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Article

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Market structure, state ownership and monetary policy transmission through bank lending channel: Evidence from Vietnamese commercial banks

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Abstract

This paper examines the impact of market structure and state ownership on bank lending as a transmission channel for monetary policies. For controlling the effects of bank heterogeneities and macroeconomic factors on bank lending, dynamic models using two-step difference GMM with panel data collected from 25 Vietnamese commercial banks and the Vietnamese banking sector from 1999 to 2017 are employed. Results indicate that a higher level of concentration in the banking market and state ownership dampen the expected impacts of interbank interest rate on the loan growth in commercial banks, which decreases the effectiveness of monetary policy via the bank lending channel. These results are robust regarding the use of alternative measures of market structure and the inclusion of event time variables in the dynamic model. Based on the findings, monetary policy could be implied using the significant moderating impacts of state-ownership as well as the market structure of the Vietnamese banking sector on the relationship between bank loan supply and interbank interest rate.

Keywords: market structure; state-owned equity; monetary policy transmission; Vietnamese commercial banks
JEL Classification Codes: G21, E52, L33, P13

1. Introduction

The topic of the monetary policy transmission receives great interest from both scholars and policy-makers due to its essential roles in economic growth (Altunbaş et al. 2002; Bernanke 1993; Bernanke and Gertler 1995; Gambacorta 2005; Kashyap and Stein 1994; Kashyap et al. 1992; Pham 2019). The prioritized channels of transmission could vary across economies based on the level of financial integration and openness, the structure of ownership, macroeconomic factors, regulatory and the structure of financial markets (Allen et al. 2017; Altunbas et al. 2009; Olivero et al. 2011a; Perera et al. 2014). Particularly in Vietnam, where most firms heavily rely

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on bank loans as their primary funding sources, the bank lending channel is genuinely essential. Recently, the ongoing largest-ever nonperforming loan in commercial banks sectors has been one of the most major policy-related changes in bank restructuring, affecting the overall picture of competition and risks in the market (Huynh et al. 2020; Ngo et al. 2019). Moreover, because of the dominant role of state-ownership in bank capital structures in Vietnam, it is urgent to investigate how these issues influence monetary transmission effectiveness.

Regarding banking market structure, previous studies found consistent evidence for its significant moderating roles on the effectiveness of monetary policy transmission (Olivero et al. 2011a; 2011b). Specifically, the weakening of monetary policy transmission via bank lending mechanism is expected when there is higher competition in the banking sector. There are two main channels through that banking market structures could influence monetary policy transmission. First, in a higher competitive environment created by the expansion of larger banks' market share, these larger banks could typically access more sources of funds rather than just the deposits or interbank loans so that they could counteract the monetary policy tightening much easier. Second, an increase in competition could reduce the informational asymmetric across banks on borrowers' financial profile creating lower switching cost for borrowers to move from small banks (who are usually severely affected by the reduction in credit supply) to larger banks (who are better in protecting their money supply) (Olivero et al. 2011a; 2011b). Thus, in this case, at the aggregate level, the impacts of tightening monetary policy on loan demand and supply could be significantly reduced.

Surprisingly, very few studies paid attention to the impacts of ownership structure on the effectiveness of monetary policy transmission. Only recently, some studies found mixed results about the impacts of state ownership level on monetary policy transmission in the banking sector, especially in emerging markets where public banks account for major banking assets (Bashir et al. 2020; Bhaumik et al. 2011). On the one hand, banks with high private ownership are typically more modernized and have much more diverse sources of funds compared to state-owned banks. Therefore, privately-owned banks could employ more alternative funds to smooth their operations than state-owned banks in the event of tightening monetary policy (Bashir et al. 2020). On the other hand, state-owned banks are found to be less responsive to the macroeconomic shocks and charge significantly lower interest rates to firms than privately-owned banks (Micco and Panizza 2006; Sapienza 2004), which reduces expected market impacts of monetary policy.

In general, this paper focuses on the market structure and the ownership structure in Vietnamese banking sectors to provide empirical evidence of their moderating impacts on the relationships between the interbank interest rate and loan supply of commercial banks over 1999-2017. The two main research questions are proposed:

Research question 1: Does the market structure in the Vietnamese banking sector significantly influence the effectiveness of monetary policy transmission by moderating the relationship between the interbank interest rate and bank loan supply?

Research question 2: Does the state ownership in the Vietnamese banking sector significantly influence the effectiveness of monetary policy transmission by moderating the relationship between the interbank interest rate and bank loan supply?

2. Data and methodology

2.1. Data

Starting with more than 35 commercial banks in the Vietnamese banking market, we remove banks that is forced into bankruptcy in the period and banks with completely missing data of one of the variables. Then, a set of unbalanced data of 25 operating commercial banks covering the period of 1999-2017 is collected. The data in the financial report such as balance sheets and income statements are retrieved from the Bankscope. Macroeconomic data such as GDP growth

and inflation index are retrieved from Worldbank. The Interbank rate is retrieved from the State bank of Vietnam. Market structure data is calculated and described in detail below and in Table 1.

2.2. Methodology

In accordance with prior studies which used the dynamic model for investigating monetary policy effects (Ehrmann et al. 2003; Fungáčová et al. 2016; Gunji and Yuan 2010), the general form of econometric regressions[1] are presented as follows.

$$\Delta \ln LOAN_{it} = \alpha * \Delta \ln LOAN_{it-1} + \beta * \Delta IIR_t + \gamma * MARKET\ POWER_t + \emptyset * MARKET\ POWER_t * IIR_t + \theta * BC_{it} + \varphi * MC_{it} + \tau_{it} + \varepsilon_{it} \quad (1)$$

$$\Delta \ln LOAN_{it} = \alpha * \Delta \ln LOAN_{it-1} + \beta * \Delta IIR_t + \gamma * STATE\ OWNERSHIP_{it} + \emptyset * STATE\ OWNERSHIP_{it} * IIR_t + \theta * BC_{it} + \varphi * MC_{it} + \tau_{it} + \varepsilon_{it} \quad (2)$$

where the dependent variable, $\Delta \ln LOAN_{it}$ is the relative change of loan for bank i at time t. ΔIIR_{it} is the change of annual average interbank interest rate from the previous period that reflects the monetary policy of the State Bank of Vietnam for a given bank i at time t. BC_{it} represent the banks' characteristics including bank size ($SIZE_{it}$), capitalization (CAP_{it}), liquidity (LIQ_{it}), and nonperforming loan index (NPL_{it}). MC_{it} refers to the variables accounting for macroeconomic factors such as the growth of gross domestic product ($GDPG_t$), the inflation (INF_t) and volatility index (VIX_t). τ_{it} is bank-specific impact unobserved individually and ε_{it} is the error term.

2.2.1. Market structure proxies

There are different measures for the market structure, which could be separated into two types. The first proxy is the nonstructural measurement, the Lerner index, used to account for bank conducts based on the condition of demand and supply gained by the position of banks in the market (Berger et al. 2017). In this paper, the Lerner index is employed as a market structure measure of the Vietnamese banking sector as a whole and is computed according to the work of De Guevara et al. (2005) and Demirguc-Kunt and Martínez Pería (2010).

Market competitiveness could be created due to higher concentration, suggesting that banks with a monopoly condition could access more sources of funds and could counteract the expected impacts of tightening monetary policy. Therefore, the second type, Herfindahl-Hirschman Index (HHI), is employed in the robustness tests to proxy for the market structure from the perspective of market share (Rhoades 1993). Table 1 represents the definitions and calculations of the two market structure proxies and other variables.

2.3. Econometric specification

In this research, the two-step difference generalized method of moments (GMM) is used for unbiased estimation of dynamic models where sample data includes a large number of cross-sectional observations and a short time span. Apart from the one-step difference GMM (Arellano and Bover 1995; Blundell and Bond 1998), the two-step difference GMM could address the conditions where the independent measurements are not completely exogenous and can be associated with the previous or present time value of residuals. Furthermore, the Hansen statistics are also used to test the instruments' validity and the presence of the identification problem, and values of AR(1) and AR(2) are employed to test the presence of the serial correlation problem in dynamic models.

[1] Eq. 1 aims to investigate the existence of the market power and the importance of bank lending mechanism while Eq. 2 is employed to test the effectiveness of monetary policy transmission based on the existence of state ownership.

Table 1. Variable descriptions.

Variables	Description
$\Delta \ln LOAN_{it}$	The relative change in loan for bank i at time t calculated using the difference in natural logarithms of loan between the two consecutive years
$LERNER_t$	The nonstructural index of market structure overtime for the banking sector in Vietnam calculated by taking the difference in the prices of output and the marginal costs. The form of this index is as follows the approach of Demirguc-Kunt and Martínez Pería (2010). Lerner index value ranges from 0 to 1. A lower Lerner index value shows the increase in competition in the banking market. The Lerner index of Vietnamese bank market is retrieved from FRED (Federal Reserve Bank of St. Louis)
HHI_t	The structural index of market concentration overtime for the banking sector in Vietnam, computed by the total squared market share of all banks in a loan market. HHI value ranges from 0 to 1. A lower HHI value depicts the increase in competition in the banking market
$STATE\ OWNERSHIP_{it}$	Dummy variables for state-owned equity for bank i at time t, with the value of 1 for the bank with the existence of state ownership which is more than 50%, and 0 otherwise
ΔIIR_t	The % change in the annual average of interbank interest rate from the previous period used as the proxy for the monetary policy of the Vietnamese state-bank through the banking lending channel at time t
$SIZE_{it}$	The logarithm form of total assets of bank i at time t. This proxy is normalized with regards to their sample averages: $SIZE_{it} = \log(total\ assets)_{it} - \frac{1}{N_t}\sum_i \log(total\ assets)_{it}$
CAP_{it}	The equity divided by the total assets. This proxy is normalized with regards to their sample averages: $CAP_{it} = \frac{Equity_{it}}{Total\ assets_{it}} - \frac{1}{T}\sum_i \frac{1}{N_t}\sum_i \frac{Equity_{it}}{Total\ assets_{it}}$
LIQ_{it}	The liquid assets divided by the total assets. This proxy is normalized with regards to their sample averages: $LIQ_{it} = \frac{Liquid\ assets_{it}}{Total\ assets_{it}} - \frac{1}{T}\sum_i \frac{1}{N_t}\sum_i \frac{Liquid\ assets_{it}}{Total\ assets_{it}}$
NPL_{it}	The ratio of non-performing loans to total loans. This proxy is normalized with regards to their sample averages: $NLP_{it} = \frac{Nonperforming\ loan_{it}}{Total\ loan_{it}} - \frac{1}{T}\sum_i \frac{1}{N_t}\sum_i \frac{Nonperforming\ loan_{it}}{Total\ loan_{it}}$
$GDPG_t$	The annual growth of the gross domestic product of Vietnam retrived from Worldbank
INF_t	The annual inflation calculated through the consumer price index of Vietnam retrived from Worldbank
VIX_t	Annual average Volatility index retrived from FRED, Federal Reserve Bank of St. Louis
WTO_t	Dummy variable for the event before and after Vietnam officially joins World Trade Organizations, with the value of 1 after the year of 2007, and 0 otherwise
$CRISIS_t$	Dummy variable for the global financial crisis event happened in 2007 and 2008, with the value of 1 for the year of 2007 and 2008, and 0 otherwise

Table 2. Descriptive statistics of variables.

Variable	Obs	Mean	SD	Min	Max
Δ*lnLOAN*	250	0.111	0.779	-6.14	3.93
LERNER	400	0.228	0.037	0.157	0.309
HHI	475	0.732	0.152	0.545	0.971
Δ*IIR*	418	0.383	0.95	-0.741	8.992
SIZE	275	0.099	0.722	-3.021	1.784
LIQ	242	0.299	0.895	-0.046	13.966
CAP	264	0.083	0.044	0.005	0.449
NPL	261	5.248	11.995	0.000	81.880
GDPG	475	6.328	0.754	4.774	7.547
INF	475	6.749	5.767	-1.580	23.060
VIX	474	19.936	7.002	11.040	40.000

Notes: Table 2 shows the descriptive statistics of variables. Variable definitions are reported in Table 1. The observation (Obs), mean, standard deviation (SD), minimum (Min) and maximum (Max) are illustrated, respectively for each variable. *Sources*: Bankscope and FRED.

Table 3: Correlation between variables.

	Variables	1	2	3	4	5	6	7	8	9	10	11
1	*SIZE*	1.000										
2	*LIQ*	-0.257	1.000									
3	*CAP*	-0.158	0.200	1.000								
4	*ΔlnLOAN*	-0.101	0.065	0.123	1.000							
5	*GDPG*	-0.444	0.214	-0.185	0.127	1.000						
6	*INF*	0.157	-0.099	0.115	0.084	-0.058	1.000					
7	*ΔIIR*	-0.228	0.167	-0.005	-0.394	0.340	-0.106	1.000				
8	*NPL*	-0.004	0.201	0.082	-0.030	-0.092	-0.035	0.189	1.000			
9	*VIX*	-0.166	0.001	0.193	0.014	-0.142	0.688	0.122	-0.060	1.000		
10	*HHI*	-0.679	0.256	-0.207	0.063	0.459	-0.347	0.095	-0.075	0.068	1.000	
11	*LERNER*	-0.385	0.207	-0.060	0.238	0.869	-0.050	0.088	-0.118	-0.084	0.368	1.000

Notes: Table 3 shows the correlation matrix across variables of interest. Variable definitions are reported in Table 1. *Sources*: Bankscope and FRED.

3. Empirical results and discussion

3.1. Descriptive statistics

The descriptive statistics of variables are reported in Table 2. The average value of marker power shows the competition and concentration of the Vietnamese commercial banking system. The average Lerner index is 0.228 indicating the Vietnamese banking market is highly competitive. The average annual changes in bank loans are approximately 0.111. The average annual change in *IIR* over time is 0.383. Table 3 presents the correlation matrix between variables.

3.2 Market structure, interbank rate and the monetary policy transmission via bank lending channel

Answering *Research question 1*, an interaction term of the market structure and interbank rate ($LERNER * IIR$) is included in the two-step difference GMM dynamic models of changes in bank loans reported in Table 4. As presented, IIR as the monetary policy instrument shows a significant negative relationship with bank loan changes, which is consistent with the expected

Table 4: Estimation for loan growth: the interaction effects of market structure (Lerner index - LERNER) and interbank interest rate.

Variables	**Δ*lnLOAN* (1)**	**Δ*lnLOAN* (2)**
$\Delta lnLOAN_{-1}$	-0.250***	-0.228***
	(-9.416)	(-3.502)
IIR	-0.514***	-1.518***
	(-10.670)	(-3.198)
LERNER	0.240***	0.174**
	(5.155)	(2.522)
*LERNER * IIR*		1.108**
		(2.670)
SIZE	-0.100***	-0.046
	(-3.568)	(-1.258)
LIQ	-0.083*	-0.016
	(-1.774)	(-0.373)
CAP	0.047	0.036
	(1.175)	(1.187)
NPL	0.133**	0.053
	(2.687)	(1.291)
GDPG	0.094	0.113
	(1.535)	(1.306)
INF	0.187***	0.128*
	(3.908)	(1.755)
VIX	-0.010	0.052
	(-0.242)	(1.359)
N	149	149
Bank	25	25
Year	1999-2017	1999-2017
Groups	24	24
Instruments	25	38
AR(1)	0.113	0.152
AR(2)	0.332	0.102
Hansen test	0.713	0.611

Notes: The model diagnostics show the insignificant value of AR(1) and AR(2), indicating no first and second-order serial correlation of the error term. The problem of over-identification restriction does not exist due to the failure to reject the Hansen test's null hypothesis. *, **, and *** show statistical significance for p-value < 0.1, p-value < 0.05, and p-value < 0.01, respectively. t-value in parentheses. Variable definitions are reported in Table 1.

theory on the monetary policy implication. The interaction term, $LERNER * IIR$ is statistically positive at the 1% level of significance, suggesting that with a lower level of competition in the banking market (higher level of Lerner index), the expected negative impact of interbank rate is significantly reduced. This finding supports the moderating effects of market structure in the use of bank lending mechanism for transmitting monetary policy by reducing the effectiveness of IIR for transmitting the monetary policy via bank loan supply. These results are in line with the research of Bashir et al. (2020).

3.3 State ownership, interbank rate and the monetary policy transmission via bank lending channel

Answering *Research question 2*, an interaction term of the state ownership and interbank rate ($STATE\ OWNERSHIP * IIR$) is included in the two-step difference GMM dynamic models of

Table 5. Estimation for loan growth: the interaction effects of state ownership and interbank interest rate.

Variables	**Δ*lnLOAN*** **(1)**	**Δ*lnLOAN*** **(2)**
Δln*LOAN*$_{-1}$	0.119***	0.137***
	(4.270)	(5.039)
IIR	-0.422***	-0.594***
	(-3.603)	(-9.686)
STATE OWNERSHIP	0.635	-0.223
	(1.674)	(-1.388)
*STATE OWNERSHIP * IIR*		0.180***
		(5.098)
SIZE	0.057	-0.078*
	(0.742)	(-1.773)
LIQ	0.013***	0.026***
	(3.610)	(3.747)
CAP	0.146	-0.076**
	(1.275)	(-2.167)
NPL	0.590***	0.259***
	(2.933)	(8.297)
GDPG	0.105**	0.090***
	(2.527)	(8.721)
INF	0.041	0.096***
	(1.011)	(2.840)
VIX	-0.128***	-0.174***
	(-3.504)	(-5.472)
N	188	188
Bank	25	25
Year	1999-2017	1999-2017
Groups	25	25
Instruments	24	27
AR(1)	0.227	0. 267
AR(2)	0.068	0.062
Hansen test	0.631	0.602

Notes: The model diagnostics show the insignificant value of AR(1) and AR(2), indicating no first and second-order serial correlation of the error term. The problem of over-identification restriction does not exist due to the failure to reject the Hansen test's null hypothesis. *, **, and *** show statistical significance for p-value < 0.1, p-value < 0.05, and p-value < 0.01, respectively. t-value in parentheses. Variable definitions are reported in Table 1.

changes in bank loans reported in Table 5. As reported in Table 5, the IIR's role as a monetary policy instrument and its significant negative impacts on bank loans remained. State ownership alone does not have significant impacts on bank loan supply (p-value >> 0.05). However, its interaction with IIR via the interaction terms is statistically significant (p-value < 0.01). More importantly, the interactive term poses a positive impact on change in bank loans, suggesting that a higher level of state ownership in banks could weaken the expected negative impacts of IIR as a monetary policy tool on bank loan supply. This moderating effect of state ownership is similar to the work of Ferri et al. (2014), suggesting the dampened effect of ownership on the effectiveness of policy transmission via bank lending mechanism.

3.4 Robustness tests with alternative measures, estimations and control variables

The alternative measure of market structure, *HHI*, is employed that reflects the market concentration or market structure. In Table 6, the findings remain consistent with Table 5,

Table 6. Robustness test of estimation for loan growth: the interaction effects of market structure (Hirschman-Herfindahl index - HHI) and interbank interest rate.

Variables	**Δ*lnLOAN* (1)**	**Δ*lnLOAN* (2)**
Δln*LOAN*$_{-1}$	-0.187***	-0.089***
	(-7.552)	(-6.446)
IIR	-0.695***	-2.524***
	(-7.329)	(-8.302)
HHI	0.438***	0.154***
	(11.573)	(5.752)
*HHI * IIR*		1.684***
		(5.865)
SIZE	0.107***	0.077*
	(4.168)	(1.810)
LIQ	-0.020***	-0.007
	(-5.431)	(-0.731)
CAP	0.115**	0.191***
	(2.572)	(6.326)
NPL	0.323***	0.440***
	(6.959)	(16.685)
GDPG	0.120***	0.344***
	(13.044)	(19.014)
INF	0.331***	0.230***
	(6.978)	(4.279)
VIX	-0.255***	-0.106**
	(-9.534)	(-2.169)
N	188	188
Bank	25	25
Year	1999-2017	1999-2017
Groups	25	25
Instruments	27	27
AR(1)	0.165	0. 129
AR(2)	0.107	0.169
Hansen test	0.301	0.415

Notes: The model diagnostics show the insignificant value of AR(1) and AR(2), indicating no first and second-order serial correlation of the error term. The problem of over-identification restriction does not exist due to the failure to reject the Hansen test's null hypothesis. *, **, and *** show statistical significance for p-value < 0.1, p-value < 0.05, and p-value < 0.01, respectively. t-value in parentheses. Variable definitions are reported in Table 1.

representing the significantly positive coefficient of the interaction term between *HHI* and interbank interest rate (*HHI*IIR*) at 1% level. This finding affirms the moderating effects of market structure on the use of *IIR* as the monetary policy instrument. So, there is a significant reduction in policy transmitting effectiveness if the level of competition in the banking market is low.

Table 7 reports the significant at 5% level and positive impacts of the interaction term of the state ownership and interbank rate ($STATE\ OWNERSHIP * IIR$) when including market structure (*LERNER* and *HHI*) as control variables. The findings are persistent with the discussion aforementioned in Table 5, suggesting that even when accounting for market structure variables, a higher level of state ownership in banks could weaken the expected negative impacts of *IIR* as a monetary policy tool on bank loan supply, thus, reducing the transmitting effects of monetary policy via bank loan supply on the economy.

Table 7. Robustness test of estimation for loan growth: the interaction effects of state ownership and interbank interest rate controlling for market structure index

Variables	**Δ*lnLOAN*** **(1)**	**Δ*lnLOAN*** **(2)**
Δln*LOAN*$_{-1}$	0.188***	-0.016***
	(6.141)	(-4.525)
IIR	-0.572***	-0.571***
	(-6.213)	(-8.080)
*STATE OWNERSHIP * IIR*	0.341**	0.402**
	(2.779)	(2.352)
LERNER	0.109**	
	(2.213)	
HHI		0.288***
		(3.343)
SIZE	-0.021	-0.041
	(-0.644)	(-1.295)
LIQ	0.022**	-0.063
	(2.532)	(-1.686)
CAP	0.067	0.019
	(1.327)	(0.462)
NPL	0.231***	0.096**
	(6.012)	(2.765)
GDPG	-0.045**	-0.117
	(-2.401)	(-1.226)
INF	0.115*	0.127*
	(1.955)	(1.978)
VIX	-0.191***	-0.102**
	(-3.881)	(-2.488)
N	149	188
Bank	25	25
Year	1999-2017	1999-2017
Groups	25	25
Instruments	27	27
AR(1)	0.594	0. 244
AR(2)	0.725	0.082
Hansen test	0.574	0.517

Notes: The model diagnostics show the insignificant value of AR(1) and AR(2), indicating no first and second-order serial correlation of the error term. The problem of over-identification restriction does not exist due to the failure to reject the Hansen test's null hypothesis. *, **, and *** show statistical significance for p-value < 0.1, p-value < 0.05, and p-value < 0.01, respectively. t-value in parentheses. Variable definitions are reported in Table 1.

The WTO joining in 2007 and the financial crisis brought dramatic changes in the market structure in Vietnam (De Waal et al. 2009; Vo and Nguyen 2018). Thus, accounting for these major recent changes in the financial sector in Vietnam, two event-time control variables are included in the model (*WTO* and *CRISIS*). The results in Table 8 again affirm the aforementioned moderating effects of market structure and state ownership even when controlling for major shifts in the market.

Regarding the concern of relative small panel data used in this study, we also confirm the main results' robustness using fixed-effect model estimators. The results in Table 9 again show the significant moderating effects of both market structure and state ownership on the effectiveness of monetary policy transmission.

Table 8. Robustness test of estimation for loan growth: the moderating effects of market structure (LERNER index) and state ownership controlling for event time variables (WTO and CRISIS).

Variables	**Δ*lnLOAN*** **(1)**	**Δ*lnLOAN*** **(2)**	**Δ*lnLOAN*** **(3)**	**Δ*lnLOAN*** **(4)**
Δln*LOAN*$_{-1}$	-0.342***	-0.614***	-0.088	-0.075
	(-5.903)	(-5.311)	(0.066)	(0.064)
IIR	-2.113***	-6.968***	-0.803***	-0.669***
	(-5.448)	(-4.347)	(0.152)	(0.113)
LERNER	0.980***	0.963***		
	(10.004)	(5.619)		
*LERNER * IIR*	2.181***	6.136***		
	(6.238)	(4.335)		
STATE OWNERSHIP			-0.086	-0.118
			(0.075)	(0.080)
*STATE OWNERSHIP * IIR*			1.236**	1.180**
			(0.476)	(0.480)
WTO	-0.487***		-0.558**	
	(-5.035)		(0.223)	
CRISIS		-0.930***		-0.463***
		(-4.328)		(0.162)
SIZE	0.106	-0.267***	0.033	0.190*
	(1.362)	(-4.141)	(0.046)	(0.101)
LIQ	-0.142**	-0.082	-0.326	-0.497
	(-2.346)	(-1.619)	(0.299)	(0.341)
CAP	0.102	0.044	2.048	2.743
	(1.077)	(0.715)	(2.042)	(2.752)
NPL	0.109*	0.221***	0.013**	0.012**
	(1.972)	(3.876)	(0.005)	(0.005)
GDPG	-0.863***	-0.598***	0.131	-0.052
	(-11.011)	(-3.257)	(0.169)	(0.172)
INF	0.463***	0.488***	0.001	0.007
	(3.999)	(3.974)	(0.010)	(0.012)
VIX	-0.123*	0.737***	0.025**	0.008
	(-1.946)	(3.696)	(0.011)	(0.008)
N	149	149	149	149
Bank	25	25	25	25
Year	1999-2017	1999-2017	1999-2017	1999-2017
Groups	24	24	24	24
Instruments	24	24	24	24
AR(1)	0.053	0. 019	0. 278	0.191
AR(2)	0.165	0.080	0.734	0.198
Hansen test	0.480	0.505	0.548	0.536

Notes: The model diagnostics show the insignificant value of AR(2), indicating no second-order serial correlation of the error term. The problem of over-identification restriction does not exist due to the failure to reject the Hansen test's null hypothesis. *, **, and *** show statistical significance for p-value < 0.1, p-value < 0.05, and p-value < 0.01, respectively. t-value in parentheses. Variable definitions are reported in Table 1.

Table 9. Robustness test of estimation for loan growth: the interaction effects of market structure and state ownership and interbank interest rate using the fixed effect model.

Variables	**Δ*lnLOAN*** **(1)**	**Δ*lnLOAN*** **(2)**	**Δ*lnLOAN*** **(3)**
Δln*LOAN*$_{-1}$	-0.384***	0.007	-0.266**
	(0.122)	(0.087)	(0.113)
IIR	-3.590**	-1.952***	-0.498***
	(1.583)	(0.488)	(0.106)
LERNER	4.188	(-4.347)	
	(4.400)		
*LERNER * IIR*	15.018*		
	(7.629)		
HHI		0.123	
		(0.791)	
*HHI * IIR*		2.577***	
		(0.691)	
*STATE OWNERSHIP * IIR*			0.425**
			(0.203)
SIZE	-0.265*	-0.061	-0.197
	(0.135)	(0.110)	(0.128)
LIQ	-0.859	-0.038	-1.016*
	(0.522)	(0.045)	(0.521)
CAP	2.495	2.945	3.172
	(2.368)	(2.005)	(2.356)
NPL	-0.003	-0.018	-0.013
	(0.022)	(0.023)	(0.022)
GDPG	-0.080	0.109	-0.095
	(0.247)	(0.107)	(0.247)
INF	0.034*	0.040***	0.030*
	(0.018)	(0.015)	(0.017)
VIX	-0.009	-0.024**	-0.013
	(0.014)	(0.012)	(0.014)
N	149	188	149
Adj. R^2	0.144	0.020	0.147
BIC	251.499	354.530	250.871
RSS	31.531	51.942	31.399

Notes: Table 9 reports the results of robustness regression using fixed-effect model to account for the concern of relative small panel data. *, **, and *** show statistical significance for p-value < 0.1, p-value < 0.05, and p-value < 0.01, respectively. t-value in parentheses. Variable definitions are reported in Table 1.

4. Conclusion

Market structure and state ownership are considered as essential factors in this paper for examining the transmitting effectiveness of monetary policy using the interbank rate as an instrument. The results show that the transmitting effect of monetary policy via bank lending mechanism is weakened when the market concentration in the banking sector is higher or the state ownership in commercial banks is high, controlling for bank heterogeneity and macroeconomic factors.

This research contributes to the area in several ways. Firstly, the prior literature employed aggregate data to examine the monetary policy transmitting effects via bank lending mechanism (Bemanke and James 1991; Bernanke 1990; Hoshi et al. 1993; Kashyap et al. 1992; Oliner and Rudebusch 1993). This paper extends prior research by controlling the effects of the bank-specific characteristic such as ownership structure.

Secondly, banking market structure and state ownership as moderators to the relationship between the interbank rate and loan supply in the context of an ongoing reconstructing banking sector like Vietnam are underexplored. In the case of the Vietnamese banking market, it seems that higher market competition fosters the transmitting effects of monetary policy via bank loan supply. This finding is consistent with the recent work of (Bashir et al. 2020) in the Chinese banking sectors. They found similar findings with this paper that "*higher market power and increased concentration tends to make the bank lending channel of monetary policy transmission less effective*" (Bashir et al. 2020). The mixed results on this issue could be an exciting and urgent direction for future research to investigate using different contexts and methods given the essence of monetary policy to the economy.

Regarding policy implication, the State Bank of Vietnam has been navigating in the right direction considering the trend of lower market consolidation and lower state ownership in the banking system. The findings in this paper could voice solid support for the current governments' effort to reconstruct the Vietnamese commercial banking system.

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