentheses. ***, **, * denote significance at the 1%, 5% and 10% level, respectively. Detailed variable definitions are available in Table 1.

Table 7
Alternative model specifications of earnings opacity.

	(1)	(2)	(3)
Affected*Post Event	0.0004***	0.0003**	0.0003**
	(0.0001)	(0.0001)	(0.0001)
Control variables	Yes	Yes	Yes
Credit Union fixed effects	Yes	Yes	Yes
Quarter fixed effects	Yes	Yes	Yes
Observations	18,521	18,160	18,160
No. of credit unions	1,194	1,194	1,194
R-squared	0.046	0.043	0.044

Note: This table presents the findings from sensitivity analyses conducted to assess how alternative measures of discretionary loan loss provisions, which is our proxy for earnings opacity, impact our baseline findings. In Column (1), we re-estimate Equation (1), including the one-quarter lag of loan loss allowance. Loan loss allowance is defined as the ratio of loan loss allowance scaled by total loans at the beginning of the quarter. In Column (2), we re-estimate Equation (1) incorporating net charge-offs. Net charge-offs defined as the ratio of net charge-offs over the quarter scaled by total loans at the beginning of the quarter. Finally, in Column (3), we re-estimate Equation (1) adding both loan loss allowance and net charge-offs. In all regressions, we include a set of control variables similar to the baseline but not reported in the table for brevity. Standard errors are shown in parentheses and are clustered at the credit union level in all models unless explicitly stated otherwise. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Detailed variable definitions are available in Table 1.

re-estimate Equation (1) incorporating net charge-offs. Net charge-offs defined as the ratio of net charge-offs over the quarter scaled by total loans at the beginning of the quarter. Finally, in Column (3), we re-estimate Equation (1) adding both loan loss allowance and net charge-offs. The results of these tests are presented in Table 7. The sign and magnitudes of the coefficient of interest (*Affected*Post Event*) remain unchanged confirming the validity of our baseline results.

5.4. Other tests

The analysis presented thus far suggests that credit unions affected by the increase in deposit insurance coverage become opaquer. To address the potential influence of unobservable factors that could vary across credit unions within a state and quarter, we augment our baseline model by including fixed effects for each state and quarter. Specifically, we re-estimate Equation (2) by including state-quarter fixed effects. The findings of this test are presented in Column (1) of Table 8. Our analysis reveals that the coefficient associated with the interaction term (Affected*Post Event) remains unchanged. Furthermore, in order to account for correlation between credit unions located in the same state, we cluster the standard errors at state rather than credit union level when re-estimating Equation (2).

Table 8
Further robustness checks.

Dependent variable: Discretionary loan loss provisions			
	(1)	(2)	(3)
Affected*Post Event	0.0004***	0.0004***	0.0004***
	(0.0001)	(0.0001)	(0.0001)
Control variables	Yes	Yes	Yes
Credit Union fixed effects	No	Yes	Yes
Quarter fixed effects	No	Yes	Yes
State-Quarter fixed effects	Yes	No	No
Observations	18,521	18,521	18,521
No. of credit unions	1,194	1,194	1,194
R-squared	0.119	0.045	0.045

Note: This table displays the outcomes from sensitivity assessments conducted on our primary model, examining variation in model specifications and sample composition. The dependent variable is *Discretionary loan loss provisions.* In Column (1) the main model is estimated including state-quarter fixed effects. In Column (2), we re-estimate the baseline model by clustering the standard error at state level. In Column (3), we re-estimate the baseline model using a winsorized sample. In all regressions, we include a set of control variables similar to the baseline but not reported in the table for brevity. Standard errors are shown in parentheses and are clustered at the credit union level in all models unless explicitly stated otherwise. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Detailed variable definitions are available in Table 1.

Column (2) of Table 8 reports the results of this test. The coefficient on the interaction term (Affected*Post Event) is statistically significant. This suggests that our results of our main analysis hold. Finally, we investigate if our results are driven by the inclusion of extreme values. To tackle this issue, we re-estimate Equation (2) using a sample that has been adjusted to eliminate outliers by winsorizing the sample at the 1% and 99% levels. The outcomes from this investigation, as presented in Column (3) of Table 8, indicate that our baseline results remain essentially unchanged even when these observations are removed.

6. Conclusion

Following the onset of the 2007–2009 global financial crisis many countries augmented deposit insurance coverage in order to prevent runs on individual depository institutions and protect financial stability. In 2023, the collapse of Silicon Valley Bank and several other regional banks in the United States, has sparked renewed discussions concerning the influence of deposit insurance on the conduct of financial institutions. Furthermore, it has raised questions about the broader issue of moral hazard associated with government financial safety nets.

In this paper, we explore the implications of a sudden increase in the maximum coverage of insured deposits for the earnings opacity of US credit unions. Not all credit unions experienced the same impact of the increased deposit insurance coverage. Insured deposits increased significantly at some credit unions. In others the impacts were less pronounced. By leveraging these differential changes in insured deposits among credit unions, we investigate whether there is a causal link between deposit insurance and the transparency (opacity) of credit union earnings.

By utilizing a propensity score matching technique to categorize credit unions into treated and control groups, in combination with a difference-in-differences approach, we provide evidence that credit unions that were impacted by the increase in deposit insurance coverage tend to exhibit reduced (increased) transparency (opacity) in their earnings. The increase in earnings opacity is more prominent for small- and medium-sized credit unions. Additional analyses of the incentives for credit unions to use discretionary loan loss provisions also reveal important insights. We provide evidence that less well capitalized credit unions exercise less discretion over loan loss provisions as they seek to bolster capital reserves to meet the minimum regulatory capital requirements. A myriad of additional tests confirm our findings.

Overall, the evidence produced in this study suggests that an increase in credit union earnings opacity following increased deposit insurance coverage. As such, our findings suggest that more intense scrutiny of the financial information produced by credit unions is warranted given the decline in depositor discipline and moral hazard pervading the industry following more generous coverage of member deposits.

Table A1
Variables used for the calculation of discretionary loan loss provisions

Variables	Definition	Source	Obs.	Mean	Median	Std. Dev.
LLP	The ratio of loan loss provisions scaled by lagged total loans	S&P Global Market Intelligence	18,786	0.0021	0.0009	0.0060
ΔNPA	The change in non-performing loans between quarter t and t-1, scaled by lagged total loans	S&P Global Market Intelligence	18,883	0.0003	0.0000	0.0121
SIZE	The natural logarithm of total assets	S&P Global Market Intelligence	18,883	10.1230	10.0730	1.2899
ΔLOANS	The change in total loans between quarter t and t-1, scaled by lagged total loans	S&P Global Market Intelligence	18,883	0.0029	−0.0012	0.0594
HPI	The return on the Home Price Index over the quarter	Federal Housing Finance Agency	19,104	358.455	321.700	123.428
ΔGSP	The change in gross state product between quarter t and t-1, scaled by 100	Bureau of Economic Analysis	19,104	30.7920	18.4180	135.0712
ΔUNEMP	The change in unemployment rates between quarter t and t-1	Bureau of Labour Statistics	19,104	0.2788	0.1666	0.5112

Note: This table provides the definition and summary statistics for the variables used to estimate discretionary loan loss provisions. Data were retrieved from three sources. Financial information was retrieved S&P Global Market Intelligence database. Macroeconomic variables were retrieved from the Bureau of Economic Analysis, the Bureau of Labor Statistics, and the Federal Housing Finance Agency. The number of observations (Obs), mean, median and standard deviation (Std. Dev) are reported.

Table A2
Stage-one regression for estimating discretionary loan loss provisions

	(1)
	Loan loss provisions
ΔNPA_{it+1}	−0.0304***
	(0.0086)
ΔNPA_{it}	−0.0133
	(0.0134)
ΔNPA_{it-1}	0.0158
	(0.0083)*
ΔNPA_{it-2}	0.0024
	(0.0052)
$SIZE_{it-1}$	0.0001***
	(0.0000)
$\Delta LOANS_{it}$	−0.0018
	(0.0022)
HPI_{it}	−0.0000
	(0.0000)
ΔGSP_{it}	0.0000
	(0.0000)
$\Delta UNEMP_{it}$	0.0005***
	(0.0000)
Observations	18,726
R-squared	0.010

Note: This table provides the findings derived from the estimation of Equation (1) using OLS. The dataset comprises of 1194 credit unions from 2007Q1 through 2010Q4. Standard errors clustered at credit level are reported in parentheses. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Detailed variable definitions are available in Table A1.

Data availability

Data will be made available on request.

Acknowledgements

We are grateful to Tim Martens, Steven A. Dennis (discussant) and participants at the 2023 European Accounting Association and Financial Management Association Europe conferences. We also thank seminar participants at the University of Limoges, 2022 and the 2022 Financial Mutuals Workshop for helpful comments and suggestions. The usual disclaimer applies.

References

Abadie, A. (2005). Semiparametric difference-in-differences estimators. *The Review of Economic Studies, 72*(1), 1–19.
Acharya, V. V., Richardson, M. P., Schoenholtz, K. L., & Tuckman, B. (2023). *SVB and beyond: The banking stress of 2023*. New York: Stern School of Business.
Altamuro, J., & Beatty, A. (2010). How does internal control regulation affect financial reporting quality? *Journal of Accounting and Economics, 49*(1–2), 58–74.
Anginer, D., & Demırgüç-Kunt, A. (2019). Bank runs and moral hazard: A review of deposit insurance. In A. Berger, P. Molyneux, & J. O. S. Wilson (Eds.), *Oxford handbook of banking* (3rd ed.). Oxford: Oxford University Press.

Atanasov, V. A., & Black, B. S. (2016). Shock-based causal inference in corporate finance and accounting research. *Critical Finance Review, 5*, 207–304.
Bauer, K. (2008). Detecting abnormal credit union performance. *Journal of Banking & Finance, 32*(4), 573–586.
Beatty, A., Iselin, M. & Liao, S. (forthcoming). Financial accounting and disclosure in banking, In Berger, A.N., Molyneux, P., Wilson, J.O.S. (eds.) Oxford handbook of banking 4th ed. Oxford: Oxford University Press.
Beatty, A., & Liao, S. (2014). Financial accounting in the banking industry: A review of the empirical literature. *Journal of Accounting and Economics, 58*(2–3), 339–383.
Berger, A. N., Makaew, T., & Roman, R. A. (2018). Do business borrowers benefit from bank bailouts?: The effects of TARP on loan contract terms. *Financial Management, 48*(2), 575–639.
Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust difference-in-differences estimates? *Quarterly Journal of Economics, 119*(1), 249–275.
Black, H., & Dugger, R. H. (1981). Credit union structure, growth and regulatory problems. *The Journal of Finance, 36*(2), 529–538.
Brushwood, J. D., Hall, C. M., & Lush, S. J. (2022). Credit unions and earnings management to mitigate political scrutiny over tax-exempt status. *Journal of Accounting and Public Policy, 41*(4), Article 106907.
Bushman, R. M., & Smith, A. J. (2001). Financial accounting information and corporate governance. *Journal of Accounting and Economics, 32*(1–3), 237–333.
Bushman, R. M., & Williams, C. (2012). Accounting discretion, loan loss provisioning, and discipline of bank's risk taking. *Journal of Accounting and Economics, 54*(1), 1–18.
Chronopoulos, D. K., Rempoutsika, L. M., & Wilson, J. O. S. (2023). Audit committee oversight and bank financial reporting quality. *Journal of Business Finance & Accounting*, 1–31.
Clair, R. T. (1984). Deposit insurance, moral hazard, and credit unions. *Federal Reserve Bank of Dallas Economic Review*, 1–12. July.
-Costello, A. M., Granja, J., & Weber, J. (2019). Do strict regulators increase the transparency of banks? *Journal of Accounting Research, 57*(3), 603–637.
Danisewicz, P., McGowan, D., Onali, E., & Schaeck, K. (2021). Debtholder monitoring incentives and bank earnings opacity. *Journal of Financial and Quantitative Analysis, 56*(4), 1–38.
Delis, M. D., Hasan, I., Iosifidi, M., & Li, L. (2018). Accounting quality in banking: The role of regulatory interventions. *Journal of Banking & Finance, 97*, 297–317.
Demirgüç-Kunt, A., Kane, E., & Laeven, L. (2015). Deposit insurance around the world: A comprehensive analysis and database. *Journal of Financial Stability, 20*, 155–183.
Eisenbeis, R. A., & Kaufman, G. G. (2014). Deposit insurance issues in the post-2008 crisis world. In A. Berger, P. Molyneux, & J. O. S. Wilson (Eds.), *Oxford handbook of banking* (2nd ed.). Oxford: Oxford University Press.
Esho, N., Kofman, P., & Sharpe, I. G. (2005). Diversification, fee income, and credit union risk. *Journal of Financial Services Research, 27*(3), 259–281.
Freyaldenhoven, S., Hansen, C., Pérez, J. P., & Shapiro, J. M. (2021). *Visualisation, identification and estimation in the linear panel event-study design*. National Bureau of Economic Research Working Paper. Number w29170.
Garcia, G. G. H. (2000). *Deposit insurance: Actual and good practices*. International Monetary Fund Occasional Paper. Number 197.
Getter, D. E. (2014). *Federal deposit insurance for banks and credit unions*. Congressional Research Service, Article R41718.
Goddard, J., McKillop, D. G., & Wilson, J. O. S. (2002). The growth of US credit unions. *Journal of Banking & Finance, 26*(12), 2327–2356.
Goddard, J., McKillop, D. G., & Wilson, J. O. S. (2008). The diversification and financial performance of US credit unions. *Journal of Banking & Finance, 32*(9), 1836–1849.
Goddard, J., McKillop, D. G., & Wilson, J. O. S. (2009). Which credit unions are acquired? *Journal of Financial Services Research, 36*(2–3), 231–252.
Goddard, J., McKillop, D. G., & Wilson, J. O. S. (2014). US credit unions: Survival, consolidation, and growth. *Economic Inquiry, 52*(1), 304–319.
Goddard, J., McKillop, D., & Wilson, J. O. S. (2016). Regulatory change and capital adjustment of US credit unions. *Journal of Financial Services Research, 50*, 29–55.
Goddard, J., McKillop, D. G., & Wilson, J. O. S. (2023). Who consumes credit union tax subsidies? *Journal of Financial Stability, 69*, Article 10176.
Gomez-Biscarri, J., López-Espinosa, G., & Mesa Toro, A. (2020). Remuneration as a motivation of earnings management in credit unions. *Centre for Responsible Banking & Finance Working. Paper* Number 20-015.
Gómez-Biscarri, J., López-Espinosa, G., & Mesa Toro, A. (2022). Drivers of depositor discipline in credit unions. *Annals of Public and Cooperative Economics, 93*(4), 849–885.
Hillier, D., Hodgson, A., Stevenson-Clarke, P., & Lhaopadchan, S. (2008). Accounting window dressing and template regulation: A case study of the Australian credit union industry. *Journal of Business Ethics, 83*, 579–593.
Hirtle, B., Konver, A., & Plosser, M. (2020). The impact of supervision on bank performance. *The Journal of Finance, 75*(5), 2765–2808.
Jiang, L., Levine, R., & Lin, C. (2016). Competition and bank opacity. *Review of Financial Studies, 29*(7), 1911–1942.
Johari, E. E. C., Chronopoulos, D. K., Scholtens, B., Sobiech, A. L., & Wilson, J. O. S. (2020). Deposit insurance and bank dividend policy. *Journal of Financial Stability, 48*, Article 100745.
Kanagaretnam, K., Lim, C. Y., & Lobo, G. J. (2010). An empirical analysis of auditor independence in the banking industry. *The Accounting Review, 85*(6), 2011–2046.
Kane, E. J., & Hendershott, R. (1996). The federal deposit insurance fund that didn't put a bite on US taxpayers. *Journal of Banking & Finance, 20*(8), 1305–1327.
Karels, G. V., & McClatchey, A. (1999). Deposit insurance and risk-taking behavior in the credit union industry. *Journal of Banking & Finance, 23*(1), 105–134.
Kyei, A. (1995). *Deposit protection arrangements: A survey*. International Monetary Fund Working Paper. Number 95/134.
Lambert, C., Noth, F., & Schüwer, U. (2017). How do insured deposits affect bank risk? Evidence from the 2008 emergency economic stabilization act. *Journal of Financial Intermediation, 29*, 81–102.
Le, N., Nguyen, D. D., & Sila, V. (2021). Does shareholder litigation information affect the corporate information environment? *Journal of Financial Markets, 56*, Article 10060.
Li, K., & Van Rijn, J. (2024). Credit union and bank subprime lending in the great recession. *Review of Corporate Finance Studies, 13*(2), 494–538.
Liñares-Zegarra, J., & Wilson, J. O. (2018). The size and growth of microfinance institutions. *The British Accounting Review, 50*(2), 199–213.
Manganaris, P., Beccalli, E., & Dimitropoulos, P. (2017). Bank transparency and the crisis. *The British Accounting Review, 49*(2), 121–137.
McKillop, D., French, D., Quinn, B., Sobiech, A. L., & Wilson, J. O. S. (2020). Cooperative financial institutions: A review of the literature. *International Review of Financial Analysis, 71*, Article 101520.
NCUA (National Credit Union Administration). (2023). Annual report, 2022. Available: https://ncua.gov/files/annual-reports/annual-report-2022.pdf.
Nguyen, L. H., Wilson, J. O. S., Le, T. Q., Luu, H. N., Vo, V. X., & Nguyen, T. (2022). Deposit insurance and credit union lending. *Journal of Financial Stability, 60*, Article 101003.
Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. *Journal of Business & Economic Statistics, 37*(2), 187–204.
Pugachev, L., Robin, A., Wang, D., & Yang, R. (2024). Deposit insurance and discretion in loan loss provisioning. Available at: SSRN: https://ssrn.com/abstract=4875522.
Roberts, M. R., & Whited, T. M. (2013). Endogeneity in empirical corporate finance. In G. M. Constantinides, M. Harris, & R. M. Stulz (Eds.), *Handbook of the economics of finance*. Amsterdam: Elsevier.
Tatom, J. A. (2005). *Competitive advantage: A study of the federal tax exemption for credit unions*. Washington: US Tax Foundation.
Van Dalsem, S. A. (2017). Uninsured deposits and excess share insurance at US credit unions: The impact on risk and returns to members. *Journal of Economics and Finance, 41*, 714–738.
Van Rijn, J. (2022). *The cooperative identity at U.S. credit unions* (Vol. 10). Journal of Co-operative Organization and Management, Article 100152.
Van Rijn, J., Zheng, S., & Hueth, B. (2023). Do credit unions have distinct objectives? Evidence from executive compensation structures. *Annals of Public and Cooperative Economics, 94*(1), 5–38.