Received: 11 September 2020 | Revised: 13 July 2023 | Accepted: 4 August 2023

DOI: 10.1111/jbfa.12749

JBFA

ARTICLE

Institutional investors' horizons and bank transparency

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Abstract

We examine the relation between institutional investors' horizons and bank transparency. The novelty of this research is to consider three important aspects of transparency: disclosure quality, private information gathering and auditor fees. We find strong evidence indicating that banks dominated by long-term (short-term [ST]) institutional shareholders exhibit higher (lower) levels of disclosure quality. However, there is no evidence that investor horizon has a differential effect on private information gathering and audit pricing. The study employs alternative proxies and estimations such as two-stage least squares and propensity score matching to address endogeneity. We also document that banks with higher ST institutional shareholding are associated with lower crash risk. These findings are particularly significant because poor bank transparency has been identified as a contributing factor to the 2007–2009 financial crisis.

KEYWORDS

auditor fees, crash risk, information asymmetry, institutional investors, investors' horizons, loan loss provision

JEL CLASSIFICATION
D82, G01, G14, G21, G32, G34, G38

1 | INTRODUCTION

Enhancing bank transparency is central to effective bank regulation and governance; increasing bank stability, market value and trust; and reducing bank panic, rollover risk and cost of debt financing (Beatty & Liao, 2014; Bushman & Williams, 2015; Granja, 2018; Huizinga & Laeven, 2012). The market discipline of banks depends essentially on bank transparency because greater transparency strengthens investors' and regulators' ability to assess banks' true financial conditions (Flannery, 1998; Freixas & Laux, 2012; Nier & Boumann, 2006).[1] In the absence of transparency, investors might withdraw their deposits, sell their stocks and refuse additional funding, potentially pushing banks to become more efficient or exit the business (Cordella & Yeyati, 1998).[2] Greater bank transparency also contributes to the efficient allocation of capital and significant economic growth (Francis et al., 2009). However, little is known about the determinants of bank transparency. A few studies have shown that factors such as competition (Burks et al., 2018; Jiang et al., 2016), geographic distance between banks and regulatory field offices (Lim et al., 2017) and board independence (Cornett et al., 2009) influence bank transparency. However, critical questions remain unanswered, including how the different monitoring incentives of institutional shareholders' investment horizons affect bank transparency.[3] Our goal is to answer this question by investigating the effects of short-term (ST) versus long-term (LT) institutional shareholdings on bank transparency.

Institutional shareholders are the dominant investors of US firms, holding 80% ownership of all stocks on the Standard and Poors (S&P) 500 (Greenspon, 2019) and are generally perceived as more capable monitors (Shleifer & Vishny, 1986). However, their monitoring incentives and capabilities differ between ST and LT investors. ST investors such as hedge funds have less incentive to incur costs to improve monitoring as they are less likely to invest for long enough to recover the costs of such monitoring efforts (Bushee, 1998; Cremers et al., 2020). Conversely, in the absence of indirect exit channels ("voting with their feet"), LT investors such as mutual and pension funds have more incentive to use their voice channels (e.g., proxy voting and direct engagement with management) as direct interventions to improve monitoring (Appel et al., 2016; Edmans & Manso, 2011; Harford et al., 2018; McCahery et al., 2016). The literature typically supports this notion that ST investors influence firms to achieve ST goals at the expense of LT value (Bushee, 1998; X. Chen et al., 2007), while LT investors focus on firms' LT prospects and thus enforce better monitoring. In this regard, several studies have highlighted the different roles and positions taken by ST versus LT investors on corporate policies and governance decisions. These studies illustrate that investors' horizons affect firm investments, financing, payout policies (Harford et al., 2018; Huang & Petkevich, 2016), corporate social responsibility activities (Nguyen et al., 2020), bank financing (Cline et al., 2020), insider trading (Fu et al., 2020) and risks (Callen & Fang, 2013; Pathan et al., 2021).

LT shareholders generally hold diversified portfolios and trade regularly throughout the year to match their fund flows. We argue that bank transparency increases with LT shareholdings for three main reasons. First, as noted above, with large shareholdings, LT shareholders have more incentives and resources to be more active monitors (Appel et al., 2016; Harford et al., 2018; McCahery et al., 2016), and a necessary precondition for monitoring bank managers is transparency (Bushman, 2016; Bushman & Williams, 2012; Freixas & Laux, 2012). Hence, LT shareholders

[1] The Basel Committee introduced Pillar 3—market discipline—in 2004 under the Basel II Accord as a complement to capital regulation.

[2] Additionally, many studies of non-banking firms show that more public disclosure (transparency) of accounting numbers allows investors to correctly assess the firms' financial condition and the amount, timing and uncertainty of their future cash flows (e.g., Francis et al., 2009; Leuz & Wysocki, 2016).

[3] Investment horizons vary due to differences in regulations and competition; investment objectives and strategies; capability to continuously raise funds to execute LT policies; and ability to gather, interpret and trade on private information (Cline et al., 2020; Yan & Zhang, 2009).

demand greater bank transparency to improve their monitoring capabilities (first-order effect). Second, LT bank stability increases with bank transparency. Therefore, LT shareholders prefer transparency to increase the likelihood of reaping benefits from their monitoring efforts via ensuring LT bank survival (Acharya & Ryan, 2016; Bushman, 2016). LT shareholders leverage their large stakes to improve corporate governance, such as engaging more independent directors and removing takeover defenses (Appel et al., 2016; Harford et al., 2018; McCahery et al., 2016). Prior studies show that firms with better governance exhibit more transparency (Armstrong et al., 2014; Boone & White, 2015; Harford et al., 2018). Therefore, greater LT shareholdings could be linked to increased transparency (second-order effect). Third, LT shareholders demand greater transparency because it increases stock liquidity (Diamond & Verrecchia, 1991) and lowers their overall transaction costs (Schoenfeld, 2017).

Conversely, ST shareholders hold small positions for short periods and lack the necessary incentives to monitor. We suggest that bank transparency decreases with ST institutional shareholdings (SIS) for two main reasons. First, ST shareholders prefer and benefit from reduced transparency (Maffett, 2012). For instance, their potential to gain from trading based on private information decreases with bank transparency (Ke et al., 2008). Second, because of the ST nature of their fund flow and investment strategies, ST shareholders are less motivated to monitor because they are less likely to reap benefits from such monitoring (X. Chen et al., 2007; Gasper et al., 2005; Livne et al., 2013; Stein, 1989). Lin et al. (2013) show that weakening monitoring reduces transparency. Therefore, greater ST shareholdings could be associated with decreased transparency (second-order effect).

Based on prior theoretical arguments and empirical findings on the different monitoring incentives of ST versus LT institutional investors, we can delineate that banks with more ST horizon shareholders have less incentives to pursue bank transparency, while banks with more LT horizon shareholders have more incentives to pursue bank transparency. Examining the effects of investor horizon on transparency in the banking industry is particularly important for three reasons. First, compared to other non-bank firms, banks are opaque because of the complex nature of their business, their possession of clients' private information and their assets being mainly financial (Morgan, 2002). The opacity of banks provides opportunities for distorting financial statements, facilitates excessive risk-taking (Bushman & Williams, 2015; Granja, 2018; Nier & Boumann, 2006) and hinders early detection of solvency problems. Such issues with banks led to the 2007–2009 global financial crisis (Basel Committee on Banking Supervision [BCBS], 2017; Bushman, 2016).[4] Identifying the types of shareholders that could potentially act as delegated monitors improving bank transparency is thus crucial.

Second, the US banking industry is strictly regulated by multiple agencies at the federal and state levels, which could potentially lessen the influence of monitoring by institutional shareholders and reduce the power of our empirical tests.[5] Therefore, any significant association detected in our empirical analysis would provide convincing evidence of the effect of institutional shareholdings on bank transparency. Third, institutional shareholders hold on to their investments in bank stocks for longer periods, compared to other stocks (see Section 3.3) and could thus be more motivated to monitor banks (Fitch et al., 2015).

Finally, the debate on whether transparency is a necessary condition for bank stability is ongoing between academics, regulators and professionals (Bouvard et al., 2015; Goldstein & Sapra, 2013); therefore, a study on the association between institutional investors' horizons and bank transparency is relevant and important. Our study aids this debate by providing evidence on the relationship between institutional investors' horizons and bank crash risk. Additionally, the provided understanding of which equity investors favor bank transparency could be factored into prudential bank regulation, such as the Pillar 3 disclosure framework of the Basel Accords, which seeks to promote market discipline through regulatory disclosure requirements (BCBS, 2017).

[4] For instance, in 2012, 3 years after the crisis, JPMorgan Chase was accused of falsely reporting a trading loss of $6 billion and making false disclosures (Silver-Greenberg & Protes 2013).

[5] The Federal agencies responsible for the regulation of the banking system include the Federal Reserve System, Comptroller of the Currency, the Federal Deposit Insurance Corporation, the Federal Reserve System, the National Credit Union Administration and the Office of Thrift Supervision.

We test our conjectures using an unbalanced panel of 10,783 bank-year observations for 1421 US bank holding companies (BHCs) from 1994 to 2020. We classify ST and LT institutional shareholders based on their portfolio churn ratio (e.g., Harford et al., 2018; Yan & Zhang, 2009) and examine the relations between ST and LT institutional shareholdings (LIS) and bank transparency. Distinct from prior studies on bank transparency, we examine three dimensions of transparency: information asymmetry between managers and outsiders (i.e., disclosure quality), information asymmetry among equity investors (i.e., private information gathering) and use of private information intermediaries such as auditors (i.e., auditor fees). We consider discretionary loan loss provision (*DLLP*) as our main proxy of bank disclosure quality (Beatty & Liao, 2014). We find evidence that the disclosure quality of banks declines with SIS as *DLLP* increases by 74%.[6] By contrast, disclosure quality improves with LIS as *DLLP* decreases by 39%.

We use *idiosyncratic volatility* as our trading-based proxy of private information gathering (Armstrong et al., 2014; Boone & White, 2015; Ferreira & Laux, 2007). Unlike for ST shareholdings, we expect less private information gathering associated with LT shareholdings because improved disclosure quality with LT shareholdings effectively reduces information disparities between traders (Diamond & Verrecchia, 1991; Verrecchia, 2001), diminishes speculative trading by informed traders (Diamond, 1985) and discourages investors from pursuing costly private information (Diamond, 1985; Peng, 2005; Verrecchia, 2001). Interestingly, our results do not support any differential impact of investor horizons on private information gathering as we note *idiosyncratic volatility* decreases with both ST and LT shareholdings by 5.85%−6.75% and 6.55%−9.71%, respectively.

Next, we evaluate auditor total fees (Kinney & Libby, 2002) as a proxy for involving private information intermediaries. We predict that in contrast to ST shareholdings, banks with greater LT shareholdings pay lower fees to their auditors because both audit and litigation risks are generally lower with LT shareholding due to superior disclosure quality (Kanagaretnam et al., 2010). In addition, high-quality public financial reporting reduces the necessity to exert more audit effort to collect and verify information (Armstrong et al., 2014; Diamond, 1985; Verrecchia, 2001). While our prediction that audit fees would rise with ST shareholdings is supported by our findings, we do not observe the opposite effect for LT shareholdings. On the contrary, our analysis indicates an increase in auditor fees by 2% with LT shareholdings.

As a corollary, we also study the impact of investor horizon on bank stock price crash risk for two reasons. First, although increased bank transparency is typically perceived as beneficial for bank stability, it can also destabilize the banking system under certain conditions (Bouvard et al., 2015; Goldstein & Sapra, 2013). For example, Bouvard et al. (2015) contend that greater transparency enhances bank stability only during crises but diminishes it during normal times. Similarly, Goldstein and Sapra (2013) argue that more transparency could initiate bank runs because of possible coordination problems among unsecured depositors. Second, although hidden accumulated negative information temporarily inflates a firm's underlying value, it could eventually lead to a stock price crash when the information is finally revealed to the market (Jin & Myers, 2006). Therefore, we test whether more (less) rigorous monitoring with LT (ST) shareholdings is associated with lower (higher) future bank crash risk. In contrast to what was predicted, our research reveals that higher *ex-ante* LT (ST) shareholding is linked to increased (decreased) crash risk *ex-post*. This suggests that ST shareholdings may lead to reduced private information gathering, which in turn may contribute to lower crash risk.

Finally, we focus on bank board structure as a potential channel for *transparency*. Our analysis offers some evidence that banks with higher LT shareholdings strengthen board governance. We find that an increase in LT shareholding is associated with more independent directors, more female directors and smaller board size.

We conduct several robustness tests to address endogeneity concerns. One possibility is reverse causality. ST (LT) investors could be attracted to banks with less (more) transparency. There could also be unobservable time-varying factors that are omitted from the model; for instance, a Chief Executive Officer (CEO) who has captured the board could determine transparency at the bank as well as influence the conditions to attract more LT shareholders as opposed to ST shareholders. Although focusing on homogenous firms, that is, banks, reduces biases in fixed-effect

[6] The economic changes indicated here and in the rest of the paper are for a one standard deviation change in ST or LT shareholding.

estimates from such confounding factors, we address these potential concerns using two approaches: the two-stage least squares instrumental variable (2sls-IV) approach and propensity score-matched (PSM) regression.

We make at least four important contributions. First, we add to the emerging body of literature on bank transparency (e.g., Bushman & Williams, 2015; Jiang et al., 2016) by documenting robust effects of ST and LT shareholdings on bank transparency. Second, unlike prior research, we study three dimensions of bank transparency: information asymmetry between managers and outsiders (disclosure quality), information asymmetry among equity investors (private information gathering) and use of private information intermediaries (auditor fees). Previous bank studies examine only one dimension of bank transparency, *DLLP*, as the main proxy for disclosure quality, and show that *DLLP* decreases with geographic distance between banks and regulatory field offices (Lim et al., 2017) and increases with competition (Burks et al., 2018; Jiang et al., 2016) and board independence (Cornett et al., 2009). Third, we contribute to the recent debate on whether greater bank transparency undermines bank stability by being the first to document that the effect of bank transparency on bank stability is conditional on the institutional investor horizon. For instance, we show that ST shareholdings are associated with lower crash risk.

Finally, our research makes a significant contribution to understanding the diverse influence of institutional shareholders on bank activities. Specifically, we emphasize the relevance of investor horizons in relation to bank transparency. Previous studies examining the shareholdings of banks have indicated that ST shareholdings have an impact on both bank risk and performance (Garel & Petit-Romec, 2017; Livne et al., 2013; Pathan et al., 2021). While our study shares similarities with Pathan et al. (2021) in terms of our measurement of investor horizons, it extends their findings by placing a significant focus on bank transparency. Additionally, we explore other essential dimensions, which are thoroughly detailed in Table S1.

We structure the rest of the paper as follows. We discuss the conceptual framework and present the hypotheses in Section 2, describe the empirical method in Section 3, discuss the results of the main tests and robustness tests in Section 4 and Section 5, respectively, present the results of additional analyses in Section 6, and conclude the study in Section 7.

2 | CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

2.1 | Conceptual framework

In recent times, pension and mutual funds (typifying an LT investor focus), along with hedge funds (typifying a more ST investor focus) have become more active investors. The change in the mix of shareholdings toward activism and the growing engagement of LT shareholders with their investee boards has attracted attention across many quarters—including, media, the public and academics. In this regard, several existing studies highlight the differential roles taken by ST versus LT investors on corporate policy and governance decisions.

On one hand, bank transparency is likely to increase with LT shareholdings for several important reasons. First, a growing number of studies find LT shareholders to be active monitors (Appel et al., 2016) because the fact that they cannot "vote with their feet" gives them incentives to influence managerial actions in multiple ways, such as proxy voting and direct engagement with management. A necessary pre-condition for monitoring managers is better access to information (Bushman, 2016; Bushman & Williams, 2012; Freixas & Laux, 2012), and hence LT shareholders would demand greater bank transparency to empower themselves as effective monitors. In this instance, Huang and Petkevich (2016) present that LT shareholders prefer value-enhancing information as they prefer internal funds, dislike external equity financing and preserve investments in LT assets. Second, transparency enhances the LT stability of banks, which allows LT shareholders to reap the benefits in the long-run (Acharya & Ryan, 2016). Third, with their large stakes, LT shareholders improve monitoring (Appel et al., 2016; R. Wang, 2021), which eventually reduces information asymmetry (Armstrong et al., 2014). In this regard, R. Wang (2021) demonstrates that the promptness of loss recognition diminishes notably when a firm's LT shareholders are distracted by unrelated extreme-performing indus-

tries in their portfolios. According to McCahery et al. (2016), LT shareholders, like other investors, monitor through both "exit" and "voice," often as complements to each other. Given that over 90% of US banks are diffusely owned, LT shareholders are likely to play a vital role in monitoring bank management (Caprio et al., 2007). Several recent public interventions, such as activist investor and LT institutional shareholder Nelson Peltz's call for board representation at the Bank of New York Mellon, provide observable evidence of the interaction between LT institutional shareholders and bank management (De la Merced, 2014).[7] Finally, LT shareholders demand greater transparency because their strong need for stock liquidity increases with transparency, and greater transparency is also linked to low transaction costs (Schoenfeld, 2017).

A growing body of studies also note that LT shareholders are more likely to hold shares in multiple firms within the same industry (termed as common ownerships). The managers of these commonly owned firms recognize the anti-competitive incentives of common owners and behave in ways to increase the portfolio value of common owners. Accordingly, following Park et al. (2019), we could argue for a positive association between LT shareholders and disclosure quality because of (i) potentially reduced proprietary cost concerns of disclosure and (ii) incentivizing firms to "internalize" the externality benefits of their disclosure for co-owned peer firms through improve liquidity and lower cost of capital for both disclosing firms and other co-owned firms within the same industry (Admati & Pfleiderer, 2000).

On the other hand, we have two reasons to suggest that bank transparency decreases with SIS. First, ST investors such as hedge funds have less incentive to incur costs to improve monitoring as they are less likely to invest for long enough to recover the costs of their monitoring efforts (Cremers et al., 2020; Livne et al., 2013; Pathan et al., 2021; Stein, 1989). In this regard, Lin et al. (2013) show that weakened monitoring reduces transparency. Second, ST shareholders prefer and benefit from decreased transparency (Maffett, 2012). For instance, their potential to gain from trading decreases with bank transparency (Ke et al., 2008). Managers of firms with ST shareholders are pressured to boost ST earnings, often at the cost of long-run fundamental firm value, because ST shareholders are also more likely to sell their shares following a stock price drop (Cella et al., 2013). Besides, by threatening to "exit," ST shareholders could influence managers, even without following through (Stein, 1989). ST shareholders often pressure the board for managerial change, in a practice known as "voice" (Bolton et al., 2006; Bushee, 1998; Derrien et al., 2013; Graham et al., 2005; Stein, 1989). Thus, managers are more likely to cater to ST shareholders, especially in the absence of transparency, as is common in banks (Derrien et al., 2013). ST shareholders, however, increase return volatility via trading and appear to amplify market-wide negative shocks (Cella et al., 2013), which is risky for banks.

Prior empirical studies using non-bank samples offer evidence in support of our above two conjectures related to LT and ST shareholders. Particularly, previous non-bank studies show that LT shareholders improve monitoring, innovation efficiency, corporate social responsibility, financial reporting quality and firm performance (e.g., Boone & White, 2015; Harford et al., 2018; Nguyen et al., 2020); decreased crash risk (Callen & Fang, 2013); and less insider trading (Fu et al., 2020). With regards to ST shareholders, the empirical non-bank studies present that ST shareholders are associated with less debt financing and more cash holdings (Huang & Petkevich, 2016); greater litigation risk (Pukthuanthong et al., 2017); lower research and development expenditures, higher leverage and payout (Bushee, 1998; Cremers et al., 2020); lower bank financing (Cline et al., 2020) but better price support during downturns (Cheng et al., 2020); greater innovation efficiency (Brav et al., 2018) and lower credit spread (Switzer & Wang, 2017).

2.2 | HYPOTHESIS DEVELOPMENT

Because "transparency is a complex, multidimensional construct" (Bushman & Williams, 2015, p. 522), we use three dimensions of transparency—disclosure quality, private information gathering and use of private information intermediaries—to gauge the effects of ST and LT shareholdings on bank transparency.

[7] De la Merced, M. (2014, December 2), "Bank of New York Mellon Gives Board Seat to Nelson Peltz's Trian Fund." *New York Times*.

2.2.1 | Relation between investor horizon and disclosure quality

Information asymmetry between managers and outsiders is an important feature of banks. Publicly disclosed financial reports aim to reduce this information gap between insiders and outsiders (Armstrong et al., 2014; Bushman & Williams, 2015), which increases with the manipulation of financial reports (Beatty & Liao, 2014). Particularly, loan loss provisions (LLP), which are estimates of changes in future loan losses, are the most important accrual through which banks manipulate their earnings (Beatty & Liao, 2014; Kanagaretnam et al., 2004). The loan portfolio, which is usually a bank's largest asset, is opaque because banks lend based on private information. Accounting principles grant significant latitude to bank managers in determining LLP, which could potentially reduce the ability of outsiders to assess a loan portfolio's true value. The Securities and Exchange Commission's lawsuit against SunTrust Bank in 1998 for over-provisioning of loan loss is explicit evidence that banks use LLP to manage earnings (Jayaraman et al., 2019). Discretionary loan loss provisions (*DLLP*), which serve as a proxy of disclosure quality, measure the degree of information asymmetry between bank managers and outsiders.

Prior bank studies show that disclosure quality (as proxied by *DLLP*) improves with increased monitoring with greater independent directors (Cornett et al., 2009) and enhanced competition (Jiang et al., 2016). As per our conceptual framework, ST shareholders, as less motivated monitors, benefit from bank opacity and therefore have incentives to reduce disclosure quality. In contrast, as more motivated and capable monitors (Appel et al., 2016; Harford et al., 2018; McCahery et al., 2016; Pathan et al., 2021), we expect that LT shareholders improve disclosure quality. In addition, as LT shareholders hold diversified portfolio, the opportunity cost of gathering private information about a particular firm increases while the marginal benefits decrease. Compared to costly private information acquisition, public disclosure represents a cost-effective alternative information channel to reduce uncertainty about portfolio firms (Peng, 2005). Accordingly, we test the following two hypotheses:

Hypothesis 1A (H1A): Bank disclosure quality decreases with ST shareholdings.
Hypothesis 1B (H1B): Bank disclosure quality increases with LT shareholdings.

2.2.2 | Relation between investor horizon and private information gathering

Information asymmetry among equity investors could also deter bank transparency. One or more shareholders could possess private information about the firm's value, while uninformed shareholders have access only to public information. This information asymmetry among shareholders creates an adverse selection problem in the market, when privately informed shareholders trade on their private information.

As discussed in Section 1, unlike ST shareholders, LT shareholders have weakened incentives to gather private information about individual firms because the opportunity cost of gathering private information increases while marginal benefit decreases with their diversified portfolios. Prior studies indicate that richer public disclosure crowds out shareholders' private information search incentives (Brown & Hillegeist, 2007; Diamond, 1985). In this regard, Maffett (2012) shows that institutional shareholders involve more informed trading for firms with low transparency. Similarly, Bushee et al. (2003) present that firms with greater institutional shareholdings are less likely to hold open conference calls.

Further, private information gathering decreases with improved monitoring such as by independent directors (Armstrong et al., 2014; Ferreira & Laux, 2007). Taken together, as opposed to ST shareholders, we expect LT shareholders to involve reduced private information gathering due to the offsetting effect of increased public disclosure (Diamond, 1985; Verrecchia, 2001) and increased net cost of gathering private information for a large number of firms in a diversified portfolio. Hence, we propose the following hypotheses:

Hypothesis 2A (H2A): Private information gathering increases with ST shareholdings.
Hypothesis 2B (H2B): Private information gathering decreases with LT shareholdings.

2.2.3 | Relation between investor horizon and private information intermediaries

The third channel through which investor horizon can influence bank transparency is through private information intermediaries such as external auditors. Auditors aid in increasing bank transparency by improving disclosure quality (Kinney & Libby, 2002). Kanagaretnam et al. (2010) document a positive relationship between audit fees and *DLLP*, a measure of bank earnings opacity. Both the supply and demand views of auditing suggest a negative (positive) association between LT (ST) shareholdings and auditor fees. First, from the supply side, if disclosure quality increases (decreases) with LT (ST) shareholdings, auditors are likely to charge lower (higher) fees to reflect the lower (higher) audit and litigation risks associated with higher (lower) disclosure quality. In addition, high-quality public financial reporting with LT shareholders reduces the necessity to exert more audit effort to collect private information about banks and vice-versa for ST shareholders. Second, from the demand side, in contrast to ST shareholders, LT shareholders have less incentive to leverage on auditors' "fee dependence." Hence, LT shareholders are less willing to pay to influence auditors to accept low-quality financial reports. Given the above reasoning, we propose the following hypotheses:

Hypothesis 3A (H3A): Auditor fees increase with ST shareholdings.
Hypothesis 3B (H3B): Auditor fees decrease with LT shareholdings.

3 | EMPIRICAL SETTING

3.1 | Data sources and sample procedure

Our data are annual observations on publicly traded BHCs in the United States between 1994 and 2020. We assemble the required information on banks from three main databases: Compustat for accounting data, Thomson Reuters Institutional Holdings (13F) database (formerly CDA/Spectrum) for institutional shareholdings data, Center for Research in Security Prices for stock return data and Audit Analytics for auditor fees. We obtain social and economic demographic data such as gross domestic product and unemployment rate from the Bureau of Economic Analysis and DataStream, and data on the composition of the Russell 2000 index on 30 June, each year from FT Russell.

Our sample includes banks for which commercial banking is the main business, and we identify these commercial banks by requiring that their deposit figures are reported (Berger & Bouwman, 2013). The main analysis excludes observations in 2007, 2008 and 2009 to avoid contamination from sudden declines in shareholders' portfolio values and the intense regulatory, political and public attention during the financial crisis, which may have altered investors' sensitivities to transparency.[8] Our initial sample comprises 18,869 firm-year observations for 1906 US commercial banks from the Compustat database. We delete 2014 observations corresponding to the Global Financial Crisis (GFC) period (2007–2009) leaving us with a sample of 16,885 firm-year observations for 1885 US commercial banks. We further lose 3611 observations after merging this dataset with the Thomson Reuters Institutional Holdings (13F) database, obtaining a sample composed of 13,244 observations for 1554 banks. Finally, we eliminate 2461 observations for which we lack complete accounting information to build discretionary loan loss provision and control variables, leading to a final sample of 10,783 observations for 1421 unique banks between 1994 and 2020. The sample construction and filtering process are summarized in panel A of Table S2. The sample size differs for the various

[8] Our main results are robust to including these crisis period observations. See Table S9, panel A.

analyses due to matching on different sets of variables. Panel B of Table S2 shows that the bank-year observations are evenly distributed over time. Figure S1 shows that the annual frequency with which each bank appears in our sample is both right-skewed and right-truncated, indicating the exit of banks via acquisitions or failure during our sample period. It is worth mentioning that 29 banks have data available for almost the entire sample period, spanning 25 years. To provide more comprehensive information about our sampling procedure, we have included three additional tables in Tables S3–S5. Specifically, Table S3 displays the number of banks (339) that were active in 2020, as well as the number of banks (1082) that exited prior to 2020 in panel A. Panel B of Table S3 presents the annual distribution of banks that exited due to acquisition (1051 banks) and bankruptcy (31 banks). Table S4 provides detailed information on the mergers and acquisitions involving the sample banks, including the types of mergers in panel A, the country of origin in panel B and the industry classification in panel C of the acquirers. Last, Table S5 lists the 29 banks that remained active throughout our entire sample period, spanning from 1994 to 2020.

3.2 | Measuring transparency—Disclosure quality, private information gathering and auditor fees

Our primary proxy of disclosure quality is *DLLP*, which is estimated from the model proposed by Beatty and Liao (2014). To measure *DLLP*, we begin with the following original model of Beatty and Liao (2014):

$$\begin{aligned} LLP_{i,j,t} &= \eta + \Phi_1 \Delta NPL_{i,j,t+1} + \Phi_2 \Delta NPL_{i,j,t} + \Phi_3 \Delta NPL_{i,j,t-1} + \Phi_4 \Delta NPL_{i,j,t-2} \\ &+ \Phi_5 lnAssets_{i,j,t-1} + \Phi_6 \Delta LOAN_{i,j,t} + \varphi_1 CSRET_{j,t} \\ &+ \varphi_2 \Delta UNEMP_{j,t} + \varphi_3 \Delta GDP_{j,t} + \gamma_j + \delta_t + u_{i,j,t}, \end{aligned} \tag{1}$$

where the subscripts refer to bank *i*, state *j* and time *t*; variable definitions are in Table 1. Following Jiang et al. (2016), we also include state fixed effects (FEs) (γ_j) to eliminate any time-invariant state characteristics, such as state-specific bank regulations, that could potentially affect LLP. The dependent variable LLP is the amount of loan loss provisions that the bank recognizes each quarter to absorb potential loan defaults. Provisions for loan losses are announced each quarter. Given that loans are the primary investments for most commercial banks, this is among the most important information that banks release. But banks have historically exercised substantial discretion regarding how this expense is determined and when it is reported and may have incentives to under-provision or smooth provisions for loan losses to reduce the impact of negative information. We use a two-step procedure to construct and then utilize the *DLLP* measure. First, as shown in Table S7, we estimate the parameters of Equation (1) using 52,411 bank-quarter observations for 1536 different commercial banks during our 1994–2020 sample period, excluding the financial crisis years of 2007–2009. Second, we calculate *DLLP* as the absolute value of the four-quarter average of the regression residuals for each bank in each year. Larger values of *DLLP* indicate greater information asymmetry regarding the quality of the bank's assets, that is, less information disclosure.

Following Armstrong et al. (2014), Boone and White (2015) and Ferreira and Laux (2007), we consider idiosyncratic volatility as our primary proxy of private information gathering, which is based on R^2 from the following bank-specific regression:

$$R_{i,t} = \alpha + \beta_1 R_{m,t} + \beta_2 R_{m,t-1} + \beta_3 IND_{i,t} + \beta_4 IND_{i,t-1} + \varepsilon_{i,t}, \tag{2}$$

where $R_{i,t}$ is stock return of bank *i* on day *t*; $R_{m,t}$ is the value-weighted market return; and *IND* is the value-weighted financial industry return downloaded from the French Data Library. Since R^2 is bounded between zero and one, we define banks' relative idiosyncratic volatility as the logarithm of one minus R^2 divided by R^2 (i.e., $\log[(1 - R^2)/R^2]$). A higher value of this measure of idiosyncratic volatility reflects relatively more bank-specific private information being incorporated into stock prices by informed trading than public information (Roll, 1988).

TABLE 1 Variable definitions.

Label	Descriptions
Investor horizon proxies	(Source: Thomson Reuters Institutional Holdings [13F] Database [formerly CDA/Spectrum])
SIS	Four-quarter average of the proportion of total shares outstanding held by short-term (ST) institutional shareholdings, where investors are classified as ST according to Yan and Zhang's (2009) procedure (see Equation 3)
LIS	Four-quarter average of the proportion of total shares outstanding held by long-term (LT) institutional shareholdings, where investors are classified as LT according to Yan and Zhang's (2009) procedure (see Equation 3)
Churn ratio	Four-quarter average of the churn ratio for each shareholder, which is calculated following Gasper et al. (2005; see Equation 3)
TRA	Four-quarter average of the proportion of total shares outstanding held by TRA institutions as classified by Bushee (1998). TRA investors have ST horizon, high portfolio turnover, and greater diversification.
DED	Four-quarter average of the proportion of total shares outstanding held by dedicated institutions as classified by Bushee (1998). Dedicated investors have an LT horizon, low portfolio turnover and less diversification
QIX	Four-quarter average of the proportion of total shares outstanding held by QIX institutions as classified by Bushee (1998). QIX have a long-horizon, low portfolio turnover and greater diversification
Instrumental variables	(Source: Thomson Reuters Institutional Holdings [13F] Database [formerly CDA/Spectrum]) unless mentioned otherwise
Russell2000	A dummy variable that equals one if a bank is in the Russell 2000 index at the end of June in each year and zero otherwise (FTSE-Russell Investments)
Industry_SIS	The average of ST institutional shareholding (SIS) of all bank in year *t* excluding the SIS of bank *i*
Industry_LIS	The average of LT institutional shareholding (LIS) of all bank in year *t* excluding the LIS of bank *i*
Transparency proxies	(Source: Thomson First Call's Company Issued Guidance)
DLLP	Discretionary loan loss provision is calculated as the absolute value of the four-quarter average of the regression residuals from Equation (1) for each bank in each year
Idiosyncratic volatility	The logarithm of one minus R^2 divided by R^2 (i.e., $\log[(1-R^2/R^2]$ where R^2 is from the following bank-specific regression:$R_{i,t} = \alpha + \beta_1 R_{m,t} + \beta_2 R_{m,t-1} + \beta_3 IND_{i,t} + \beta_4 IND_{i,t-1} + \varepsilon_{i,t}$, where $R_{i,t}$ indexes stock returns of bank *i* in day *t*, $R_{m,t}$ is the value-weighted market return and *IND* is the value-weighted financial industry return downloaded from the French Data Library
LMSW C2	LMSW's C2 is obtained from the estimation of the following regression for each bank year:$R_{i,t} = CO_i + C1 \times R_{i,t-1} + C2 \times (R_{i,t-1} \times VOL_{i,t-1}) + e_{i,t}$, where $R_{i,t}$ indexes weekly stock returns of bank *i* in week *t*, *VOL* is the logarithm of stock turnover (= weekly trading volume/total shares outstanding), de-trended by subtracting a 26-weeks moving average of logarithmic turnover
ln*(Total_FEE)*	Natural log of total fees to the external auditor
Forecast frequency	The number of annual forecasts of earnings, cash flow or funds from operations
Forecast horizon	The number of days between the annual earnings forecast and the fiscal period-end divided by fiscal-period length (365)

(Continues)

TABLE 1 (Continued)

Label	Descriptions
Analyst following	The number of unique analysts on Thomson Reuters' I/B/E/S providing earnings forecasts for bank *i*
DLLP determinants	(Source: Compustat-Capital IQ and US Bureau of Economic Analysis)
ΔNPL	Change in non-performing assets over the quarter divided by beginning total loans
SIZE	The natural log of total assets in million U$
ΔLOAN	Change in total loans over the quarter divided by beginning total loans
CSRET	The return on the S&P/Case-Shiller US National Home Price Index over the quarter
ΔUnemployment	Change in unemployment rates over the quarter
ΔGDP	Change in gross domestic product (GDP) over the quarter
Crash risk proxies	(Source: Center for Research in Security Prices [CRSP])
NCSKEW	The ratio of the negative of the third moment for bank *i*'s weekly stock returns to the standard deviation of bank *i*'s weekly returns raised to the power of three
DUVOL	The natural logarithmic of the ratio of the standard deviations of the "down" and "up" weeks. A down (up) week for a bank *i* is the week with bank *i's* weekly stock returns lower (greater) than the annual mean
CRASH	A dummy variable that equals one for a bank-year if the bank experiences weekly stock returns falling 3.09 standard deviations below the mean weekly stock return for that year and zero otherwise
Controls	(Sources: Bank Regulatory Database [FRB of Chicago] and ISS [formerly RiskMetrics])
ln*(Assets)*	The natural logarithm of the book value of total assets
Loan loss provision	The ratio of the loan loss provisions to total loans
Charter value	The market value of equity plus the book value of liabilities divided by the book value of total assets
LOSS	A dummy variable that equals one if the net income is negative in a bank year and zero otherwise
Non-interest income	Total non-interest income divided by the sum of interest income and non-interest income
Revenue growth	The growth in total revenue from the beginning of year $t-1$ to the beginning of year t
Equity ratio	The ratio of the book value of equity to total assets
Liquidity proxies	(Source: CRSP if not mentioned otherwise)
Turnover	The daily trading volume divided by the outstanding shares averaged over the year
Dollar volume (mil. $)	The daily trading volume multiplied by the closing price averaged over the year
Board structure	(Source: DEF 14A proxy statements)
ln*(Board size)*	Natural logarithm of board size where boar size is the total number of directors in a bank board
%Independent directors	The total number of independent directors as a percentage of board size
%Female directors	The number of female directors as a percentage of board size

Following prior studies, we focus on total fees paid to an external auditor for their services (*Total_FEE*; Kanagaretnam et al., 2010; Kinney & Libby, 2002). We take the natural logarithm of *Total_FEE* to smooth the variables. We obtain audit fee data from Audit Analytics.

3.3 | Measuring and validating investor horizon

We use a three-step procedure to construct the *investor horizon* (i.e., ST and LT shareholdings) measure. First, we calculate the following *churn ratio* for shareholder *i* in the set of companies denoted by *Q* in their portfolio at quarter *t*[9]:

$$Churn\ ratio_{i,t} = \frac{\sum_{j \in Q} |N_{j,i,t}P_{j,t} - N_{j,i,t-1}P_{j,t-1} - N_{j,i,t-1}\Delta P_{j,t}|}{\sum_{j \in Q} \frac{N_{j,i,t}P_{j,t} + N_{j,i,t-1}P_{j,t-1}}{2}}. \quad (3)$$

where $P_{j,t}$ represents the price of a share of company *j* at quarter *t*, and $N_{j,i,t}$ represents the number of shares held by shareholder *i* in company *j* at quarter *t*. To minimize the influence of an extreme churn ratio in any given quarter, we use the mean of the churn ratios over the past four quarters (Yan & Zhang, 2009). The mean churn ratio of shareholders that have at some point invested in our sample banks is 0.22, which is significantly less than the mean churn ratio of 0.35 observed by Cella et al. (2013). This suggests that the horizon of shareholders in banks is longer. Second, we sort shareholders into terciles each quarter, based on the average churn ratio. We adopt Yan and Zhang's (2009) approach and classify institutional shareholders as LT if they fall within the bottom tercile and as ST if they fall within the top tercile. Third, we compute SIS as the proportion of total outstanding shares held by ST shareholders and LIS as the proportion of total outstanding shares held by LT shareholders.[10] Figure S2 shows that the means of both ST and LT shareholdings are relatively stable and that LT shareholdings generally remain higher than ST shareholdings after the year 2002.

3.4 | Summary statistics

From Table 2 of summary statistics, we note that the mean LT shareholdings (*LIS*) of 11.6% is greater than the mean of 6.56% in Yan and Zhang (2009), which indicates that LT shareholders hold more shares for our sample banks. The mean ST shareholdings (*SIS*) of 5.9%, however, is comparable to the 7.91% mean for all firms in Yan and Zhang (2009). We do not discuss the summary statistics of the other bank-specific variables for brevity.

Table S6 presents the Pearson pair-wise correlation matrix between continuous variables. The correlation coefficients between investor horizon and transparency proxies offer some evidence consistent with our expectations. For example, the correlation between LIS and disclosure quality measures such as DLLP is significantly negative. The largest correlation coefficient among regressors, which is between the log transformation of bank total assets (*ln Assets)* and LT investors shareholdings (*LIS*), is 0.63. However, in a multivariate setting, the average variance inflation factor (a post-estimation measure) of 3.78 suggests that multicollinearity among the regressors is not a concern.

3.5 | Empirical model and estimation techniques

We use the following regression model to empirically test our two main conjectures that bank transparency decreases with ST shareholdings and increases with LT shareholdings:

$$Transparency_{i,t} = \alpha_i + \beta' Investorhorizon_{i,t-1} + "'X_{i,t-1} + \delta_t + \varepsilon_{i,t}, \quad (4)$$

[9] We compute the churn rate based on every stock in the investors' portfolios rather than the churn rate on their holdings of bank stocks. By computing investor turnover across the entire portfolio, this evens out the effect of firm-specific shocks to the investors' holding periods. This measurement rests on the intuitive notion that an LT investor will hold their stock positions for a substantially greater length of time when compared with an ST investor who buys and sells frequently.

[10] We also use the Bushee (1998) classification of shareholder horizon as a robustness check in Section 5.1.

TABLE 2 Summary statistics.

	Obs.	Mean	Std dev	25th percent	Median	75th percent
Investor horizon proxies						
SIS	10,783	0.0593	0.0650	0.0052	0.0370	0.0953
LIS	10,783	0.1160	0.1068	0.0270	0.088	0.1777
TRA	10,783	0.0541	0.0665	0.0024	0.0266	0.0845
DED- QIX	10,783	0.2121	0.1839	0.055	0.1656	0.3345
Instrumental variables						
Russell2000	10,783	0.1402	0.3472	0	0	0
Industry_SIS	10,783	0.0564	0.0184	0.039	0.054	0.0686
Industry_LIS	10,783	0.1102	0.0528	0.0681	0.0912	0.1663
DLLP determinants (quarterly data)						
ΔNPL	52,411	0.0001	0.0129	−0.0012	−0.0001	0.0011
SIZE	52,411	7.5508	1.7198	6.3718	7.2004	8.4128
ΔLOAN	52,411	0.0282	0.0889	−0.0022	0.0167	0.0397
CSRET	52,411	0.0112	0.0209	−0.0011	0.0124	0.0261
ΔUnemployment	52,411	0.0137	0.2832	−0.0408	−0.0175	0.0192
ΔGDP	52,411	0.011	0.0132	0.0081	0.0116	0.0158
Transparency proxies						
DLLP	10,783	0.0015	0.0020	0.0004	0.0009	0.0017
Idiosyncratic volatility	10,487	2.2754	1.8650	0.6152	2.4263	3.8295
LMSW C2	10,408	0.01853	0.10182	−0.03111	0.01928	0.07214
ln*(Total_FEE)*	7473	12.9110	1.2534	12.0629	12.725	13.552
Crash risk proxies						
NCSKEW	10,374	0.0103	0.031	−0.0003	0.00006	0.0042
DUVOL	10,369	0.1245	0.4085	−0.1369	0.0938	0.3322
CRASH	10,385	0.2784	0.4482	0	0	1
Mgt forecast and other proxies						
Forecast frequency	7653	2.484	1.216	1.609	2.565	3.367
Forecast horizon	7653	0.851	0.206	0.836	0.923	0.940
ln*(1+Analyst following)*	7653	1.447	0.967	0.693	1.387	2.080
Controls						
ln*(Assets)*	10,783	7.4989	1.6499	6.3476	7.1716	8.367
Loan loss provision	10,783	0.00515	0.0077	0.00123	0.002905	0.005719
Charter value	10,783	1.0389	0.06420	0.9975	1.031	1.073
LOSS	10,783	0.0653	0.247	0	0	0
Non-interest income	10,783	0.2117	0.1326	0.1244	0.1947	0.2760
Revenue growth	10,783	0.1038	0.1901	−0.0133	0.0714	0.1741
Equity ratio	10,783	0.0986	0.0321	0.0781	0.0932	0.1126

(Continues)

TABLE 2 (Continued)

	Obs.	Mean	Std dev	25th percent	Median	75th percent
Liquidity proxies						
ln(*Turnover*)	10,510	−6.311	0.8543	−6.929	−6.302	−5.714
ln(*Dollar volume*)	10,510	12.906	2.384	11.016	12.631	14.472
Board structure						
ln(*Board size*)	2603	0.667	0.180	0.6	0.667	0.8
%Independent directors	2603	0.075	0.1176	0	0	0.1667
%Female directors	2603	1.714	0.1900	1.609	1.609	1.7918

Note: This table reports the summary statistics for the full sample of banks from 1994 to 2020, excluding the crisis period (2007–2009). All variables are defined in Table 1.

where *i* indexes banks and *t* indexes time in years; $Transparency_{i,t}$ is proxied by three different sets of measures: disclosure quality, private information gathering and auditor fees; $Investorhorizon_{i,t-1}$ is a vector of *SIS* and *LIS or churn_ratio*; ***X*** is a vector of seven control variables: ln(*Assets*), *LLP*, *charter value*, negative net income indicator (*LOSS*), *non-interest income*, *revenue growth* and *equity ratio*. Definitions of all these variables are in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles to mitigate the potential effects of extreme values. Our model also includes bank fixed-effects (α_i) and year fixed-effects (δ_t) and adjusts for heteroskedastic robust standard errors clustered at the bank level ($\varepsilon_{i,t}$).

The banking literature suggests that investor horizon is unlikely to be exogenous to bank transparency due to reverse causality and omitted variable bias (e.g., Cornett et al., 2009; Huizinga & Laeven, 2012; Jiang et al., 2016; Laeven & Levine, 2009; Pathan et al., 2021). We address these endogeneity concerns *ex-ante* in our main estimation technique—by including bank fixed-effects estimation, a wide-selection of control variables and year fixed-effects and lagging all explanatory variables by 1 year. However, to strengthen causal inferences, we adopt two additional techniques: 2sls-IV and PSM analysis.

3.5.1 | 2sls-IV

We use three instruments for *investor horizon*, all of which have been used in prior studies as instruments for institutional shareholdings (e.g., Appel et al., 2016; Cremers et al., 2020; Harford et al., 2018; Laeven & Levine, 2009; Pathan et al., 2021). The first instrument is the indicator variable $Russell2000_{i,t-1}$, which equals 1 if bank *i* is a constituent of the Russell 2000 index in the reconstitution year $t-1$. Index inclusion is shown to be directly related to both ST and LT shareholdings (Appel et al., 2016; Cremers et al., 2020; Harford et al., 2018; Pathan et al., 2021), although we have no a priori expectation about the direction in which *SIS* and *LIS* will vary with *Russell2000*. The second instrument is the average shareholdings by ST institutional shareholders at all other banks (*Industry_SIS*), which we expect to be positively associated with *SIS* and negatively with *LIS*. The third instrument is the average shareholdings by LT institutional shareholders at all other banks (*Industry_LIS*), which we project to be negatively associated with *SIS* and positively with *LIS*. The last two instruments (*Industry_SIS*, *Industry_LIS*) assume that they cover industry and national environments, such as property prices and banking regulations, which help determine *investor horizon* levels (Laeven & Levine, 2009).

Our 2sls-IV estimation relies on the assumption that, after conditioning on bank characteristics, the *Russell2000*, *Industry_SIS* and *Industry_LIS* are associated with a significant change in *SIS* or *LIS* (relevance condition) but do not directly affect our *transparency* proxies except through their effect on *SIS* or *LIS* (exclusion condition). We validate the relevance condition in our first-stage estimations as shown in Table S8; the coefficients on all three of the instruments are statistically significant with expected signs, and the standard diagnostic tests give us confidence that the model

is neither under-identified nor weakly identified. Regarding satisfying the exclusion condition, it is unclear why index inclusion would be directly related to bank transparency after robustly controlling for factors that determine index inclusion, such as banks' market capitalization. Similarly, the transparency of one bank is unlikely to be influenced by changes in the ST or LT shareholding levels of other banks, hence satisfying the exclusion condition. However, if changes in the national bank information environment affect bank ownership across all banks, then these two instruments will not reduce endogeneity bias. This possibility is not very compelling because bank ownership structure has been shown to be sticky over time and is not correlated across banks within a country (Laeven & Levine, 2009). Like Harford et al. (2018), however, we do not restrict our sample surrounding the Russell 1000/2000 cut-off to increase our sample size; this means that there will be enough variation in our variables of interest as well as improvement in the external validity of our estimates.

3.5.2 | PSM analysis

To mitigate any potential sample selection bias in our fixed-effect estimates, we utilize PSM regression. Specifically, we conduct a regression analysis of matched samples of banks with high and low levels of shareholders' turnover, which is measured as the weighted average of the bank shareholders' churn ratio. To accomplish this, we create a treatment group consisting of banks with high levels of shareholders' churn ratio and a control group of banks with low levels of shareholders' churn ratio, based on the median churn ratio in each year. We then synthetically match each treated bank with a non-treated bank that shares similar characteristics using the nearest-neighbor matching strategy without replacement and employ the matched observations as the samples for our regressions. In this way, we remove concerns that our results are influenced by systematic differences in the values of the model covariates between banks with high and low average shareholders' churn ratio.

4 | MAIN RESULTS

Tables 3–5 report the results of Equation (4) using three estimation techniques: FEs in column 1, 2sls-IV in column 3 and PSM regression in column 3 that relates the three measures of bank transparency, that is, disclosure quality, private information gathering and auditor fees, to investor horizon. We discuss these results in Sections 4.1, 4.2 and 4.3.

4.1 | Results for disclosure quality (hypotheses H1A and H1B)

Table 3 shows the relationship between investor horizon (ST and LT shareholdings) and *DLLP* as our proxy of disclosure quality using three estimation techniques. The estimates in the first two columns show that the coefficient on *SIS* is significantly positive with 2sls-IV estimation in column 2. This indicates that a one standard deviation increase in ST shareholdings is associated with a 74% increase in absolute discretionary loan loss provision.[11] This result provides some support for hypothesis H1A that bank *disclosure quality* decreases with ST shareholdings. The significant negative coefficient on *LIS* in the first two columns indicates that a one standard deviation increase in LT shareholdings is associated with a 39% decrease in DLLP. This result lends strong support to hypothesis H1B that bank *disclosure quality* increases with LT shareholdings.

[11] The economic significance of an estimate is computed as the change in a *transparency* proxy, compared to its respective mean value in response to a one standard deviation increase in *SIS* (i.e., by 6.5%) or *LIS* (i.e., by 10.7%). For instance, the result for *SIS* is calculated as (0.065 × 0.00165)/0.0015 = 73.58%, where 0.065 is the standard deviation of *SIS*, 0.00165 is the regression coefficient on *SIS* and 0.0015 is the mean value of *DLLP*.

TABLE 3 *Investor horizon* and bank disclosure quality.

	(1)	(2)	(3)
	Fixed-effect (FE)	Two-stage least squares instrumental variable (2sls-IV)	Propensity score-matched (PSM)
SIS_{t-1}	−0.0006	0.0165***	
	(−1.64)	(8.21)	
LIS_{t-1}	−0.0011***	−0.0053***	
	(−3.67)	(−5.31)	
Churn ratio $_{t-1}$			0.000312***
			(5.12)
$\ln(Assets)_{t-1} \times 10^{-3}$	0.1*	0.1	−0.0853***
	(1.68)	(1.60)	(−4.24)
Loan loss provision $_{t-1}$	0.0818***	0.0818***	0.0834***
	(23.94)	(21.68)	(17.90)
Charter value $_{t-1}$	−0.0012***	−0.0037***	−0.00137***
	(−2.83)	(−9.70)	(−2.66)
$LOSS_{t-1}$	0.0009***	0.0011***	0.00130***
	(9.94)	(10.68)	(9.64)
Non-interest income $_{t-1}$	0.0008***	0.0011***	0.000211
	(3.81)	(5.13)	(0.83)
Revenue growth $_{t-1}$	−0.0009***	−0.0010***	−0.00130***
	(−8.03)	(−9.01)	(−8.05)
Equity ratio $_{t-1}$	−0.0032***	−0.0057***	−0.00144
	(−3.65)	(−5.43)	(−1.56)
Constant	0.0021***		0.00307***
	(3.59)		(5.54)
Bank and Year FE?	Yes	Yes	Yes
Adj. R^2	0.169	−0.0119	0.238
Observations	10,783	10,650	4136
Model diagnostic tests:			
F-test for instruments		311.6***	
Sanderson–Windmeijer X^2 test for under-identification		376.7***	
Sanderson–Windmeijer *F*-test for weak identification		130.7***	
Hansen *J-stats* for endogeneity		0.00293	

Note: This table presents the results of Equation (4) estimated using panel FE in column 1, 2sls-IV in column 2 and PSM regression in column 3. The dependent variable is financial disclosure quality, measured as *discretionary loan loss provisions* (*DLLP*) from Equation (1). *Investor horizon* is measured as *Short-term institutional shareholding* (*SIS*) and *Long-term institutional shareholding* (*LIS*) in the first two columns and *Churn ratio* in column 3. Each regression controls for seven covariates (X_{it}): ln(*Assets*), *Loan loss provision*, *Charter value*, a loss indicator *(LOSS)*, *Non-interest income*, *Revenue growth* and *Equity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample includes 10,783 bank-year observations of 1421 US listed commercial banks from 1994 to 2020, excluding the financial crisis years of 2007–2009. Robust standard errors in parentheses are clustered at the bank level. *t*-statistics are in parenthesis.

*, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

TABLE 4 *Investor horizon* and private information.

	(1) FE	(2) 2sls-IV	(3) PSM
SIS_{t-1}	−2.0474***	−2.3643**	
	(−9.89)	(−2.21)	
LIS_{t-1}	−2.0702***	−1.3964***	
	(−12.86)	(−2.63)	
Churn ratio $_{t-1}$			−0.0379
			(−1.10)
$\ln(Assets)_{t-1} \times 10^{-3}$	−0.6269***	−1.1275***	−0.862***
	(−21.48)	(−29.49)	(−72.99)
Loan loss provision $_{t-1}$	1.5725	−7.5899***	−0.0356
	(0.87)	(−3.90)	(−0.01)
Charter value $_{t-1}$	−3.6193***	−3.6738***	−3.152***
	(−15.45)	(−18.38)	(−10.25)
$LOSS_{t-1}$	0.2050***	0.2010***	−0.166**
	(4.10)	(3.70)	(−2.03)
Non-interest income $_{t-1}$	0.0859	−0.3922***	−0.144
	(0.77)	(−3.31)	(−1.00)
Revenue growth $_{t-1}$	−0.1341**	0.3191***	−0.272***
	(−2.33)	(5.57)	(−2.87)
Equity ratio $_{t-1}$	−7.0467***	−7.7560***	−8.683***
	(−16.09)	(−14.82)	(−17.30)
Constant	12.7278***		13.01***
	(40.27)		(39.63)
Bank and Year FE?	Yes	Yes	Yes
Adj. R^2	0.435	0.337	0.580
Observations	11,831	11,686	4616
Model diagnostic tests:			
F-test for instruments		789.0***	
Sanderson–Windmeijer X^2 test for under identification		403.2***	
Sanderson–Windmeijer *F*-test for weak identification		139.7***	
Hansen *J-stats* for endogeneity		23.53	

Note: This table presents the results of Equation (4) estimated using panel FE in column 1, 2sls-IV in column 2 and PSM regression in column 3. The dependent variable is private information gathering, measured as *Idiosyncratic volatility*. *Investor horizon* is measured as *SIS* and *LIS*)in the first two columns and *Churn ratio* in column 3. Each regression controls for seven covariates (X_{it}): ln(*Assets*), *Loan loss provision*, *Charter value*, a loss indicator *(LOSS)*, *Non-interest income*, *Revenue growth* and *Equity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample includes 11,831 bank-year observations of 1520 US listed commercial banks from 1994 to 2020, excluding the financial crisis years of 2007–2009. Robust standard errors in parentheses are clustered at the bank level. *t*-statistics are in parenthesis.
*, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

TABLE 5 *Investor horizon* and auditor fees.

	(1) FE	(2) 2sls-IV	(3) PSM
SIS_{t-1}	−0.0618	2.4254***	
	(−0.60)	(4.94)	
LIS_{t-1}	0.1397*	2.5221***	
	(1.82)	(9.70)	
Churn ratio $_{t-1}$			0.0499***
			(2.77)
$\ln(Assets)_{t-1} \times 10^{-3}$	0.4469***	0.3751***	0.679***
	(29.35)	(15.43)	(106.69)
Loan loss provision $_{t-1}$	1.2748	0.9869	1.654
	(1.48)	(1.03)	(1.18)
Charter value $_{t-1}$	0.3988***	0.0214	−0.341**
	(3.52)	(0.19)	(−2.13)
$LOSS_{t-1}$	0.0697***	0.1310***	0.277***
	(2.95)	(4.89)	(6.90)
Non-interest income $_{t-1}$	0.2895***	0.3099***	0.628***
	(4.21)	(4.06)	(8.14)
Revenue growth $_{t-1}$	0.0605**	0.0701**	0.186***
	(2.06)	(2.33)	(3.84)
Equity ratio $_{t-1}$	0.9532***	−0.1710	1.863***
	(4.26)	(−0.59)	(6.89)
Constant	7.9972***		7.684***
	(18.79)		(45.38)
Bank and Year FE?	Yes	Yes	Yes
Adj. R^2	0.424	0.248	0.816
Observations	8168	8105	3164
Model diagnostic tests:			
F-test for instruments		252.4***	
Sanderson–Windmeijer X^2 test for under-identification		372.1***	
Sanderson–Windmeijer *F*-test for weak identification		130.7***	
Hansen *J-stats* for endogeneity		0.01	

Note: This table presents the results of Equation (4) estimated using panel FEin column 12sls-IV in column 2 and PSM in column 3. The dependent variable is audit fee, measured as ln(*Total_FEE*). *Investor horizon* is measured as *SIS* and *LIS* in columns 1, 2, 4, and 5 and *Churn ratio* in columns 3, and 6. Each regression controls for seven covariates (X_{it}): ln(*Assets*), *Loan loss provision*, *Charter value*, a loss indicator (*LOSS*), *Non-interest income*, *Revenue growth* and *Equity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample includes 8,168 bank-year observations of 1082 US listed commercial banks from 1994 to 2020, excluding the financial crisis years of 2007–2009. Robust standard errors in parentheses are clustered at the bank level. *t*-statistics are in parenthesis.

*, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

The PSM regression results for *disclosure quality* in column 3 where the investor horizon is proxied by *churn ratio* provide robust results. Particularly, the significant positive coefficient on *churn ratio* ($p < 0.01$) reinforces our inferences from FE and 2sls-IV estimations in the first two columns of Table 3 that bank *disclosure quality* weakens with ST shareholdings. In sum, the evidence suggests that the effect on disclosure differs by investor horizons.

The control variable coefficients are statistically significant in most of the models and generally have the expected signs. For example, the significant positive coefficients on *Loan loss provision*, *LOSS* and *Non-interest income* suggest that provisions for loan losses, poor performance and non-traditional banking activities are negatively associated with bank *disclosure quality*. On the other hand, the significantly negative coefficients on *Charter value* and *Equity ratio* indicate that market discipline and regulatory intensity are positively associated with *disclosure quality*.

4.2 | Results for private information gathering (hypotheses H2A and H2B)

Table 4 presents the results relating investor horizon to *Idiosyncratic volatility*, our main proxy of private information gathering. The coefficients on *SIS* are significantly negative in the first two columns indicating that a one standard deviation increase in ST shareholding is associated with a 5.85%–6.75% decrease in idiosyncratic volatility. These results do not support our hypothesis H2A that private information gathering increases with ST shareholdings. One potential reason for such a finding could be that bank-specific regulation might refrain ST shareholders from gathering private information to benefit from their trading. Regarding LT shareholdings, the significantly negative coefficients on *LIS* in both columns indicate that a one standard deviation increase in LT shareholding is associated with a 6.55%–9.71% decline in *idiosyncratic volatility*. These results lend strong support to hypothesis H2B that private information acquisition decreases with LT shareholdings.

The coefficient on *churn ratio* in column 3 from PSM analysis is negative but insignificant suggesting no distinct impact of investor horizon on bank private information gathering. This insignificant coefficient on *churn ratio* is consistent with the estimates of SIS and LIS in the first two columns of Table 3 that bank *private information gathering* decreases with both ST and LT shareholdings. Overall, in contrast to non-bank studies, we fail to observe the differential impact of ST and LT shareholdings on private information gathering.

4.3 | Results for auditor fees (hypotheses H3A and H3B)

Table 5 presents the results relating ST and LT shareholdings to total and audit-related fees paid to external auditors of banks. The coefficient on *SIS* is significantly positive with 2sls-IV estimations (columns 2), indicating that a one standard deviation increase in ST shareholdings is associated with a 1% increase in total fees. This result offers some support for hypothesis H3A that, among other reasons, fees paid to auditors increase with ST shareholdings as a reward for high audit and litigation risks with inferior disclosure quality (Kanagaretnam et al., 2010).

Regarding LT shareholdings, the significantly positive coefficients on *LIS* in both columns (columns 1 and 2) suggest that a one standard deviation increase in LT shareholdings is associated with a 2% increase in total fees (economic magnitude is based on 2sls-IV estimates). These results do not support our last hypothesis H3B that auditor fees decrease with LT shareholdings. One potential interpretation of this observation could be that high audit fees with LT shareholdings signal the high quality of audit as argued in prior audit fee literature (Moon et al., 2019).

The coefficient on *churn ratio* in both columns 3 from PSM analysis is significantly positive conveying that the positive impact of ST shareholdings dominates the impact of LT shareholdings on audit fees. Therefore, this significant coefficient on *churn ratio* is consistent with our anticipation that bank *audit fees* increase (decrease) with ST (LT) shareholdings.

TABLE 6 Alternative measures of *investor horizon*.

Dependent variables	(1) *DLLP*	(2) *Idiosyncratic volatility*	(3) ln(*Total_FEE*)
TRA_{t-1}	−0.0002	−1.9972***	−0.0723
	(−0.46)	(−9.87)	(−0.77)
QIX_DED_{t-1}	−0.0009***	−1.7223***	0.0544
	(−4.33)	(−16.48)	(1.08)
Bank and Year FE?	Yes	Yes	Yes
Adj. R^2	0.169	0.442	0.424
Observations	10,783	11,831	8168

Note: This table presents the results of Equation (4) estimated using panel FE where *investor horizon* is measured as Bushee's *Transient Institutional Shareholding* (*TRA*) and sum of *Quasi-Indexer Shareholding* and *Dedicated Institutional Shareholding* (*QIX_DED*). The dependent variable (*transparency*) is disclosure quality measured by *Discretionary loan loss provisions* (*DLLP*); private information gathering measured by *Idiosyncratic volatility*; and auditor fees measure by *total auditor fees* (*Total_FEE*). Each regression controls for seven covariates (X_{it}): ln*(Assets)*, *Loan loss provision*, *Charter value*, a loss indicator *(LOSS)*, *Non-interest income*, *Revenue growth* and *Equity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The samples include 10,783 bank-year observations of 1421 US listed commercial banks, 11,831 bank-year observations of 1520 US listed commercial banks and 8168 bank-year observations of 1082 listed commercial banks from 1994 to 2020, excluding the financial crisis years of 2007–2009. Robust standard errors in parentheses are clustered at the bank level.

*, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

5 | ROBUSTNESS TESTS

5.1 | Bushee measures of investor horizon

To demonstrate that our results in Section 4 are not sensitive to our proxies for *investor horizon*, we use the Bushee classification of *investor horizon*. Based on past investment behavior and trading styles, Bushee (1998) classifies institutional shareholders as transient (*TRA*), quasi-indexers (*QIX*) and dedicated (*DED*). We consider shareholding by transient investors as ST shareholdings and the sum of shareholdings by quasi-indexers and dedicated investors (*QIX_DED*) as LT shareholdings. Table 6 presents the panel fixed-effect estimates of Equation (4) using the Bushee measure of *investor horizon*. The coefficient on *TRA* is significant for *idiosyncratic volatility*, while the coefficient on *QIX_DED* is significantly negative for *DLLP* and *idiosyncratic volatility*. Thus, these results using fixed-effect estimations are largely consistent with those reported in Tables 3–5 and confirm that our findings are robust to using the Bushee classification as an alternative proxy of *investor horizon*.

5.2 | Alternative measures of transparency

We check the robustness of our main findings to the four additional proxies of bank *transparency*: volume-return coefficient (*C2*) (Llorente et al., 2002; *LMSW*), two properties of management earnings forecasts (frequency and horizon) from Thomson's First Call Company Issued Guidance and the number of analysts from the Institutional Brokers' Estimate System (I/B/E/S) database that issued a 1-year-ahead earnings per share forecast during the year (see Table 1 for detailed definitions). We propose that, unlike ST shareholdings, LT shareholdings are associated with less private information gathering as proved by low *LMSW-C2* and more informative management forecasts, as evidenced by more frequent, and longer forecast horizon earnings forecasts.

TABLE 7 Alternative measures of *bank transparency*.

Panel A: Fixed-effect estimations				
	(1)	**(2)**	**(3)**	**(4)**
Dependent variables	***LMSW C2***	***Forecast frequency***	***Forecast horizon***	**ln*(1+Analyst following)***
SIS_{t-1}	−0.0779***	1.2506***	0.2029***	1.0937***
	(−3.54)	(8.61)	(4.39)	(9.90)
LIS_{t-1}	0.0072	0.0972	0.0081	0.1458*
	(0.42)	(0.85)	(0.22)	(1.68)
Bank and Year FE?	Yes	Yes	Yes	Yes
Adj. R^2	0.0295	0.348	−0.0574	0.186
Obs/# of banks	11,744	8360	8360	8360
Panel B: 2sls-IV estimations				
	(1)	**(2)**	**(3)**	**(4)**
Dependent variables	***LMSW C2***	***Forecast frequency***	***Forecast horizon***	**ln*(1+Analyst following)***
$\widehat{SIS_t}$	−0.5492***	4.2135***	−0.0220	2.7558***
	(−4.70)	(6.67)	(−0.11)	(5.82)
$\widehat{LIS_t}$	0.3362***	0.4432	−58	−1.3244***
	(5.73)	(1.50)	(−0.17)	(−5.98)
Bank and Year FE?	Yes	Yes	Yes	Yes
Adj. R^2	−0.192	0.292	−0.0758	0.139
Obs/# of banks	11,600	8188	8188	8188
Panel C: PSM estimations				
	(1)	**(2)**	**(3)**	**(4)**
Dependent variables	***LMSW C2***	***Forecast frequency***	***Forecast horizon***	**ln*(1+Analyst following)***
Churn ratio $_{t-1}$	0.000396	0.286***	0.0622***	0.214***
	(0.14)	(9.49)	(7.29)	(9.26)
Bank and Year FE?	Yes	Yes	Yes	Yes
Adj. R^2	0.00376	0.628	0.203	0.620
Observations	4234	2540	2540	2540

Note: This table presents partial results of Equation (4) estimated using panel FE technique in panel A, 2sls-IV technique in panel B and PSM regression in panel C. The dependent variable is *LMSCW C2* in column 1 and management forecast, measured as *Forecast frequency* and f*orecast horizon* in columns 2 and 3, respectively, and ln*(Analyst following)* in column 4. *Investor horizon* is measured as *SIS* and *LIS*. Each regression controls for seven covariates ($X_{i,t}$): ln*(Assets)*, *Loan loss provision*, *Charter value*, a loss indicator *(LOSS)*, *Non-interest income*, *Revenue growth* and *Equity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample includes 11,744 bank-year observations of 1510 US listed commercial banks from 1994 to 2020, excluding the financial crisis years of 2007–2009. Robust standard errors in parentheses are clustered at the bank level. Selected results are reported in all panels.
*, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

We present the results of Equation (4) for these alternative proxies of bank *transparency* using panel fixed-effect estimates in panel A and 2sls-IV in panel B of Table 7. Our measure of LMSW's *C2* as another proxy of private information gathering is based on the stock return autocorrelation conditional on trading volume and is obtained from the

estimation of the following regression for each bank year:

$$R_{i,t} = CO_i + C1 \times R_{i,t-1} + C2 \times \left(R_{i,t-1} \times VOL_{i,t-1}\right) + e_{i,t}, \quad (7)$$

where $R_{i,t}$ is the weekly stock return of bank *i* in week *t*, $VOL_{i,t}$ is the logarithm of stock turnover (= weekly trading volume/total shares outstanding) of bank *i* in week *t*, de-trended by subtracting the 26-week moving average of logarithmic turnover. Higher values of *C2* indicate more information-based trading than liquidity-based trading. The outcomes presented in column 1 of Table 7, panels A and B, indicate a noteworthy negative coefficient on SIS, which is comparable to the findings reported in Table 4. However, these results contradict the notion that private information gathering rises with ST shareholdings. The positive coefficient on LIS is insignificant in panel A but significant in panel B. Further, the PSM regression results in panel C where the investor horizon is proxied by *churn ratio*, provide an insignificant coefficient on *churn ratio*. This conveys no diverse effect of investor horizon on private information gathering but is consistent with 2sls-IV estimations in panel B that bank *private information gathering* declines with ST shareholdings and grows with LT shareholdings.

Similarly, the coefficient on *SIS* in columns 2–3 of panel A offers evidence in contrast to our propositions; for example, a one standard deviation increase in ST shareholdings is associated with a 3% longer forecast horizon and a 2% greater forecast precision. Nonetheless, the insignificant coefficients on LT shareholdings suggest that LT shareholding does not relate to forecast frequency and precision. The 2sls-IV estimates for these alternative proxies of *transparency* in panel B are largely consistent with the panel fixed-effect estimates in panel A. The significant coefficient on the *churn ratio* in columns 2 and 3 of panel C confirms the results obtained from panels A and B, where panel fixed-effect and 2sls-IV are used, respectively.

Prior studies argue that analysts, as information processors and producers, can also affect firm transparency (Armstrong et al., 2014; Boone & White, 2015; Brown & Hillegeist, 2007). For example, Brown and Hillegeist (2007) propose that a greater analyst following is associated with more trading by privately informed investors. Equity analysts are often no different from ST investors as they both exert ST pressures on managers. Consistent with this reasoning, He and Tian (2013) show that firms with greater analyst following are less innovative. We predict a negative (positive) association between LT (ST) shareholdings and analyst following for the following reasons. First, improved disclosure quality with LT shareholdings could diminish the need for analysts as private information producers (Diamond, 1985; Verrecchia, 2001). Second, like Akerlof's lemon problem, less transparent banks with ST shareholders could benefit more from improved investor confidence through engaging additional analysts to produce information than more transparent banks could. Third, ST shareholders could engage more analysts to gather private information to generate ST trading profits from information advantages. The results from the panel fixed-effects analysis in column 4 of Table 7 demonstrate a positive correlation between both ST shareholdings and LT shareholdings and analyst following. Specifically, the estimates in column 4 indicate that a one standard deviation increase in SIS (LIS) leads to a 5% (1%) rise in analyst following. These findings are generally robust, as shown in panel B, even though the 2sls-IV estimation reveals a significant negative effect only for LIS.[12] The results from the PSM estimation in panel C support the findings in panels A and B by revealing a significant and positive coefficient on *churn ratio*, providing evidence of a positive relationship between ST shareholding and analyst following.

In summary, our study examining the *return-volume coefficient* (*LMSW-C2*), *management earnings forecasts* and *analyst following* as alternative measures of private information gathering do not yield conclusive evidence supporting our hypotheses that bank private information gathering is hindered by LT shareholdings and enhanced by ST shareholdings. If anything, our findings suggest that private information gathering diminishes as ST shareholdings increase.

[12] Although our results for ST shareholding are consistent with our expectation, we note that the positive relation we observe between analyst following and LT institutional holding could result from LT shareholders' demand for more information about banks to make better investment decisions and to comply with their fiduciary responsibility to their investees (O'Brien & Bhushan 1990). Fiduciaries often use analyst reports as evidence of care and prudence.

TABLE 8 *Investor horizon* and crash risk.

Panel A: Logit/panel fixed-effect estimations			
Dependent variables	***NCSKEW***	***DUVOL***	***CRASH***
SIS_{t-1}	−0.008	−0.235**	−1.239*
	(−1.18)	(−2.58)	(−1.92)
LIS_{t-1}	0.0023	−0.0936	−0.2880
	(0.43)	(−1.33)	(−0.58)
Bank and Year FE?	Yes	Yes	Yes
(Pseudo) Adj. R^2	0.112	0.0759	0.0306
Observations	10,767	10,761	9561
Panel B: 2SLS-IV estimations			
Dependent variables	***NCSKEW***	***DUVOL***	***CRASH***
$\widehat{SIS_t}$	−2.0816***	−0.1809***	−1.8793***
	(−4.72)	(−5.48)	(−3.84)
$\widehat{LIS_t}$	0.8782***	0.0815***	0.4253*
	(3.86)	(4.79)	(1.68)
Bank and Year FE?	Yes	Yes	Yes
Hansen *J-stats* for endog.	0.0498	0.0393	0.759
Observations	10,589	10,596	9561
Panel C: PSM estimations			
Dependent variables	***NCSKEW***	***DUVOL***	***CRASH***
Churn ratio $_{t-1}$	−2.082***	−0.181***	−1.879***
	(−4.72)	(−5.48)	(−3.84)
Bank and Year FE?	Yes	Yes	Yes
(Pseudo) Adj. R^2	0.119	0.0708	0.0567
Observations	4544	4552	4566

Note: This table presents the results of Equation (4) estimated using logit/FE technique in panel A, 2sls-IV technique in panel B and PSM regression in panel C. The dependent variable is *crash risk*, measured as *NCSKEW*, *DUVOL* and *CRASH*. *Investor horizon* is measured as *SIS* and *LIS* in the first two panels and *Churn ratio* in panel C. Each regression controls for seven covariates (X_{it}): ln(*Assets*), *Loan loss provision*, *Charter value*, a loss indicator *(LOSS)*, *Non-interest income*, *Revenue growth* and *Equity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample includes 10,767 bank-year observations of 1440 US listed commercial banks from 1994 to 2020, excluding the financial crisis years of 2007–2009. Robust standard errors in parentheses are clustered at the bank level. Selected results are reported in all panels. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

6 | ADDITIONAL ANALYSES

6.1 | Impact on crash risk

In this section, we examine the relation between *investor horizon* and bank stock price *crash risk*. Prior crash risk studies document that lack of transparency could lead to extreme outcomes such as stock price crash when the market finally discovers the accumulated hidden, firm-specific, bad news (Jin & Myers, 2006).

Panel A of Table 8 shows the panel fixed-effect estimates of Equation (4) relating the three bank crash risk proxies, *NCSKEW*, *DUVOL*, *CRASH* (see Table 1 for detailed definitions), to *investor horizon*. The results contrast the prediction

that bank crash risk increases with ST shareholdings and decreases with LT shareholdings. Particularly, the significant negative coefficients on *SIS* in last two columns indicate that an increase in ST shareholdings is associated with a 12% lower *DUVOL* and a 29% lower *DUVOL*. Similarly, the coefficient on *LIS* is not significant for any of our crash risk proxies. In panel B, the 2sls-IV significant coefficient estimates on $\widehat{SIS}$ and $\widehat{LIS}$ provide added robust evidence that *NCSKEW*, *DUVOL* and *CRASH* decrease with ST shareholdings and increase with LT shareholdings. The PSM regression results for *crash risk* in panel C where the investor horizon is proxied by *churn ratio*, provide robust results. Particularly, the significant negative coefficient on *churn ratio* ($p < 0.01$) underlines our inferences from FE and 2sls-IV estimations in the first two panels of Table 8, that bank *crash risk* declines with ST shareholdings. Taken together, the results for crash risk do not support the conjecture that superior (inferior) monitoring with greater LT (ST) shareholdings is associated with increased (decreased) transparency, which leads to lower (higher) future crash risk. Instead, the results suggest that private information gathering decreases with ST shareholdings, which may contribute to lower crash risk. This aligns with the findings in Tables 4 and 7.

6.2 | Analyzing stock liquidity

Next, we investigate the relation between *investor horizon* and bank stock liquidity as a potential channel for bank transparency. Stock liquidity is higher for firms with better governance (Chung et al., 2010) and higher institutional shareholdings (Boone & White, 2015). Stock liquidity facilitates better monitoring by making investors' exit threats more credible and encourages greater shareholder engagement (Edmans & Manso, 2011). We expect that stock liquidity increases with LT shareholdings and decreases with ST shareholdings for three reasons. First, in contrast to ST shareholders, LT shareholders mainly trade to match their fund flows. Hence, their trades are not information-driven (Kahn & Winton, 1998; Maug, 1998). Second, LT shareholders enhance bank disclosure quality and reduce information asymmetry, which could lead to greater liquidity. Previous studies note that higher disclosure quality is associated with greater stock liquidity (Diamond & Verrecchia, 1991). Third, Maug (1998) and Kahn and Winton (1998) show that liquidity facilitates block formation, which incentivizes intervention.

Columns 1 and 2 of Table 9, panel A, present panel fixed-effect estimates of Equation (4) for the logarithm of turnover and logarithm of dollar volume, respectively, as the two bank liquidity proxies (see Table 1 for detailed definitions). Although we find evidence that bank stock liquidity increases with LT shareholdings as expected, we also find that liquidity increases with ST shareholdings, in contrast to expectation.[13] Particularly, the estimated positive coefficients on both SIS and LIS for both turnover and dollar volume indicate that an increase in ST (LT) shareholdings is associated with a 12% (5%) increase in turnover and a 16% (5%) greater dollar volume. The 2sls-IV estimates in panel B reaffirm these results for the two liquidity proxies for LT shareholdings while the significant positive coefficient on *churn ratio* in panel C for the first two columns demonstrates that bank stock liquidity increases with ST shareholdings. Thus, our findings evidence that bank stock liquidity increases with both ST and LT shareholdings.

6.3 | Analyzing board structure

To offer some insights into bank board governance as another potential channel for *transparency*, we examine the relations between three representative board features, *independent directors*, *female directors* and *board size* (see Table 1 for detailed definitions), and *investor horizon*.[14] The last three columns of Table 9, panels A and B, report, respectively,

[13] The positive relation between our liquidity proxies and ST institutional holding is consistent with the predictions of Admati and Pfleiderer's (1988) and Holden and Subrahmanyam's (1992) theoretical models. Both models suggest that ST institutional shareholders compete aggressively, revealing their price very quickly, and thus increasing the stock liquidity. Moreover, this theoretical conjecture is supported by the empirical evidence presented by X. Wang and Wei (2021).

[14] We hand-collect board-related data from DEF 14A proxy statements. Thus, we limit our collection to top-200 banks by total assets in 2004.

TABLE 9 *Investor horizon*, stock liquidity and board structure.

Panel A: Panel fixed-effect estimations					
	(1)	(2)	(3)	(4)	(5)
Dependent variables	ln(*Turnover*)	ln(*Dollar volume*)	*%Independent directors*	*%Female directors*	ln(*Board size*)
SIS_{t-1}	1.9713***	2.5079***	0.0072	−0.0331	0.0098
	(18.62)	(18.74)	(0.14)	(−1.04)	(0.15)
LIS_{t-1}	0.4456***	0.4420***	−0.0574	−0.0236	0.1132**
	(5.41)	(4.24)	(−1.40)	(−0.93)	(2.16)
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.300	0.677	0.0582	0.0550	0.0582
Observations	11,854	11,854	2706	2706	2706
Panel B: 2sls-IV estimations					
	(1)	(2)	(3)	(4)	(5)
Dependent variables	ln(*Turnover*)	ln(*Dollar volume*)	*%Independent directors*	*%Female directors*	ln(*Board size*)
$\widehat{SIS_t}$	−2.4537***	−7.3798***	−0.2839	0.0063	−0.4841*
	(−4.13)	(−8.49)	(−1.43)	(0.05)	(−1.89)
$\widehat{LIS_t}$	4.6583***	7.3469***	0.3355***	0.1798***	−0.3201***
	(15.76)	(16.97)	(4.55)	(3.97)	(−3.35)
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes
Hansen *J-stats*	0.293	0.0132	0.0585	0.0800	0.243
Observations	11,710	11,710	2687	2687	2687
Panel C: PSM estimations					
	(1)	(2)	(3)	(4)	(5)
Dependent variables	ln(*Turnover*)	ln(*Dollar volume*)	*%Independent directors*	*%Female directors*	ln(*Board size*)
Churn ratio $_{t-1}$	0.383***	0.380***	0.00855	−0.00655	0.0413**
	(18.27)	(14.83)	(0.48)	(−0.55)	(2.03)
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.391	0.859	0.0192	0.0155	0.109
Observations	4622	4622	398	398	398

Note: This table presents the results of Equation (4) estimated using logit/FE technique in panel A, 2sls-IV technique in panel B and PSM regression in panel C. The dependent variable is two proxies of *stock liquidity* (ln(*Dollar volume*), ln(*Turnover*)) in columns 1 and 2 and *board structure*, measured as *%Independent directors*, *%Female directors* and ln(*Board size*) in columns 3–5. *Investor horizon* is measured as *SIS* and *LIS* in the first two panels and *Churn ratio* in panel C. Each regression controls for seven covariates (X_{it}): ln(*Assets*), *Loan loss provision*, *Charter value*, a loss indicator *(LOSS)*, *Non-interest income*, *Revenue growth* and *Equity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample includes 11,854 bank-year observations of 1520 US listed commercial banks and 2706 bank-year observations of 267 US listed commercial banks from 1994 to 2020, excluding the financial crisis years of 2007–2009. Robust standard errors in parentheses are clustered at the bank level. Selected results are reported in all panels.

*, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

the panel fixed-effect and 2sls-IV estimates of Equation (4) relating the four board structure measures, *% Independent directors*, *% Female directors* and ln*(Board size)*, to *investor horizon*. We make no predictions about the direction of the relations between these board structure variables and *investor horizon* because the board of directors' literature provides mix evidence.

In panel A, the coefficient on *SIS* is not significant in any of the last three columns, while the coefficient on *LIS* is significantly positive in column 5 for ln*(Board size)* suggesting bank board size increases with LT shareholding. Panel B shows that the coefficient on $\widehat{SIS}$ is negative and statistically significant in column 5. Across all three columns, the significant coefficients on $\widehat{LIS}$ indicate that banks with higher LIS tend to have more independent directors, employ more female directors and possess small board size and structure that are considered effective for monitoring managers. The significant positive coefficient on *churn ratio* in column 5 of panel C suggests a positive correlation between board size and ST shareholding. Overall, in line with Appel et al. (2016) findings for a non-bank sample, our results for the board characteristics provide some evidence that LT shareholders promote improved board governance and, thus, enhance bank transparency.

6.4 | Impacts of policy environment and crisis: Sarbanes–Oxley Act (SOX) and the Dodd–Frank Act

Our sample period includes two significant policy initiatives: the introductions of the SOX of 2002 and the Dodd–Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd–Frank Act) in the aftermath of the 2008–2009 GFC. These might have relevance to the nature of the impact of investor horizon on bank transparency as these regulatory reforms involve improved monitoring of banks. Panel B of Table S9 reports the panel fixed-effect results for Equation (4) separately for pre- and post-SOX periods for three different proxies of bank transparency. The pre-SOX sub-sample includes banks in periods before the introduction of the SOX in 2002 while the post-SOX sub-sample includes banks in the 2002 period onward. With the pre-/post-SOX analysis, we observe that the impact of ST/LIS is primarily visible for the post-SOX sub-sample. These findings convey that with increasing sizeable stakes, institutional shareholdings have become more assertive in the post-SOX period, compared to the pre-SOX period.

Panel C of Table S9 presents the results for Equation (4) for pre-/post-Dodd–Frank analysis. The pre-Dodd–Frank sub-sample includes banks in periods before the introduction of the Dodd–Frank Act in 2010 excluding the 2008–2009 GFC periods, while the post-Dodd–Frank sub-sample includes banks in the 2010 period onward. With this pre-/post-Dodd–Frank sub-sample analysis, we find that the impact of ST/LT institutional shareholders on bank transparency proxies is discernible generally in the post-Dodd–Frank periods. Just like the explanation for the post-SOX era outcome, a possible explanation is that institutional shareholders have become more forceful in the post-Dodd–Frank period in comparison to the pre-Dodd–Frank period, as their stakes have grown larger.

7 | CONCLUSION

We provide a comprehensive assessment of whether and to what extent SIS versus LIS relate to disclosure quality, private information gathering and abnormal auditor fees as three important dimensions of bank transparency. We operationalize investor horizon as the past four quarters' portfolio turnover rate of institutional shareholders and use panel fixed-effects, 2sls-IV and PSM estimation to strengthen our inferences.

Regarding disclosure quality, we find new and robust evidence that bank disclosure quality, as proxied by DLLP, increases with LT shareholdings and decreases with ST shareholdings. Regarding private information gathering, we document that private information gathering, as measured by idiosyncratic volatility, decreases with both LT shareholdings and ST shareholdings. Similarly, regarding auditor fees, we find some evidence that audit fees relate positively

to ST and LT shareholdings. In additional analyses, we also provide some fresh insights for banks; for instance, banks dominated by ST shareholdings experience lower stock price crash risk, which is consistent with improved private information gathering. In sum, our study is the first to investigate whether bank transparency is positively (negatively) associated with LT (ST) shareholdings, which potentially enhances (impairs) the market's ability to monitor banks. Yet, unlike non-bank studies, we find some inconclusive evidence that bank transparency improves with LT shareholdings but deteriorates with ST shareholdings.

Our findings have two significant policy implications related to enhancing transparency. Most importantly, regulators should emphasize the need for banks' estimates of loan loss provision to be forward-looking and to incorporate a wide range of available fund providers' information. Second, bank regulators could focus on improving bank transparency because it is critical to bank stability.

ACKNOWLEDGMENTS

We thank Andrew Stark (senior editor), an anonymous reviewer, Robert Durand, Kiridaran Kanagaretnam, Gopal Krishnan, Robert DeYoung, David Martinez-Meira, Tom Cronje, James Vickery, Christa Bouwman, Bjorn Jorgensen, Ambrus Kecskés, Mostafa Hasan, Vladimir Volkov, Jing Tian, Aaron Gilbert, Jun Chen, Bart Frijns, Michael Skully, George Pennacchi, Darren Henry, Trent Seymour, Petko Kalev, Adam Clements, Phong Ngo, Kathy Walsh, Martien Lubberink, Victoria Clout, Brandon Cline (discussant at 2019 FMA Glasgow), Alison Parkes, Kamran Ahmed, Alireza Vafaei, Robert Bianchi and Reza Monem and seminar and conference participants at Griffith University, Auckland University of Technology, University of Tasmania, La Trobe University, Monash University, the 2019 New Zealand Finance Colloquium and the 2017 FIRN Banking and Financial Stability Meeting at Australian National University for helpful suggestions and comments. We thank Mo El-Assaad, Jason Chao and Kelvin Saekow of FTSE-Russell Investments for providing Russell indexes reconstitution data. For sharing their data, we are especially thankful to Brian Bushee for his investor classification data. We also thank Zhengling Xiong and Victor Maxwell for their excellent research assistance. Finally, Shams Pathan gratefully acknowledges the generous research support received from the Australian Research Council Discovery Early Career Research Award [ARC DECRA # DE140100253]. Carlos Fernandez Mendez also acknowledges the financial support from the Spanish Ministry of Science and Innovation via Project PID2022-140940NB-I00 and from the Government of the Principate of Asturias via Project AYUD/2021/50878. The usual disclaimers apply.

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DATA AVAILABILITY STATEMENT

Unless noted otherwise, all data are available from the commercial sources identified in the text.

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Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Haq, M., Pathan, S., Mendez, C. F., & Lobo, G. J. (2023). Institutional investors' horizons and bank transparency. *Journal of Business Finance & Accounting*, 1–30. https://doi.org/10.1111/jbfa.12749