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How do depositors respond to banks' discretionary behaviors? Evidence from market discipline, deposit insurance, and scale effects

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ABSTRACT

We investigate how depositors respond to the U.S. bank's discretionary behaviors. We document higher deposit rates for banks that engage more in earnings management, suggesting evidence of market discipline. The quantile regressions, which dissect bank behavior at the right tail of deposit costs distribution, point out that the leveraged effect of earnings management is more significant in low- and high-deposit costs banks. Additionally, we note that depositors monitor banks' discretionary behavior to a greater extent before and during the crisis; however, they become less severe after the crisis. Interestingly, there is strong evidence of depositors monitoring large banks before, during, and after the crisis, suggesting the "too-big-to-fail" perception does not hold for our sample. The study also documents evidence of monitoring by insured and uninsured depositors over the sample period. After the crisis, we find a "wake-up call" for uninsured depositors, and more importantly, insured depositors remain sensitive to banks' reporting quality despite a weakening of incentives due to the increase of deposit insurance limit. The evidence is crucial when confirming that a deposit insurance scheme does not completely remove the deposit discipline. Our findings are useful for regulators and policymakers concerned about strengthening the market discipline.

1. Introduction

In recent decades, the banking industry landscape has witnessed significant evolution. Financial institutions have grown increasingly intricate, engaging in intricate transactions both within and beyond their balance sheets. Such sophistication presents a plethora of challenges for regulatory authorities responsible for the oversight and surveillance of these institutions. Given that banks primarily serve as intermediaries, transforming illiquid, long-term assets into liquid, short-term instruments, they inherently confront vulnerabilities such as rollover risks and potential withdrawals by their stakeholders (Gao & Jiang, 2018). They also ensure that they have enough capital to absorb potential losses from their investments in risky assets. The default problem could arise when banks' solvency does not take into account the interests of depositors and those of the whole society (Nier & Baumann, 2006). The standard recommendation for preventing bank failures, financial instability, and costly government-financed bailouts is squeezing the "visible" hand through strengthening regulation and supervision. The increased complexity and constraint supervisory resources generally thorough oversight of bank risk-taking incentives. However, regulators and policymakers, due to their limited human resources and knowledge, cannot thoroughly oversee bank risk-taking incentives. Complementary tools like market discipline are needed besides the traditional regulatory discipline (Meyer, 1999; Beyhaghi, Chris, & Gordon, 2014; Barajas & Mario, 2015; Bennett, Vivian, & Myron, 2015; Cubillas, Fonseca, & González, 2012; Trinugroho, Putra, Mochammad, & Amine Tarazi, 2020) to promote safety and soundness in banks and financial systems.

However, in the aftermath of the U.S. subprime crisis of 2007, inefficient regulations and limited market discipline have been viewed as primary reasons for the failures of many banks and the ensuing economic recessions. Some authors even question whether market

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discipline can still be used as a channel to supervise banks (Acharya, Anginer, & Joseph Warburton, 2016; Hasan, Jackowicz, Kowalewski, & Kozlowski, 2013) because what happens during the crisis may send mixed signals to depositors regarding the intervention of governments, the safety of banks, and consequently the need to monitor banks. Notably, governments' unprecedented support in many countries following the 2008–2009 global financial crisis heightens concerns about moral hazard arising from investors' expectations about government guarantees.

Generally, the government is believed to go beyond the *de-jure* boundaries for insured depositors and protect other banks' liability holders.[1] A bulk of failing bank bailouts and the resulting protection of uninsured claimants from bearing the total losses reinforce this market perception, mitigating the role of market discipline and the incentives to engage in ex-ante monitoring of banks. Recent studies, such as Cubillas et al. (2012) and Berger and Turk-Ariss (2014), find that the government interventions weaken the overall market discipline. On the other hand, the massive bank failures during and after the crisis can also entail a "wake up call" for depositors (Peria, Soledad, & Schmukler, 2001; Karas, Pyle, & Schoors, 2010; Karas, Pyle, & Schoors, 2013; Iyer & Puri, 2012) since these events put bank creditors at risk – a preliminary condition for the discipline to be exerted.

The unresolved query revolves around whether depositors effectively exert their monitoring influence on banks. Representing a pivotal group of bank claim holders, depositors contribute to nearly 80% of the funding for the banks within our sample of commercial institutions. Their actions, as delineated by banking theories, wield significant implications for the efficacy and stability of the banking sector (Chen, Vashishtha, & Wang, 2022). Distinctively different from stock- and debt-holders who invest in banks with an expectation of returns and liquidity from secondary markets, depositors entrust their funds to banks primarily for value preservation and transactional purposes. This underscores a critical stipulation: the value of these deposits should remain constant over time and be readily accessible without depreciation (Dang, Gorton, Holmström, & Ordoñez, 2017). However, despite these insights, there appears to be a noticeable research gap in understanding the extent and mechanisms through which depositors' monitoring pressures, or lack thereof, manifest in real-world banking scenarios.

It is directly related to banks' moral hazard problems through the bank's earnings management since banks are inherently more opaque than other firms (Morgan, 2002). There are cash inflows and outflows through their intermediation process, but outsiders experience difficulties in observing the risk taken from banks (Tran, Hassan, & Houston, 2018a, 2018b). Moreover, when banks manipulate their reported numbers, there will be greater opacity and interference with the private governance and official regulation of banks (Jiang, Levine, & Lin, 2016), leading to higher expropriation opportunities. For instance, previous studies on the bank's earnings management document that earnings management affects the cost of equity (Bhattacharya, Daouk, & Welker, 2003), the cost of debt through the credit rating (Shen & Huang, 2013).

On the other hand, the literature on market discipline primarily focuses on how depositors punish bank's risk-taking behavior (Ellis & Flannery, 1992; Hannan & Hanweck, 1988; Peria et al., 2001). For example, Demirgüç-Kunt and Huizinga (2004) show that the presence and the generosity of explicit deposit insurance weaken market discipline. Berger and Turk-Ariss (2014) document a decrease in market discipline, primarily attributed to the decreased discipline for large and listed banks, suggesting the moral hazard problem from government interventions. Correa, Sapriza, and Zlate (2016) document that the U.S. branches of euro-area banks experience a deposit run during the European sovereign debt crisis in 2011 due to their euro-area affiliation rather than to country- or bank-specific characteristics.

The financial statement furnishes a comprehensive textured depiction of the financial performance of a bank, which can be used for a variety of outsiders' purpose. Yet it provides a snapshot of reality, not reality itself. Outsiders cannot observe the true balance sheet, but the accounting one is constructed with the application of managerial judgment and discretion to existing accounting rules (Bushman, 2015). When banks manipulate their financial statements, this can increase bank opacity, affect the reporting quality (Jiang et al., 2016), and consequently the decisions of stakeholders. Ultimately, whether bank transparency is an important factor in depositors' behavior is an open question. The reasons that we focus on depositors are as follow. First, depositors are the key claimholder of bank, and assume almost 80% of bank funding. They can use their feet voting right through withdrawing their fund from banks when having concerns about banks' safety, either related to bank fundamentals, or related to noisy signals, aggregate information, or expectations about other depositors' behavior (Chavaz & Slutzky, 2021; Diamond & Dybvig, 1983). Consequently, a change in depositors' risk perceptions is a critical source of discipline for banks. Second, the objective of depositors is different from those of stock-, and debt-holders as argued above. With these objectives' difference, we cannot infer the responses of depositors on banks' transparency from prior findings for stock-, and bond-holders.

By examining how depositors respond to the accounting discretion of the U.S. commercial banks, this study complements these two strands of literature. We empirically examine three critical issues. *First*, as discussed above, with the difference in objectives of depositors and other claimholders when entrusting their funds in banks, we provide one of the premier investigations on how depositors assess the bank's discretionary behaviors. Since depositors could punish banks by ex-post withdrawal of their funds (in the extreme case, depositor runs) and ex-ante adjust the funding costs, market discipline would be more efficient and orderly if the bank's costs truly reflect their risk (Ellis & Flannery, 1992). More concretely, we investigate whether the costs of deposits vary directly with the bank's earnings management. *Second*, we study how the behavior of depositors changes over different periods. *Finally*, we examine the effects of size and deposit insurance on depositor's discipline.

To this end, we use a large sample of U.S. commercial banks from 2001:Q1 to 2019:Q4. Following Jiang et al. (2016), Tran and Ashraf (2018), we measure banks' transparency by focusing on the loan loss provisions (LLP), which are by far the most necessary accruals in bank accounts (Beatty & Liao, 2014; Ryan, 2012), and the key accounting policy choice that affects the volatility and cyclicality of bank bottom lines. Accounting information consists of important sources for non-regulator outsiders to monitor banks (Bushman & Williams, 2012). If a bank's weakness is evident to non-regulator outsiders (such as depositors and the public) through accounting information, regulators could feel pressured to close the bank (Gallemore, 2023).

Controlling for the effects of different bank characteristics and time fixed effects, our empirical analysis provides consistent evidence on the sensitivity of depositors to assess the quality of information across banks. Banks that engage more in earnings management heighten the asymmetry of information between insiders and outsiders, become consequently more opaque, and have to offer higher deposit rates. Our findings stress on the sensitivity of depositors to the banks' reporting quality, and suggest that depositors' behavior can be considered as an important channel through which banks' accounting discretion choices affect banking business. Our findings survive under a battery of sensitivity tests and endogeneity checks. Additionally, we find that the relationship between earnings management and deposit costs is uniform in sign (positive) but increases in magnitude for the upper quantiles. These results, taken together, support our previous findings that banks pay higher deposit costs when engaging in earnings management through DLLP, and the impact on the costs of deposits appears to be more profound for banks at each tail of deposit costs distribution.

[1] To prevent bank runs, the U.S. government temporarily increased deposit insurance level from $100,000 to $250,000 in 2008:Q3, and an increase made permanent in the Dodd-Frank act.

We also note that depositors are sensitive to the quality of information across sample periods, and command a premium for banks that manage more earnings, especially prior the crisis. There is evidence of market discipline during the crisis time when depositors realize that their funds may be at risk. However, they become less responsive to bank's discretionary behavior in the aftermath of the crisis, suggesting a "go to sleep" effects on depositors to banking business.

We dig deeper our analysis by focusing on the potential effects of the deposit insurance scheme through comparing the behaviors of insured and uninsured depositors. We document the evidence of market discipline for both types of depositors. The sensitivity of insured and uninsured account holders seems to economically stronger during the crisis times where they experience higher probability of losses due to increased number of bank failures. After the crisis, we find a "wake-up calls" for uninsured depositors, and more importantly that insured depositors remain sensitive to banks' reporting quality despite a weakening of incentives due to the increase of deposit insurance limit. The evidence is crucial when confirming that deposit insurance scheme does not completely remove the deposit discipline. Furthermore, the evidence also stresses on the role insured depositors as an important source of discipline. This type of depositor consists a predominant part in bank funding structure, leading that even relatively minimal responsiveness by these account holders to banks' reporting quality may have consequences for bank's funding costs.

When focusing on bank size ranges, we find that the larger the banks, the higher the monitoring from depositors as reflected through higher deposit rates, indicating evidence of market discipline over bank size ranges. We document that those depositors monitor larger banks closely before, during, and after the crisis, suggesting that depositors' *"too-big-to-fail"* perception does not hold for our sample.

Our study contributes to the literature in several ways. First, our study contributes to the market discipline literature by providing one of the few investigations of depositor's behavior on banks' discretionary behavior. Previous studies mainly focus on bank's risk-taking behavior. We take a different view when assessing banks' discretionary behavior-proxied by the measure of earnings management. Our main results suggest that depositors punish banks that engage more in earnings management by requiring higher deposit rates. Second, our study contributes to the earnings management literature. Previous studies typically focus on the influence of earnings management on the cost of capital (Bhattacharya et al., 2003) on the cost of debt (Shen & Huang, 2013). Our study complements the literature by providing the impacts of earnings management on deposits' costs – a significant funding source for banks.

Third, our study documents one of the first pieces of evidence of market discipline change after the crisis. We find there is evidence of market discipline during the crisis time when depositors realize that their funds may be at risk. More particularly, there is evidence of the discipline from depositors for larger banks during the whole study period. Our findings also indicate that deposit insurance scheme does not completely remove the deposit discipline, and stresses on the role insured depositors as an important source of discipline. This type of depositor consists a predominant part in bank funding structure, leading that even relatively minimal responsiveness by these account holders to banks' reporting quality may have consequences for bank's funding costs.

We believe that our study is in the interests of regulators and policymakers. First, prior literature usually treats depositors, especially the fully insured one, as inattentive, and lacking incentives, sophistication, knowledge to discipline banks. One of messages of our study is there is a price to be paid for banks when deteriorating the reporting quality through managing earnings. The attention from this type of claim-holders can be part of supervisory early-warning systems for banks. Second, the literature generally argues the existence of deposit insurance would weaken the market discipline from private agents. Our evidence on the weaken of depositor discipline after the crisis suggests that the deposit insurance schemes are always credible.

The following section describes the data and variables. Section 3 reports the main results and alternative tests. We provide additional tests in Section 4. Section 5 concludes the study.

2. Data and variables

2.1. Sample banks

Following Berger, El Ghoul, Guedhami, and Roman (2016), we retrieve bank data from the quarterly Call reports provided by the Federal Reserve. Our raw data cover the period 2001:Q1 to 2019:Q4. Using single-country data mitigates the endogeneity problems related to cross-border research since our variables of interest (bank's cost of deposits and earnings management) could be mutually determined by country- and institutional-level characteristics (Kim & Yi, 2006; Tran, Hassan, & Houston, 2018a, 2018b). Our sample ends by 2019:Q4, just before the starting of the Covid-19. The main reason why we do not include the period after 2020:Q1 is related to the nature of the Covid-19 health crisis. The rapid transmission of the Covid-19 virus leads to social distancing and other strict public health orders such as lockdowns, contributing to a synchronized collapse in economic activity. The nature of this health crisis is different from past financial crises, since the Covid-19 crisis is not stemmed from the financial sector, and is not the result of financial intermediaries behaving irresponsibly due to ex-ante moral hazard (Didier, Huneeus, Larrain, & Schmukler, 2021; Reinhart, 2020; Reinhart & Rogoff, 2009). Hence the behaviors of depositors during the Covid-19 crisis may not be related to the financial health of financial intermediaries, but rather to the precautionary savings and flight-to-safety view (Levine, Lin, Tai, & Xie, 2021).

We remove any bank-quarter observations with missing or incomplete financial data on the main regression model's accounting variables. Following Berger and Bouwman (2013), we replace all observations with the ratio of total equity over total assets less than 1% by 1% to avoid distortion in ratios containing equity and exclude observations with negative or nonexistent outstanding loans or deposits. Our dataset contains 288,899 observations for 9302 banks. All financial ratios are winsorized at a 1% level on the top and bottom of their distribution to dampen outliers' effects.[2]

2.2. Bank's cost of deposits, earnings management, and other control variables

Since we cannot get the information related to real interest rate paid by banks on different types of deposits, following Levine, Lin, and Xie (2016), Gilje, Loutskina, and Strahan (2016), Jiang, Levine, Lin, and Xie (2022), we use the implied cost of deposits, measured as the interest expense on deposits during a quarter divided by the deposits at the beginning of the quarter. We then take the natural logarithm of the difference between the cost of deposits of each bank in each time and the average cost of deposits of the industry in each state and in each time ($lnDC_{it}^{E}$). By subtracting the average cost of the industry in each state, we can eliminate common factors of the industry in each state that could affect the cost of deposits. This is critical due to the cyclical nature of the banking sector where various changes in performance are related to common shocks. The remained value should reflect the idiosyncratic characteristic related to banks. Table 2 provides summary statistics for all variables. The average cost of deposits during the period of study is about 1.7%, and on average, in each state, the deviation cost from the average of the industry is 0.4 bps.

Following Jiang et al. (2016), Tran & Ashraf, 2018, Tran, Hassan, and Houston (2018a, 2018b), we employ the Beatty and Liao (2014)

[2] Our results remain unchanged with non-winsorized ratios.

preferred model of LLP estimation since there is no consensus on how to best model discretionary provisions even if there is a large body of literature on the earnings management by shaping an underlying model to capture the LLP characteristics. This model allows us to separate the normal LLP that is supposed to capture all adjustments reflecting banks' actual performance from the abnormal LLP that are, at least in part, due to managerial discretion. The abnormal of *LLP* is used as a proxy of bank earnings management. LLP is typically large relative to net income and equity capital (Healy & Wahlen, 1999), which are signals for financial health for stakeholders such as creditors or regulators (Bushman & Williams, 2012). Due to high dependence on the judgment of managers, LLP reflects information asymmetry.

$$llp_{it} = \alpha + dnpl_{it+1} + dnpl_{it} + dnpl_{it-1} + alw_{it-1} + cho_{it} + size_{it} + dloan_{it} + csret_{it} + dgdp_{it} + dunemp_{it} + \epsilon_{it} \quad (1)$$

Once model (1) is estimated, we then use the forecasted value to estimate the non-discretionary *LLP*, and the discretionary *LLP* fall out as the prediction error (Tran and Ashraf (2018)). We compute the absolute value of both positive and negative residuals and assign it to bank opacity. A higher (absolute) value of abnormal LLP reflects higher discretionary behavior in bank management, increasing the bank opacity.

In assessing the impact of earnings management on deposit rates, we control for several time-varying bank characteristics. The funding costs may differ according to bank size, or between banks with different leverage, we include banks size (SIZE), capital ratio (CAPITAL). Larger and well-capitalized banks are considered less risky, hence can secure funds at reduced costs. We also control for differences in bank business models (NII) since an expansion toward other activities allows banks to reduce risk, then lower their funding costs (Diamond (1984), Boyd and Graham (1986), Tran, 2020).

We control for the bank's exposure to the demand for liquidity – the unused commitment ratio (UNUSED COMMIT). The latter measures the proportion of credit lines that have not been drawn down. Banks with higher unused commitments are more likely to expose their drawdown when having funding problems. Following Acharya and Mora (2015), we also control for a bank's other liquidity and solvency measures, including wholesale funding (WHOLESALE), as wholesale financiers may withdraw funds based on negative public signals, leading to inefficient liquidations (Huang & Ratnovski, 2011), funding structure (DEPOSIT) as banks with higher deposit ratios are considered as having lower funding liquidity risks (Acharya & Naqvi, 2012)), real-estate exposure (LOAN RE) as banks with higher real-estate lending are riskier (Blaško & Sinkey, 2006), and loan portfolio quality (NPL). We also control for the number of branches of each bank (NUMBER BRANCHES), and the local market power (DEPOSIT HHI). See Table 1 for definitions and Table 2 for summary descriptive.

3. Does earnings management affect a bank's funding costs?

3.1. Findings and discussion

In this section, we conduct multivariate analysis to formally investigate the magnitude of bank' earnings management on funding costs after controlling other control variables. Specifically, the empirical specification we estimate is as follows:

$$lnDC_{it}^{E} = \alpha + DLLP_{it-1} + Z_{it-1} + \theta_t + \varepsilon_{it} \quad (2)$$

where $lnDC_{it}^{E}$ and $DLLP_{it}$ are defined above. Z_{it} is the vector of control variables described above. We use the lag of DLLP and control variables to mitigate the endogeneity concerns, and to consider that the balance sheet information is available to the public with an unavoidable delay. As our dependent variable is related to depositors' behavior, the lag of these explanatory variables may arise from a desire of the depositor to avoid penalties by waiting until maturity to withdraw deposits

Table 1
Variables definitions.

Variables	Definitions
Dependent variables	
$\ln DC^{E}$	Natural logarithm of the difference between the cost of deposits of each bank (DC) in each time and the average cost of deposits of the industry in each state and in each time
DC	(Implied) cost of deposits of each bank measured as the interest expense on deposits during a quarter divided by the deposits at the beginning of the quarter following Levine et al. (2016), Gilje et al. (2016), Jiang et al. (2022).
FC	Total cost of funds equals, which is the ratio of total interest expenses over the interest-bearing liabilities following Levine et al. (2016), Demirgüç-Kunt and Huizinga (2004).
Variable of interests	
DLLP	Absolute value of residuals from: $llp_{it} = dnpl_{it+1} + dnpl_{it} + dnpl_{it-1} + alw_{it-1} + cho_{it} + size_{it} + dloan_{it} + csret_{it} + dgdp_{it} + dunemp_{it} + \epsilon_{it}$
Deviation DLLP	$DLLP_{i,t}$ – Average $DLLP_{i,t}$ of the industry
DLLP_1	Absolute value of residual from: $llp_{it} = dnpl_{it+1} + dnpl_{it} + dnpl_{it-1} + size_{it} + dloan_{it} + csret_{it} + dgdp_{it} + dunemp_{it} + \epsilon_{it}$
DLLP_2	Absolute value of residual from: $llp_{it} = dnpl_{it+1} + dnpl_{it} + dnpl_{it-1} + size_{it} + dloan_{it} + alw_{it-1} + csret_{it} + dgdp_{it} + dunemp_{it} + \epsilon_{it}$
DLLP_3	Absolute value of residual from: $llp_{it} = dnpl_{it+1} + dnpl_{it} + dnpl_{it-1} + size_{it} + dloan_{it} + cho_{it} + csret_{it} + dgdp_{it} + dunemp_{it} + \epsilon_{it}$
Components of variable of interests	
NPL	Nonperforming assets over the quarter, scaled by total loans at the beginning of the quarter
DNPL	Change in NPA over the quarter, divided by total loans at the beginning of the quarter
LOAN	Total loans over the quarter
DLOAN	Change in total loans over the quarter, divided by total loans at the beginning of the quarter
ALW	Loan loss allowance as a percentage of lagged total loans
CHO	Adjusted charge-off as a percentage of lagged total loans
RSGL	Realized security gains and losses as a percentage of total assets (includes realized gains and losses from available-for sale securities and held-to-maturity securities)
URSGL	Unrealized security gains and losses (includes only unrealized gains and losses from available-for-sale securities) as a percentage of total assets;
SIZE	The natural logarithm of gross total assets
CSRET	The return on the Case-Shiller Real Estate Index over the quarter
DUNEMP	Change in unemployment rates over the quarter
DGDP	Change in GSP (gross state product) over the quarter
Control variables	
CAPITAL	Book value of equity over gross total assets
SIZE	The natural logarithm of gross total assets
NII	Non-interest incomes over the net operating incomes
WHOLESALE	Wholesale funds (also known as managed liabilities in the Federal Reserve Bulletin) are the sum of large time deposits, deposits booked in foreign offices, subordinated debt and debentures, gross federal funds purchased, repos, and other borrowed money, following Acharya and Mora (2015)
UNUS COMMIT	Unused commitments divided by the sum of unused commitments and loans, following Acharya and Mora (2015)
LOAN RE	Real estate loans ratio
NPL	Nonperforming assets over the quarter, scaled by total loans at the beginning of the quarter
DEPOSIT	Ratio of deposit over gross total assets
NUMBER BRANCHES	Natural logarithm of the number of branches of each banks
DEPOSIT HHI	Herfindahl-Hirschman Index of the share of deposit of banks in each state.

This table presents definitions of all main variables used in the analysis.

Table 2
Summary statistics.

Panel A

Variable	Obs	Mean	Std. Dev.	Min	Max
$lnDC^E$	142,440	−5.947	1.174	−16.518	−4.234
DC^E	142,440	0.004	0.003	0	0.014
DC	142,440	0.024	0.008	0.003	0.046
DLLP	142,440	0.004	0.007	0	0.077
SIZE	142,440	11.814	1.121	9.053	17.118
CAPITAL	142,440	0.106	0.042	0.054	0.731
WHOLESALE	142,440	0.233	0.104	0	0.574
UNUSED COMMIT	142,440	0.101	0.077	0	0.47
LOAN RE	142,440	0.288	0.162	0	0.668
NII	142,440	0.098	0.089	−0.035	0.926
NPL	142,440	0.065	0.088	0	0.461
DEPOSIT	142,440	0.826	0.084	0	0.929
DEPOSIT HHI	142,440	0.06	0.107	0.004	0.941
NUMBER BRANCHES	142,440	0.715	0.106	0.693	3.091

Panel B

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) $lnDC^E$	1										
(2) DLLP	0.074*	1									
(3) SIZE	−0.032*	−0.001	1								
(4) CAPITAL	0.046*	0.045*	−0.223*	1							
(5) WHOLESALE	0.206*	0.108*	0.182*	−0.213*	1						
(6) UNUSED COMMIT	0.031*	−0.021*	0.394*	−0.068*	0.097*	1					
(7) LOAN RE	0.060*	0.052*	0.260*	−0.224*	0.202*	0.276*	1				
(8) NII	−0.070*	0.037*	0.138*	0.387*	−0.105*	0.128*	−0.182*	1			
(9) NPL	0.045*	0.398*	0.022*	−0.050*	0.112*	−0.137*	0.094*	0.011*	1		
(10) DEPOSIT	−0.089*	−0.042*	−0.073*	−0.769*	−0.101*	−0.088*	0.171*	−0.458*	0.030*	1	
(11) DEPOSIT HHI	−0.007*	0.008*	0.185*	0.075*	−0.013*	0.062*	−0.036*	0.098*	−0.034*	−0.085*	1
(12) NUMBER BRANCHES	−0.029*	0.011*	0.438*	0.018*	0.028*	0.198*	0.030*	0.158*	0.031*	−0.120*	0.061*

This table reports summary statistics for the main sample of U.S. commercial banks used in the analysis.

(Maechler and McDill (2006)). We include time-fixed effects, θ_t, to control for the macroeconomic conditions common across banks. ε_{it} is the error term. Since $lnDC^E_{it}$ is likely to be correlated within a bank over time, standard errors used to assess significance are corrected for heteroscedasticity and bank-level clustering.

Our main results from the multivariate analysis are shown in Table 3. Model (1) represents our baseline model, including our variable of interest (DLLP), and our control variables. The coefficient on our primary variable of interest, DLLP, is positive and highly significant. One standard deviation increase of DLLP (roughly twice the difference between a 75th percentile bank and a 25th percentile bank), holding all other equal, raises additional costs over the average of the industry by 5.7 bps (i.e., the coefficient of DLLP, 8.154, times the standard deviation of DLLP, 0.007). The results suggest an economically significant, positive relationship between banks' funding costs and the management of LLP, indicating that on average, banks that engage more in earnings management will be required by depositors to pay an extra cost than others. The evidence suggests that from the perspective of depositor decision-making, the banks' reporting quality is of relevance to depositors.

In Model (2), we rank the DLLP variable into quartiles and create a variable called DLLP_QUARTILE, which takes a value ranging from 1 (lowest) to 4 (highest). This approach allows us to generate greater variation in the distribution of the bank's earnings management. Again, we still obtain a positive and significant coefficient on DLLP_QUARTILE.

In Model (3), we include the bank fixed-effects to consider the unobservable bank invariant characteristics such as corporate culture, and bank management. In Model (4), we include the state-time fixed effects in order to condition out all time-varying, and time-invariant state characteristics such as cultural norms, state regulation, and demographic. In both models, we still reach similar findings.

In Model (5), we re-run our baseline model with only the fourth quarter's data. This specification is motivated by findings of prior literature suggesting that managers are more likely to engage in earnings management during the fourth quarter than other fiscal quarters (Liu, Ryan, & Wahlen, 1997). Again, we document that the costs of funding are higher in banks that encounter more earnings management.

Our sample covers the financial crisis of 2007–2009, which critically affects the U.S. banking industry. One may concern whether our findings are driven by the crisis period, which often brings about a large change in the environment where banks function, resulting in large structural breaks in bank's discretionary behaviors and funding costs. During the turmoil times, coordination failures and panicking behaviors of depositor may lead to bank runs without linking to bank fundamentals. Banks' reactions can also be more extreme and less effective during crisis periods (Goldstein and Pauzner (2005), Martin, Puri, and Ufier (2018)). In Model (6), we re-perform our primary analysis by excluding the crisis period to address this issue. Our results continue to hold in this subsample. The coefficient on DLLP decreases slightly from our baseline model, Model (1), suggesting that the relation between $lnDC^E_{it}$ and $DLLP_{it}$ would be more positive during the crisis. However, as indicated in prior studies, the last global financial crisis is special. It is indeed the banks' crisis as liquidity providers (Acharya & Mora, 2015), then it is worth investigating separately. We address more parsimoniously in the next section.

In Model (7), we exclude banks that engage M&A (proxies as the growth rate of assets over quarter higher than 10%) since banks may decide to acquire target banks that are riskier which affects bank funding costs and earnings management incentives. Our results remain unchanged.[3]

In the next analyses, we perform our baseline model with alternative

[3] Our results remain unchanged with alternative thresholds of asset growth over quarter (i.e. 15%, 20%).

Table 3
Baseline multivariate analysis.

VARIABLES	Baseline model	DLLP Quartile	Including BFE	Controlling State*Quarter FE	Only 4rd quarter data	Excluding crisis	Excluding M&A sample	Average analysis	Balanced panel data	Prais-Winsten	Newey-West	Fama-McBeth	Cluster two-ways
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
DLLP	8.154***	0.040***	1.404***	7.694***	8.960***	7.799***	8.089***	46.268***	6.416***	1.015***	8.154***	10.842***	8.154***
	(0.724)	(0.004)	(0.440)	(0.710)	(1.060)	(0.818)	(0.754)	(4.006)	(1.412)	(0.260)	(0.539)	(1.518)	(1.101)
SIZE	−0.012	−0.013	0.516***	−0.019*	−0.013	−0.010	−0.015	−0.059***	0.017	0.127***	−0.012**	−0.014***	−0.012
	(0.011)	(0.011)	(0.030)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.015)	(0.009)	(0.005)	(0.003)	(0.010)
CAPITAL	2.845***	2.887***	1.743***	2.841***	2.784***	2.835***	2.995***	2.937***	2.715***	1.191***	2.845***	2.436***	2.845***
	(0.280)	(0.282)	(0.302)	(0.302)	(0.291)	(0.291)	(0.302)	(0.327)	(0.506)	(0.204)	(0.134)	(0.231)	(0.301)
WHOLESALE	2.597***	2.611***	1.505***	2.884***	2.551***	2.602***	2.695***	3.902***	2.821***	1.077***	2.597***	2.569***	2.597***
	(0.108)	(0.108)	(0.108)	(0.114)	(0.114)	(0.111)	(0.111)	(0.158)	(0.179)	(0.069)	(0.051)	(0.096)	(0.123)
UNUSED COMMIT	−0.141	−0.134	−0.131	−0.352**	0.124	−0.162	−0.260	0.092	−0.394	−0.527***	−0.141**	−0.489**	−0.141
	(0.152)	(0.154)	(0.122)	(0.155)	(0.157)	(0.156)	(0.162)	(0.179)	(0.282)	(0.076)	(0.067)	(0.233)	(0.203)
LOAN RE	0.555***	0.570***	0.073	0.601***	0.535***	0.442***	0.553***	0.435***	0.355***	0.109**	0.555***	0.495***	0.555***
	(0.072)	(0.072)	(0.099)	(0.077)	(0.076)	(0.075)	(0.074)	(0.086)	(0.121)	(0.052)	(0.031)	(0.097)	(0.089)
NII	−1.152***	−1.140***	−0.738***	−1.123***	−1.138***	−1.081***	−1.267***	−0.833***	−1.370***	−0.227***	−1.152***	−1.146***	−1.152***
	(0.128)	(0.128)	(0.080)	(0.132)	(0.127)	(0.122)	(0.130)	(0.151)	(0.210)	(0.039)	(0.057)	(0.087)	(0.141)
NPL	0.741***	0.849***	−0.044	0.739***	0.575***	0.585***	0.754***	0.721***	0.644***	0.261***	0.741***	0.702***	0.741***
	(0.088)	(0.087)	(0.069)	(0.091)	(0.102)	(0.095)	(0.090)	(0.264)	(0.154)	(0.049)	(0.053)	(0.105)	(0.117)
DEPOSIT	1.093***	1.100***	2.698***	1.295***	1.060***	1.166***	1.187***	0.417*	1.195***	2.580***	1.093***	0.965***	1.093***
	(0.179)	(0.180)	(0.166)	(0.187)	(0.184)	(0.184)	(0.180)	(0.214)	(0.289)	(0.103)	(0.078)	(0.107)	(0.183)
DEPOSIT HHI	0.404***	0.411***	0.094	0.129	0.310***	0.430***	0.409***	0.063	0.241**	0.140**	0.404***	0.540***	0.404***
	(0.081)	(0.081)	(0.072)	(0.130)	(0.088)	(0.088)	(0.082)	(0.102)	(0.116)	(0.060)	(0.041)	(0.064)	(0.084)
NUMBER BRANCHES	−0.181**	−0.182**	−0.162	−0.188**	−0.184**	−0.192**	−0.165*	0.073	−0.356***	−0.302***	−0.181***	−0.203***	−0.181**
	(0.084)	(0.085)	(0.116)	(0.084)	(0.091)	(0.087)	(0.085)	(0.096)	(0.119)	(0.082)	(0.043)	(0.029)	(0.082)
Constant	−7.373***	−7.460***	−14.042***	−7.619***	−7.360***	−7.424***	−7.433***	−7.427***	−7.582***	−9.876***	−7.373***	−7.426***	−8.141***
	(0.230)	(0.232)	(0.396)	(0.266)	(0.240)	(0.237)	(0.234)	(0.279)	(0.349)	(0.159)	(0.106)	(0.131)	(0.247)
Obs	142,440	142,440	142,440	142,440	36,290	113,347	134,344	8031	75,552	142,440	142,440	142,440	142,440
Adj R2	0.096	0.096	0.084	0.120	0.101	0.086	0.097	0.194	0.077	0.615	0.090	0.081	0.096
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports regression estimates of the relation between $\ln DC^{E}$ and DLLP. All regressions include time (quarter) fixed effects. All financial variables are winsorized at the 1% and 99% levels. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively. Standard errors are clustered at the bank level. Numbers in parentheses are t-statistics.

samples, econometric approaches. In Model (8), we perform an average analysis where we average all variables over the sample of study. By averaging out the random variation of variables of interest, this cross-sectional analysis shows clear measure of bank's accounting discretion choices (Stiroh and Rumble (2006)). In Model (9), we perform our baseline model with the balanced panel data. By excluding banks that are partially exist during the period studied, this exclusion mitigates the effects of M&A activities and bank defaults on our investigation, though at the price of over-representing "successful" banks (Tran and Houston (2021)). This also attenuates the concern of poor-performing banks which may have problems to attract deposits (Tran, Hassan, and Houston (2018a, 2018b)). In all specifications, the results are still robust.

We carry out the Prais-Winsten approach in Model (10) to address the serial correlation, the Newey-West approach in Model (11) to produce consistent estimates in case there is autocorrelation in addition to possible heteroscedasticity, the Fama-MacBeth in Model (12), and the two-way cluster procedure in Model (13) to correct for both cross-sectional correlation and serial correlation. In all specifications, the results are still robust.

Regardless of the control variables, the results also document depositor responsiveness to the bank characteristics. Diversified banks, and banks with greater number of branches in each state enjoy lower costs of deposits than average. We document that funding costs are lower for large banks, but the coefficient is insignificant.[4] Additionally, banks with a greater number of pre-existing commitments outstanding offer lower deposit rates, whereas banks reliant on wholesale funding pay higher deposit rates on average. Banks with a high proportion of real-estate loans, lower loan portfolio quality encounter higher funding costs than others. Banks that located in high competitive market experience a higher funding cost than others.

In brief, our findings indicate that banks that engage more in earnings management heighten the asymmetry of information between insiders and outsiders, become consequently more opaque, and have to offer higher deposit rates. The results indicate that there is evidence of depositor discipline, and stresses on the sensitivity of depositors to the banks' reporting quality. These claimholders can be informed directly via reading the Call Reports publicly released by banks, and/or indirectly via professional reports, media, or word of mouth (Chen, Goldstein, Huang, and Vashishtha (2022)). This suggests that depositors' behavior can be considered as an important channel through which banks' accounting discretion choices affect banking business.

3.2. Quantile regressions

This study's primary purpose is to investigate the relation between banks' deposit costs and their discretionary behaviors through loan loss provisions. Investors, regulators, and policymakers seem to be more interested in bank behaviors at the tails of the distribution of (funding) cost since the degree of the (funding) costs can reflect a critical bank financial health situation.

Regressions usually reflect the conditional mean relationship between banks' deposit costs and their discretionary behaviors. Thus, in Table 4, we perform quantile regression – a generalization of median regression analysis to other quantiles - to assess whether the association between deposit rates and earnings management differs across the distribution of deposit rates. The traditional inference approach (i.e., the ordinary least squares, OLS) used above represents the average behavior of the sample with the assumption of the homogeneity of the effects of earnings management on bank's funding costs (Tran, Hassan, & Reza, 2018). However, when there is an essential heterogeneity in the sample, the traditional approach's use might not be ideal. Rather than relying on a single description of the central behavior of the sample, the quantile approach explores a range of conditional quantile functions - models in which quantiles of the conditional distribution of the deposit rates are expressed as functions of observed covariates, which in turn allows us to explore potential forms of conditional heterogeneity (Tran, Hassan, & Houston, 2018a, 2018b). Furthermore, the quantile regression approach avoids the restrictive assumption that the error terms are identically distributed at different distributions of the bank's funding costs (Klomp & de Haan, 2012).

Table 4
Quantile regression.

VARIABLES	Q25	Q50	Q75
	(1)	(2)	(3)
DLLP	6.833***	6.759***	7.759***
	(0.665)	(0.479)	(0.369)
SIZE	−0.028***	−0.023***	−0.005*
	(0.005)	(0.003)	(0.003)
CAPITAL	2.770***	2.410***	2.282***
	(0.140)	(0.098)	(0.081)
WHOLESALE	3.369***	2.615***	1.888***
	(0.050)	(0.032)	(0.021)
UNUSED COMMIT	−0.401***	−0.278***	−0.128***
	(0.066)	(0.045)	(0.037)
LOAN RE	0.843***	0.627***	0.439***
	(0.031)	(0.021)	(0.017)
NII	−2.130***	−1.513***	−0.899***
	(0.064)	(0.046)	(0.038)
NPL	0.728***	0.679***	0.717***
	(0.059)	(0.037)	(0.031)
DEPOSIT	1.956***	1.194***	0.582***
	(0.078)	(0.053)	(0.038)
DEPOSIT HHI	0.386***	0.491***	0.425***
	(0.045)	(0.028)	(0.023)
NUMBER BRANCHES	−0.085*	−0.084***	−0.185***
	(0.049)	(0.030)	(0.027)
Constant	−8.564***	−7.110***	−6.043***
	(0.110)	(0.074)	(0.058)
Obs	142,440	142,440	142,440

This table reports regression estimates of the relation between $\ln DC^E$ and DLLP using quantile regression. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively. Numbers in parentheses are t-statistics.

The coefficients on DLLP in Models (1)–(3) show the impact of earnings management on bank's deposit rates is indeed uniform in sign (positive), suggesting that discretionary behaviors through loan loss provisions increase banks' deposit costs at all levels of deposit costs. The U-shape form in magnitude with the increase of quantiles suggests the sensitivity of depositors to the banks' reporting quality varies across banks. Depositors seem to be more sensitive, and respond more strongly to banks with low (high) quantile of deposit costs (i.e. at 25th (75th) percentiles) which are considered as less (more) risky when manipulating their numbers.

Overall, these results taken together reaffirm our previous findings that the bank's discretionary behaviors through loan loss provisions are associated with higher deposit costs. They also indicate that discretionary behaviors affect the conditional average funding costs and affect their distribution. Banks with higher and lower deposit costs banks, leveraged by higher discretionary behaviors, are more likely to pay higher costs. The evidence suggests that depositors are caution to the bank's reporting quality, and react more firmly to banks at each tail of the distribution. That is, any variation on reporting quality of banks at

[4] In an unreported test, we use alternative measures of bank size. First, since the size is, to a large extent, an outcome of bank decision making, then is highly correlated with other independent and dependent variables, we decompose bank size concerning all other independent variables into two components: an organic growth component that is measured by the fitted value, and a historical size component that equals to residual. Orthogonalizing size allows us to derive the pure effects of size (De Jonghe (2010). Second, we also check for the nonlinear relationship between deposit costs and size by including size-decile fixed effects to control for unobserved heterogeneity across banks in different size categories, as suggested in Ellul and Yerramilli (2013). We obtain similar results.

each tail of the distribution would be met with even stronger increases in deposit costs.

3.3. Alternative measures of earnings management

In Panel A of Table 5, we re-run our baseline model with alternative bank earnings management measures. In Model (1), following Tran, Hassan, and Houston (2019), we use the deviation of DLLP of bank *i* at time *t* from the industry average at time *t* as a measure of bank earnings management.

Next, we use three alternative models in Beatty and Liao (2014) to compute the DLLP. We detail each model in Table 1. We next re-estimate our primary model. The results are shown in Models (2)–(4), confirm the previous finding on the higher deposit rates of banks that manipulate their earnings more.

3.4. Alternative measures of funding costs

In Panel B of Table 5, we re-conduct our baseline model with alternative measures of bank funding costs. In Model (1), instead of using the difference between deposit costs of each bank and the average of the industry in each state, we use the deposit cost of each bank as our dependent variable. In Model (2), following Levine et al. (2016), Demirgüç-Kunt and Huizinga (2004), we compose the total cost of funds equals, which is the ratio of total interest expenses over the interest-bearing liabilities. This measure of the overall cost of bank debts reflects the implicit interest rate on bank liabilities and differs across banks and time due to the heterogeneity of interest rates and debt maturity.[5] In all specifications, our findings remain unchanged, suggesting that banks that manipulate their earnings would encounter higher funding costs.

3.5. Endogeneity checks

To deal with endogeneity, we complement our OLS estimation with instrumental variables approach and the propensity score matching (PSM). The results are presented in Table 6. We first employ the propensity score matching (PSM) system developed by Rosenbaum and Rubin (1983) and extended by Heckman, Ichimura, and Todd (1997). To conduct propensity score matching (PSM), we separate the entire sample into quartiles by discretionary behaviors. We measure the propensity of a bank engagement in earnings management by using a logit model with the complete set of control variables. We also add in this logit model an instrument variable - the average of earnings management of the industry. Then, we match each bank that engages in earnings management with another bank with the closest propensity score with a caliper of 0.0005 to minimize the risk of bad matches. We use one-to-one matching without replacement, which requires each focused bank to be used exactly one time. We also use one-to-one matching with replacement. We also match each bank that manipulates the earnings with the two and three other banks with the closest propensity scores.[6] We present the results of our PSM analysis in Models (1)–(4). The previous findings are robust to different specifications of PSM.

The matching estimator presented above mitigates the selection bias. However, there may be unobservable factors that may explain decisions to manipulate earnings. We therefore use the instrumental variables (IV) estimation. As above, the instrument is the average earnings management of other banks. We report the first-stage and second-stage IV regression results in Models (5) and (6) of Table 6. The result of the

[5] In unreported test, we divide the total interest expenses over the total assets instead of interest-bearing liabilities, and still find similar finding.

[6] Using this oversampling matching leads to a trade-off between bias and variance. Since more information is used to construct the counterfactual for each participant, leading to a decreased variance increases bias resulting from more flawed matches.

Table 5
Alternative measures.

Panel A: Alternative measures of DLLP

VARIABLES	Deviation DLLP	DLLP_1	DLLP_2	DLLP_3
	(1)	(2)	(3)	(4)
DLLP	3.754***	5.828***	6.230***	6.825***
	(0.447)	(0.472)	(0.533)	(0.513)
SIZE	−0.013	−0.014	−0.011	−0.012
	(0.011)	(0.011)	(0.011)	(0.011)
CAPITAL	2.925***	2.837***	2.832***	2.941***
	(0.282)	(0.269)	(0.277)	(0.279)
WHOLESALE	2.616***	2.573***	2.570***	2.581***
	(0.108)	(0.107)	(0.107)	(0.107)
UNUSED COMMIT	−0.126	−0.155	−0.189	−0.163
	(0.154)	(0.148)	(0.148)	(0.150)
LOAN RE	0.548***	0.572***	0.556***	0.558***
	(0.073)	(0.071)	(0.072)	(0.072)
NII	−1.134***	−1.147***	−1.176***	−1.162***
	(0.128)	(0.126)	(0.125)	(0.126)
NPL	0.964***	0.799***	0.727***	0.849***
	(0.087)	(0.087)	(0.087)	(0.087)
DEPOSIT	1.100***	1.075***	1.071***	1.083***
	(0.180)	(0.178)	(0.178)	(0.179)
DEPOSIT HHI	0.413***	0.413***	0.412***	0.412***
	(0.081)	(0.080)	(0.080)	(0.080)
NUMBER BRANCHES	−0.178**	−0.178**	−0.180**	−0.177**
	(0.084)	(0.084)	(0.084)	(0.084)
Constant	−7.362***	−7.316***	−7.315***	−7.346***
	(0.231)	(0.229)	(0.229)	(0.230)
Obs	142,440	143,205	142,440	142,440
Adj R2	0.095	0.098	0.098	0.098
FE	Yes	Yes	Yes	Yes

Panel B: Alternative measures of funding costs

VARIABLES	Deposit Costs (DC)	Cost of funds (FC)
	(1)	(2)
DLLP	0.025***	0.015***
	(0.004)	(0.004)
SIZE	0.000	−0.000**
	(0.000)	(0.000)
CAPITAL	0.019***	−0.017***
	(0.002)	(0.001)
WHOLESALE	0.025***	0.023***
	(0.001)	(0.001)
UNUSED COMMIT	−0.003***	−0.002***
	(0.001)	(0.001)
LOAN RE	0.004***	0.005***
	(0.000)	(0.000)
NII	−0.012***	−0.012***
	(0.001)	(0.001)
NPL	0.005***	0.002***
	(0.000)	(0.000)
DEPOSIT	0.013***	−0.001*
	(0.001)	(0.001)
DEPOSIT HHI	−0.003***	−0.003***
	(0.000)	(0.000)
NUMBER BRANCHES	0.000	0.000
	(0.000)	(0.000)
Constant	0.007***	0.023***
	(0.001)	(0.001)
Obs	288,417	288,434
Adj R2	0.655	0.677
FE	Yes	Yes

Panel A reports regression estimates of the relation between $\ln DC^E$ and alternative measures of DLLP. Panel B reports estimates using alternative measures of funding costs. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively. Standard errors are clustered at the bank level. Numbers in parentheses are t-statistics.

Table 6
Endogeneity concerns.

VARIABLES	PSM				IV	
	N = 1 w/o replacement	N = 1	*N* = 2	*N* = 3	First stage	Second stage
	(1)	(2)	(3)	(4)	(5)	(6)
DLLP	7.721***	8.373***	8.135***	7.930***		2.422***
	(0.831)	(1.043)	(0.934)	(0.881)		(0.703)
SIZE	−0.015	−0.010	−0.011	−0.012	−0.000***	0.515***
	(0.012)	(0.012)	(0.012)	(0.011)	(0.000)	(0.012)
CAPITAL	2.720***	2.812***	2.811***	2.809***	−0.005***	1.726***
	(0.286)	(0.314)	(0.300)	(0.294)	(0.001)	(0.138)
WHOLESALE	2.669***	2.617***	2.688***	2.706***	−0.000	1.496***
	(0.110)	(0.118)	(0.113)	(0.109)	(0.000)	(0.050)
UNUSED COMMIT	−0.052	−0.124	−0.087	−0.151	−0.004***	−0.128*
	(0.165)	(0.168)	(0.161)	(0.158)	(0.000)	(0.067)
LOAN RE	0.560***	0.590***	0.566***	0.547***	−0.000	0.077
	(0.078)	(0.081)	(0.078)	(0.076)	(0.000)	(0.048)
NII	−0.822***	−1.077***	−1.115***	−1.093***	−0.001**	−0.738***
	(0.126)	(0.142)	(0.136)	(0.132)	(0.000)	(0.045)
NPL	0.744***	0.631***	0.694***	0.744***	0.015***	−0.074*
	(0.096)	(0.105)	(0.100)	(0.098)	(0.000)	(0.042)
DEPOSIT	1.053***	1.163***	1.178***	1.203***	0.000	2.690***
	(0.185)	(0.205)	(0.202)	(0.193)	(0.000)	(0.078)
DEPOSIT HHI	0.467***	0.483***	0.460***	0.433***	−0.000	0.097**
	(0.090)	(0.094)	(0.088)	(0.086)	(0.000)	(0.038)
NUMBER BRANCHES	−0.242***	−0.139	−0.170*	−0.186**	0.001***	−0.153***
	(0.092)	(0.093)	(0.089)	(0.088)	(0.000)	(0.049)
L.adllpr1_w_mean					0.644***	
					(0.014)	
L.lambda						
Constant	−7.321***	−7.548***	−7.511***	−7.490***		
	(0.245)	(0.267)	(0.258)	(0.247)		
Obs	65,430	39,983	58,452	72,519	142,068	142,068
Adj R2	0.098	0.096	0.097	0.096		
Underidentification test						
Anderson canon. Corr. LM statistics					4.2e+04***	
Weak identification test						
Cragg-Donald Wald F Statistics					3.1e+04***	

The table reports regression estimates of the relation between $\ln DC^E$ and DLLP. Models (1)–(4) reports results from matching PSM. Models (5)–(6) present estimations of IV estimations. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively. Standard errors are clustered at the bank level. Numbers in parentheses are t-statistics.

second stage also supports our earlier finding.

4. Additional analysis

4.1. Banking crisis and the market discipline of depositors

The banking crisis would be a unique occasion to analyze the market discipline. During turmoil times, banks face greater difficulties and are more likely to go bankrupt. Banks generally have an incentive to use discretion over accounting rules to understate balance sheet stresses and to overstate bank capital. This incentive is particularly strong at times of financial crisis when balance sheets are under pressure (Huizinga and Laeven (2012)). Depositors consequently become more aware of the risk of losing their deposits, and then they increase discipline during the crisis. However, due to the potential costs of a banking crisis, governments are more likely to respond with containment and resolution policies that reinforce banks' safety nets and protect depositors. The moral hazard resulting from government intervention at the start of the crisis could decrease the market discipline. These factors may induce an offset effect to the discipline of depositors during the crisis. This section investigates whether the association between earnings management and bank deposit rates changes during crisis periods. Following Acharya and Mora (2015), our study starts from 2001:Q1, including the recent global financial crisis from 2007:Q3–2009:Q2.

Following Peria et al. (2001), we evaluate the sensitivity of depositors to bank's reporting quality separately before, during, and after the crisis, i.e., 2001:Q1–2007:Q2, 2007:Q3–2009:Q2, and 2009:Q3–2019:Q4, respectively. The results are shown in Table 7.

We find that there is evidence of market discipline from depositors across the sample periods. The coefficient on DLLP is positive and statistically significant before the crisis as in Model (1), suggesting that depositors pay attention to banks' discretionary behavior during normal times. Economically, during the pre-crisis period, one standard deviation of DLLP would lead to an increased deposit costs of 6.1 bps. These results for the pre-crisis period corroborate those documented by Cubillas et al., 2012, Demirgüç-Kunt and Huizinga (2004), suggesting that riskier banks pay higher deposit costs during normal times.

In Model (2), during the crisis time, the coefficient on DLLP is still positive and statistically significant but is lower than the coefficient on DLLP before the crisis. Economically, during the crisis, one standard deviation of DLLP would lead to an increased deposit costs of 6.0 bps. This evidence is consistent with our prediction that there exist an offset effect to the discipline of depositors during the crisis. Depositors still monitor banks during this crisis time, but at a lesser extent than during normal times due to the moral hazard induced from the government intervention. This evidence suggests that the offsetting effect of the moral hazard resulting from government intervention is more pronounced compared to depositors' increased awareness of during the crisis.

Model (3) documents that there is evidence of depositor discipline after the crisis, but with a lesser extent than previous periods. Indeed, one standard deviation increase of DLLP, holding all others equal, increases the deposit rates of 3.2 bps after crisis periods (comparing to 6.1 bps, and 6.0 bps for the periods before and during the crisis, respectively), suggesting depositors become less sensitive to the banks' reporting quality after the crisis. This reduced sensitivity of the cost of

Table 7
The effects of the crisis.

VARIABLES	Before crisis	During crisis	After crisis
	2001: Q1–2007Q2	2007:Q3–2009: Q2	2009:Q3–2019: Q4
	(1)	(2)	(3)
DLLP	12.822***	8.861***	4.382***
	(1.169)	(1.128)	(1.035)
SIZE	−0.012	−0.026*	0.001
	(0.011)	(0.014)	(0.017)
CAPITAL	3.148***	2.805***	1.442***
	(0.322)	(0.362)	(0.522)
WHOLESALE	2.707***	2.634***	2.257***
	(0.127)	(0.144)	(0.163)
UNUSED COMMIT	0.041	−0.046	−1.438***
	(0.154)	(0.198)	(0.335)
LOAN RE	0.536***	0.877***	0.172
	(0.080)	(0.090)	(0.116)
NII	−1.357***	−1.404***	−0.686***
	(0.152)	(0.218)	(0.144)
NPL	0.586***	1.213***	0.631***
	(0.174)	(0.126)	(0.117)
DEPOSIT	1.276***	0.900***	0.557*
	(0.192)	(0.225)	(0.295)
DEPOSIT HHI	0.638***	0.391***	0.267**
	(0.118)	(0.094)	(0.111)
NUMBER BRANCHES	−0.169	−0.142	−0.234*
	(0.107)	(0.114)	(0.124)
Constant	−7.595***	−7.230***	−6.935***
	(0.257)	(0.302)	(0.378)
Obs	80,466	29,093	32,881
Adj R2	0.083	0.110	0.073
FE	Yes	Yes	Yes

The table reports regression estimates of the relation between LN_COSTDEPO and DLLP before, during and after the crisis. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively. Standard errors are clustered at the bank level. Numbers in parentheses are t-statistics.

deposits to banks' accounting discretion choices after the global financial crisis of 2007–2009 reveals that depositors may anticipate the accommodative interventions from the government will protect them if a new crisis occurs. This finding is consistent the "go to sleep" effects on depositors to banking business (Cubillas et al. (2012), Berger and Turk-Ariss (2014), Levy-Yeyati, Peria, and Schmukler (2004)).

In summary, the results shown in Table 7 suggest evidence of market discipline across sample periods. Depositors are sensitive to the quality of information across banks, and command a premium for banks that manage more earnings, especially prior the crisis. There is evidence of market discipline during the crisis time when depositors realize that their funds may be at risk. However, they become less responsive to bank's discretionary behavior in the aftermath of the crisis, suggesting a "go to sleep" effects on depositors to banking business.

4.2. Size and the depositor discipline

Previous studies document size effects on the market discipline of depositors. During the last crisis, many large banks are rescued, reviving the debate over the adverse effects of the scale effects, or in an extreme case, the "too-big-to-fail" policy. The bailout expectations would reduce creditors, depositors, and other stakeholders' incentives to monitor and exert discipline over bank's operations, leading to increased risk-taking in banks and ultimately to greater financial instability. Pop and Pop (2009), using an event study of the bailout Resona Holdings – the 5th largest Japanese financial group in 2003, document a reduction in the CDS spreads for the largest banks. Völz and Wedow (2011) find the distortion of CDS spreads by a size effect when a one percentage point increase in size would decrease the CDS spreads of a bank by about two basis points. Using a sample of Brazilian banks, Oliveira Raquel, Schiozer, and Lucas (2015) observe a "run" of depositors from the smaller banks to the largest banks during late 2008. These studies conclude there should be a weaker market discipline in larger banks. However, Bertay, Demirgüç-Kunt, and Huizinga (2013) find that systemically large banks are subject to greater market discipline as evidenced by a higher sensitivity of their funding costs to risk proxies view that these banks may be too-large-to-save.

To examine the size effects, we divide banks in our sample into 3 size ranges: Small banks with gross total assets under $0.5B, Medium banks with gross total assets between $0.5B and $3B, Large banks with gross total assets over $3B.

Table 8 shows the results. In Models (1)–(3), we find that higher DLLP is associated with higher deposit rates across all size classes. It is worth noting that the coefficients on DLLP are increasing with the size of banks, suggesting that the larger the banks, the higher the monitoring from depositors, and the higher the deposit rates. Economically, one standard deviation increase of DLLP would lead to an increase of deposit costs of 4.6, 7.7 and 10.7 bps in small, medium and large banks, respectively. This evidence is consistent with Bertay et al. (2013).

However, the depositors' behavior may change over the period, as explained in section 4.1. We then re-perform our analyses during different periods: before the crisis with Models (4)–(6), during the crisis with Models (7)–(9), and after the crisis with Models (10)–(12). For the pre-crisis period, we observe that depositors are more sensitive to the reporting quality of larger banks. Economically, one standard deviation increase of DLLP would lead to an increase of deposit costs of 5.7, 9.9 and 9.6 bps in small, medium and large banks before the crisis, respectively.

During the crisis, we still observe similar trend: one standard deviation increase of DLLP would lead to an increase of deposit costs of 5.6, 8.0 and 9.0 bps in small, medium and large banks during the crisis, respectively. The evidence confirms the previous findings in Section 4.1., where depositors still monitor banks during this crisis time, but at a lesser extent than during normal times due to the moral hazard induced from the government interventions.

After the crisis, there is evidence of depositor discipline across bank size range. One standard deviation increase of DLLP would lead to an increase of deposit costs of 2.4, 6.5 and 10.8 bps in small, medium and large banks after the crisis, respectively. We observe that depositors become more sensitive to the reporting quality of larger banks after the crisis.

In brief, we find that the larger the banks, the higher the monitoring from depositors as reflected through higher deposit rates, indicating evidence of market discipline over bank size ranges. We document that those depositors monitor larger banks closely before, during, and after the crisis, suggesting that depositors' *"too-big-to-fail"* perception does not hold for our sample.

4.3. Insurance and the depositor discipline

Having documented the evidence of heterogeneity of depositor responsiveness across the sample periods, we focus in this section on the potential effects of the deposit insurance scheme by comparing insured and uninsured depositors' behaviors. We separate insured and uninsured deposits. We suggest that uninsured depositors be more severe than insured depositors since they face a higher risk of losing their funds. We re-run our investigation across the type of deposits for the entire sample period. We also run the analyses across sample periods to see how different types of depositor behavior before, during, and after the crisis. One may argue that the increase of deposit insurance limit of $250,000 from $100,000 in October 2008.[7] This may also affect the

[7] This increase of deposit insurance cover is initially temporary until December 31, 2009, according to the Emergency Economic Stabilization Act of 2008. However, on July 21, 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act are passed, making this limit permanent.

Table 8
The effects of bank size.

VARIABLES	Full sample			Before Crisis			During Crisis			After Crisis		
	Small (Under $0.5B)	Medium (Between $0.5B-$3B)	Large (Over $3B)	Small (Under $0.5B)	Medium (Between $0.5B-$3B)	Large (Over $3B)	Small (Under $0.5B)	Medium (Between $0.5B-$3B)	Large (Over $3B)	Small (Under $0.5B)	Medium (Between $0.5B-$3B)	Large (Over $3B)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
DLLP	6.903***	11.662***	16.169***	11.265***	21.636***	19.260*	7.695***	10.658***	9.407**	2.967***	8.951***	16.854**
	(0.731)	(2.200)	(4.519)	(1.208)	(4.252)	(10.119)	(1.217)	(2.944)	(4.396)	(1.040)	(3.336)	(7.392)
SIZE	−0.033**	−0.171***	0.151	−0.025*	−0.162***	0.174	−0.063***	−0.126	0.135	−0.020	−0.259***	−0.541**
	(0.013)	(0.052)	(0.104)	(0.015)	(0.058)	(0.117)	(0.019)	(0.077)	(0.164)	(0.021)	(0.092)	(0.234)
CAPITAL	2.938***	4.310***	2.857**	3.212***	4.724***	1.811	2.988***	3.924***	1.664	1.447**	3.416**	4.799**
	(0.299)	(0.719)	(1.131)	(0.347)	(0.852)	(1.394)	(0.372)	(1.010)	(1.416)	(0.583)	(1.479)	(2.340)
WHOLESALE	2.676***	2.660***	1.991***	2.709***	3.170***	3.336***	2.865***	2.045***	0.684	2.352***	2.182***	−2.039*
	(0.114)	(0.269)	(0.636)	(0.135)	(0.332)	(0.569)	(0.152)	(0.368)	(1.012)	(0.173)	(0.440)	(1.189)
UNUSED COMMIT	−0.267*	−0.258	0.218	−0.038	0.046	0.019	−0.164	−0.297	0.091	−1.864***	−1.237	−0.527
	(0.162)	(0.343)	(0.493)	(0.173)	(0.388)	−0.574	(0.209)	(0.482)	(0.763)	(0.336)	(0.900)	(0.860)
LOAN RE	0.712***	0.094	−0.324	0.678***	−0.010	−0.539	1.046***	0.580**	0.004	0.380***	−0.234	0.418
	(0.076)	(0.194)	(0.520)	(0.086)	(0.238)	(0.572)	(0.094)	(0.247)	(0.624)	(0.120)	(0.309)	(0.822)
NII	−1.281***	−0.903***	−0.270	−1.443***	−1.510***	−0.297	−1.568***	−0.791*	−0.813	−0.878***	−0.251	−0.018
	(0.142)	(0.264)	(0.401)	(0.175)	(0.323)	(0.507)	(0.246)	(0.467)	(0.735)	(0.160)	(0.296)	(0.386)
NPL	0.586***	1.703***	0.479	0.520***	1.236**	1.007	1.111***	1.735***	1.826**	0.395***	1.741***	−0.313
	(0.094)	(0.246)	(0.587)	(0.182)	(0.536)	(1.189)	(0.133)	(0.372)	(0.876)	(0.125)	(0.326)	(0.837)
DEPOSIT	1.488***	1.229***	−0.085	1.626***	1.564***	0.576*	1.325***	0.898*	−0.667	1.060***	0.556	−3.609***
	(0.180)	(0.385)	(0.374)	(0.207)	(0.457)	(0.343)	(0.226)	(0.508)	(0.682)	(0.312)	(0.696)	(0.759)
DEPOSIT HHI	0.392***	0.304*	−0.013	0.531***	0.790**	0.045	0.435***	0.108	0.323	0.298**	0.171	−0.543
	(0.088)	(0.177)	(0.467)	(0.124)	(0.339)	(0.682)	(0.102)	(0.222)	(0.587)	(0.123)	(0.242)	(0.880)
NUMBER BRANCHES	−0.000	−0.008	−1.011***	0.004	0.089	−0.985***	0.256	−0.126	−1.166***	−0.215	−0.042	−0.971***
	(0.128)	(0.120)	(0.183)	(0.163)	(0.167)	(0.209)	(0.176)	(0.164)	(0.317)	(0.201)	(0.169)	(0.341)
Constant	−7.613***	−5.662***	−7.962***	−7.865***	−6.284***	−9.102***	−7.532***	−5.715***	−6.579**	−7.126***	−3.816***	6.221
	(0.257)	(0.821)	(1.600)	(0.293)	(0.924)	(1.740)	(0.339)	(1.190)	(2.878)	(0.428)	(1.465)	(4.036)
Observations	125,243	15,481	1716	71,968	7500	998	24,890	3797	406	28,385	4184	312
Adj R2	0.097	0.131	0.244	0.080	0.146	0.299	0.121	0.087	0.217	0.078	0.108	0.327

The table reports regression estimates of the relation between $\ln DC^E$ and DLLP across bank's size ranges before, during and after the crisis. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively. Standard errors are clustered at the bank level. Numbers in parentheses are t-statistics.

Table 9
The effects of deposit insurance.

	Insured deposit costs				Uninsured deposit costs			
VARIABLES	Full sample	Before crisis	During crisis	After crisis	Full sample	Before crisis	During crisis	After crisis
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DLLP	8.521***	12.503***	8.722***	5.321***	4.150***	5.123***	3.752***	3.989***
	(0.714)	(1.202)	(1.075)	(1.007)	(0.801)	(1.292)	(1.331)	(1.191)
SIZE	−0.055***	−0.052***	−0.070***	−0.044**	−0.179***	−0.175***	−0.157***	−0.237***
	(0.010)	(0.011)	(0.014)	(0.018)	(0.012)	(0.013)	(0.016)	(0.022)
CAPITAL	1.910***	2.308***	1.840***	0.255	3.260***	3.575***	4.022***	1.311**
	(0.263)	(0.310)	(0.324)	(0.478)	(0.324)	(0.364)	(0.449)	(0.611)
WHOLESALE	1.784***	1.969***	1.554***	1.466***	3.853***	4.215***	4.159***	2.382***
	(0.105)	(0.124)	(0.151)	(0.160)	(0.123)	(0.147)	(0.180)	(0.206)
UNUSED COMMIT	0.154	0.374**	0.177	−1.306***	−1.094***	−1.011***	−1.145***	−2.675***
	(0.142)	(0.153)	(0.191)	(0.303)	(0.175)	(0.183)	(0.242)	(0.462)
LOAN RE	0.768***	0.767***	1.052***	0.443***	−0.266***	−0.271***	−0.079	−0.621***
	(0.071)	(0.080)	(0.090)	(0.113)	(0.081)	(0.091)	(0.100)	(0.147)
NII	−0.853***	−0.916***	−1.223***	−0.619***	−0.483***	−0.535***	−0.318	−0.564***
	(0.111)	(0.137)	(0.191)	(0.134)	(0.127)	(0.154)	(0.213)	(0.158)
NPL	0.529***	0.542***	1.068***	0.278**	1.089***	0.886***	1.094***	1.456***
	(0.086)	(0.151)	(0.123)	(0.118)	(0.098)	(0.181)	(0.140)	(0.143)
DEPOSIT	0.656***	0.825***	0.402*	0.297	1.498***	1.642***	1.710***	1.052***
	(0.165)	(0.193)	(0.205)	(0.278)	(0.218)	(0.231)	(0.328)	(0.377)
DEPOSIT HHI	0.345***	0.582***	0.434***	0.137	0.262***	0.405***	0.191*	0.329**
	(0.073)	(0.120)	(0.084)	(0.101)	(0.089)	(0.143)	(0.102)	(0.131)
NUMBER BRANCHES	−0.088	−0.034	−0.117	−0.105	−0.010	−0.028	−0.107	0.125
	(0.092)	(0.124)	(0.114)	(0.128)	(0.095)	(0.112)	(0.128)	(0.160)
Constant	−6.353***	−6.671***	−5.901***	−5.926***	−5.496***	−5.759***	−5.899***	−2.991***
	(0.221)	(0.259)	(0.290)	(0.373)	(0.275)	(0.296)	(0.406)	(0.485)
Obs	139,132	78,639	28,164	32,329	118,341	70,097	26,163	22,081
Adj R2	0.079	0.067	0.083	0.054	0.160	0.122	0.121	0.110

The table reports regression estimates of the relation between $\ln DC^E$ and DLLP for 2 subsamples: Insured and uninsured deposit before, during and after the crisis. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively. Standard errors are clustered at the bank level. Numbers in parentheses are t-statistics.

monitoring incentives of wealthy depositors who were previously uninsured (Pozen, 2010). We cannot have the data on deposits under or more than $250,000 since banks start to disclose the information after 2016.

The results are shown in Table 9. The results for full sample which are reported in Models (1) and (5) suggest that both insured and uninsured depositors require higher deposit rates to banks that engage more in earnings management, respectively. Indeed, one standard deviation of increase of DLLP is associated with an increase of insured (uninsured) deposits of 5.6 (2.7) bps. The evidence stresses on the higher sensitivity of insured depositors over uninsured depositors regarding the reporting quality of banks.

To get a clearer picture of depositor discipline, we next perform our analysis across sample periods. First, we find that before the crisis of 2007–2009, there is evidence of market discipline from both insured and uninsured account holders (Model (2) and (3), respectively). One standard deviation of increase of DLLP is associated with an increase of insured (uninsured) deposit costs of 6.3 (2.6) bps for the period before the crisis.

During the crisis, we still find evidence of discipline for both types of depositors. One standard deviation of increase of DLLP is associated with an increase of insured and uninsured deposit costs of 6.5 bps and 2.7 bps, respectively. The findings indicate an increase of discipline for both types of account holders during the period of stress where banks tend to be financially weak and the odds of bank collapse rises.

After the crisis, there is evidence of the market discipline from depositors, but with a greater extent from uninsured depositors. One standard deviation of increase of DLLP is associated with an increase of insured and uninsured deposit costs of 4.2 bps and 3.2 bps. The increase of insured deposit costs after the crisis is lower than before and during the crisis, whereas the increase of uninsured deposit costs after the crisis is higher than before and during the crisis. The evidence suggests after the crises, the market discipline becomes more severe for uninsured account holders, potentially due to traumatic episodes, and the number of failed banks during the crisis might act as "wake-up calls" for uninsured depositors. While the increase of deposit insurance limit of $250,000 from $100,000 in October 2008 weakens overall discipline as documented in Section 4.1, it does not completely temper the wake-up call for insured depositors who still discipline banks despite a weakening of incentives. Depositors may not want to face any costs related to bank failures since it could take time for the repayments from insurance funds, imposing liquidity costs for depositors (Peria et al. (2001)). This finding is exciting and consistent with the evidence documented by Peria et al. (2001), Karas et al. (2010), Karas et al. (2013).

In brief, the results document the evidence of market discipline for both types of depositors. The sensitivity of insured and uninsured account holders seems to economically stronger during the crisis times where they experience higher probability of losses due to increased number of bank failures. After the crisis, we find a "wake-up calls" for uninsured depositors, and more importantly that insured depositors remain sensitive to banks' reporting quality despite a weakening of incentives due to the increase of deposit insurance limit. The evidence is crucial when confirming that deposit insurance scheme does not completely remove the deposit discipline. Furthermore, the evidence also stresses on the role insured depositors as an important source of discipline. This type of depositor consists a predominant part in bank funding structure, leading that even relatively minimal responsiveness by these account holders to banks' reporting quality may have consequences for bank's funding costs.

5. Concluding remarks

In this comprehensive study, we embark on one of the pioneering large-scale investigations delving into the responsiveness of depositors concerning the discretionary behaviors exhibited by commercial banks within the United States. Based on a robust dataset, our research is uniquely positioned to explore this dynamic within an environment characterized by pronounced information asymmetry.

Our empirical findings underscore a compelling narrative: bank's strategic pursuit of earnings management amplifies the costs associated

with deposits. This revelation serves as a poignant reminder to bank managers, elucidating the repercussions of compromising reporting quality through manipulative earnings practices. Interestingly, our analysis reveals nuanced temporal variations in depositor vigilance. Specifically, depositors exhibit heightened scrutiny leading up to and during financial crises; however, this vigilance appears to wane somewhat in the post-crisis landscape.

Delving deeper into the granularity of our findings, we observe that depositors' monitoring tendencies transcend bank size distinctions, although larger institutions appear to attract more pronounced scrutiny. Moreover, our research elucidates the manifestation of market discipline, evident across insured and uninsured depositors. Post-crisis, uninsured depositors seem to experience a palpable "wake-up call", whereas insured depositors, despite a diluted incentive framework stemming from augmented deposit insurance limits, continue to demonstrate sensitivity to banks' reporting quality.

Aligning with contemporary calls urging governance research to incorporate market-level perspectives, our findings furnish invaluable contributions to the discourse on bank governance. Specifically, our research illuminates the depositors' pivotal role as agents of market discipline, vigilantly monitoring banks' reporting behaviors. Furthermore, our study enriches the accounting literature by furnishing novel empirical evidence showcasing depositors' governance efficacy in curbing earnings management practices within banks.

It is essential to highlight the resilience and credibility of our empirical findings, which have been subjected to meticulous sensitivity analyses. This rigorous examination reaffirms the robustness and trustworthiness of our results, lending them enhanced credibility. As a consequence, the implications of our research resonate profoundly across a diverse spectrum of stakeholders, including bank managers, regulatory authorities, and policymakers.

For bank managers, our study serves as an invaluable reservoir of insights, shedding light on depositor behaviors, especially concerning their expectations and perceptions regarding reporting quality amidst economic downturns. Such granular insights empower bank managers with a nuanced understanding, equipping them to navigate the intricate challenges of volatile economic landscapes more strategically and adeptly. Simultaneously, the ramifications of our research extend to regulatory bodies and investors, offering them a comprehensive framework for informed decision-making. Our study delineates actionable policy guidelines, furnishing regulators with pragmatic strategies to enhance oversight and governance within the banking sector. Additionally, investors benefit from our insights, through a deeper understanding of depositor preferences concerning banks' reporting quality. This heightened awareness fosters a more informed and resilient financial ecosystem, wherein stakeholders can make informed choices, thereby fortifying the stability and integrity of the financial landscape.

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Declaration of competing interest

The authors declared that they have no conflicts of interest to this work. We declare that we do not have any commercial or associative interest that represents a conflict of interest in connection with the work submitted.

Data availability

The authors do not have permission to share data.

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