INSTITUTIONAL OWNERSHIP AND BANK LIQUIDITY CREATION

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ABSTRACT

This paper examines whether institutional ownership of banks plays a significant role in explaining bank liquidity creation . Using data from 338 bank holding companies from 2010 to 2016, we examine whether banks with higher institutional ownership levels create more liquidity and proceed to test this relationship using three subsamples defined by size. We expand our analysis by incorporating an institutional ownership concentration variable and testing whether the presence of an institutional block holder affects this relationship between institutional ownership and bank liquidity. Our findings are threefold: (1) there is a positive and statistically significant relationship between bank liquidity creation and institutional ownership, particularly when using liquidity creation on and off the balance sheet as our dependent variable (2) the relationship between institutional ownership and liquidity creation varies with bank size, the effect is stronger with small banks (3) the presence of institutional ownership concentration intensifies the association between institutional ownership and bank liquidity creation.

JEL Classification: G21; G23; G32; G34
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INTRODUCTION

Banks perform a central role in the economy through liquidity creation, the process of transforming liquid liabilities such as deposits into illiquid assets such as business loans and mortgages. They leverage their access to funds from deposits to provide individuals and enterprises with the necessary capital for future investments and expenses. Banks also create liquidity off the balance sheet through loan commitments and similar claims. Activities of this nature allow clients to plan on investments and expenditures, knowing they have guaranteed access to capital. Liquidity creation is a vital activity for both the economy and banks themselves. Berger and Bouwman (2009) find that liquidity creation increases bank value. When banks create liquidity, they use liquid liabilities, associated with lower rates, to finance illiquid assets, associated with higher costs. Shareholders are thus incentivized to demand more liquidity creation from banks. While liquidity creation is a key reason why banks exist, it also exposes them to risk of liquidity shortages. Thakor (2005) finds evidence of excessive risk-taking happening off balance sheets during economic booms, destabilizing the banking sector for subsequent periods. Institutional shareholders further contribute to the short-sightedness of the banking industry by pressuring banks to boost short-term profits through excessive risk-taking (Dallas, 2011). Erkens et al. (2012) find evidence of financial firms with higher institutional ownership levels taking on more risk in periods preceding a financial crisis. These findings suggest that institutional ownership has a positive association with bank liquidity creation. Literature sheds light on our financial system's shortcomings and existing literature on the banking industry. Berger and Bouwman (2016) find evidence of surges in bank liquidity creation immediately before financial crisis periods. During periods of heightened macroeconomic risk, banks experience surges in deposits, leaving them with abundant liquidity on their balance sheets. These liquidity inflows incentivize the loosening of credit standards, leading to excessive lending and asset price bubbles, key precedents of financial crises (Acharya & Naqvi, 2012). While bank liquidity creation helps predict financial crises, monetary policy has minimal effect on it, regardless of size (Berger & Bouwman, 2017). These studies highlight the importance of increasing our understanding of bank liquidity creation.

Institutional investors have replaced retail investors as the primary shareholders of public companies in recent decades. They are often able to influence managers' decisions through voting rights and shape the nature of corporate risk-taking (Barry et al., 2011). Our paper aims to study the relationship between institutional ownership and bank liquidity creation. With the purpose of expanding the growing literature on bank liquidity creation, this paper examines the impact of institutional ownership on bank liquidity creation levels by answering the following questions: How do higher levels of institutional ownership affect liquidity creation? Does this relationship vary with size? Does institutional ownership concentration intensify the association between institutional ownership and liquidity creation?

To answer these questions, we consider a sample of 338 U.S. bank holding companies, for which we construct a database on institutional ownership and concentration for the period 2010-2016.

We use Berger and Bouwman's (2009) liquidity creation measures cat fat and cat nonfat. Cat fat, their preferred liquidity creation measure, includes liquidity created from off-balance sheet activities while cat nonfat does not. Our twofold focus rises from bank liquidity creation findings, particularly off the balance sheet, preceding financial crises (Berger & Bouwman, 2017).

In this study, we find that institutional ownership has a significant and positive impact on bank liquidity creation. In other words, an increase in the percentage of a bank's shares held by institutions leads to increased bank liquidity creation. Secondly, we find that the effect of institutional ownership on liquidity is higher for small banks. Subsamples with medium and large banks showed similar results between the two variables. Thirdly, our results indicate that concentrated institutional ownership intensifies the positive and significant relationship between institutional ownership and bank liquidity creation.

TEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

We present the key results of the existing literature in this section. We use these findings and theories to formulate our hypotheses about the relationship between bank liquidity creation and institutional ownership.

Banks perform two central functions in the economy by creating liquidity and transforming risk. They perform the latter by issuing riskless deposits to finance risky loans (Diamond, 1984). From a bank holder's point of view, liquidity creation and risk-taking are closely related. If bank holders are risk-averse, banks will lean towards using liquid liabilities to finance liquid assets like treasury investments, where banks create no liquidity. As bank holders embrace more risk seeking higher yields, banks are more likely to use those liquid liabilities to finance riskier illiquid assets, where banks create more liquidity (Yeddou & Pourroy, 2020). Risk transformation and liquidity creation can overlap, but do not move in perfect tandem (Berger & Bouwman, 2009). It is thus essential to study the difference between them. While prior studies examine the role of banks as risk transformers extensively, literature on their role as liquidity creators remains scarce but growing.

Berger and Bouwman (2009) introduce a comprehensive framework with four empirical measures of bank liquidity: cat fat, mat fat, cat nonfat, and mat nonfat. The authors base these measures on the category (cat) or maturity (mat) of loans and the inclusion (fat) or exclusion (nonfat) of off-balance sheet activities. They introduce cat fat as the preferred liquidity indicator. Categories are better indicators of the time, cost, and ease for banks to obtain liquid funds from their obligations. "Fat" variables include off-balance-sheet activities and provide a complete picture of a bank's liquidity creation. Using U.S. bank data from 1993 to 2003, they find bank liquidity creation is positively related to bank value as measured by market-to-book and price-earnings ratios . Building from this groundbreaking study, subsequent papers examine and find significant links between liquidity creation and non-traditional banking activities (Dang, 2020), ownership structure (Yeddou & Pourroy, 2020), monetary policy (Berger & Bouwman, 2017), and

governance (Díaz & Huang, 2017). Our paper is the first to examine the relationship between institutional ownership and bank liquidity creation.[4]

Liquidity creation and institutional ownership

As shareholders, institutions tend to have a higher risk tolerance and greater concern over investment returns than individuals (Ahmad and Jusoh, 2014). Pound (1988) finds that greater expertise allows institutional investors to monitor bank managers at lower costs. Institutions leverage these monitoring capabilities to take on greater investment risk and maximize returns. As a bank's institutional ownership level increases, shareholders exert greater influence over managers to undertake more risk, increase revenues, and thus create more liquidity.

H1. Banks with higher institutional ownership levels create more liquidity on and off the balance sheet (cat fat and cat nonfat).

Liquidity creation, institutional ownership and bank size

The initial hypothesis of this study claims institutional ownership is positively linked to bank liquidity creation. Institutional investors are drawn to companies with solid governance structures, provided they minimize risk and monitoring costs. Chung and Zhang (2011) show institutional ownership as a percentage of outstanding shares increases with governance quality. Diaz and Zhang (2017) find a positive and significant effect of bank governance on liquidity creation, but only for large banks. Moreover, Berger and Bouwman (2009) find that large banks create 81% of industry liquidity creation based on their preferred "cat fat" measure. Considering our initial hypothesis, we expect institutional ownership to have a more significant effect on liquidity creation for those banks that account for most of the liquidity created in the banking industry.

H2. The positive relationship between institutional ownership and bank liquidity creation increases with bank size.

Liquidity creation, institutional ownership, and ownership concentration

This paper expands our analysis of liquidity creation factors by incorporating ownership concentration into our study. We initially hypothesize that liquidity creation and institutional ownership have a positive relationship. Existing literature on ownership concentration examines its link with bank performance. A substantial collection of papers finds a positive link between

[4] To our knowledge, there is no existing literature that focuses on the impact of institutional ownership on bank liquidity creation. Yeddou and Pourroy (2020) analyze liquidity creation in relation to ownership concentration and blockholder nature, while our study focuses on institutional ownership, its concentration and institutional blockholder nature as predictors.

ownership concentration and bank profitability (Leech & Leahy, 1991; Zeckhouser & Pound, 1990**)**. Ozili and Uadiale (2017) show that banks with more concentrated ownerships have higher returns on assets, net interest margins, and earning power. Prior studies show mixed findings on the relationship between ownership concentration and credit risk. Ianotta (2007) et al. find significant block holder ownership is associated with better loan quality, lower asset risk, and lower liquidity risk. Alternatively, Chalermchatvichien (2013) et al. show a one standard deviation increase in concentration improve capital adequacy by 7.64%. Similarly, there is no consensus as to the relationship between capital and liquidity creation. "Risk absorption" theory suggests that banks with higher capital have a greater ability to absorb risk and therefore create more liquidity. On the other hand, the "financial crowding out" theory conveys that banks with more capital have less fragile structures, making them less likely to commit to monitoring borrowers and hindering their ability to create liquidity. Berger and Bouwman (2009) find empirical evidence of a positive relationship between capital and liquidity creation for large banks, a negative relationship for small banks, and a non-significant relationship for medium banks.

H3. The presence of ownership concentration intensifies the relationship between institutional ownership and bank liquidity creation.

SAMPLE, DATA, AND VARIABLES

Sample and data

This study incorporates data from 338 U.S, public bank holding companies, covering the period from 2010-2016. We identified all U.S. bank holding companies with available information on institutional ownership levels expressed in three different modalities: as the total number of shares owned by institutions, as a percentage of total outstanding shares, and as the percentage change from quarter to quarter[5]. We proceeded to incorporate an institutional ownership concentration variable: the percentage of shares owned by the top institutional holder for each bank. Ownership concentration and institutional ownership data were available for a total of 583 banks.

We build our final dataset by merging our institutional ownership and concentration data, gathered from the Bloomberg Terminal, with liquidity creation data, gathered and made publicly available by Berger and Bouwman[6]. Institutional ownership data includes quarterly observations of each sampled bank's percentage of total outstanding shares held by institutions. Ownership concentration data includes quarterly observations of each sampled bank's percentage of total

[5] Institutional ownership levels are expressed as a percentage of total outstanding shares in our final regression. Institutional ownership expressed as the total number of shares owned by institutions and percentage change from quarter to quarter did not show statistically significant results.

[6] Bank liquidity creation data was obtained through Christa Bouwman's website: http://people.tamu.edu/~cbouwman/

shares held by the controlling institutional holder[7]. We do this by matching the two data sets using reported bank holding company identifiers. Our final dataset includes 338 banks and 7,967 observations worth of quarterly data, including 2,240 for large banks, 2,100 for medium banks, and 3,627 for small banks**.** Table 1 shows a full list of variables along with their definition, while Table 2 shows descriptive statistics for all variables in our sample.

Table 1
Variable definitions

Variable	Definition
Cat fat	Bank liquidity created on and off the balance sheet.
Cat nonfat	Bank liquidity created on the balance sheet.
OBS	Bank liquidity created off the balance sheet.
InstOwn	Percentage of total outstanding shares owned by institutions.
InstCon	Percentage of total outstanding shares owned by the controlling institutional holder.
GTA	Gross total assets in millions of USD.
T1CapRatio	Tier 1 capital/ risk-weighted assets.
ROE	Return on equity: Net income/Stockholder's equity.
ROA	Return on assets: Net income/Total assets.
Z-Score	The sum of ROA and equity-to-assets ratio divided by the standard deviation of ROA.
Size	Categorical variable that classifies banks as small, medium or large[8].
CO dummy	Dummy variable that identifies banks with an institutional block holder[9].

[7] An institutional block holder refers to an institutional investor that holds 5% or more of a bank's total outstanding shares.
[8] Small banks are banks with gross total assets of $1 billion or less; medium banks are those with gross total assets between $1 billion and $3 billion; large banks are those with gross total assets of $3 billion or greater.
[9] An institutional block holder refers to an institutional investor that holds 5% or more of a bank's total outstanding shares.

Table 2

Descriptive statistics by bank size and ownership concentration

Variable	All Banks	Large	Medium	Small	Concentrated Own	Dispersed Own
Observations	7,965	2,240	2,099	3,626	3,531	4,434
Catfat						
Mean	3,384.65	11,013.97	721.92	212.94	5,781.53	1,475.90
Std. deviation	17,427.89	31,607.58	356.30	128.01	24,622.43	7,394.11
Catnonfat						
Mean	2,393.79	7,669.72	590.40	178.47	3,972.86	1,136.30
Std. deviation	10,794.20	19,377.59	296.20	109.01	14,953.85	5,261.89
OBS						
Mean	990.86	3,344.26	131.52	34.47	1,808.68	339.59
Std. deviation	6,725.25	12,375.64	73.89	24.06	9748.51	2,150.12
InstOwn						
Mean	34.86	72.13	28.57	15.47	55.03	18.81
Std. deviation	32.49	21.27	22.05	22.39	29.37	25.05
InstCon						
Mean	5.42	7.98	4.49	4.38	9.75	1.97
Std. deviation	7.15	6.75	3.71	8.40	8.83	1.72
GTA						
Mean	6.69	21.35	1.67	.54	11.07	3.19
Std. deviation	3.41	61.94	.56	.25	47.86	15.42
T1Cap						
Mean	13.85	13.85	13.48	14.09	14.18	13.57
Std. deviation	3.97	3.99	3.08	4.41	4.22	3.72
ROE						
Mean	5.77	8.14	5.18	4.52	7.67	4.18
Std. deviation	18.23	8.48	24.64	18.26	10.48	22.65
ROA						
Mean	.70	.91	.69	.57	.84	.59
Std. deviation	.84	.70	.91	.87	.66	.96
Z-Score						
Mean	3.97	3.77	3.81	4.20	4.20	3.78
Std. deviation	1.54	.97	1.29	1.91	1.74	1.31

Cat fat refers to liquidity created on and off the balance sheet, expressed in thousands. Cat nonfat refers to liquidity created on the balance sheet only, expressed in thousands. OBS refers to liquidity created off the balance sheet, expressed in thousands. InstOwn refers to the percentage of total outstanding shares held by institutional investors. GTA refers to gross total assets, expressed in millions of USD. ROE and ROA measure return on equity and return on assets, respectively. Z-Score refers to the sum of ROA and equity-to-assets ratio divided by the standard deviation of ROA. Banks were separated into subgroups based on their gross total assets. Large banks are those with gross total assets equal to or greater than $3 billion; medium banks are those with gross total assets between $1 billion and $3 billion; small banks are those with gross total assets equal to or below $1 billion.

Institutional ownership

This study aims to examine the relationship between institutional ownership and bank liquidity creation using a three-step procedure. In our first step, we focus on the impact institutional ownership has on liquidity creation. Our variable *InstOwn* reflects the fraction of total shares outstanding that are held by institutions. For us to consider an investor as institutional, they must fall within one of the following categories: investment advisor, bank, holding company, pension fund, hedge fund, or private equity.

The second phase of this study involves analyzing how a bank's size affects the relationship between institutional ownership and liquidity creation. We generate a categorical variable *Size* that allows us to split our dataset into three different size subsamples: large, medium, and small banks. As proposed by Berger and Bouwman (2009), large banks are those with gross total assets exceeding $3 billion, medium banks are those with gross total assets between $3 billion and $1 billion, and small banks are those with gross total assets lower than $1 billion. We conduct separate regressions for each subsample using our categorical variable *Size* to define them.

Ownership concentration

Our study's third and final step entails examining how the relationship between institutional ownership and liquidity creation changes with banks who have concentrated institutional ownerships. Our variable *InstCon* reflects the fraction of total shares outstanding that are held by the controlling institutional shareholder. We proceed to create a dummy variable *CO* with the purpose of identifying banks with institutional block holders[10]. An observation takes a value of 1 when variable *InstCon* is equal to 5% or higher and takes a value of 0 otherwise. Out of our entire data sample, 3,712 observations were classified as concentrated (1), and 4,435 were classified as dispersed (0). We proceeded to create an additional interaction variable**,** the product of our continuous institutional ownership variable *InstOwn* and our dummy variable *CO*, allowing us to establish a relationship between institutional ownership and liquidity creation when a bank's ownership structure is concentrated.

Bank liquidity creation

Out of the four liquidity creation variables computed by Berger and Bouwman (2009), our study includes "cat fat" as a primary measure and "cat nonfat" as a secondary measure. We believe categories are better indicators of the time, cost, and ease for banks to obtain liquid funds from their obligations, while "fat" variables include off-balance-sheet activities and provide a complete picture of a bank's liquidity creation. The calculation of both measures involves a three-step

[10] An institutional block holder refers to an institutional investor holding 5% or more of a bank's outstanding shares.

procedure. First, we classify all balance sheet items[11] as liquid, semiliquid, or illiquid. All classifications are based on the ease, cost, and time for either customers to obtain liquid funds from the bank or banks to sell off their obligations to meet liquidity demands. Second, we assign weights to the activities classified in the first step. Illiquid assets, liquid liabilities, and illiquid guarantees are given a positive weight of 0.5; semiliquid assets, liabilities, and guarantees receive a neutral weight of 0; liquid assets, illiquid liabilities, equity, and liquid guarantees and derivatives receive a negative weight of -0.5. Third, we compute liquidity creation measures as the sum of the weighted items.

Control variables

Our study considers the following control variables in our regression models: gross total assets, tier 1 capital ratio, return on equity and return on assets. We use gross total assets to account for bank size in our regressions. We proceed to use the tier 1 capital ratio, a regulatory capital requirement measure, to account for the effect capital has on liquidity creation. Finally, we use return on equity and return on assets to account for bank profitability in our regression.

EMPIRICAL METHODOLOGY

Institutional ownership

We use panel data to conduct our model estimation, using our continuous variable *InstOwn* as our main predictor and "cat fat" and "cat nonfat" as our dependent variables. Therefore, we test our first hypothesis (H1) using the following model:

$$Liquidity_{it} = \alpha_i + \mu_t + \beta_1\,(InstOwn) + \beta_2\,(GTA) + \beta_3\,(T1CapRatio) + \beta_4\,(ROA) + \beta_5\,(ROE) + \varepsilon_{it} \quad (1)$$

Where $Liquidity_{it}$ is the measure of bank liquidity for bank i at time t, α_i is a bank-level fixed effect for bank $_i$, μ_t is a time fixed effect for quarter t, and ε_{it} is a random disturbance term[12]. We then examine how bank size affects this relationship between institutional ownership and liquidity creation using **Size** as a categorical variable. We conduct separate regressions separating our dataset into subsamples based on a bank's gross total assets. Regarding the estimation technique, the Hausman test indicated that a fixed-effects model is more suitable for the model. We include bank and time fixed effects to reduce the correlation between error terms and account for variance not captured by control variables.

[11] For the preferred "cat fat" measure, the same classification procedure is used for items off the balance sheet.
[12] Our disturbance term is assumed to: be normally distributed, have a mean of 0 and hold a constant variance across all observations.

Our estimation includes gross total assets, tier 1 capital ratio, ROE, and ROA to account for differences between banks. We gross total assets to account for bank size. We create a categorical variable *Size* to categorize banks as small (gross total assets equal to or below $1 billion), medium (gross total assets between $1 billion and $3 billion), and large (gross total assets equal to or above $3 billion). *Size* serves as our defining variable in separating our observations into subsets for size-specific regression analyses. Moreover, we include tier 1 capital ratios to control for bank-level risk. Tier 1 capital ratio is a regulatory measure of capital adequacy for commercial banks obtained by dividing tier 1 capital by the bank's risk-weighted assets[13]. Finally, we account for bank profitability by including control variables ROE and ROA, in which ROE pertains to investor performance while ROA pertains to managerial performance.

Ownership concentration

We extend our analysis on the relationship between institutional ownership concentration by adding ownership concentration as a predictor. Our variable *InstCon* reflects the percentage of outstanding shares held by the controlling institutional shareholder[14]. We proceed to create dummy variable *CO*, which identifies banks with concentrated institutional ownerships. Banks with a controlling institutional shareholder holding more than 5% of total outstanding shares take a value of 1 and 0 if otherwise.

Dummy variable *CO* also serves as our defining variable for a second set of subsets, separating banks by their institutional ownership concentration. Our sample includes 3,532 observations with concentrated institutional ownerships and 4,435 with dispersed institutional ownerships. We proceed to conduct separate regressions using the model proposed in Eq. (1) for each subset.

Interaction between institutional ownership and ownership concentration

Previous literature shows that ownership concentration has a significant and positive impact on bank liquidity creation (Yeddou & Pourroy, 2020). If both institutional ownership and ownership concentration affect liquidity creation, we expect impact of institutional ownership on liquidity to change according to ownership concentration levels. We test our third hypothesis using the following model:

$$Liquidity_{it} = \alpha_i + \mu_t + \beta_1\,(InstOwn) + \beta_2\,(InstOwn)*(CO) + \beta_3\,(GTA) + \beta_4\,(T1CapRatio) + \beta_5\,(ROA) + \beta_6\,(ROE) + \varepsilon_{it} \quad (2)$$

[13] Tier 1 capital includes common stockholder's equity and disclosed reserves, while risk-weighted assets is calculated by weighing each type of assets relative to their risk.

[14] We refer to the controlling institutional shareholder as the institutional investor holding the highest number of shares of a bank.

In which β_1 represents the relationship coefficient between institutional ownership and liquidity creation, while the interaction term β_2 represents the added association between institutional ownership and liquidity creation when ownership concentration is present. In other words, the impact of institutional ownership on liquidity creation when ownership concentration is present equals $\beta_1 + \beta_2$.

EMPIRICAL RESULTS

Our paper examines the relationship between institutional ownership and bank liquidity creation in a sample of 338 U.S. bank holding companies and 7,965 observations. Table 2 shows descriptive statistics for all our variables, sub grouped by bank size and ownership concentration. Our full sample of banks created on average $3.4 and $2.4 billion in liquidity measured by cat fat and cat nonfat, respectively. We see a clear contrast between the average total liquidity (cat fat) of $11 billion created by large banks and the $213 million created by small banks. Similarly, banks with concentrated ownerships created on average $4.3 billion more in liquidity than banks with a dispersed ownership structure.

Institutional ownership follows the same pattern as size increases, with large banks having average institutional ownership of 72.13% vs. 15.49% for small banks. Average institutional ownership for banks with concentrated ownerships is 55.09%, while banks with dispersed ownerships average 18.82%.

Table 3 shows a correlation matrix between all variables included in our models. We can observe that GTA has the highest correlation with dependent variables cat fat and cat nonfat among the different predictors. Logically, variables ROA and ROE present the highest level of correlation between predictors.

Table 3

Correlation between variables

	Cat fat	Cat nonfat	OBS	InstOwn	InstCon	GTA	T1Cap	ROE	ROA	Z Score
Cat fat	1									
Cat nonfat	.9968	1								
OBS	.9917	.9782	1							
InstOwn	.2367	.2617	.1934	1						
InstCon	.0542	.0576	.0480	.4385	1					
GTA	.9918	.9873	.9857	.2268	.0531	1				
T1Cap	-.087	-.095	-.0727	.0044	.0878	-.0689	1			
ROE	.0242	.0258	.0214	.0935	.0196	.0230	.1133	1		
ROA	.0533	.0564	.0475	.1862	.0410	.0504	.1778	.5624	1	
Z-Score	-.001	-.009	.0112	.0891	.0492	-.0004	.0620	.2866	.3501	1

Our first hypothesis in this study claims that institutional ownership has a significant and positive impact on bank liquidity creation. Table 4 presents the fixed effects results of our baseline model stated in Eq. (1) in three different liquidity creation variables as dependent variables. Column 1 shows regression coefficients and standard errors for each predictor using liquidity created on and off the balance sheet (cat fat) as a dependent variable. Columns 2 and 3 present the same measures using liquidity created exclusively on the balance sheet (cat nonfat) and off the balance sheet (cat fat-cat nonfat) as dependent variables. Table 4 shows institutional ownership has a significant and positive association with bank liquidity created on the balance sheet (cat nonfat), off the balance sheet (OBS), and the combination of both (cat fat). The relationship between institutional ownership and liquidity creation is 0.2033 using cat fat, 0.1607 using cat nonfat, and 0.0425 using off-balance-sheet liquidity.

Table 4
Liquidity creation variables and institutional ownership

VARIABLES	Cat fat	Cat nonfat	OBS
InstOwn	.1863***	.1469***	.0394***
	(.0289)	(.0245)	(.0069)
GTA	-.0002	-.0001	.0001***
	(.0001)	(.0001)	(.0000)
T1Cap	-.8576***	-.7582***	-.0993**
	(.0948)	(.0727)	(.0425)
ROE	.0034	.0027	.0007
	(.0149)	(.0128)	(.0026)
ROA	.1981**	.1177	.0803
	(.4797)	(.4143)	(.1014)
Z-Score	.0423**	.0335**	.0087**
	(.0193)	(.0167)	(.0040)
Observations	7,244	7,244	7,244
Number of banks	310	310	310
Adjusted R-squared	0.0689	0.0455	0.1178

Liquidity creation variables cat fat, cat nonfat and OBS are dependent variables in our panel estimation, all standardized by gross total assets. Cat fat refers to liquidity created on and off the balance sheet. Cat nonfat refers to liquidity created on the balance sheet only. OBS refers to liquidity created off the balance sheet. InstOwn refers to the percentage of total outstanding shares held by institutional investors. GTA refers to gross total assets, while ROE and ROA measure return on equity and return on assets. Tier1Cap is our capital measure obtained by dividing tier 1 capital by total risk-weighted assets. Z-Score refers to the sum of ROA and equity-to-assets ratio divided by the standard deviation of ROA. All models include bank and time fixed effects. Robust standard errors for each coefficient are presented in parentheses. ***, ** and * indicate statistical significance at 0.01, 0.05 and 0.10 level respectively.

Table 5 presents our baseline model's fixed effects results presented in Eq. (1) using the same dependent variables but separating banks into three subsamples: large, medium, and small banks. Using cat fat as our dependent variable, the association between institutional ownership and liquidity is 0.1595 for large banks, 0.1813 for medium banks, and 0.2025 for small banks, all of which are statistically significant. These results suggest that bank size indeed affects the relationship between institutional ownership and liquidity creation in a positive and considerable fashion.

Table 5
Liquidity creation and institutional ownership by bank size

	Large Banks			Medium banks			Small banks		
VARIABLES	Cat fat	Cat nonfat	OBS	Cat fat	Cat nonfat	OBS	Cat fat	Cat nonfat	OBS
InstOwn	.1397***	.1013***	.0384***	.1656***	.1264***	.0392***	.1695***	.1370***	.0325***
	(.0372)	(.0286)	(.0143)	(.0477)	(.0402)	(.0110)	(.0352)	(.0316)	(.0081)
GTA	.0020***	.0014***	.0006*	.0586***	.0548***	.0038	.1516***	.1279***	.0237*
	(.0007)	(.0005)	(.0003)	(.0146)	(.0137)	(.0034)	(.0507)	(.0435)	(.0130)
T1Cap	-1.1720***	-.9319***	-.2401***	-.8383***	-.7354***	-.1029**	-.3401***	-.4143***	.0742
	(.1318)	(.0824)	(.0805)	(.2050)	(.1776)	(.0437)	(.0961)	(.0743)	(.0587)
ROE	.0153	-.0173	.0804*	-.0159	-.0120	-.0039	.0213	.0175	.0038
	(.0606)	(.0513)	(.0169)	(.0126)	(.0103)	(.0027)	(.0350)	(.0307)	(.0047)
ROA	.0625	.1865	-.1241	-.4599	-.3310	-.1289	.4110	.1912	.2198*
	(.8484)	(.7152)	(.2974)	(.4796)	(.3960)	(.1182)	(.6870)	(.6156)	(.1264)
Z-Score	.0495	.0455**	.0039	.0549	.0434**	.0115**	.0375**	.0339**	.0036
	(.0327)	(.0219)	(.0162)	(.0260)	(.0214)	(.0052)	(.0190)	(.0167)	(.0049)
Observations	2,218	2,218	2,218	1,972	1,972	1,972	3,054	3,054	3,054
Number of banks	111	111	111	121	121	121	158	158	158
Adjusted R-squared	0.0615	0.0086	0.2269	0.0463	0.0429	0.0378	0.0059	0.0050	0.0153

Liquidity creation variables cat fat, cat nonfat and OBS are dependent variables in our panel estimation, all standardized by gross total assets. Cat fat is the total bank liquidity created on and off the balance sheet. Cat nonfat is the traditional calculation of bank liquidity creation (on the balance sheet only). OBS is off the balance sheet liquidity creation. GTA refers to gross total assets, expressed in billions. Tier1Cap is our capital measure obtained by dividing tier 1 capital by total risk-weighted assets. ROE and ROA are the return on equity and return on assets, respectively. Z-Score refers to the sum of ROA and equity-to-assets ratio divided by the standard deviation of ROA. Large banks are those with gross total assets equal to or greater than $3 billion; medium banks are those with gross total assets between $1 billion and $3 billion; small banks are those with gross total assets equal to or below $1 billion. Robust standard errors in parentheses. ***, **, * indicate significance at a 0.01, 0.05, and 0.10 level, respectively.

Table 4 shows a positive and significant relationship between gross total assets and both cat fat and cat nonfat variables, supporting Berger and Bouwman's (2009) findings of a positive relationship between bank size and liquidity creation.

Furthermore, our capital ratio variable shows a negative and significant effect on all three of our liquidity creation variables, supporting "financial fragility-crowding out" theory (Berger and Bouwman, 2009). Findings of a negative relationship between our capital ratio and bank liquidity creation are present in all size subgroups using all three of our dependent variables, apart from off-balance sheet liquidity for small banks. This effect is predominantly significant with the exception of our off-balance-sheet liquidity regressions for medium and small banks.

Table 6 presents the fixed effects results of our model proposed in Eq. (2) using cat fat, cat nonfat, and off-balance-sheet liquidity as our dependent variables. We can observe that the interaction term between institutional ownership and our ownership concentration dummy is positive and significant for dependent variables cat fat and off-balance-sheet liquidity. We show congruent findings in table 8, where the relationship between institutional ownership and liquidity creation is stronger for banks with concentrated institutional ownerships. Using the preferred cat fat measure as our dependent variable, the impact of institutional ownership on liquidity changes from 0.1807 for dispersed institutional ownerships to 0.2217 for concentrated institutional ownerships. We find similar outcomes using cat nonfat and off-balance sheet liquidity as dependent variables.

Table 6

Interaction between institutional ownership and ownership concentration

VARIABLES	Cat fat	Cat nonfat	OBS
InstOwn	.1888***	.1515***	.0369***
	(.0269)	(.0228)	(.0067)
GTA	-.0091***	-.0128***	.0037***
	(.0034)	(.0025)	(.0010)
T1Cap	-.7690***	-.6864***	-.0826**
	(.0854)	(.0620)	(.0405)
ROE	.0098	.0070	.0028
	(.0146)	(.0125)	(.0028)
ROA	.6779**	.4866*	.1912***
	(.3111)	(.2652)	(.0668)
InstOwn* CO	.0992*	.0636	.0356**
	(.0579)	(.0496)	(.0142)
Observations	7,302	7,302	7,302
Number of banks	318	318	318
Adjusted R-squared	0.683	0.1373	0.1715

Liquidity creation variables cat fat, cat nonfat and OBS are dependent variables in our panel estimation, all standardized by gross total assets. Cat fat is the total bank liquidity created on and off the balance sheet. Cat nonfat is the traditional calculation of bank liquidity creation (on the balance sheet only). OBS is off the balance sheet liquidity creation. GTA refers to gross total assets expressed in billions of USD. Tier1Cap is our capital measure obtained by dividing tier 1 capital by total risk-weighted assets. ROE and ROA are the return on equity and return on assets, respectively. Z-Score refers to the sum of ROA and equity-to-assets ratio divided by the standard deviation of ROA. InstOwn*CO is our interaction variable, obtained by multiplying institutional ownership by our ownership concentration indicator, which identifies companies with institutional ownership concentrations higher than 5%. Robust standard errors in parentheses. ***, **, * indicate significance at a 0.01, 0.05, and 0.10 level, respectively

Table 7

Interaction between institutional ownership and ownership concentration by bank size

	Large Banks			Medium banks			Small banks		
VARIABLES	Cat fat	Cat nonfat	OBS	Cat fat	Cat nonfat	OBS	Cat fat	Cat nonfat	OBS
InstOwn	.1458***	.1105***	.0352***	.1504***	.1166***	.0338***	.2070***	-.3361***	.0322**
	(.0323)	(.0263)	(.0110)	(.0423)	(.0367)	(.0100)	(.0332)	(.0285)	(.0085)
GTA	.1736***	.1158**	.0578*	6.4577***	5.9399***	.5178	11.8209**	9.7361**	2.0848
	(.0620)	(.0446)	(.0312)	(1.5658)	(1.4378)	(.3523)	(4.6650)	(4.1475)	(1.3353)
T1Cap	-1.1640***	-.9142***	-.2498***	-.6456***	-.5844***	-.0613	-.2571**	-.3361***	.0790
	(.1293)	(.0821)	(.0730)	(.1794)	(.1569)	(.0396)	(.1004)	(.0793)	(.0556)
ROE	.0164	-.0123	.0288*	.0009	.0011	-.0003	.0082	.0062	.0020
	(.0460)	(.0392)	(.0149)	(.0083)	(.0070)	(.0017)	(.0342)	(.0301)	(.0044)
ROA	.6508	.7240	-.0732	.4297	.3566	.0731	.7389	.4993	.2397**
	(.6824)	(.6171)	(.1513)	(.4400)	(.3578)	(.1118)	(.6364)	(.5565)	(.1083)
InstOwn*CO	.1468	.0968	.0500*	.2257*	.1650	.0608	-.0193	-.0353	.0160
	(.0927)	(.0797)	(.0260)	(.1319)	(.1103)	(.0416)	(.0481)	(.0429)	(.0135)
Observations	2,224	2,224	2,224	1,986	1,986	1,986	3,092	3,092	3,092
Number of banks	114	114	114	122	122	122	162	162	162
Adjusted R-squared	0.0902	0.0353	0.2202	0.0915	0.0935	0.0383	0.0432	0.0550	0.0190

Liquidity creation variables cat fat, cat nonfat and OBS are dependent variables in our panel estimation, all standardized by gross total assets. Cat fat is the total bank liquidity created on and off the balance sheet. Cat nonfat is the traditional calculation of bank liquidity creation (on the balance sheet only). OBS is off the balance sheet liquidity creation. GTA refers to gross total assets expressed in billions of USD. Tier1Cap is our capital measure obtained by dividing tier 1 capital by total risk-weighted assets. ROE and ROA are the return on equity and return on assets, respectively. Z-Score refers to the sum of ROA and equity-to-assets ratio divided by the standard deviation of ROA. InstOwn*CO is our interaction variable, obtained by multiplying institutional ownership by our ownership concentration indicator, which identifies companies with institutional ownership concentrations higher than 5%. Large banks are those with gross total assets equal to or greater than $3 billion; medium banks are those with gross total assets between $1 billion and $3 billion; small banks are those with gross total assets equal to or below $1 billion. Robust standard errors in parentheses. ***, **, * indicate significance at a 0.01, 0.05, and 0.10 level, respectively.

Table 8

Liquidity creation and institutional ownership by ownership concentration

	Concentrated Institutional Ownership			Dispersed Institutional Ownership		
VARIABLES	Cat fat	Cat nonfat	OBS	Cat fat	Cat nonfat	OBS
InstOwn	.2217***	.1740***	.0478***	.1807***	.1433***	.0374***
	(.0370)	(.0310)	(.0096)	(.0422)	(.0347)	(.0112)
GTA	.0100***	-.0133***	.0034***	.2810**	.1647**	.1163
	(.0027)	(.0019)	(.0008)	(.1292)	(.0724)	(.0709)
T1Cap	-.8042***	-.6962***	-.1080**	-.6119***	-.5874***	-.0244
	(.1024)	(.0780)	(.0435)	(.1232)	(.1030)	(.0435)
ROE	.0261	.0181	.0080	.0211	.0164	.0046**
	(.0211)	(.0180)	(.0052)	(.0135)	(.0123)	(.0018)
ROA	.4384	.3559	.0825	.4998	.3365	.1632**
	(.6785)	(.5765)	(.1665)	(.3566)	(.2939)	(.0819)
Obs.	3,414	3,414	3,414	3,888	3,888	3,888
Number of banks	213	213	213	226	226	226
Adjusted R^2	0.1468	0.1104	0.1659	0.1124	0.1109	0.1197

Liquidity creation variables cat fat, cat nonfat and OBS are dependent variables in our panel estimation. Cat fat is the total bank liquidity created on and off the balance sheet. Cat nonfat is the traditional calculation of bank liquidity creation (on the balance sheet only). OBS is off the balance sheet liquidity creation. GTA refers to gross total assets expressed in billions. Tier1Cap is our capital ratio measure obtained by dividing tier 1 capital by total risk-weighted assets. ROE and ROA are the return on equity and return on assets, respectively. Z-Score refers to the sum of ROA and equity-to-assets ratio divided by the standard deviation of ROA. Banks included in "Concentrated Institutional Ownership" have an institutional investor holding 5% or more of their outstanding shares. Banks that do not fulfill this condition are placed under "Dispersed Institutional Ownership". Robust standard errors in parentheses. ***, **, * indicate significance at a 0.01, 0.05, and 0.10 level, respectively.

CONCLUSION

According to existing literature, banks perform two central roles in the economy as risk transformers and liquidity creators. As extensive research has previously focused on the risk-transforming process, this paper aims to build on the growing literature on bank liquidity creation. Stemming from Berger and Bouwman's (2009) pioneer study, subsequent papers examine the role of non-traditional banking activities (Dang, 2020), ownership structure (Yeddou & Pourroy, 2020), monetary policy (Berger & Bouwman, 2017), and governance (Díaz & Huang, 2017) as predictors of bank liquidity creation. To our knowledge, our study is the first to focus on the relationship between institutional ownership and bank liquidity creation using a panel of U.S. banks.

Using a sample of 338 bank holding companies and 7,967 observations covering the period from 2010-2016, we test our three main hypotheses following a fixed-effects model: (1) there is a positive and significant relationship between institutional ownership and bank liquidity creation, (2) the relationship between institutional ownership and bank liquidity creation is affected by bank size and (3) the relationship between institutional ownership and bank liquidity creation is intensified by ownership concentration.

Our main findings are threefold. Firstly, bank liquidity creation has a statistically significant and positive relationship with liquidity, especially on liquidity created on and off the balance sheet. Secondly, the impact of institutional ownership on liquidity measures cat fat, and cat nonfat is higher for small banks. Large and medium banks show very similar results using all three liquidity measures. Thirdly, we find a heightened relationship between institutional ownership and liquidity creation in banks with concentrated institutional ownerships. Our interaction analysis shows that the presence of ownership concentration intensifies the relationship between institutional ownership and liquidity creation in a statistically significant fashion.

Expanding the understanding of bank liquidity creation is vital to its monitoring and the overall stability of our financial system. Our results extend the existing empirical literature on bank liquidity creation by presenting both institutional ownership and ownership concentration as predictors of liquidity creation. We consider this study an initial step in exploring the relationship between institutional ownership and liquidity creation.

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