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Ownership structure and bank lending

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Abstract

Employing a large sample of US BHCs from 2000 to 2017, we compare the lending decisions between public and private banks. We find consistent evidence of higher loan growth of public banks versus their private peers. However, public banks decrease more their lending than private peers during the crisis. Public banks with low franchise value increase more their lending than private banks during the crisis. Our study is of interest to regulators and policymakers who point out the negative effects of the excessive lending of banks during the turmoil times

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1. Introduction

In the afterward of the financial crisis with the bailout of a larger number of banks and the subsequent economic recession, many blames the excessive risk-taking through an excessive softening of lending standards by banks as one of the main reasons (Taylor (2009), Allen and Carletti (2010), Maddaloni and Peydró (2011), Tran, Kabir Hassan, and Houston (2019)). Excessive bank risk-taking is considered as the bête noire of the markets (Delis and Kouretas (2011)). Bank supervisors focus more on excessive bank growth, since it can be an effective indicator of financial distress (Cole and White (2012), Berger, Imbierowicz, and Rauch (2016), Altunbas, Manganelli, and Marques-Ibanez (2017), OCC (2018)). In this article, we investigate the association between bank lending and ownership structure. More specifically, we examine how the bank's listing status impact the lending decisions of banks. Our baseline supposition relies on the extent that the information asymmetry and agency costs are more pronounced in public banks than their private peers, due to differences in control and access to the capital markets. And this differences may induce to different risk profiles, and investment decisions for public and private banks.

One may argue that public banks may issue more loans than private banks. First, thanks to their access to capital markets which leads to cheaper funding, public banks tend to take higher risk by increasing their loan issuances. Second, due to the diffused ownership structure of public banks, shareholders of public banks have higher marginal costs of retrieving information, then are more likely to use simple low-cost heuristics to assess and monitor bank activities (Black (1992), Burgstahler and Dichev (1997), Beatty, Ke, and Petroni (2002), Tran, Kabir Hassan, and Houston (2019)). Third, public banks may face pressures from capital markets, which may induce managers of public banks to take risky investments and lend more to build credibility from markets, to improve the stock performance, or to boost their wages (Narayanan (1985), Tran, Kabir Hassan, and Houston (2019)). Consequently, public banks are more likely to increase lending than private banks. We call this hypothesis the opportunistic hypothesis.

On the other hand, one may argue that public banks may issue less loans than private banks. Market discipline's literature documents the offsetting mechanism from the capital markets that can alleviate the opportunistic behaviors as stated above. The efficient market can allow the risk-sensitive shareholders to correctly estimate the bank risk profile. This implies that public banks may lend more carefully, and lend less than private banks which are not faced the same discipline forces. Furthermore, public banks also experience stricter discipline from external monitors of management such as financial analysts and rating agencies (Jensen and Meckling, 1976). The information related to public banks is up-to-date, which may be not the case for private banks. A greater amount of timely information leads to a faster reaction by regulators. Then, this may lead to an increased conservatism in lending in public banks. Additionally, public banks with superior access to capital markets experience a higher franchise value, then may have much to lose in the worst case (Tran, Kabir Hassan, and Houston (2019)), inducing a reduction in excessive lending (Demsetz, Saidenberg, and Strahan, 1996). In line with these arguments, public banks may issue less loans than private banks. We call this hypothesis the monitoring hypothesis.

In this study, our purpose is to clarify the interplay between listing status and bank lending decisions, by using a large sample of US banks from 2000:Q1 to 2017:Q4. Following prior literature (See e.g. Cornett et al. (2011), Ibrahim and Rizvi (2017), Kim and Sohn (2017), Tran (2019), our primary measure of bank lending is the growth rate of loans (LENDING). We document a consistent evidence that public banks experience higher loan growth than private banks, consistent with our opportunistic hypothesis. Since our two hypotheses are not mutually

exclusive, a cautious interpretation of the positive and significant coefficient on listing status is it reflects the net effect of the increased agency problems and the reduced monitoring from external agents (Tran, Kabir Hassan, and Houston (2019)). We further examine the lending decisions of public banks should behave were they a private bank, and find that public banks would decrease lending if they were private. Our main results survive from a battery of sensitivity tests, such as alternative econometric approaches, alternative sub-samples, and additional control variables, etc.

One may have concern about the endogeneity of the decision to go public. We then use different approaches such as Heckman selection, instrument variables approach and propensity score matching approach. In all specifications, our findings remain quantitatively similar. We also use the sub-sample of transition of ownership status (i.e. go-public and go-private samples). We find a significant increase (decrease) of LENDING when banks change their ownership structure from private to public (public to private).

We next examine how the impact of listing status on bank lending decisions varies during the crisis. We find that public banks become more prudent, then experience lower loan growth than their private peers during the crisis, suggesting that the increased monitoring forces offset the opportunistic behaviors during this turmoil period. Furthermore, by focusing on banks with low franchise value (i.e. the sample of banks with higher agency problems), we observe that public banks with low franchise value tend to increase their lending than their private peers during the crisis times. This evidence is interesting, and highlights the necessity of this research, since regulators point out the negative effects of excessive lending during the last crisis. The evidence also support the theory of Acharya, Le, and Shin (2016).

Our study contributes to the literature in several ways. First, to the best of our limited knowledge, our study is one of the first examination of the difference of lending decisions between public and private banks. We document higher loan growth in public banks than their private peers. Second, our paper documents differential lending decisions of public versus private banks during crisis period. This analysis is of interest of regulators since recent studies point out the negative effects of excessive lending on the real economies. We find public banks become more prudent, then decrease more their loan growth than private banks during tumultuous periods. Furthermore, the study identifies the variety of settings that could motivate different lending decisions between public and private banks. The evidence stresses the strengthened role of the franchise value on bank's activities. That is, public banks with low franchise value are more likely to increase their loan growth than their private peers during the crisis times.

The next section provides the hypothesis framework. Section 3 describes the data and variables. Section 4 reports the main results and alternative tests. We provide tests related to endogeneity concerns in Section 5. Section 6 provides evidence from the last financial crisis, and the effects of market discipline and regulatory pressure. Section 7 concludes the study.

2. Theoretical background

The separation of control from ownership is critical in the contemporary theory of firm, inducing two issues: agency problems and information asymmetry (Beatty and Harris (1999), Tran, Kabir Hassan, and Houston (2019)). In this study, we focus on the listing status of banks, i.e. public versus private banks, since there exist important differences in asymmetry information and agency costs, which may cause variation in bank's risk profile, hence lending decisions.

On the one hand, one may argue that public banks may issue more loans than private banks. First, public banks have easier access to capital markets to finance their growth opportunities, and their funding may be cheaper than private banks, then public banks are more likely to take higher risk by increasing their loan issuances. Second, due to the diffused ownership structure of public

banks, shareholders of public banks have higher marginal costs of retrieving information, then are more likely to adopt the rational apathy. They are more likely to use simple low-cost heuristics to assess and monitor bank activities (Black (1992), Burgstahler and Dichev (1997), Beatty, Ke, and Petroni (2002), Tran, Kabir Hassan, and Houston (2019)). This suggests that public banks may have greater incentives to take higher risks, and issue more loans than private banks. Third, public banks may face pressures from capital markets, which is not the case with private banks. The fact that investors rely on hard information to investigate the short-term performance may push managers of public banks to take risky investments and lend more to build credibility from markets, to improve the stock performance, or to boost their wages (Narayanan (1985), Tran, Kabir Hassan, and Houston (2019)). Consequently, public banks are more likely to increase lending than private banks. In line with these arguments, we postulate our first hypothesis:

Opportunistic hypothesis (H1a):

Public banks experience higher loan growth than private banks.

On the other hand, one may argue that public banks may issue less loans than private banks. Market discipline's literature documents the offsetting mechanism from the capital markets that can alleviate the opportunistic behaviors as documented above. The efficient market can allow the risk-sensitive shareholders to correctly estimate the bank risk profile. All information should be accurately incorporated in the share price, reflecting the fair yield for risk. This implies that public banks may lend more carefully, and lend less than private banks which are not faced the same discipline forces. Furthermore, public banks also experience stricter discipline from external monitors of management such as financial analysts and rating agencies (Jensen and Meckling, 1976). The information related to public banks is up-to-date, which may be not the case for private banks. A greater amount of timely information leads to a faster reaction by regulators. Then, this may lead to an increased conservatism in lending in public banks. Additionally, public banks with superior access to capital markets experience a higher franchise value, then may have much to lose in the worst case (Tran, Kabir Hassan, and Houston (2019)), inducing a reduction in excessive lending (Demsetz, Saidenberg, and Strahan, 1996). In line with these arguments, we postulate our second hypothesis:

Monitoring hypothesis (H1b):

Public banks experience lower loan growth than private banks.

Prior empirical studies document scant evidence on the difference between public and private banks. Beatty, Ke, and Petroni (2002) suggest that public banks tend to manipulate their earnings than private banks to escape the small earnings declines. In a recent article, Tran, Hassan, and Houston (2019) also find greater earnings management of public banks versus private banks, partially explained by the capital requirement. Samet, Boubakri, and Boubaker (2018) show that public banks are less risky than private banks. Tran, Kabir Hassan, and Houston (2019) document evidence of greater stability in listed banks versus their unlisted peers. However, listed banks became riskier than unlisted banks during the last crisis.

3. Data, and variables

3.1 Sample banks

We use quarterly Y-9C regulatory reports filled by US bank holding companies (BHC) with assets over $150 million. The period of study lasts from 2000:Q1 to 2017:Q4. All bank-quarter observations with missing or incomplete data will be removed. Our dataset contains 73,473

observations for 2,976 BHCs. All financial ratios are winsorized at 1% level on the top and bottom of their distribution to mitigate the effects of outliers.

3.2. Variables

Following prior literature (See e.g. Cornett et al. (2011), Ibrahim and Rizvi (2017), Kim and Sohn (2017), Tran (2019), our primary measure of bank lending is the growth rate of loans (LENDING).

In order to mitigate a potential omitted variable bias, we control for various bank-specific variables, as well as time (quarters) fixed effects. We include banks size (SIZE), capital ratio (CAPITAL), banks performance (DUMMY LOSS, and EARNINGS), assets growth (GROWTH), and functional diversification (NII). See Table 1 for definitions.

Table 1. Variables Definitions

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

Variables	Definitions
LENDING	The growth rate of loans
PUBLIC	A dummy that takes a value of 1 if the bank is listed on a stock exchange, 0 otherwise.
SIZE	The natural logarithm of gross total assets
CAPITAL	Book value of equity over gross total assets
DUMMY LOSS	A dummy variable that equals one if net income is negative, and zero otherwise
GROWTH	The growth rate of gross total assets
EARNINGS	Income before taxes, provisions recognized in income over gross total assets
NII	Noninterest income / Net operating income

Table 2 reports the summary statistics and univariate tests between public and private banks. On average, public banks are larger, better capitalized, and are more profitable than private banks. Furthermore, they have greater growth opportunities, higher fraction of noninterest incomes in their revenue stream.

Table 2. Summary Statistics and Univariate Tests

This table reports summary statistics for the main sample of U.S. commercial banks used in the analysis. All financial variables are winsorized at 1% and 99% levels. Panel A shows the mean of our main variables, and presents tests of differences between public and private banks. Panel B provides the correlation between main variables.

Panel A: Mean and median

	Mean		
	Private	Public	t-test
	(1)	(2)	(3)=(1)-(2)
LENDING	0.019	0.021	-.0011***
SIZE	13.357	14.617	-1.259***
CAPITAL	0.091	0.095	-.004***
EARNINGS	0.015	0.015	-0.000**
GROWTH	0.019	0.021	-0.002***
DUMMY_LOSS	0.081	0.095	-0.013***
NII	0.219	0.250	-0.030***

Panel B: Correlation between variables

	LENDING	SIZE	CAPITAL	EARNINGS	GROWTH	DUMMY_LOSS
SIZE	-0.033***	1				
CAPITAL	0.007	0.050***	1			
EARNINGS	0.107***	0.067***	0.256***	1		
GROWTH	0.216***	0.014***	-0.063***	0.099***	1	
DUMMY_LOSS	-0.196***	0.058***	-0.129***	-0.479***	-0.126***	1
NII	-0.018***	0.381***	0.067***	0.148***	-0.005	0.010***

4. Does listing status affect bank lending?

The above section documents evidence of the association between bank lending and listing status from univariate tests. These tests however may discard a number of factors that could impact both bank lending and PUBLIC. In this section, we conduct multivariate tests when controlling other control variables to assess the impacts of listing status to bank lending. The empirical specification is as follows:

$$Y_{it} = \alpha + PUBLIC_{it} + Z_{it} + \theta_t + \varepsilon_{it} \quad (1)$$

where Y_{it} is the measure of LENDING of bank i at time t. Our variable of interest is PUBLIC, which equals to 1 if bank i is listed at quarter t, and 0 otherwise. Z_{it} is the vector of control variables. We include time-fixed effects, θ_t, to control for time effects which can affect the lending decisions of banks. ε_{it} is the error term. LENDING is likely to be correlated within a bank over time, standard errors used to assess significance are corrected for heteroscedasticity and bank-level clustering.

Table 3. Baseline Multivariate Analysis

This table reports regression estimates of the relation between LENDING and PUBLIC. Panel A presents baseline models. The main independent variable is PUBLIC. Panel B presents differences between accrual LENDING and predicted LENDING. Panel C presents alternative econometric methods. All financial variables are winsorized at the 1% and 99% levels. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively. Standard errors are clustered at the bank level. Numbers in parentheses are t-statistics.

Panel A: Baseline Models

	Reduced model	Baseline model	Additional variables	Excluding crisis	Annual data	Balanced panel data	Lag of 2 periods	Excluding Top 10th	Excluding TBTF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Public	0.002***	0.002***	0.003***	0.002***	0.015***	0.005***	0.002***	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)
Size		0.000	0.001	0.000	0.000	-0.001**	0.000	0.001**	0.000*
		(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
Capital		-0.002	-0.016	-0.006	0.080	0.016	-0.002	-0.001	-0.002
		(0.011)	(0.014)	(0.012)	(0.059)	(0.028)	(0.011)	(0.012)	(0.011)
Earnings		-0.004	0.038	0.000	-0.099	0.019	-0.019	-0.010	-0.006
		(0.040)	(0.043)	(0.044)	(0.235)	(0.086)	(0.042)	(0.043)	(0.041)
Growth		0.183***	0.131***	0.188***	0.296***	0.096***	0.171***	0.196***	0.185***
		(0.008)	(0.009)	(0.008)	(0.014)	(0.013)	(0.007)	(0.008)	(0.008)
Dummy Loss		-0.017***	-0.009***	-0.016***	-0.076***	-0.021***	-0.018***	-0.016***	-0.017***
		(0.001)	(0.001)	(0.001)	(0.005)	(0.002)	(0.001)	(0.001)	(0.001)
NII		-0.002	-0.003	-0.003	0.006**	-0.008	0.000	-0.002	-0.002
		(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.003)	(0.003)	(0.003)
NPL			-0.443***						
			(0.022)						
Deposits			-0.011***						
			(0.003)						
Earnings volatility			-0.045						

			(0.046)						
EPU			-0.072***						
			(0.014)						
GDP dispersion			-0.262***						
			(0.045)						
Jurado			2.927***						
			(0.566)						
VXO			-0.037***						
			(0.007)						
SD_Profit			0.027***						
			(0.003)						
Constant	0.028***	0.013***	0.023***	0.012***	0.029	0.034***	0.013***	0.007	0.013***
	(0.001)	(0.003)	(0.006)	(0.004)	(0.019)	(0.007)	(0.004)	(0.006)	(0.003)
Observations	73,473	68,114	34,363	60,749	10,972	12,308	65,311	60,686	67,625
R-squared	0.087	0.128	0.201	0.128	0.295	0.121	0.130	0.140	0.129
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N_banks	2976	2933	1832	2931	2117	226	2866	2747	2933

Panel B: Difference between actual LENDING and predicted LEDNING

	Full sample	1:1 matching w/o replacement	1:1 matching with replacement	Nearest neighbor N=2	Nearest neighbor N=3
	(1)	(2)	(3)	(4)	(5)
Mean of difference	0.0013***	0.0022***	0.0021***	0.0019***	0.0021***

Panel C: Alternative estimation methods

	Size weighted	Newey-West	Prais-Winsten	Fama-McBeth	Clusted two-way
	(1)	(2)	(3)	(4)	(5)
Public	0.002**	0.002***	0.003***	0.001*	0.002***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Size	0.000	-0.001***	-0.001***	0.000	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Capital	0.000	-0.018**	-0.013	0.023	-0.018
	(0.012)	(0.008)	(0.009)	(0.025)	(0.020)
Earnings	-0.009	0.075**	0.125***	0.015	0.075
	(0.042)	(0.030)	(0.032)	(0.035)	(0.054)
Growth	0.180***	0.196***	0.031***	0.165***	0.196***
	(0.008)	(0.006)	(0.005)	(0.010)	(0.013)
Dummy Loss	-0.017***	-0.026***	-0.022***	-0.013***	-0.026***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)
NII	-0.002	-0.003	-0.004*	-0.002	-0.003
	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)
Constant	0.013***	0.030***	0.036***	0.009	0.030***
	(0.004)	(0.002)	(0.003)	(0.008)	(0.006)
Observations	67,625	68,114	68,114	68,114	68,114
R-squared	0.127	0.089	0.021	0.072	0.072

Table (3), Panel A, reports our main results. We first start with a reduced model where we include only our variable of interest, PUBLIC, and time fixed-effects (Model (1)). We estimate our baseline model (Model (2)) where we include all control variables. The coefficient on PUBLIC is positive and highly significant, suggesting that public banks lend more than private banks.

Even that we already include control variables as documented in prior literature in our

baseline model, there may exist some omitted and correlated variables. Then, we extend our baseline model by adding additional variables in Model (3), especially the variables related to economic policy uncertainty (Gissler, Oldfather, and Ruffino (2016), Chi and Li (2017), Hu and Gong (2018), Tran and Nguyen (2019)). In Model (4), we exclude the crisis period from our period of study since one may argue bank lending behaviors may vary during this turmoil times. In all specifications, we still document a statistically positive coefficient on PUBLIC, suggesting that public banks are more likely to increase loans than private banks.

In Model (5), we perform our baseline model using annual data instead of quarterly data. We use balanced panel data in Model (6) which help us to mitigate the effects of M&A activities and bank defaults on our investigation, though at the price of over-representing "successful" banks (Tran, Hassan, and Houston (2019)). In Model (7), we lag all control variables of 2 periods. We also use higher lags in unreported tests. In all specifications, our results remain unchanged.

Public banks are usually larger than private banks. Large banks usually face tighter prudential supervision and regulatory constraints given their systemic importance within banking sector (Tran, Kabir Hassan, and Houston (2019)). To alleviate the concern that a few large banks are influencing our results, we exclude top ten largest banks in Model (8). In Model (9), we exclude too-big-to-fail banks (assets greater than $100B), consistent with banks that were subject to stress tests or the Supervisory Capital Assessment Program (SCAP) and the first Comprehensive Capital Analysis and Review (CCAR). Our results remain unchanged, suggesting that our main result is not driven by too-big-to-fail or the largest banks.

Having investigated the relationship between bank lending and listing status, following Tran, Kabir Hassan, and Houston (2019), Tran, Hassan, and Houston (2019), we further examine the lending decisions of public banks should behave were they a private bank. We start by performing Equation (1) with the sample of private bank, then apply each individual public bank factor to the resulting regression model. We then obtain the predicted LENDING for each public bank, and take the difference between each bank's actual LENDING and its predicted LENDING. The results are reported in Table (1), Panel B. The mean difference is statistically positive at the level of 1% (Column (1)), indicating that public banks would decrease lending if they were private. Comparing with 0.002 (Model (2), Panel A, Table 1) when using OLS, the difference between these two values (0.002 versus 0.0013) may reflect the net effect of the opportunistic incentives and monitoring from markets (Tran, Kabir Hassan, and Houston (2019)). In columns (2)-(4), we re-perform all these procedures but with different propensity-score matched samples,[1] and again the results remain unchanged.

In Panel C, Table 1, we use alternative estimation approaches. Even that in Panel A, we already take into account the scale effect. However, to ensure that our core result is not driven by bank size, we use weighted OLS regressions where the weight is the bank's inverse total assets. In Models (2) - (5), we also perform Newey-West, Prais-Winsten Fama-MacBeth and two-way clustering procedures. In all specifications, our findings remain unchanged.

In brief, our findings are consistent with the opportunistic hypothesis that the agency problems derived from the separation of ownership and control would make public banks issue more loan than their private peers. Our results do not support the monitoring hypothesis that pressure from capital markets and other external agents would lead public banks to become more prudent, then issuing less loan. Since these two hypotheses are not mutually exclusive, a cautious interpretation of the positive coefficient of PUBLIC is the effect from opportunistic effects dominates the monitoring effects in terms of the net effects on bank lending decisions. In other

[1] We detail the propensity-score matching methods in the Section 5.

words, the results could be considered as the net effect of the increased agency problems and the reduced monitoring from external agents.

5. Is the choice of being public endogenous?

The obtained findings rely on the assumption that PUBLIC is not endogenous. However, prior literature documents the endogeneity of the listing status is endogenous. It is a deliberate decision by bank managers. The positive relation between LENDING and PUBLIC may be derived from the unobservable differences between public and private banks that simultaneously affect the decision to go public/stay private and the lending decisions of banks. These unobservable differences could lead to potential bias in the OLS framework. We address these concerns with different econometric procedures: the Heckman selection model and the instrumental variables approach, the propensity score matching. These procedures should control for any selection bias that could be present in the above estimation. We also perform estimations for transition samples. The results are tabulated in Table 4.

Table 4. Endogeneity concerns

In Panel A, the table reports regression estimates of the relation between ZSCORE and PUBLIC. All financial variables are winsorized at the 1% and 99% levels. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively. Standard errors are clustered at the bank level. Numbers in parentheses are t-statistics. Panel B reports the results with transition samples (Private to Public, and Public to Private).

Panel A: Propensity-score matching, Heckman selection and Instrument variables approach

	Heckman selection		IV		PSM			
	1rst stage	2nd stage	1rst stage	2nd stage	N=1 Without replacement	N=1	N=2	N=3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Public		0.006***		0.007***	4.130**	0.002*	0.002*	0.002**
		(0.002)		(0.002)	(1.829)	(0.001)	(0.001)	(0.001)
Size	0.372***	0.000	0.119***	-0.000	1.165*	0.000	0.000	0.000
	(0.034)	(0.000)	(0.009)	(0.000)	(0.633)	(0.000)	(0.000)	(0.000)
Capital	0.967	-0.011	0.421*	-0.012	152.739***	0.038*	0.037*	0.026
	(0.906)	(0.012)	(0.230)	(0.012)	(32.217)	(0.023)	(0.020)	(0.018)
Earnings	1.431	0.026	-0.317	0.031	497.467***	-0.030	-0.017	-0.000
	(2.890)	(0.041)	(0.798)	(0.041)	(94.562)	(0.079)	(0.070)	(0.063)
Growth	0.693***	0.178***	0.085	0.178***	3.836	0.208***	0.200***	0.203***
	(0.246)	(0.008)	(0.065)	(0.008)	(8.591)	(0.016)	(0.013)	(0.012)
Dummy Loss	-0.027	-0.017***	0.001	-0.017***	-24.317***	-0.015***	-0.016***	-0.015***
	(0.054)	(0.001)	(0.015)	(0.001)	(1.535)	(0.002)	(0.002)	(0.002)
NII	-0.238	-0.002	-0.068	-0.002	-39.229***	-0.005	-0.005	-0.004
	(0.232)	(0.003)	(0.059)	(0.003)	(5.847)	(0.005)	(0.004)	(0.004)
Fraction of listing	2.847***		0.845***					
	(0.161)		(0.048)					
IMR		-0.003**						
		(0.001)						
Constant	-6.698***	0.016***	-1.571***	0.018***	25.554***	0.010*	0.012**	0.011**
	(0.455)	(0.004)	(0.117)	(0.005)	(9.289)	(0.006)	(0.005)	(0.005)
Observations	68,114	64,176	68,114	64,176	15,370	12,524	18,342	22,174
R-squared		0.128	0.301	0.128	0.208	0.144	0.143	0.144
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N_clust	2933	2864	2933	2864	1545	1911	2118	2222

Panel B: Transition samples

	Private to Public	Public to Private
	(1)	(2)

Dummy_GoPublic	0.005*	
	(0.003)	
Dummy_GoPrivate		-0.010**
		(0.005)
Constant	0.040***	0.028**
	(0.007)	(0.013)
Observations	5,478	1,398
R-squared	0.115	0.143
Control variables	Yes	Yes
FE	Yes	Yes
N_clust	161	41

5.1. Heckman selection

The Heckman approach is used to eliminate the bias due to unobservable variables. We first model the selection of public and private status by using the logit selection model, and then obtain the inverse Mills ratio (IMR) – the omitted variable in Equation (1). The accounting literature (See e.g. Ball and Shivakumar (2005), Kim and Yi (2006), Nichols, Wahlen, and Wieland (2009)) usually includes firm size, leverage, and growth in the logit listing-choice model as explanatory variables. Following Laeven and Levine (2007), we add the fraction of listed banks in the quarter with control variables defined in Equation (1). In Model (1), we estimate the logit listing-choice model and calculate IMR. The IMR is the conditional expectation of the model selection error term, given the banks' observable characteristics and ownership status. In the second stage, we re-estimate Equation (1) by including IMR as an additional control variable to correct for potential self-selection biases. Model (2) reports the second-stage model results. Consistent with our main finding, public banks exhibit higher LENDING.

5.2. Instrumental variables approach

The instrumental variables (IV) estimation extracts the exogenous component of the listing status of banks. The instrument is the fraction of listed banks.

We report the first-stage and second-stage IV regression results in Models (3) and (4). The result of second-stage supports the hypothesis that LENDING of public banks are greater than private banks. The coefficient in the IV estimation is larger than the OLS estimate, which is consistent with our concern about the reverse causality and hence with the need to use an IV approach to identify the impact of going public on bank risk, since the OLS estimation might yield coefficient estimates of the impact of PUBLIC on LENDING that are biased toward zero.

5.3. Propensity score matching

We employ the propensity score matching (PSM) system developed by Rosenbaum and Rubin (1983). We divide the full sample into two groups: public (treated) and private (untreated) banks, then measure the propensity of going public by using a logit model for both treated and untreated samples. Our dependent variable in this logit model is a binary variable which equals 1 if the bank goes public, and equals zero otherwise.[2] Next we match each public bank with one or more private banks sharing similar characteristics as reflected in their propensity scores. We present the results of our PSM analysis in Models (5)-(8). The results are robust to different specifications of PSM.

5.4. The transitioning sample

In this section, we examine the changes in bank lending for a sample of banks that undergo a change in ownership status: (i) from private to public bank status (GoPublic); and (ii) from public to private bank status (GoPrivate). Using the transition set allows us to compare the same bank as

[2] We detail the first-stage in Section 5.1.

both a private and public bank, mitigating the concern of invariant unobservable bank characteristics.

For transition sample from private to public status (public to private status), we create a dummy Dummy_GoPublic (Dummy_GoPrivate) equals to 1 if banks go public (go private), and 0 otherwise. We then re-perform our baseline model by replacing PUBLIC by these two dummy variables. The results are reported in Table 4, Pabel B. Model (1) documents a positive and statistically significant coefficient on Dummy_GoPublic and Model (2) documents a negative and statistically significant coefficient on Dummy_GoPrivate.

In brief, the results from Panel B suggest a significant increase (decrease) of LENDING when banks change their ownership structure from private to public (public to private).

6. Bank lending and listing status: The effects of the crises.

We use the financial crises as a quasi-natural experiment to examine whether the difference in lending between public and private banks changes during crisis periods. We identify the last crisis from 2007:Q3-2009-Q2 following Cornett et al. (2011).

Table 5. The Effects of the Financial Crises

The table reports regression estimates of the relation between LENDING and PUBLIC. All financial variables are winsorized at the 1% and 99% levels. ***, **, * indicate significance at the 1%, 5%, and 10% level respectively. Standard errors are clustered at the bank level. Numbers in parentheses are t-statistics.

	Crisis	Low Franchise
	(1)	(2)
Public	0.002***	0.004***
	(0.001)	(0.001)
Public * Crisis	-0.002*	-0.004***
	(0.001)	(0.001)
Public * Low Franchise*Crisis		0.006**
		(0.003)
Low franchise		0.003***
		(0.001)
Public * Low Franchise		-0.007***
		(0.001)
Low Franchise*Crisis		-0.006***
		(0.002)
Constant	0.013***	0.010***
	(0.003)	(0.004)
Observations	68,114	66,613
R-squared	0.128	0.132
Control variables	Yes	Yes
FE	Yes	Yes
N_clust	2933	2811

During the crisis, investors increase the monitor to listed banks, leading to a decreased opportunistic behavior by public banks. Furthermore, due to their variety of funding resources (e.g. wholesale funding, capital markets, etc.) which become more volatile during the crisis, public banks may become more prudent during this turmoil times rely on different funding sources which become more volatile during crises. However, prior literature stresses that moral hazard arising from government intervention during the crisis may mitigate the discipline of public banks.

We re-perform Equation (1) by adding the interaction of the crisis dummy with PUBLIC (PUBLIC * CRISIS). We report our results in Model (1) of Table 5. The coefficient on the interaction term (PUBLIC*CRISIS) is negative and statistically significant, indicating that public banks reduce more loan growth during financial crises than private banks, suggesting that public banks become more prudent during that time. This evidence suggests the opportunistic behaviors

are offsetting by the monitoring effects of the market during the crisis.

Acharya, Le, and Shin (2016) stress the role of banks' franchise value during the last crisis. The authors suggest that lower franchise value can exacerbate the incentive problem and leas to worse outcomes. We then investigate how differences in lending decisions between public and private banks with low franchise value. Following Tran and Ashraf (2018), we create LOW_FRANCHISE, equals to one if banks are at the bottom quartile of Tier 1 capital ratio, and zero otherwise.[3] We include this dummy variable, and its interactions with PUBLIC and PUBLIC * CRISIS, and re-estimate our baseline model. Interestingly, we observe that public banks with low franchise value are more likely to increase their loan growth than private banks during the crisis, but not during the normal times. This evidence highlights the fact that for those banks, the opportunistic behaviors become more pronounced, and outweigh the monitoring forces during the crisis.

7. Conclusions

Our study provides one of the first investigation on the difference of lending behaviors between public and private banks. This unique and large-sample dataset allows us to examine the impact of variations in information asymmetry. We document a higher loan growth of public banks versus private banks. However, during the crisis, public banks seem to become more prudent, and lower their loan growth, suggesting the effectiveness of the market discipline during this turmoil times. We provide a battery of sensitivity tests to ensure the robustness of our findings. Our results are of interest of regulators and policymakers.

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[3] We also use the ratio of deposits, and core deposits in unreported tests, and find similar findings.

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