China Accounting and Finance Review

Large deposits and bank fragility: evidence from an emerging economy

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Received 17 October 2025
Revised 12 April 2026
7 June 2026
Accepted 18 June 2026

Abstract

Purpose – The role of large bank deposits from a small number of customers has dominated the public policy and regulatory discourse. The recent turmoil (in 2023) in the US banking industry shows how a withdrawal by a set of major depositors can be perceived as a red flag and trigger withdrawal contagion, which could propagate bank fragility. On the contrary, it is argued that large deposits can provide a liquidity buffer and significant funding – more money for the bank to lend and invest – albeit at a cost. Moreover, it is argued that these large depositors are better monitors of banks, which act as a market discipline mechanism. In this paper, we examine whether emerging markets like India are exposed to profitability pressures and fragility triggers due to the banks' reliance on large deposits.

Design/methodology/approach – The study is based on a data set of the entire pool of public and private banks in India for the period from 2013 to 2022 (426 firm-years). Our variable of interest is the large deposit share, which we proxy using a new measure disclosed by banks – the concentration from the top 20 depositors. We use a panel regression model to estimate the impact of large deposits on profitability (net interest margin [NIM]) and fragility (Z-score). The robustness of the results is confirmed using the generalized method of moments (GMM) framework and applying an alternative fragility measure (loan loss provisions). We find the results to be consistent.

Findings – Our empirical investigation provides evidence that banks in India could transmit the cost of large deposits into loan pricing, thereby protecting the NIM. On the contrary, we find that these large deposits also contribute to bank fragility due to moral hazard. Our study shows that large depositors have a limited impact on bank monitoring and therefore lack disciplining power – one possible reason being the collateralization effect.

Research limitations/implications – Our study has not covered the implications of the liquidity coverage ratios (LCRs) and net stable funding ratio (NSFR) implemented by the Reserve Bank of India to reflect any incipient signs of liquidity dry ups. The absence of standard data on the LCR and NSFR limits the exploration of the channel through which deposit concentration affects banks' liquidity and financial stability. This study has implications for promoting financial stability. The study calls for intensive monitoring of large deposits by banks and regulators as part of their liquidity risk assessments. This is especially required in the digital age, where funds can move instantly.

Practical implications – As policy prescriptions, regulators could take supervisory action when large deposits in a bank cross a threshold – an early-warning signal for any impending liquidity challenges and capital risk. Given the limited deposit-insurance coverage, we recommend mandatory disclosure of deposits at a bank level beyond the insured limit, which would improve transparency. Banks with large deposits from few clients may be required to be kept under the regulatory watch.

Originality/value – To the best of our knowledge, this is the first study in an Indian context examining the interconnectedness effect of large deposits on the NIM and fragility. We overcome the persistent empirical gap caused by the unavailability of the data on large deposits using top 20 depositors' share as a sound proxy for large deposits. This variable is a disclosure mandated by the RBI and serves as a scalable solution to overcome the data opacity issues. We showcase the ability of the Indian banks to transmit the high cost of deposits into loan pricing, which may come at the cost of moral hazard. We find that large deposits could trigger fragility. We confirm our

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China Accounting and Finance Review
Emerald Publishing Limited
e-ISSN: 2307-3055
p-ISSN: 1029-807X
DOI 10.1108/CAFR-10-2025-0238

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results using a two-step approach: first, using the GMM approach under the IV regression framework and second, using an alternative measure of fragility.

Keywords Large deposits, Emerging markets, Disclosure, Net interest margin, Bank fragility
Paper type Research article

1. Introduction

The benefits and risks of large deposits are still an interesting research area in academic and regulatory discourse. Large deposits lie at the very heart of what makes banks both useful and vulnerable – they are a double-edged sword. They provide a key source of funding for banks – more money for banks to lend and invest. It is argued that large deposits are an effective way to strengthen banks' balance sheets and maintain a stable liquidity position. Large deposit funds are often uninsured (as they exceed the insurance limit) and are highly sensitive to banks' perceived health. They are like hot money and a potent source of vulnerability (Heeb, 2023). Large depositors are quick to move their money at the first sign of trouble or even a rumor to seek a safer or higher-yielding alternative. In the digital age, large depositors can move their deposits in seconds with a few clicks. Social media and group chats often aggravate such unprovoked withdrawals.

Banks often have to pay higher interest rates to attract and retain large deposits. This "hot money" is expensive and is also highly volatile, often being withdrawn when banks show signs of weakness. During the recent Silicon Valley Bank crisis in March 2023, about a quarter of the bank's total deposits (~$42 billion) were withdrawn in a single day. Interestingly, these deposits were heavily concentrated among a small group of venture capitalists, which increased the likelihood of a bank run (Van Vo & Le, 2023). One of the key risks to which depository institutions are exposed is the interest risk (Li, 2017; English, 2002). Banks are expected to demonstrate a symmetric response of their interest rates to changes in market rates set by the central bank (Kho, 2024). This transmission of rates also impacts liquidity. When interest rates are low, banks are normally flooded with deposits. However, when interest rates are high, banks are compelled to offer higher interest rates to encourage customers to stay with them. In either case, banks turn to large deposits for mitigating their intermittent liquidity challenges, exposing them to the "flight risk" (Li, Lu, & Ma, 2024). Withdrawals by a small number of such large depositors can create the potential for a bank run (Juelsrud, 2021) and could also affect banks' maturity transformation incentives (Müller *et al.*, 2025).

The seminal studies of Bryant (1980) and Diamond and Dybvig (1983) demonstrate the interconnectedness between borrower defaults and funding withdrawals. Extant studies have also shown the interaction between credit risk and liquidity risk (Imbierowicz & Rauch, 2014). Recent studies by Zheng and Peabody (2025), Blickle *et al.* (2025) and Dagher and Fuster (2026) show growing interest in the deposit flightiness, bank run episodes and financial stability. These studies underscore the need for further research to examine financial resilience through the lens of large deposits due to their significant role in banks' funding structures. The present study focuses on the funding side as erratic withdrawals pose a funding risk to banks, forcing them to either liquidate their assets or seek additional funds to honor such transactions. Heavy reliance on sizeable short-term funding instead of more stable sources also creates structural maturity mismatches as banks typically use such funding to finance long-term assets. The US banking system is characterized by deep capital markets, high depositor mobility and strong rate sensitivity, which limits banks' pricing power (e.g. Rajan, 2006). The US banking system is market-driven, with predominantly privately owned banks and a depositor base that is responsive to risk signals and interest rate differentials. Large depositors in the USA are more likely to reallocate funds in response to perceived deterioration in bank fundamentals and funding volatility.

From a theoretical perspective, financial intermediation suggests that diversified funding sources enhance banks' ability to perform their capital allocation role while reducing dependence on individual funding sources. When deposits are concentrated among a few

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depositors, the banks' intermediation function becomes vulnerable to depositor behavior. A withdrawal by one large depositor has a much greater effect than the withdrawal by several retail depositors, emphasizing the need of funding stability. Banks' liquidity risk arises when banks cannot meet withdrawal demands without incurring high costs. Since banks face maturity mismatches as they transform short-term deposits into long-term loans, any sudden withdrawal cannot immediately offset the recalled loans. Therefore, deposit concentration exacerbates liquidity pressure by increasing banks' exposure to large withdrawal shocks, potentially necessitating fire-sales or premature asset liquidation. Liquidity shocks often precede solvency problems. Large depositors may create a self-fulfilling bank run as they can react more quickly to negative information and have stronger incentives to move their funds. Consistent with Diamond and Dybvig's bank run framework, reliance on large depositors may increase fragility because withdrawal decisions by a small number of informed depositors can trigger broader depositor concerns and amplify liquidity stress. While funding concentration risk creates vulnerability, concentrated deposits may improve operational efficiency due to lower administrative costs and facilitate relationship banking by providing sizeable funding pools. Banks' ability to pass any incremental funding costs associated with such large deposits on to depositors would further support their reliance on large deposits. This study builds on this theoretical tension by examining whether the benefits associated with concentrated deposits outweigh the potential fragility risks.

The aforementioned context provides a segue to the emerging markets like India. In contrast to the US banking system, the Indian banking system is more bank-centric, with a relatively sticky depositor base and a greater scope of relationship-driven intermediation. This allows banks to exercise higher pricing discretion and maintain margins, which may come at the cost of risk-taking behavior. Similar to the US market, the impact of dependence on large deposits is no different in India, i.e. heightened rollover risks and knee-jerk outflows during economic uncertainty [1]. This concern is exacerbated as the Indian banking system witnessed credit growth outpacing deposit growth [2]. This funding pressure, leading to the reliance on large deposits, has its ramifications on bank performance through a muted net interest margin (NIM) and potential amplification on fragility under adverse market conditions. In India, the dominance of public-sector banks combined with implicit guarantees reduces depositor sensitivity to bank-specific risk as depositors perceive a high likelihood of state support in distress.

In recent days, the Reserve Bank of India (RBI) – the regulator in India – has cautioned about potential structural liquidity issues due to the reliance on large deposits to fund loan demand. Swaminathan (2024) also expressed similar concerns on the reliance of Indian banks on bulk or large deposits. This, in conjunction with the partial deposit-insurance coverage, adds to the complexities of bank fragility, i.e. 51% of bank deposits in value are uninsured [3] (see Figure 1). Historically, the RBI has increased the deposit insurance coverage to tackle banking crises. The last amendment was the increase from INR 100,000 to INR 500,000 in February 2020 [4]. This change was brought in the wake of several banking failures like the Punjab and Maharashtra Cooperative Bank (PMC Bank) in September 2019 [5]. Uninsured depositors are most often unpaid when a bank is faced with a banking crisis, exposing the bank to a potential depositor-led run (Egan, Hortaçsu, & Matvos, 2017).

Extant studies have shown the impact of the large or wholesale deposits on bank fragility due to their inherent instability and market-sensitive nature. Unlike retail deposits which are typically granular, wholesale deposits are concentrated among a small number of large institutional or high-net-worth depositors who exhibit greater sensitivity to interest rate differentials. As a result, banks that rely more heavily on wholesale or large deposits are exposed to heightened rollover risk and sudden withdrawal pressures during periods of stress. The literature on bank runs and market discipline highlights that large depositors are more informed and responsive, thereby exerting stringer discipline but also increasing vulnerability to rapid finding shocks (for e.g., Diamond & Dybvig, 1983; Gorton & Metrick, 2012; Shin, 2009, 2008; Egan *et al.*, 2017; Nguyen, 2023). While such large deposits may offer cost

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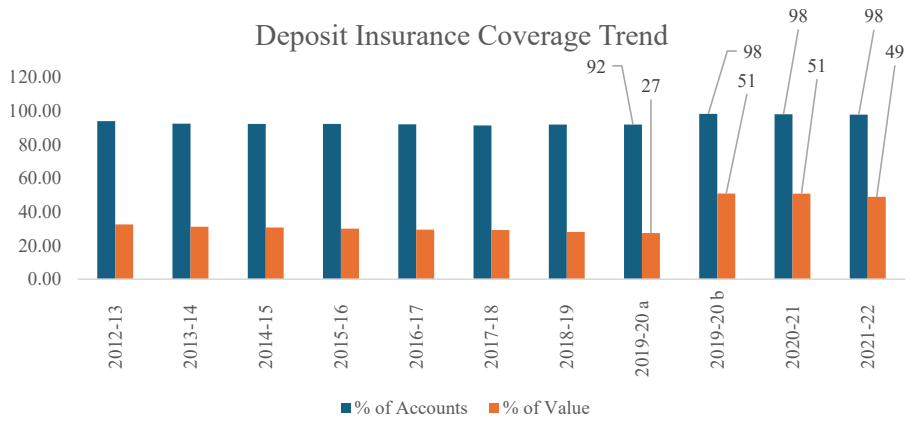

Figure 1. Deposit insurance coverage in India, 2013–2022. Source: Statistical tables related to banks in India (RBI, Database on Indian Economy)

advantages or funding flexibility in normal times, their procyclical and confidence-sensitive behavior implies that they can exacerbate fragility during downturns. We do not find studies covering large deposits and fragility in an emerging market setting like India. There is limited evidence on how large deposit dependence affects both profitability and stability in India. In this context, where banking systems are relationship-driven and deposit bases are relatively sticky, the transmission of a funding structure into margins and fragility remains insufficiently understood. Despite the growing literature on wholesale deposits and financial stability, there is relatively limited attention to the collateralization effect, which also creates deposit concentration, as deposits act as collateral for credit exposures. While such deposits may increase liquidity risk, as withdrawals by a few large depositors can generate funding shocks, the connectedness with credit can also enhance stability. As a result, the relationship between deposit concentration and bank stability remains theoretically ambiguous and empirically inconclusive. Our study attempts to address this gap in emerging markets such as India, where banks remain the dominant financial intermediaries.

Unlike prior studies which focused on the risks on the asset side of the balance sheet, our study looks at the liability side of banks' balance sheets and maps its potential impact on fragility. We bring large depositors into the financial stability discourse and ask whether they bring financial stability through their disciplining ability or trigger fragility due to moral hazard. Our empirical methodology is two-pronged. First, we examine whether the Indian banks could effectively pass through the cost of large deposits to price their loans. If this pass-through holds true, then the reliance on large deposits will have a positive impact on the NIM. Second, if the banks' ability to pass-through occurs at the expense of higher risk exposure, i.e. lending to risky ventures – then the moral hazard overrides, which could create fragility. However, the moral hazard could be moderated if the large depositors monitor bank performance. We also argue that some of these depositors could also be collateralized borrowers, i.e. having exposure on the asset side of the bank's balance sheet.

Effective market discipline by depositors pivots around "monitoring", i.e. the ability to assess the firm's condition, and "influence", i.e. the ability to cause actions to mitigate the findings of the assessments (Bliss & Flannery, 2002). We examine if there exists evidence of "monitoring" and "influence" among large depositors of Indian banks using a unique setting of large deposits that are "sophisticated" and have the wherewithal ability.

We examine the impact of these large deposits using a deposit concentration proxy on bank fragility across a panel of all public- and private-sector Indian banks during 2013–2022 [6]. We find that banks were able to transmit the high cost of deposits for large depositors to price

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loans. However, this comes at the cost of fragility. Our paper contributes to the existing literature in the following ways. First, to the best of our knowledge, this is the first paper to bring to light the effect of large deposits on fragility in an emerging market (India), using the top 20 depositor concentration ratio as a proxy for large funding sources. Second, we analyze the implications of deposit concentration across bank ownership groups, which helps us to better understand funding risk. Third, the study brings into focus the effect of collateralization, where large deposits are the security to the credit exposures that banks have through advances.

Guardrails like deposit insurance have limitations in times of bank runs. Our empirical results show the banks' ability to sustain NIM despite their reliance on high-cost large deposits. However, such dependence also signaled financial instability arising from yield chase from high-risk loans. Our study brings to the fore the requirement of disclosure regulation for separating large deposits into retail and wholesale, both in terms of count and value. To impose efficient supervision, banks should also disclose the value of uninsured deposit holders. These disclosures will enable better liquidity management and augment the asset-liability management of banks. The remainder of our paper is organized as follows. Section 2 provides an overview of the Indian banking context. Section 3 details the review of literature and hypothesis development. Section 4 discusses the data and methodology. Section 5 discusses the empirical results, followed by a conclusion in Section 6.

2. Indian banking context

Existing studies are based on the bank-run episodes emanating from the asset side of banks in developed countries. There is an imperative need to analyze whether such concentration risks exist in emerging markets, which have a predominantly bank-dominated financial structure. India, an emerging market economy and the fourth largest economy in the world in terms of GDP, has one of the highest numbers of bank branches (160,500), of which 52% are in the public sector, covering around 9,280 persons per bank branch (RBI, 2025). We investigate the effect of large depositors in the Indian banks on which the economy is dependent than those in many other countries (Kulkarni, Ritadhi, Vij, & Waldock, 2025; Kumar & Prasanna, 2021). The Indian banking system has undergone major transformations, with the most recent one being the large-scale consolidation in the public sector banks (Jasrotia & Agarwal, 2021). There is an increasing debate over whether the Indian banking system represents a concentrated market and whether competition increases bank risk.

The RBI has been monitoring these large deposits, commonly referred to as "bulk" deposits. Indian banks are allowed to offer differential interest rates on bulk deposits depending on their asset-liability maturity profiles. Recently, the RBI raised the bulk deposit limit to INR 30 million (single deposit) from INR 20 million (single deposit) in order to enhance asset-liability management for banks (RBI, 2024). However, Indian banks currently do not separately disclose the quantum of retail and large deposits. Given this inherent gap in literature, we utilize the disclosures of the top 20 large depositors. The size of the deposits held by these top 20 depositors leads us to believe that the incentives to "monitor" and "influence" banks exist. The value of these large deposits stands at INR 12.5 trillion (March 2022), representing 6.43% of the total deposit base and reflecting a reasonable concentration (see Table 1). Anecdotally, we find that banks offer higher interest rates on larger (bulk) deposits while imposing limited restrictions on premature withdrawal [7].

3. Review of literature and hypothesis development

The evolving funding dynamics in Indian banking due to the reliance on large deposits raise important questions on the stability and resilience of the financial system. Large deposits are rate sensitive and potentially volatile, which could cause structural vulnerabilities. This

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Table 1. Top 20 depositors' contribution overall and across different ownership groups in India during 2013–2022

Year	Overall Value of top 20 depositors (INR million)	% of total deposits	Ownership groups New private sector banks (NPVTSB)	Old private sector banks (OPVTSB)	Public sector banks (PSB)
2012–13	10,778,460	11.19	14.02	13.28	10.46
2013–14	9,422,780	10.81	12.19	12.38	10.40
2014–15	28,417,320	10.33	11.10	11.82	10.06
2015–16	10,862,980	9.69	10.34	11.58	9.39
2016–17	10,890,040	9.06	10.62	10.21	8.52
2017–18	12,764,100	8.69	10.54	10.03	7.98
2018–19	11,634,510	8.06	10.16	8.96	7.21
2019–20	10,431,240	6.80	7.85	8.88	6.24
2020–21	11,222,290	6.20	7.73	7.39	5.44
2021–22	12,476,450	6.43	7.64	7.30	5.84

Note(s): Year: Financial year April to March

Source(s): Compiled by authors, Centre for Monitoring Indian Economy (CMIE, Prowess) accessed on August 21, 2024

provides a natural springboard to the broader academic literature, which has examined large deposits to assess their impact on liquidity risk, bank stability and regulatory design.

(1) Large deposits as a source of risk

The extant literature has reported a surge in large deposits before the great financial crisis in 2007–2008, followed by a sharp fall in this funding source (Agur, 2013; Brunnermeier, Crockett, Goodhart, Persaud, & Shin, 2009; Diamond & Rajan, 2009). The bank run–prone large uninsured depositors and the inability of the depository institutions to roll over these deposits triggered the crisis (Egan *et al.*, 2017; Acharya & Merrouche, 2013; Afonso, Kovner, & Schoar, 2011). Thus, if a large depositor withdraws a significant amount of deposits, it can create liquidity risks, damage a bank's reputation and turbocharge bank runs.

Banks use large deposits as a strategic way to raise funding. This strategy helps to stabilize deposits when they experience withdrawal from many retail depositors at the same time. However, the risk-sensitiveness of these large deposits makes them require higher rates. This raises the optimal risk choice of the bank as it becomes a price taker in this case, despite having market power on the retail-deposit side (Craig & Dinger, 2013). Bulk or large deposits will have an impact on the costs of bank funding and could shrink the NIM unless banks are able to pass on the cost to price their loans. The transmission of higher cost could also lead to reallocation towards risky assets (for e.g., Delis & Kouretas, 2011).

Banks preserve and seek to enhance their NIM to enhance their franchise value (Keeley, 1990). The only efficient way for banks to tend to protect their NIMs is by allocating funds towards high-risk projects (You & Seo, 2025; Delis & Kouretas, 2011). Heightened competition in the funding market compels banks to increase the interest rate for deposits and chase the hot money aggressively. The tradeoff between liquidity and profitability is a knife-edge issue for banks (Diamond & Rajan, 2001). In response to these tradeoffs, regulators have prescribed liquidity ratios like net stable funding ratios (NSFRs) that impact the NIM (King, 2013).

Large depositors, being agents in the banking system, could bring a sudden shock to financial stability by their idiosyncratic withdrawals, despite being small in number (Juelsrud, 2021). Unlike retail (small) depositors, they have low switching costs and do not have a predictable withdrawal pattern (Song & Thakor, 2007; Feldman & Schmidt, 2001). Interestingly, large depositors do not experience any impact (loss) on their funds as they enjoy a "seniority" due to a bigger stake and, at the same time, being better informed and

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prompt in withdrawing (Huang & Ratnovski, 2011). Passive retail depositors are jeopardized in the process as liquid assets get exhausted, repaying the large depositors (Goldsmith-Pinkham & Yorulmazer, 2010; Shin, 2008). These idiosyncratic withdrawals often lead to herd-like behavior among other depositors and could lead to fragility (Jones & Nguyen, 2005).

Exposure to the large depositors' base introduces pockets of vulnerability in the Indian banking system due to the susceptibility of these depositors to quicker withdrawals. Such deposits come from corporates, institutions and high-net-worth individuals. Despite having a strong retail deposit base, large depositors could cause a retail depositor panic if the broader macro-financial conditions deteriorate.

(2) The Market Discipline Channel

On the other hand, large deposits do have a "brighter side" with their disciplining and refinancing powers (Calomiris, 1999; Calomiris & Kahn, 1991; Goodfriend & King, 1988). Being "uninsured" due to their deposit size, they are theoretically motivated monitors as they stand a chance to lose the entire money if the bank indulges in excessive risk-taking (Feldman & Schmidt, 2001). Such imprudence is generated due to the perils of moral hazard as high cost induces aggressive lending for the "yield chase" (Acharya, Gale, & Yorulmazer, 2011). The researchers identified several reasons for enforcement in market discipline, i.e. the ability of large depositors to monitor and influence the banks to rein in from excessive risk. However, increasing complexity in banks, failure of the regulators in establishing predicate conditions and limitations enforced through covenants inhibit effective monitoring by depositors (Min, 2014; Flannery, 1998, 2001, 1998). The absence of market discipline augurs well for a trigger in fragility in banking when the banks take exposure in high-risk assets for yield chase.

In India, public sector banks dominate the banking system. This leads to an inherent assumption that the government will not let the banks fail. At the same time, we expect higher financial sophistication of large depositors who can reprice risk due to the alternatives available to park funds. They can shift their deposits to other banks or demand higher yields from existing banks. These alternatives act as a backstop reducing incentives to actively discipline banks.

(3) The Collateralization Hypothesis

One of the other reasons why large depositors fail to monitor banks is the "collateralization effect" (Francis, Hasan, Liu, & Wang, 2019; Agur, 2013). This means that such large depositors are also borrowers where banks also have an exposure in assets and where the deposits are given as collaterals or margin money. This two-sided relationship implies that the deposits are not purely discretionary funds and could be linked to lending arrangements. This interlinkage between the large depositors and credit exposure weakens the effectiveness of market discipline. In the Indian banking context, the collateralization can introduce a different form of fragility – where a stress in borrowers' financial position can simultaneously impact the asset quality (loans) and the stability associated with their deposits.

Therefore, in line with our research and existing theories to examine the transmission effect and fragility, we hypothesise as follows:

H1. Large bank deposits have a negative impact on the NIM due to the higher cost of funds and the inability to transfer the same to loan prices.

H2. Large bank deposits have a positive effect on bank fragility.

4. Data and methodology

4.1 Data

Our data set consists of the entire pool of public and private banks in India for the period 2013 to 2022. This sample period starts from 2013, during which the depositor and borrower

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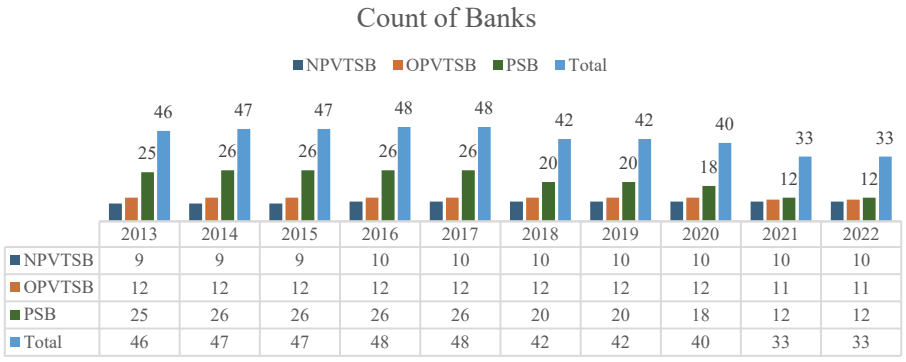
concentration disclosures were standardized. In addition, the asset quality review which came around the year 2015 gives us the choice of doing pre- and post-phase empirical analysis. Private sector banks are further classified into old and new private sector banks (with the latter having greater technology leverage and were formed after liberalization). The overall number of banks has declined from 46 to 33 during this period, and a major reduction occurred due to consolidation among public sector banks post 2017 (see Figure 2). The number of public sector banks almost halved from 25 (2013) to 12 (2022). The government initiated a merger between the weaker public sector banks and their stronger counterparts to drive operational efficiency. This consolidation drive also led to a concentration in the market share for deposits. For example, the top five banks held 55.1% of deposits in 2022 compared to only 39.3% in 2013 (see Table 2). The three bank categories being, new private sector (NPVTSB), old private sector (OPVTSB) and public sector (PSB) contribute 94.2% of deposits and 95.2% of gross advances (credit) of all scheduled commercial banks in India in 2021–22 (see Table 3).

4.2 Methodology

The direct information about large deposits, which are flight-prone, remains opaque in the current Indian banking scenario. To mitigate this gap, we employ an empirical design using a potent proxy to measure large deposits – i.e. top 20 depositors' share (T20DEP). The Reserve Bank of India (RBI) introduced T20DEP disclosure in 2010 (RBI, 2010a; 2010b) to drive better transparency of financial reports. Our variable of interest is a large deposit share, which we proxy using a new measure disclosed by banks – the share from the top 20 depositors. The idea was to gauge the concentration risk from the funding (liability) standpoint. If there is a high deposit concentration, the bank will find it difficult to secure funds in the event of a sudden withdrawal.

Consistent with our empirical design and hypothesis, we first tested the transmission effect, i.e. the impact of T20DEP on the NIM. If the coefficient of T20DEP is negative, then we can hypothesize the banks' inability to pass on the higher interest cost of their borrowers. We deploy panel regression models on the NIM to assess pass-through efficiency. The NIM is the spread or difference between the interest income and interest expense, scaled by total assets. This spread shows how successfully banks manage their intermediation process (Saksonova, 2014). Second, we examine whether the pass-through could trigger fragility. This can occur when the transmission is at the expense of higher risk exposure. Therefore, to examine fragility due to moral hazard lending, we study the impact of T20DEP on the Z-Score – as a standard measure of bank fragility. Distance to default, i.e. the Z-Score, is computed using a three-year



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
NPVTSB	9	9	9	10	10	10	10	10	10	10
OPVTSB	12	12	12	12	12	12	12	12	11	11
PSB	25	26	26	26	26	20	20	18	12	12
Total	46	47	47	48	48	42	42	40	33	33

Figure 2. Number of new private sector banks (NPVTSB), old private sector banks (OPVTSB) and public sector banks (PSB) during 2013–2022. Source: Statistical tables related to banks in India (RBI, database on Indian economy)

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Table 2. Concentration of deposits across top five banks

Bank	2013		2014		2015		2016		2017
State Bank of India	16.8%	State Bank of India	17.0%	State Bank of India	17.5%	State Bank of India	18.0%	State Bank of India	19.2%
Bank Of Baroda	6.6%	Bank Of Baroda	7.0%	Bank Of Baroda	6.8%	Bank Of Baroda	6.0%	HDFC Bank	6.0%
Punjab National Bank	5.5%	Bank Of India	5.8%	Bank Of India	5.9%	Punjab National Bank	5.7%	Punjab National Bank	5.8%
Bank Of India	5.3%	Punjab National Bank	5.5%	Punjab National Bank	5.6%	HDFC Bank	5.7%	Bank Of Baroda	5.7%
Canara Bank	5.0%	Canara Bank	5.1%	Canara Bank	5.2%	Bank Of India	5.3%	Bank Of India	5.1%
Top five share	39.3%		40.5%		41.0%		40.7%		41.8%

Bank	2018		2019		2020		2021		2022
State Bank of India	24.0%	State Bank of India	23.8%	State Bank of India	24.5%	State Bank of India	25.1%	State Bank of India	25.0%
HDFC Bank	7.0%	HDFC Bank	7.5%	HDFC Bank	8.7%	HDFC Bank	9.1%	HDFC Bank	9.6%
Punjab National Bank	5.7%	Punjab National Bank	5.5%	Bank Of Baroda	7.2%	Punjab National Bank	7.5%	Punjab National Bank	7.1%
Bank Of Baroda	5.2%	ICICI Bank	5.3%	ICICI Bank	5.8%	Canara Bank	6.9%	Canara Bank	6.7%
ICICI Bank	5.0%	Bank Of Baroda	5.2%	Punjab National Bank	5.3%	Bank Of Baroda	6.6%	ICICI Bank	6.6%
Top five share	46.9%		47.3%		51.6%		55.1%		55.1%

Note(s): The table shows the share of deposits from the top five banks over the period 2013 to 2022. The share of deposits increased from 39.3% in 2013 to 55.1% in 2023

Source(s): Compiled by authors, Statistical tables related to banks in India (RBI, Database on Indian Economy)

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Table 3. Share of deposits and advances across bank ownership groups

Ownership groups		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
New private sector banks	Deposits	18.1%	17.9%	18.8%	20.5%	21.9%	24.0%	25.6%	26.5%	27.9%	29.2%
	Advances	19.6%	19.7%	21.2%	24.0%	25.9%	28.0%	29.9%	31.3%	32.8%	34.1%
Old private sector banks	Deposits	4.7%	4.5%	4.4%	4.6%	4.8%	5.0%	5.1%	5.0%	4.8%	4.6%
	Advances	4.1%	4.1%	4.1%	4.2%	4.6%	5.0%	5.2%	5.1%	4.8%	4.7%
Public sector banks	Deposits	77.3%	77.7%	76.8%	74.9%	73.4%	71.1%	69.2%	68.5%	67.4%	63.3%
	Advances	76.3%	76.2%	74.8%	71.8%	69.5%	67.0%	65.0%	63.7%	62.4%	61.3%
Total share of banks	Deposits	100%	100%	100%	100%	100%	100%	100%	100%	100%	100.%
	Advances	100%	100%	100%	100%	100%	100%	100%	100%	100%	100.%
Total of public and private	Deposits	96.1%	95.9%	95.7%	95.5%	95.8%	95.6%	95.1%	94.5%	94.3%	94.2%
	Advances	95.6%	95.7%	95.6%	95.4%	95.9%	95.7%	95.5%	95.2%	95.3%	95.2%

Source(s): The Reserve Bank of India (RBI) Statistical tables related to banks in India (b) Database on Indian Economy (http://rbi.org.in)

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rolling time window for average return on assets, average equity to assets and the standard deviation of return on assets (Gupta & Kashiramka, 2020). A high Z-Score reflects low insolvency risk and hence greater stability (Laeven & Levine, 2009; Boyd & Graham, 1986, 1988). We take the natural logarithm of Z-Score to neutralize the bank size in line with the previous studies (for e.g., Gropp, Gruendl, & Guettler, 2014). While our primary data set is from 2013, for Z-Score we utilize the past value to ensure that there is no loss of data. We obtain all the relevant values for Z-Score computation from 2010, which enables us to capture the Z-Score values from 2013. The Z-Score in our model is a dependent variable capturing the number of standard deviations a bank's return would have to fall to exhaust the capital buffer. A higher value indicates a larger distance to consume the capital buffer, thereby lowering the probability of insolvency. The Z-Score is computed using the standard approach according to the literature. Being the outcome variable, the serial correlation coming from the rolling time window does not introduce bias in regression estimates of the regressors or the independent variables.

We control for firm-specific characteristics like the credit-to-deposit ratio (CDR), current account and savings account ratio (CASAR), gross nonperforming assets ratio (GNPAR), different sector wise loan (credit) allocation like lending to sensitive sector (SLSS), priority sector (SPRIO), total assets, i.e. bank size (NLTA) and macroeconomic factors like the gross domestic product growth (GDPR), benchmark repo rate (REP) to examine the real effect of large deposits on NIM and Z-Score (see Appendix for details). These variables impact bank profitability and bank fragility. For example, CDR, also known as the loan-to-deposit ratio, acts as a proxy for the risk behavior of banks. Higher CDR beyond the reserve requirement asserts the aggressiveness of banks to deploy the deposits into credit to firms or households (Satria, Harun, & Taruna, 2016). Past studies have shown that higher CDR could lead to banking fragility (for e.g., see Bwire, Tenai, & Odunga, 2021). CASAR estimates the banking profitability as these deposits carry lower interest rates than the term deposits. GDPR and REP are macro-economic factors that affect the bank lending channels and NIM. Due to procyclicality explained by high GDPR, banks tend to lend more during the boom. Credit quality suffers as banks do not screen the loan profiles (Ibrahim, 2016; Caporale, Di Colli, & Lopez, 2014). Repo rate is the policy interest rate, and its transmission helps in protecting the bank profitability. Higher NNPAR would impact profitability as all interest accruals would be derecognized when a loan turns delinquent. Controlling these variables helps us to tease the effect of large deposits proxied using T20DEP on the NIM and Z-Score.

We use panel regression estimates to model (equations 1 and 2). We also introduce a third equation to examine the impact of T20DEP on the Z-Score in the presence of NIM. To further investigate the mechanism through which deposit concentration affects bank stability, we extend the analysis by estimating a specification where the Z-Score is regressed on both T20DEP and NIM. Conceptually, if banks are able to pass on the high cost of large deposits, the NIM can be enhanced, which in turn can improve stability by increasing earnings buffers. At the same time, large deposits could also cause an adverse effect on stability due to funding concentration risk, withdrawal pressures or yield chase leading banks to take high-risk loan exposure. The mediation effect of NIM captures the extent to which the impact of large deposits on bank deposits operates indirectly through its influence on NIM, alongside any direct effect on fragility.

$$NIMTA_{it} = \alpha_i + \beta X_{it} + \gamma T20D_{it} + \delta_t + \mu_i + \varepsilon_{it} \tag{1}$$

$$Z - Score_{it} = \varphi_i + \gamma X_{it} + \vartheta T20D_{it} + \theta_t + \omega_i + \epsilon_{it} \tag{2}$$

$$Z - Score_{it} = \varphi_i + \gamma X_{it} + \vartheta T20D_{it} + \rho NIMTA_{it} + \theta_t + \omega_i + \epsilon_{it} \tag{3}$$

where

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$NIMTA_{it}, Z\text{–}Score_{it}$ = *dependent variable for bank i at time t.*

α_i & φ_i = *is the unknown intercept for each bank i .*

X_{it} = *is a vector of control variables or predictors for each entity i at time t.*

γ & ϑ = *coefficient capturing the impact of the key variable of interest*, $T20D$.

δ_t & θ_t = *time fixed effects controlling for time heterogeneity.*

ρ = *coefficient capturing the mediating impact of the key variable of interest*, NIM.

μ_i & ω_i = *within bank error term*

ε_{it} & ϵ_{it} = *overall error ter*m

Fixed-effect models provide consistent estimates in the presence of correlation between regressors and unobserved time-invariant heterogeneity or bank-specific latent traits or characteristics. Under random effects, the regressors or the explanatory variables are plausibly exogenous to the unobserved time-invariant heterogeneity, implying nonexistence of correlation between the independent variables and the firm characteristics. We retain the orthogonality between the regressors and the unobserved bank characteristics as our dependent variables, i.e. NIM, Z-Score, would reflect broader structural banking model constructs rather than bank-specific strategic choices. The random-effect framework allows us to retain and interpret time variants or slow-moving structural features of banks which are otherwise absorbed in fixed effects. In addition, our study aims to examine the impact of large deposits not only through within-bank dynamics but also across (between) banks with differing funding structures and heterogenous business models. This supports the use of the random-effect model by making the orthogonality condition economically plausible, particularly in a competitive and regulated banking environment.

Endogeneity questions are examined using instrumental variables through generalized methods of moments (GMM). We use the share of advances from the top 20 borrowers (T20ADV) and bank ownership group as instruments. The validity of the instruments relies on two key conditions: instruments being sufficiently correlated with the endogenous regressor (our variable of interest being the top 20 depositors) and the instruments not directly impacting the dependent variable except through the endogenous regressor. We used the share of advances from top 20 borrowers (T20ADV) and bank ownership groups as instruments. In line with the existing literature, the share of advances from the top 20 borrowers' servers is a relevant instrument due to collateralization. T20ADV captures concentration on the asset side, which is closely linked to the liability side concentration, i.e. deposits through underlying client relationships. Borrower concentration is plausibly exogenous to fragility, affecting fragility primarily through its association with deposit concentration, rather than through any direct channel. Bank ownership groups, on the other hand, reflect structural and institutional characteristics such as governance, funding models and deposit base that systematically influence deposit concentration. Since bank ownership is largely time-invariant and predetermined, it is unlikely to respond to fragility.

We report on C-statistics, first-stage results and Hansen's J-statistics in the results section. Furthermore, to confirm the robustness of our findings, we also deploy an alternative variant of equation (2), using loan loss provision to operating profit (LLPOPR) – a vulnerability indicator, as a dependent variable (for e.g., see Aristei & Gallo, 2019; Bhat, Ryan, & Vyas, 2019; Pesola, 2011). Higher loan loss provision due to T20DEP would also indicate increased fragility arising from delinquent assets.

We also conducted a battery of cross-sectional tests for both models (i.e. NIM and Z-Score) to confirm the consistency in our results. We study whether the effect of large deposits is differentiated between bank ownership groups. The banks are categorized across three types: new private sector, old private sector and public sector. We also address survivorship bias by

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taking two time periods. The two time periods are taken as 2013–2017 and 2018–2022, where 2017 is taken as the cut-off to align with the initiation of consolidation activity among public sector banks.

5. Empirical results

We report descriptive statistics in Table 4 for all key variables used in the panel regression analysis over the period 2013–2022. The final sample consists of 426 firm-years covering 49 distinct banks. For example, our key dependent variables, NIM and bank fragility (measured by the natural logarithm of Z-Score), have mean values of 2.78 and –0.75, respectively. The standard deviations of 0.99 and 2.01 for these two variables suggest heterogeneity in NIM and fragility across the bank samples. Our key variable of interest, the proxy for large deposits, i.e. top 20 depositors' share, has a mean of 12.44 and a standard deviation of 8.30, reflecting a sufficient cross-sectional variation to facilitate robust regression analysis.

We estimate equations (1) and (2) to examine the effect of large deposits on the NIM and Z-Score. Table 5 reports the results of the regression exercise. The pass-through efficiency is examined by regressing the higher cost of large deposits on the NIM. We find that the large deposits proxied by T20DEP to have a significant positive impact on NIM, invalidating hypothesis 1 (column 1 of Table 5). Overall, this confirms the efficient pass-through of the higher interest cost. Our findings align with those of the earlier studies of Segev, Ribon, Kahn, and De Haan (2024) and Drechsler, Savov, and Schnabl (2021), where interest margins become insensitive to interest rate levels in concentrated markets. We estimate the economic effect of T20DEP on NIM by scaling the beta coefficient of T20DEP by mean values of T20DEP and NIM. The economic effect or the practical significance of T20DEP on NIM comes to 0.086 [8]. This implies that a proportionate increase in T20DEP by 10% would induce a proportionate rise in the NIM by roughly 0.86%. This is possibly a significant contribution of our variable of interest (i.e. T20DEP) to NIM, which is measured as a spread between yields and the cost of funds. We find the relative importance of T20DEP – with a one-unit change in T20DEP, NIM changes by 0.15 units [9]. We reject our first hypothesis and conclude that large deposits have a positive impact on NIM due to either efficient rate transmission or exposure to high-risk assets. The stability of NIM in the presence of a higher cost of funds due to large deposits depends on the market power to price loans, in other words, asset-side pricing. The other way is to adopt a yield-chasing behavior and take exposure to high-risk loans. On average, we find banks to be efficient in the transmission of funding costs, which can occur due to either their market power or a strategic tilt towards yield-chasing behavior. Banks with market power can effectively pass through higher funding costs to lending rates, thereby preserving margins. On the other hand, banks respond to higher costs by reallocating their asset portfolios towards higher yields and potentially higher-risk exposures.

We now move to the next phase to understand if the reliance on large deposits impacts bank fragility due to yield-chasing, in other words, reallocation towards high-risk loans. Column 2 of Table 5 shows the results of the impact of the T20DEP on the Z-Score.

The coefficient of T20DEP is negative and statistically significant at the 1% level, implying a decrease in the distance to default, i.e. increasing bank fragility, thereby validating hypothesis 2. In essence, an increase in the share of T20DEP leads to an increased probability of insolvency risk. This could arise because risky assets turning sour magnify the moral hazard issue. We fail to reject our second hypothesis and conclude that large deposits have a positive impact on bank fragility. We also found the economic effect of T20DEP on the Z-Score by scaling the beta coefficient of T20DEP. The economic effect of T20DEP on Z-Score comes to negative 0.85[10]. This implies that a proportionate increase in T20DEP by 10% would induce a proportionate rise in the Z-Score by roughly 8.5%. This is a significant contribution of our variable of interest (i.e. T20DEP) to the Z-Score, our banking fragility measure. We find the relative importance of T20DEP – with a one-unit change in T20DEP, the Z-Score changes by negative 0.20 units [11]. Economically, this suggests that greater concentration in large

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Table 4. Descriptive statistics of banks in India, 2013–2022

Variables	Description	(1) N	(2) Mean	(3) Median	(4) Standard deviation	(5) Minimum	(6) Maximum
TA	Total Assets INR Million	426	330,406.18	161,890.00	553,886.02	1,117.45	4,987,597.41
NLTA	Natural Log of Total Assets	426	11.90	11.99	1.36	7.02	15.42
T20DEP	Top 20 Depositors Share	426	12.44	10.62	8.30	2.92	71.29
T20ADV	Top 20 Borrowers Share	426	14.16	13.16	8.22	0.57	99.83
NIM	Net Interest Margin	426	2.78	2.58	0.99	1.02	9.62
NNPAR	Net nonperforming assets ratio	426	3.51	2.65	3.13	0.00	16.89
CDR	Credit-to-deposits ratio	426	75.65	74.29	27.04	42.39	556.02
GDPR	Gross domestic product growth rate	426	5.92	32.18	3.69	−5.78	9.69
REP	Repo rate	426	6.42	6.46	1.25	4.00	7.86
CASAR	Current account and savings account ratio	426	33.18	32.18	9.74	5.21	60.68
CTAR	Cash-to-total assets ratio	426	0.09	0.07	0.06	0.03	0.52
NLZScore	Natural log of Z-Score	419	−0.75	−0.72	2.01	−6.20	4.87
SLSS	Lending to sensitive sector-to-total assets ratio	426	0.11	0.11	0.05	0.00	0.28
SPRIO	Lending to priority sector-to-total assets ratio	426	0.22	0.21	0.08	0.01	0.67
SUSL	Unsecured lending-to-total assets ratio	426	0.08	0.07	0.07	0.00	0.63
LLPOPR	Loan loss provision-to-operating profits ratio	426	1.02	0.47	11.39	−73.42	198.52

Source(s): Authors' estimates

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Table 5. Impact of large deposits on the net interest margin and Z-Score of banks in India, 2013–2022

Variables	Description	(1) NIM	(2) Z-Score	(3) Z-Score
T20DEP	Top 20 depositors share	0.019*	−0.049***	−0.050***
		(0.010)	(0.018)	(0.018)
CDR	Credit-to-deposit ratio	−0.002*	0.004	0.003
		(0.001)	(0.012)	(0.013)
CASAR	Current account and savings account ratio	0.037***	−0.023*	−0.026*
		(0.010)	(0.014)	(0.014)
NNPAR	Net nonperforming assets ratio	−0.087***	−0.174***	−0.169***
		(0.015)	(0.035)	(0.034)
SLSS	Lending to sensitive sector-to-total assets ratio	0.442	4.579	4.685
		(1.208)	(2.976)	(2.974)
SPRIO	Lending to priority sector-to total assets ratio	4.969***	−0.231	−0.589
		(1.237)	(1.483)	(2.154)
SUSL	Unsecured lending-to-total assets ratio	2.273	−0.304	−0.572
		(1.630)	(1.737)	(1.978)
NLTA	Natural log of total assets	−0.138*	−0.959***	−0.945***
		(0.073)	(0.112)	(0.120)
GDPR	Gross domestic product growth rate	−0.007**	0.018	0.018
		(0.003)	(0.018)	(0.018)
REP	Repo rate	0.071**	0.200**	0.197**
		(0.035)	(0.098)	(0.099)
CTA	Cash-to-total assets ratio	2.385*	2.454	2.271
		(1.323)	(1.831)	(2.089)
NIM	Net interest margin	–	–	0.070
				(0.238)
Constant	Constant	1.487	10.325***	10.272***
		(1.194)	(1.818)	(1.829)
Number of bank id		49	49	49
Entity effects		YES	YES	YES
Prob > F		0.00***	0.00***	0.00***
Overall R^2		0.667	0.561	0.562

Note(s): Robust standard errors are in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Figures in brackets are standard errors. ***, ** and * indicates statistical significance at 1%, 5% and 10%, respectively. The Hausman test was conducted for the NIM and Z-Score. The *p*-value for NIM was 0.0000, signifying fixed effects. The *p*-value for Z-Score was 12.98, signifying random effects. The key coefficients are qualitatively and directionally consistent under both the models. We have retained random effects in line with our econometric approach
The table shows the panel regression using random effects model results using equations (1) and (2). Equation (1) examines the regression model with the net interest margin (NIM) being the dependent variable. Equation (2) examines the regression model with natural logarithm of Z-Score as the dependent variable. The independent variables are large deposits (T20DEP), credit-to-deposit ratio (CDR), CASAR, net nonperforming assets ratio (NNPAR), lending to sensitive sectors (LSS), priority sector lending (SPRIO), unsecured loan (USL), natural log of total assets (NLTA), growth in gross domestic product (GDPR), benchmark repo rate (REP) and cash to total assets (CTA)
Source(s): Authors' estimates

deposits is linked to reduced bank stability, potentially due to higher yield-chasing and moral hazard.

The mediation analysis reveals that larger deposits affect bank stability through both direct and indirect channels. Column 3 of Table 5 captures the results of the impact of T20DEP on the Z-Score in the presence of the NIM. While larger deposits increase the NIM, which in turn enhances stability by strengthening earnings buffers, they also exert a direct negative effect on

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the Z-Score due to concentration risk, withdrawal pressures, or yield chase. The coefficient of T20DEP remains negative and significant, re-emphasizing the persistent impact of large deposits on bank stability. Therefore, with the partial mediation of NIM, the direct fragility channel outweighs the indirect profitability benefits.

Our results show that large deposits increase bank fragility even in the presence of a plausible enhanced monitoring opportunity by "sophisticated" investors (Allen & Gale, 2004, 2001; Hellmann *et al.*, 2000; Jensen & Meckling, 1976). One of the reasons that could justify this is the presence of a "collateralization" effect (Francis *et al.*, 2019; Agur, 2013). This would arise when most of these large depositors are "collateralized" borrowers where banks have an exposure in assets belonging to these depositors. In other words, banks could have extended credit secured by deposit collateral. Therefore, these large depositors are "mirrored borrowers" who lack motivation to monitor banks. We substantiate this finding using top 20 borrower concentration (T20ADV) – a variable also disclosed by banks under the reporting regulations. We observe a high correlation between top 20 depositors and top 20 advances, which could explain the implied increasing possibility of collateralization effect (see Table 6). While data for top 20 depositors and borrowers are not available – the assertion should hold true as banks require borrowers to give margin money as collaterals for working capital loans [12, 13]. The coefficient of the control variables follows economic intuition. for example, low-cost deposits proxied using the current and savings accounts ratio (CASAR) help in improving NIM, i.e. they have a positive coefficient. On the other hand, CASAR has a negative impact on the Z-Score, implying weaker market discipline. While higher CASAR improves funding cost and liquidity, it may not translate to better banking stability. Banks with a high CASAR franchise may engage in higher risk-taking or experience higher earnings volatility due to weaker depositor discipline. High levels of delinquent assets measured through the net nonperforming assets ratio (NNPAR) negatively impact the NIM due to the derecognition of interest income. NNPAR has a significant negative impact on the Z-Score, which is a clear reflection of asset quality playing a role in banking fragility – lower asset quality (higher NNPAR) will reduce the distance to default (Z-Score), thereby increasing the probability of default.

5.1 Cross-sectional tests

We conducted a battery of cross-sectional investigations. According to bank ownership groups, barring old private sector banks, we find both new private sector and public sector banks displaying a positive coefficient of T20DEP. The inability of the old private sector banks (as seen in the negative coefficient of T20DEP) to transmit the high cost of these large deposits could be either due to lower exposure to high-risk advances or operational inefficiency arising from a lower market share. Old private sector banks control only 5% of the deposits and advances market (see Table 5) over the last five years. This is consistent with their relatively weak or marginal presence in the banking market making them behave as price takers. Their weaker franchise strength and low customer stickiness prevent them from being better positioned to transmit the higher cost of funds and incapacitate them from exercising pricing discretion. The public sector banks show better efficiency in this pass-through of high cost deposits with a statistically significant coefficient (columns 1, 2 and 3 of Table 7). T20DEP continues to have a significant impact on banking fragility across all ownership groups

Table 6. Correlation between top 20 largest depositors and largest advances

Correlation between top 20 largest depositors and top 20 largest borrowers	Overall	NPVTSB	OPVTSB	PSB
Correlation	0.61	0.56	0.51	0.77

Source(s): Authors' estimates

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Table 7. Impact of large deposits on net interest margin and Z-Score of across banking groups in India, 2013–2022

	NIM			Z-Score			NIM		Z-Score	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	NPVTSB	OPVTSB	PSB	NPVTSB	OPVTSB	PSB	<=2017	>2017	<=2017	> = 2018
T20DEP	0.002	−0.013	0.033***	−0.051*	−0.031*	−0.069**	0.032***	0.008	−0.023	−0.048*
	(0.010)	(0.010)	(0.009)	(0.029)	(0.018)	(0.028)	(0.010)	(0.012)	(0.019)	(0.027)
CDR	0.000	0.037***	0.013**	−0.007	−0.035	0.040*	−0.002	0.017**	0.009	−0.002
	(0.002)	(0.011)	(0.005)	(0.011)	(0.024)	(0.023)	(0.001)	(0.009)	(0.019)	(0.015)
CASAR	0.039***	0.052***	0.029***	−0.030	−0.095***	−0.017	0.040***	0.042***	−0.013	−0.035
	(0.010)	(0.008)	(0.009)	(0.031)	(0.022)	(0.022)	(0.010)	(0.011)	(0.015)	(0.024)
NNPAR	−0.120***	−0.132***	−0.057***	−0.263***	−0.276***	−0.152***	−0.121***	−0.078***	−0.240***	−0.136*
	(0.018)	(0.036)	(0.010)	(0.081)	(0.070)	(0.042)	(0.026)	(0.017)	(0.052)	(0.071)
SLSS	−3.886***	−3.985**	1.202	−2.223	7.721	6.713	1.512	−2.521**	7.758*	0.205
	(1.417)	(1.930)	(1.103)	(4.305)	(6.024)	(5.619)	(1.845)	(1.258)	(4.038)	(4.334)
SPRIO	7.846***	2.605***	1.629*	0.054	4.709*	−2.413	6.003**	5.736***	4.821	−1.348
	(1.741)	(0.840)	(0.866)	(3.039)	(2.678)	(4.201)	(2.357)	(0.961)	(3.104)	(1.335)
SUSL	2.412	1.303	−1.172	0.859	5.503	−8.254***	−3.451	2.903***	3.148	1.914
	(2.302)	(1.468)	(1.193)	(2.592)	(3.524)	(2.911)	(3.252)	(0.786)	(3.806)	(1.406)
NLTA	−0.009	−0.297**	−0.122*	−0.466	−0.395	−1.159***	0.018	−0.125**	−0.857***	−0.985***
	(0.140)	(0.124)	(0.064)	(0.355)	(0.395)	(0.182)	(0.116)	(0.057)	(0.139)	(0.138)
GDPR	0.003	−0.013**	−0.008***	−0.020	0.033	0.027	−0.099*	−0.008*	0.027	0.005
	(0.014)	(0.005)	(0.003)	(0.034)	(0.024)	(0.033)	(0.052)	(0.004)	(0.095)	(0.015)
REP	0.063	−0.009	0.021	0.562**	0.026	−0.001	−0.136	0.058	−0.206	0.114
	(0.104)	(0.055)	(0.033)	(0.236)	(0.190)	(0.130)	(0.093)	(0.042)	(0.240)	(0.162)
CTA	1.411	0.566	2.145***	1.436	6.601***	3.098	4.056**	2.320*	4.394**	0.031
	(1.729)	(0.700)	(0.510)	(6.343)	(2.145)	(2.958)	(1.788)	(1.268)	(1.777)	(3.622)
Constant	0.448	2.169*	1.218	4.638	8.197***	12.184***	1.571	−0.019	9.610***	12.559***
	(2.145)	(1.281)	(1.092)	(2.963)	(3.170)	(3.962)	(0.997)	(0.992)	(2.825)	(2.391)
Observations	97	118	211	92	118	209	236	190	230	189
Number of bank id	11	12	26	11	12	26	49	42	47	42
Entity effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Prob > F	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
Overall R^2	0.813	0.686	0.689	0.508	0.456	0.476	0.566	0.834	0.608	0.514

Note(s): Robust standard errors are in parentheses

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Figures in brackets are standard errors. ***, ** and * indicates statistical significance at 1%, 5% and 10%, respectively

Deposit concentration (T20D) is the key variable of interest. The table reports the effect of T20DEP on the NIM and Z-Score. Columns (1), (2), (3), (4), (5) and (6) report results between bank ownership groups: new private sector banks (NPVTSB), old private sector banks (OPVTSB) and public sector banks (PSB). New public sector banks were incorporated post liberalization and de-regularization of Indian economy in 1990. Old private sector banks existed since the beginning of the 20th century, and the public sector banks are the resultant of nationalization of the private sector banks in 1969 and 1980 where the government holds minimum 51% stake. Column (7), (8), (9) and (10) report the results during two time periods (2013–2017) and (2018–2022)

Source(s): Authors' estimates; see Appendix for variable description

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(columns 4, 5 and 6 of Table 7). Our survivorship analysis based on the pre- (before 2017) and post- (after 2017) bank consolidation phases also shows a positive pass-through, albeit not at conventional levels post 2017 (columns 7 and 8 of Table 7). The coefficient of large deposits is positively significant in the pre-bank consolidation phase, while not significant at conventional levels in the post-bank consolidation phase, with a smaller number of banks controlling the Indian banking market. Kho (2024) suggests that the efficacy in the transmission of monetary policy to deposit rates depends on the heterogeneity in the degree of banking sector concentration – a highly concentrated banking sector transmits any unexpected monetary tightening more slowly than its less concentrated counterparts. The pass-through of higher deposit cost in the post-2017 regime can also be attributed to the asset quality review (AQR) initiated by the RBI to contain zombie lending or evergreening [14]. The banks were restricted from taking exposure to high risk loans where they could have enjoyed better pricing and expanded spreads. In summary, tighter regulatory oversight reduced banks' ability to offset higher funding costs through higher margins – which explains the insignificance of the coefficient post-2017. The impact of T20DEP on fragility is more pronounced post consolidation, which confirms the concentration-fragility framework – i.e. higher concentration with few large banks increases fragility (for e.g., Khan & Ahmad, 2023; Das, 2023).

5.2 Robustness

We examine the robustness of the empirical results (due to endogeneity concerns) using two approaches. First we deploy GMM, an econometric estimator within an instrumental variable regression framework which provides consistent and asymptotically efficient coefficients. Second, we use an alternative measure for bank fragility – loan loss provisions. Loan loss provisions act as early warning indicators (Dal Maso, Kanagaretnam, Lobo, & Terzani, 2018). The GMM results hold the impact of T20DEP, our main variable on the NIM and Z-Score, therefore confirming the results of the panel regression model (Table 8). Our results show that T20DEP is exogenous as the *p*-value of the GMM test statistic is higher than the conventional levels of significance, because of which we fail to reject the null hypothesis. The high adjusted *R*-square shows that the instruments serve as a strong proxy for T20DEP, despite the fact that

Table 8. GMM results – impact of large deposits on net interest margin and Z-Score of banks in India, 2013–2022

Variables	(1) NIM	(2) Z-Score
T20DEP	0.039*	−0.049*
GMM C statistic $\chi^2(1)$ - *p* value (Note 1)	0.6991	0.9112
First stage adjusted *R*-square (Note 2)	0.7198 ***	0.5561***
Hansen's J χ^2 - *p* value (Note 3)	0.0294	0.6354
Observations	426	419
R-squared	0.674	0.564
Instrumental variables	T20ADV, bank categories	T20ADV, bank categories
Overall R^2	0.674	0.564

Note(s): (1). Null hypothesis: The variable is exogenous
(2). Higher values of first stage adjusted *R*-square indicates stronger instruments, and instrumental-variables estimators exhibit less bias when the instruments are strongly correlated with the endogenous variable
Robust standard errors in parentheses
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
Figures in brackets are standard errors. ***, ** and * indicates statistical significance at 1%, 5% and 10%, respectively

Source(s): Authors' estimates

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the variable cannot be directly construed to be endogenous. Using the Hansen J statistic, we also fail to reject the fact that the instruments are valid at the 1 and 10% levels of significance. This confirms the validity of the instruments and the chances of overidentification due to the inclusion of more instruments than the number of endogenous variables – i.e. our structural model is specified correctly. We also report the robustness of our finding using loan loss provision as a proxy of bank fragility in Table 9. Using scaled loan loss provision as a proxy for fragility, we also find that T20DEP has a positive and statistically significant impact on bank fragility.

Table 9. Impact of large deposits on banking fragility in India – loan-loss provisioning model

Symbols	Variables	(1) LLPOPR
T20DEP	Top 20 depositors share	0.240*** −0.088
CDR	Credit-to-deposit ratio	−0.025 (0.023)
CASAR	Current Account Savings Account Ratio	0.146* (0.075)
NNPAR	Net nonperforming assets ratio	−0.046 (0.240)
SLSS	Lending to sensitive sector-to-total assets ratio	−10.889 (9.380)
SPRIO	Lending to priority sector-to-total assets ratio	4.402 (5.445)
SUSL	Unsecured lending-to-total assets ratio	−9.094 (6.429)
NLTA	Natural log of total assets	0.334 (0.706)
GDPR	Gross domestic product growth rate	0.051 (0.060)
REP	Repo rate	0.149 (0.211)
CTA	Cash-to-total assets ratio	−12.393 (13.261)
Constant	Constant	−7.945 (10.775)
Observations		426
Number of bank		49
Entity effects		YES
Prob > F		0.01**
Overall R^2		0.0197

Note(s): ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Figures in brackets are standard errors. ***, ** and * indicates statistical significance at 1%, 5% and 10%, respectively. Robust standard errors are in parentheses

The table shows the panel regression results using equation (2), using an alternative dependent variable of loan loss provision. Loan loss variables is scaled using operating profits and regressed with the independent variables, deposit concentration (T20DEP), credit-to-deposit ratio (CDR), current account and savings account ratio (CASAR), net nonperforming assets ratio (NNPAR), scaled lending to sensitive sectors (LSS), scaled priority sector lending (SPRIO), scaled unsecured loan (USL), natural log of total assets (NLTA), growth in gross domestic product (GDPR), benchmark repo rate (REP) and cash to total assets (CTA). Deposit concentration (T20D) is the key variable of interest. Columns (1) and (2) are the random effects model with time fixed effects and without time fixed effects

Source(s): Authors' estimates

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6. Conclusion

The study shows that higher dependence on noncore (large) deposits could undermine financial stability due to both high cost and withdrawal vulnerability. New technologies in electronic banking have often turbocharged rumors paving the way for simultaneous withdrawals. In this digital age, funds can migrate instantaneously. During such occasions, regulatory responses in form of prescribing withdrawal limits (moratorium) may come too late to salvage adverse situations. Large deposits aggravate the moral hazards associated with bank lending. Large depositors, although defined as "motivated monitors," have limited ability to check banks' balance sheets due to the "collateralization" effect. This puts high-value retail depositors at risk, i.e. any negative news can trigger panic withdrawals. Public sector consolidation resulted in greater concentration, with a smaller number of banks holding a large share of deposits in the Indian market. Risk-taking is also aggravated as few large banks enjoy implicit guarantees through 'too-big-to-fail' subsidies and explicit deposit insurance. The combination of all these factors absolves the depositors from monitoring banks; thus, neither banks adjust risk exposures nor fear any early warning signals.

As a policy prescription, we recommend mandatory disclosure of large deposits in both count and value terms at the end of each reporting period. This mandatory disclosure should require splitting large deposits into retail and wholesale deposits beyond INR 0.5 million (i.e. the threshold of insurance cover). The disclosure should capture the details of count and value of large retail and large whole depositors both in count and value as of the end of reporting periods each quarter, along with a comparison with the immediately preceding quarter and the same quarter in the previous financial year. Supervisory norms for a high share of large deposits could reduce information asymmetry and also offer a better reflection of riskier banks prone to runs. Banks with a high concentration of deposits may be required to hold more capital or liquidity. The proposed disclosure requirement should be viewed with certain trade-offs. While there are potential benefits, the disclosure could also impose additional compliance and operational burden. This disclosure could also bring to the fore the banks that may otherwise be strong in terms of solvency but expose them to perceptions of customers as weak. The policy should be designed to ensure a clear balance between prudential objectives and the costs of such disclosure as it could create unintended distortions.

Our proposed disclosure framework provides a useful complement to the existing liquidity disclosures such as the LCR and NSFR. While the LCR and NSFR primarily assess the adequacy and stability of funding based on maturity assumptions, they do not capture the structural assertions. The proposed disclosure would give quantitative evidence of the concentration deposits among a small set of depositors holding significant deposit values, which could amplify withdrawal risk beyond average run-off parameters under stress conditions. The recommended disclosures from this study should serve as additional overlays to identify structural vulnerabilities and help to calibrate liquidity buffers more effectively.

6.1 Future research

Banks expose themselves to rollover risks and sudden withdrawals, particularly during episodes of market stress. These situations could transmit funding shocks and negatively impact the liability franchise – i.e. the banks' ability to attract and retain stable, low-cost retail deposits. Our study has not covered the implications of the LCR implemented by the RBI in reflecting any incipient signs of liquidity dry ups. LCR requires banks to hold high-quality liquid assets to cover 30-days net cash outflows under stressed conditions. Banks are required to maintain 100% LCR with effect from January 2019, with subsequent changes introduced during the pandemic. Similarly, the implementation of NSFR guidelines was deferred and came into effect in October 2021. The absence of the standardized and publicly available data limits the examination of whether liquidity buffers moderate the impact of deposit concentration on bank fragility. This is one of the limitations of our study, which can be explored for potential future research.

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Notes

1. https://www.business-standard.com/finance/news/higher-bulk-deposit-reliance-signals-structural-liquidity-risks-rbi-dy-guv-125012001132_1.html
2. https://www.business-standard.com/industry/banking/credit-growth-tops-14-6-per-cent-in-jan-31-fortnight-126021301577_1.html
3. The Indian banking regulator, the Reserve Bank of India (RBI) enhanced the deposit insurance limits from INR 100,000 to INR 500,000 in February 2020.
4. https://www.dicgc.org.in/pdf/2019/TheIncreaseInInsuranceCoverageForDepositorsFeb2020.pdf
5. https://www.businesstoday.in/latest/story/what-went-wrong-in-pmc-bank-rbi-lists-three-wrongdoings-230185-2019-09-26
6. These banks include the public and private sector banks which account for 95% of the total assets of the banking system as on March 31, 2022.
7. https://www.kvb.co.in/interest-rates/bulk-term-deposit-rates/; https://www.kvb.co.in/interest-rates/resident-nro-deposits/
8. Beta of T20DEP multiplied by Mean of T20DEP divided by Mean of NIM.
9. Beta of T20DEP multiplied by Standard Deviation of T20DEP divided by Standard Deviation of NIM.
10. Beta of T20DEP multiplied by Mean of T20DEP divided by absolute Mean of Z-Score
11. Beta of T20DEP multiplied by Standard Deviation of T20DEP divided by Standard Deviation of Z-Score.
12. https://www.voiceofca.in/siteadmin/document/WorkingCapital(Part-II)%5B1%5D.pdf
13. https://www.rbi.org.in/commonman/Upload/English/Notification/PDFs/NT20097D966B84C34C0CA1B6D2E0A62B5BFD.PDF
14. https://www.bis.org/review/r170921c.htm

Supplementary material

The supplementary material for this article can be found online.

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