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Banking Competition, Banking Stability and the Lending Channel of Monetary Policy: the Case of Thailand

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Abstract

This paper examines the bank lending channel and the effect of banking competition and banking stability on the lending channel of monetary policy in Thailand, using bank-level panel data from the period 1999Q1-2016Q4. The results show a significant effect of monetary policy via the bank lending channel in Thailand, which is higher in larger sized banks and lower in banks with low capitalization and liquidity. A higher degree of banking competition and banking stability mainly weaken the effect of monetary policy through the bank lending channel. This effect is higher in financially constrained banks than the less financially constrained ones.

Keywords: Bank Lending Channel, Banking Competition, Banking Stability, Monetary Policy, Thailand

1. Introduction

After the 1997 financial crisis in Thailand, the financial sector and the Thai economy continued to develop. This is because several financial policies and financial restructuring plans were introduced to encourage liquidity in the financial market after this period. The Bank of Thailand also introduced the financial market development plan in order to improve financial competition and increase financial stability in the country. The Financial Sector Master Plan Phase I (2003-2005) was introduced to support banking competition and extend universal banking businesses in the country (Bank of Thailand, 2002). This was followed by the Financial Sector Master Plan Phase II (2010-2014), with the aim of supporting financial stability and financial competition. There was also an announcement of the issuing of the new Financial Development Master Plan (2016-2020), intended to improve financial development in order for the country to join the Asian Economic Community (AEC), and to develop risk management techniques and banking security systems, and to support financial soundness and stability in the future (Bank of Thailand, 2015). Regarding the improvement in financial competition and stability in the country, this can also have an important influence on monetary policy and the economy. Olivero, Li, and Jeon (2011) and Singh, Razi, Endut, and Ramlee (2008) state that banking competition and stability also affect the financial system and financial institutions, influencing the way in which monetary policy affects the economy through the bank lending channel. Olivero et al. (2011) point out that this effect can vary depending on different banking characteristics, such as bank size, bank capitalization and bank liquidity. This raises the important issue of the effect of banking competition and stability on monetary policy transmission, especially via the bank lending channel. This is because banking competition and banking stability can have an important influence on the banking and credit sector, and this can affect the way in which monetary policy passes through the bank lending channel. Studies of the effect of banking competition on the lending channel have appeared in the recent literature, especially in developed countries (Adams & Amel, 2005; Brissimiss & Delis, 2009; Fungácova, Solanko, & Weill, 2014; Khan, Ahmad, & Gee, 2016; Olivero et al., 2011; Yang & Shao, 2016). However, the study of the effect of banking stability on the lending channel is still limited and only focuses on developed countries (Fernández, González, & Suárez, 2016; Tabak, Marcela, & Cajueiro, 2013). Moreover, papers on this issue do not yet focus on the effect of banking competition and stability in terms of different

banking characteristics. Therefore, this paper aims to fill the gap in the previous literatures by introducing evidence from Thailand, as a case study of a developing Asian country. The objectives of the paper are threefold: first, to examine the bank lending channel in Thailand using a bank-level panel database from 1999Q1 to 2016Q4; second, to examine the effect of banking competition and banking stability on the bank lending channel; and third, to study the bank lending channel and the effect of banking competition and stability on it with regard to different banking characteristics. This study will also fill the gap in the empirical studies of Thailand, which do not focus on this issue. Our findings show a significant effect of monetary policy via the bank lending channel in Thailand. The results show that a higher degree of banking competition and banking stability mainly weaken this effect, and that it is higher in financially constrained banks than less constrained ones.

2. Literature survey

Several bank-level panel data studies of the bank lending channel have found a significant effect of monetary policy via the bank lending channel. Ehrmann, Gambacorta, Martinez-Pagés, Sevestre, and Worms (2001) found the existence of the bank lending channel in European countries, as the policy interest rate has a negative effect on bank loan supply. They also found that this effect is relatively higher in small banks compared to large ones, due to their lower balance sheet condition and lower creditworthiness, thus reducing their opportunities to obtain external funds. Similar results have been found by Hosono (2006) and Kishan and Opiela (2000) in their studies of the bank lending channel in Japan and the US respectively. Gambacorta and Mistrulli (2004) report a significant effect of monetary policy via the bank lending channel in Italy and this effect is comparatively greater when banks have lower capitalization and liquidity. This is due to the weak balance sheet condition of banks with low capitalization and liquidity, leading to their relatively low external funds to compensate for the effect of monetary policy on loan supply. Similar results can be found in Ehrmann et al. (2001), Gambacorta (2001), and Haan (2001). Case studies of developing countries and of Thailand in particular remain limited. Piyavongpinyo (2002) and Lerskullawat (2018) found the existence of the bank lending channel, with a greater effect of monetary policy on low capitalised bank in Thailand. Wu, Luca, and Jeon (2007) investigated the bank lending channel in emerging market countries, including Thailand, and found a significant effect of monetary policy via the

bank lending channel, with the effect being higher in smaller banks and those with low capital and liquidity. This is because banks with weaker balance sheet conditions, normally smaller ones with lower capital and liquidity, have less opportunities to obtain external funds. Similar results were also obtained by Karim, Ngah, and Karim (2010) and Zulkhibri (2013) who found evidence of the bank lending channel in Malaysia and India, with a greater effect of monetary policy when banks are small and have low capitalization and liquidity. These results are similar to those of Agung, Morena, Pramono, and Prastowo (2002) in Indonesia; Alfaro, Franken, Garcia, and Jara (2003) in Chile, and Boughrara and Ghazouani (2010) in MENA countries.

As for the study of the effect of banking competition and banking stability on the bank lending channel, previous empirical researches remain limited. Studies mainly focus on developing countries, with none on Thailand. Brissimiss and Delis (2009) and Fungácova et al. (2014) study the effect of banking competition on the bank lending channel in EU countries and found that the effect of banking competition will weaken the channel. This is because greater banking competition will lead to the extension of commercial bank businesses and an increase in the capital and liquidity of banks. This causes banks to have better financial conditions and external funding opportunities. Similar results were obtained by Yang and Shao (2016) in China and Japan. Olivero et al. (2011) report that banking competition can weaken the effect of monetary policy on bank loan supply among Asian and Latin America countries. This effect is also higher when banks are smaller in size and have lower liquidity and capital. With regard to the effect of banking stability, studies of this issue are limited and no case study in Thailand. Tabak et al. (2010) found that the greater the banking stability, the higher the bank lending and thus the lower the effect of monetary policy on the loan supply of banks in Brazil. Fernández et al. (2016) state that a greater degree of banking stability will result in a decrease in banking risk and an improvement in the financial condition of banks. This leads to an increase in the opportunities for banks to issue loans and obtain external funds, thus weakening the bank lending channel.

3. Data and Methodology

The commercial bank balance sheet data were collected from the Stock Exchange of Thailand (SET) database from 1999Q1 to 2016Q4. Backward

aggregation was used as the merger treatment and the merged banks were treated as a single one throughout the sample period, as seen in Kishan and Opiela (2000) and Gambacorta (2001). After the merger treatment, the total sample was reduced to 15 commercial banks[1] with a total sample of 1,080 bank-year observations. The banking competition and stability data were collected from the World Bank Global Financial Development database and SET. The real GDP growth rate and the monetary policy interest rate were obtained from the Bank of Thailand website. Table 1 presents the data description of the overall sample and table 2 shows the sub-samples in line with different bank characteristics.

The baseline empirical model to examine the bank lending channel is based on the reduced form model of Hosono (2006):

$$\Delta L_{it} = \alpha_i + \sum_{s=1}^{k}\beta_1 \Delta L_{i,t-1} + \sum_{s=1}^{k}\beta_2 \Delta GDP_{t-1} + \sum_{s=1}^{k}\beta_3 \Delta r_{t-1} + \sum_{s=1}^{k}\beta_4 size_{i,t-1} \quad (1)$$
$$+\sum_{s=1}^{k}\beta_5 cap_{i,t-1} + \sum_{s=1}^{k}\beta_6 liq_{i,t-1} + \sum_{s=1}^{k}\beta_7 \left(\Delta r_{t-1} \times size_{i,t-1}\right) +$$
$$\sum_{s=1}^{k}\beta_8 \left(\Delta r_{t-1} \times cap_{i,t-1}\right) + \sum_{s=1}^{k}\beta_9 \left(\Delta r_{t-1} \times liq_{i,t-1}\right) + \varepsilon_{i,t}$$

where α_i is the individual banks' fixed effect, i is individual banks, t is the time period, ΔL is the growth of bank loans, and ΔGDP is the real GDP growth rate used to control for the economic effect. Δr is the change of policy interest rate. We use bank characteristic variables based on previous literature (Ehrmann et al., 2001; Gambacorta, 2001), as follows:

$$size_{i,t} = lnA_{i,t} - \frac{1}{N_t}\sum_{i=1}^{N_t} lnA_{i,t}\,,\; cap_{i,t} = \frac{E_{i,t}}{A_{i,t}} - \frac{1}{T}\sum_t \left(\frac{1}{N_t}\sum_i \frac{E_{i,t}}{A_{i,t}}\right),$$
$$liq_{i,t} = \frac{l_{i,t}}{A_{i,t}} - \frac{1}{T}\sum_t \left(\frac{1}{N_t}\sum_i \frac{l_{i,t}}{A_{i,t}}\right)$$

where $A_{i,t}$ is the total assets of bank i at time t, $E_{i,t}$ is the total equity, $l_{i,t}$ is the bank liquid assets, N_t is the number of banks, and T is the time period. An increase in these bank characteristic variables will represent a higher bank balance sheet condition, leading to an increase in the opportunities to access

[1] This sample excludes the specialized financial institutions, as these are controlled and regulated by the Ministry of Finance and are independent of Bank of Thailand policies.

Table 1. Summary statistics for the key variables from 1999Q1 to 2016Q4.

	Mean	Median	Min	Max	Std. Dev.
Growth of bank loans: ΔL	1.8567	0.0000	-66.6987	84.8455	14.2603
Bank size characteristic: *Size*	0.0224	0.2137	-2.2689	2.1028	1.2310
Bank capital characteristic: *Cap*	-0.0011	-0.0080	-0.0323	0.0934	0.0283
Bank liquidity characteristic: *liq*	0.0038	-0.0114	-0.0640	0.2171	0.0610
Bank total assets (Millions US)	693,959,660.30	410,000,000	21,000,000	2,900,000,000	736,909,324.30
5 largest bank assets to total bank assets: *cr5*	66.2050	66.2450	63.7588	68.7669	1.2247
Lerner Index: *Lerner*	0.3098	0.3600	-0.1000	0.4100	0.1133
Boone Index: *Boone*	6.7292	0.3126	-56.5276	298.4837	39.6924
Bank nonperforming loans to gross loans: *npl*	0.0981	0.0792	0.0047	0.2403	0.0591
Bank regulatory capital to risk-weighted assets: *regcap*	0.1154	0.1105	0.0332	0.2759	0.0621
Liquid assets to deposits and short term funding: *liqasset*	17.3790	17.7447	9.5446	21.9188	2.7360
Annual growth of real GDP: *GDP*	3.5336	4.5000	-4.3000	7.9000	3.2828
Change of policy interest rate (Δr)	-0.0893	-0.0033	-1.5566	0.8633	0.5025

Table 2. Summary statistics for the sub-sample groups.

Variable	Large banks (6 banks)	Small banks (9 banks)	Well capitalized banks (5 banks)	Poorly capitalized banks (10 banks)	High liquidity banks (8 banks)	Low liquidity banks (7 banks)
	Mean	Mean	Mean	Mean	Mean	Mean
ΔL	2.1802	1.6008	2.4998	1.5914	1.6376	1.9617
Size	0.0001	-4.4267	-1.8660	-1.5406	-0.3732	-0.0042
Cap	0.0000	-0.0021	0.0016	-0.0295	-0.0034	-0.2505
Liq	-0.0002	0.0014	-0.2789	-0.2805	0.0064	-1.3439
Total bank assets	1,271,486,410.63	206,709,970.53	360,421,362.79	880,145,669.87	1,143,602,075.07	257,123,120.11
Liquidity to total assets ratio	0.0843	0.0536	0.1422	0.0751	0.0944	0.0411
Bank equity to total assets	0.0831	0.1615	0.1166	0.0362	0.1691	0.0818

external funding sources. This leads to a rise in bank loans and a lower effect of monetary policy on loan supply. Therefore, the coefficient of these variables is expected to be positive.

To examine the effect of banking competition and banking stability, we extend model (1) as follows:

$$\Delta L_{it} = \alpha_i + \sum_{s=1}^{k} \beta_1 \Delta L_{i,t-1} + \sum_{s=1}^{k} \beta_2 \Delta GDP_{t-1} + \sum_{s=1}^{k} \beta_3 \Delta r_{t-1} + \sum_{s=1}^{k} \beta_4 size_{i,t-1} \quad (2)$$

$$+ \sum_{s=1}^{k} \beta_5 cap_{i,t-1} + \sum_{s=1}^{k} \beta_6 liq_{i,t-1} + \sum_{s=1}^{k} \beta_7 \left(\Delta r_{t-1} \times size_{i,t-1} \right) +$$

$$\sum_{s=1}^{k} \beta_8 \left(\Delta r_{t-1} \times cap_{i,t-1} \right) + \sum_{s=1}^{k} \beta_9 \left(\Delta r_{t-1} \times liq_{i,t-1} \right) + \sum_{s=1}^{k} \beta_{10} FI_{t-1} +$$

$$\sum_{s=1}^{k} \beta_{11} \left(FI_{t-1} \times \Delta r_{t-1} \right) + \varepsilon_{i,t}$$

FI measures the banking competition and banking stability indicators. The banking competition indicators are *FI1-FI3* and the banking stability indicators are *FI4-FI6. FI1* is the 5 largest bank assets to total bank assets (*cr5*), representing the bank concentration, in which an increase in this indicator will show a higher monopoly power of banks and less banking competition. *FI2* is the Lerner Index (*Lerner*), measuring the degree of market power, a higher level of this index will represent an increase in the market power of banks and less banking competition. *FI3* is the Boone Index (*Boone*), showing the level of financial competition. *FI4* is the ratio of bank non-performing loans to gross loans (*npl*), measuring banking instability in terms of the quality of bank assets and the possibility of default. *FI5* is bank regulatory capital to risk-weighted assets (*regcap*), showing banking stability in terms of the strengthening of bank balance sheet, and *FI6* is liquid assets to deposits and short-term funding (*liqasset*), measuring banking liquidity stability. A decrease in *FI1* and *FI2*, and a rise in *FI3*, will present more financial competition in the banking sector. This leads to greater opportunities for banks to increase their funding and lending. A decrease in *FI4* and increase in *FI5-FI6* will show more financial stability in the banking sector. This can create a stronger financial condition of banks in terms of less default, more liquidity and greater bank balance sheet strength, hence increasing their loan supply. Therefore, more banking competition and banking stability will lead to an increase in lending and opportunities for banks to obtain external funding sources.

This causes a lower effect of monetary policy on bank loans, consequently weakening the bank lending channel. Model (2) will be estimated separately regarding the different indictors.

We estimate models (1) and (2) by using Generalized Method of Moments (GMM) estimation, based on Arellano and Bond (1991) and System-GMM estimation for the robustness check. We also divide the sample into different sub-samples regarding bank size, capital and liquidity, and estimate models (1) and (2) again to study this issue when banks have different banking characteristics.

4. Empirical results

The empirical results of the baseline model of the bank lending channel are shown in table 3, column (1) for first difference-GMM estimation, and in table 4 column (1) for the System-GMM estimation. The results in column (1), table 3, show that the lending channel exists in Thailand, as the coefficient of Δr_{t-1} is negative and statistically significant. The coefficients of $\Delta r_{t-1} \times cap_{t-1}$ and $\Delta r_{t-1} \times liq_{t-1}$ are significantly positive. This indicates that the higher the bank capitalization and liquidity, the higher the bank loan supply and the weaker the effect of monetary policy on bank loans. This in line with expectations, and with the Thai bank balance sheet condition shown in table 2, we can see that the highly capitalized and highly liquid banks in Thailand show a higher liquidity to total asset ratio and bank equity to asset ratio than the poorly capitalized and low liquid ones. Thus, higher bank capitalization and bank liquidity will result in a stronger bank balance sheet, and consequently raise more opportunities for banks to obtain external funding and will weaken the effect of monetary policy through the bank lending channel. This results also in line with other studies such as Agung et al. (2002), Alfaro et al. (2003), and Zulkhibri (2013). In contrast, the coefficients of $size_{t-1}$ and $\Delta r_{t-1} \times size_{t-1}$, are significantly negative; this means that a greater bank size has a negative effect on bank loan supply, strengthening the bank lending channel. Although we obtained an unexpected result, this result is supported in other empirical literatures, such as in Loupias, Savignac, and Sevestre (2002) and Topi and Vilmunen (2001), who explain that this is possibly due to the financial structure of small banks, which have higher bank capitalization and liquidity

than large ones. Table 2 shows that small banks in Thailand have greater liquidity characteristic and equity to total asset ratios than the large banks. Consequently, this condition can lead to a greater effect of monetary policy on bank loans when there is a rise in bank size, as larger banks in Thailand have lower liquidity, resulting in the possibility of fewer external funding opportunities. When estimating the model with the System-GMM estimation, the results are also similar to those in table 3, confirming its robustness.

Table 3. Results of the bank lending channel and the effect of banking competition and banking stability on the bank lending channel (First-Difference GMM)

Variable	(1) Baseline	(2) *cr5*	(3) *Lerner*	(4) *Boone*	(5) *npl*	(6) *regcap*	(7) *liqasset*
ΔL_{t-1}	1.8942**	-0.3305*	-0.2496	-0.3326	0.1930	-0.6090**	-0.3433
	(0.8407)	(0.1884)	(0.1716)	(0.2851)	(0.1781)	(0.2517)	(0.2487)
ΔGDP_{t-1}	0.2081*	0.4739**	0.3526*	0.6509***	0.1162	0.2066*	0.2028
	(0.1102)	(0.2381)	(0.1903)	(0.1935)	(0.1687)	(0.1637)	(0.1638)
Δr_{t-1}	-1.6561**	-1.2737**	-1.8014	-0.5677	-0.7892**	-1.9955*	-1.1029*
	(0.8831)	(0.6549)	(1.1096)	(1.3326)	(0.3692)	(1.0293)	(0.0687)
$size_{t-1}$	-0.7339**	-1.6862***	-2.6268***	-2.9804***	-1.8474***	-1.8622***	-1.0484
	(0.2914)	(0.6061)	(0.7466)	(1.0354)	(0.6203)	(0.6919)	(0.6721)
cap_{t-1}	0.8663	1.8922	1.9582***	1.2157***	-0.2372	1.9906**	1.1396*
	(1.2131)	(1.5431)	(0.9267)	(0.5783)	(1.3485)	(0.9832)	(0.7012)
liq_{t-1}	1.0285	0.9101	1.9748*	1.8438**	1.4971*	2.3710	0.9385
	(5.5068)	(7.8732)	(0.8501)	(0.6663)	(0.8347)	(0.6114)	(1.6557)
$\Delta r_{t-1} \times size_{t-1}$	-0.2555*	-0.6922*	-0.5939	-1.2558	-0.1530**	-0.0694	-0.2237*
	(0.1394)	(0.3268)	(1.1575)	(1.2801)	(0.0739)	(0.2168)	(0.1150)
$\Delta r_{t-1} \times cap_{t-1}$	0.7253**	1.0734**	0.6198*	0.4339*	1.2250**	-1.0313	-1.5627
	(0.3605)	(0.5234)	(0.4019)	(0.2890)	(0.6039)	(1.7421)	(2.4055)
$\Delta r_{t-1} \times liq_{t-1}$	1.9772*	1.1778	1.9526*	1.1017*	1.4273	1.0723**	0.8785
	(1.1186)	(1.1468)	(1.1002)	(0.6028)	(1.6613)	(0.5734)	(1.0227)
FI_{t-1}		-0.3983	1.4831	1.2617	1.5268	0.4479**	0.4409
		(0.3251)	(0.8638)	(1.4812)	(1.3477)	(0.2000)	(0.1918)
$\Delta r_{t-1} \times FI_{t-1}$		-0.0085**	-0.8777*	0.5960*	-0.5932*	0.0178*	0.3414**
		(0.0042)	(0.5019)	(0.3004)	(0.2893)	(0.0098)	(0.1889)
Sargan Test	830.52	826.44	826.53	826.58	712.13	830.59	820.11

Table 4. Results of the bank lending channel and the effect of banking competition and banking stability on the bank lending channel (System-GMM)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	***cr5***	***Lerner***	***Boone***	***npl***	***regcap***	***liqasset***
ΔL_{t-1}	-0.2032**	-0.2667***	-0.1605	-0.2265	0.3148	0.0475	0.2001
	(0.0999)	(0.0998)	(0.1088)	(0.1000)	(0.1294)	(0.1476)	(0.1499)
ΔGDP_{t-1}	0.4479***	0.5053***	0.5356***	0.4857***	0.1411	0.1321	0.1149
	(0.1292)	(0.1372)	(0.1092)	(0.1257)	(0.0972)	(0.1396)	(0.1305)
Δr_{t-1}	-1.8111*	-1.7197*	-1.7773*	-1.0016**	-1.3767*	-1.5920*	1.2209
	(0.1038)	(0.9012)	(0.9030)	(0.0527)	(0.7012)	(0.8021)	(1.8721)
$size_{t-1}$	-2.1454***	-1.1678***	-2.5165***	-2.3505***	-2.8699***	-0.4984**	-0.4872**
	(0.5520)	(0.6903)	(0.6474)	(0.5444)	(0.6564)	(0.2132)	(0.1961)
cap_{t-1}	1.5946**	2.3738***	1.7303***	1.4564**	1.7065*	1.2619	1.6793*
	(0.7948)	(0.9435)	(0.7938)	(0.7072)	(0.9269)	(1.1515)	(0.9115)
liq_{t-1}	1.6916***	1.2141	1.3936**	1.7486**	1.9113**	1.7799	1.4663
	(0.5597)	(1.1143)	(0.6738)	(0.8472)	(1.0353)	(1.0356)	(0.9188)
$\Delta r_{t-1} \times size_{t-1}$	-0.7644*	1.1756	0.7930	0.4564	-0.2951	0.7900	-0.0335
	(0.4112)	(1.2089)	(0.6737)	(0.7624)	(0.6048)	(1.1466)	(0.9253)
$\Delta r_{t-1} \times cap_{t-1}$	1.0975**	1.3877**	1.6191*	1.0125*	1.7376**	1.8878**	0.8852
	(0.0579)	(0.6089)	(0.9012)	(0.6021)	(0.8939)	(0.9523)	(1.7025)
$\Delta r_{t-1} \times liq_{t-1}$	0.4333*	-1.2838	-1.8985	1.5858	-1.9851	-1.2646	1.1271
	(0.2565)	(1.4782)	(1.2940)	(1.6189)	(1.3402)	(1.4223)	(1.7524)
FI_{t-1}		-1.0939***	1.3718	1.5754	0.7303	-0.1150	-1.3346
		(0.2829)	(1.1482)	(0.9340)	(1.7906)	(0.1693)	(1.4204)
$\Delta r_{t-1} \times FI_{t-1}$		-0.5946***	-0.7958*	0.4467*	-0.5556*	0.7998**	0.9963**
		(0.2455)	(0.4276)	(0.2799)	(0.2948)	(0.3184)	(0.4132)
Sargan Test	839.57	837.54	839.61	839.61	720.65	834.75	827.01

For the study of the effect of banking competition and stability on the bank lending channel, the results from tables 3 and 4, columns (2)-(7), show that there is still evidence of the bank lending channel in Thailand, as Δr shows a negative effect on bank loans. We find that banking competition and banking stability have a significant effect on the channel. The results from the first-difference GMM in table 3, columns (1)-(3), show that the interaction term between Δr_{t-1} and banking competition indicators (*cr5, Lerner,* and *Boone*) show a statistically significant negative result for *cr5* and *Lerner*, and positive result for *Boone*. This shows that a rise in banking competition in

Thailand in terms of a reduction in banking concentration (*cr5*) and the degree of market power (*Lerner*), and an increase in the Boone index representing banking competition, can weaken the bank lending channel. This is because a reduction in banking concentration and market power will result in a higher degree of financial competition, and other banks in the market will have more opportunities to find funding sources in the market. This can increase bank lending supply and outweigh the effect of monetary policy on them, thus weakening the bank lending channel. Our result is in line with expectations and with Brissimiss and Delis (2009), Fungácova et al. (2014), and Yang and Shao (2016). For the effect of banking stability, the results from table 3, columns (4)-(6), show that the interaction term between Δr_{t-1} and banking stability indicators (*npl*, *regcap*, and *liqasset*) show a statistically significant negative for *npl* and positive for others. This means that higher banking stability in Thailand in terms of the quality of bank assets and default possibility, the strength of the bank balance sheet, and banking liquidity stability respectively. This will lead to a strengthening of the bank balance sheet condition, higher bank liquidity, and more opportunities for banks to issue loans and obtain external funds. Therefore, banks can compensate for the effect of monetary policy on them, causing a weaker of the bank lending channel. This result is similar to our expectation and with Fernández et al. (2016) and Tabak et al. (2010). Our results also be supported by the issuing of the financial master plan in Thailand, from phase I (2003-2005), to phase II (2010-2014) which can improve the banking competition and stability in the country. The result of System-GMM in table 4 are still to table 3.

When estimating models (1) and (2) when banks have different in size, capital and liquidity, the results in table 5 shows that the coefficient values, especially those of Δr_{t-1}, $\Delta r_{t-1} \times size_{t-1}$, $\Delta r_{t-1} \times cap_{t-1}$ and $\Delta r_{t-1} \times liq_{t-1}$ in the group of large banks with low capitalization and low liquidity, are statistically significant and higher than the group of small, highly capitalized and highly liquid banks, which mostly show a lower value of the coefficients and statistically insignificant results. This result is in line with Olivero et al. (2011) and Zulkhibri (2013), as banks with a weaker balance sheet condition will suffer a greater effect from monetary policy, as they will have difficulty in obtaining external funding sources to outweigh the impact of monetary policy

on their bank loans. As shown in table 2, we see that banks which are higher in size will have lower liquidity characteristics and a lower equity to total asset ratio compared with small banks. Moreover, the liquidity to total asset ratio of low capitalization and low liquidity banks is lower than the highly capitalized bank and high liquidity banks. Thus, this balance sheet condition shows that the small, highly capitalized and highly liquid banks in Thailand are less financially constrained than the large, poorly capitalized and low liquidity ones. As a result, the effect of monetary policy on bank loans will be higher in banks with a weaker balance sheet condition, considered as large, low capitalization and low liquidity banks, compared with banks with a better balance sheet condition which previously were able to find external funds to outweigh the effect of monetary policy on them.

The results in table 6 shows that the effect of banking competition, shown in columns (1)-(3), and banking stability, shown in in columns (4)-(6), still weakens the bank lending channel. This is similar to the findings presented in tables 3 and 4. For the effect of banking competition, the interaction term between Δr_{t-1} and banking competition indicators are statistically significant and shows a higher coefficient among the large, weakly capitalized and low liquidity banks. Similar to the banking stability indicators, the interaction term between Δr_{t-1} and these indicators are statistically significant and shows a higher coefficient in the large, weakly capitalized and low liquidity banks, compared with the small, highly capitalized and highly liquid ones, which have a lower coefficient and insignificant results. Therefore, the effect of banking competition and stability on the bank lending channel is higher, particularly in the more financially constrained banks, considered as the large, weakly capitalized and low liquidity ones, compared with those with less financially constrained, namely the small, highly capitalized and more liquid banks. Our results are in line with Olivero et al. (2011), as the more financially constrained banks will normally face difficulties in finding external funding. As a result, when there is more banking competition and banking stability, these banks will respond more from these conditions than the less financially constrained ones, which generally can easily find external funding sources to outweigh the effect of monetary policy on their loan supply. The results from the System-GMM estimation also remain similar to our first-difference GMM estimation. To conserve space, the results will not be tabulated.

Table 5. Results of the bank lending channel and the effect of banking competition and banking stability on it when dividing the sample into different subsamples in term of size, capital, and liquidity.

Variables	(1) Small	(2) Large	(3) Low Cap	(4) High Cap	(5) Low Liq	(6) High Liq	(7) Small	(8) Large	(9) Low Cap	(10) High Cap	(11) Low Liq	(12) High Liq
	GMM	GMM	GMM	GMM	GMM	GMM	System-GMM	System-GMM	System-GMM	System-GMM	System-GMM	System-GMM
ΔL_{t-1}	0.2976	0.3257	0.2701	0.2484	0.0113	-0.0151	-0.5168***	0.2396***	0.0463	-0.0521	0.0726	-0.0160
	(0.2906)	(0.2053)	(0.2294)	(0.4010)	(0.1652)	(0.0405)	(0.1474)	(0.0876)	(0.1288)	(0.1557)	(0.1654)	(0.0401)
ΔGDP_{t-1}	0.0459	0.1997	-0.0648	1.1572***	1.1659***	-0.1688	0.8467***	0.0271	-0.0857	1.2472***	0.6841**	-0.1688
	(0.3149)	(0.1576)	(0.1867)	(0.4018)	(0.3851)	(0.1796)	(0.2665)	(0.1011)	(0.1178)	(0.2534)	(0.2655)	(0.1778)
Δr_{t-1}	-1.9875*	-2.0145*	-0.9597*	-0.8461*	1.1048*	-1.0470*	-1.3895*	-1.0094*	-1.3441**	-0.9207**	-0.6772*	-1.0470*
	(1.0231)	(1.1356)	(0.5013)	(0.5613)	(0.6012)	(0.5013)	(0.7658)	(0.5932)	(0.7034)	(0.4689)	(0.0447)	(0.5612)
$size_{t-1}$	-1.0746***	-0.8018	-1.9180***	-1.1704	-2.8205**	-2.4614*	-1.5737**	-1.1944	-1.1721***	-1.0489	-2.0634**	-2.4614
	(0.4487)	(1.2702)	(0.9461)	(1.4501)	(1.3484)	(1.2013)	(0.7651)	(0.7970)	(0.5134)	(0.7152)	(1.0115)	(1.7120)
cap_{t-1}	1.6608**	2.2635*	0.0334	-1.4214	-1.6404	0.5079	1.4604**	2.3448*	1.2042***	-1.8875	0.8629	0.5079
	(0.8614)	(1.2646)	(1.1905)	(1.1326)	(1.3648)	(0.6712)	(0.7381)	(1.3858)	(0.6134)	(1.0733)	(0.3078)	(1.4371)
liq_{t-1}	1.7975	1.3484	1.1142	1.3999	0.3047	1.4628	1.3305**	1.3143	0.0869	1.4987	1.3120*	1.4628
	(1.0975)	(1.0359)	(0.5600)	(1.5017)	(1.1984)	(1.1356)	(0.6431)	(1.3384)	(1.2036)	(1.1824)	(0.7013)	(1.6182)
$\Delta r_{t-1} \times size_{t-1}$	1.5585	-0.9942*	-2.0552*	-1.2071	-1.6115**	-1.7271	1.3976*	1.6310*	-1.9992**	-1.8003*	-1.9050**	-1.7271
	(4.2964)	(0.5130)	(1.1795)	(1.8799)	(0.8644)	(1.2024)	(0.7787)	(0.9046)	(0.9561)	(1.0345)	(0.9130)	(1.1796)
$\Delta r_{t-1} \times cap_{t-1}$	2.5099	1.0729**	1.9449*	1.7228***	1.5639	1.6093	-1.6594	3.7853	1.1314**	1.1161	-0.9252	0.6093
	(7.9267)	(0.5130)	(1.0209)	(0.8669)	(1.4648)	(1.3180)	(1.7953)	(3.1158)	(0.5355)	(1.6095)	(1.2210)	(0.6331)
$\Delta r_{t-1} \times liq_{t-1}$	-1.8974	2.3431	1.8760	0.6925	1.6977	0.7031	0.8556	1.6585	1.1198	1.3950	0.5160	0.7031
	(1.6242)	(7.4709)	(0.8970)	(0.6678)	(0.7495)	(1.3062)	(0.6772)	(1.2225)	(0.8101)	(1.2025)	(0.5620)	(0.9227)
Sargan Test	477.54	361.64	512.98	309.49	430.82	442.29	478.32	362.48	517.64	309.50	431.31	442.29

Table 6. Effect of banking competition and banking stability on the bank lending channel when dividing the sample in terms of size, capital and liquidity.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	small	large	small	large	small	large	small	large	small	large	small	large
	cr5	*cr5*	*lerner*	*lerner*	*boone*	*boone*	*npl*	*npl*	*regcap*	*regcap*	*liqasset*	*liqasset*
Δr_{t-1}	1.0651	-1.7920**	-1.1757*	-0.9282	-0.4882	-0.6303*	-1.1785*	0.8072	-1.7122*	-1.9777	-1.6233**	-1.1722**
	(0.7347)	(0.8942)	(0.6014)	(1.0648)	(0.4578)	(0.4012)	(0.6013)	(0.7202)	(0.9013)	(1.8352)	(0.8136)	(0.6025)
$\Delta r_{t-1} \times size_{t-1}$	-1.0821*	0.2882	0.0084	2.2921	2.8116	1.0247	2.2004	-1.3740	0.5786	-1.9126	1.5641	-1.8618
	(0.6012)	(4.2703)	(1.4920)	(3.2331)	(2.5032)	(4.0834)	(3.9720)	(1.3210)	(1.0434)	(1.0021)	(3.6061)	(1.0312)
$\Delta r_{t-1} \times cap_{t-1}$	0.4216*	0.7705*	1.1159	1.4698	1.4405*	-1.8899	0.9021	-2.0455	1.1950	1.4851	2.5814	1.3167**
	(0.2946)	(0.4002)	(0.2565)	(1.6275)	(0.7821)	(1.3471)	(1.9762)	(1.7743)	(1.7575)	(1.3489)	(2.0315)	(0.5852)
$\Delta r_{t-1} \times liq_{t-1}$	1.2784	1.6471	0.2975	2.0359***	0.7265	0.2780	1.3801	0.0396*	0.8680*	1.2351	1.2384	0.5644
	(1.1802)	(1.9050)	(0.5612)	(0.7891)	(1.7556)	(0.6294)	(1.0143)	(0.0203)	(0.5562)	(2.7017)	(0.8135)	(0.4651)
FI_{t-1}	1.1888	-0.3259	1.4853	1.4405	1.9873	0.3914	-1.3158	-1.8023	1.0308*	-1.1230	1.2100	-0.0066
	(1.0235)	(0.6982)	(1.9431)	(0.7719)	(1.5242)	(0.2346)	(2.6213)	(2.7534)	(0.6012)	(1.8055)	(1.3554)	(0.0061)
$\Delta r_{t-1} \times FI_{t-1}$	0.3241	-0.0973***	0.4649**	0.9483***	0.4236*	0.8186*	-0.6436*	-0.7136*	0.1810**	0.2840***	0.0310***	0.0601*
	(0.5298)	(0.0466)	(0.2465)	(0.4231)	(0.2645)	(0.5013)	(0.3423)	(0.4031)	(0.9315)	(0.1460)	(0.0164)	(0.0401)
Sargan Test	475.35	359.39	477.80	361.40	477.26	361.45	481.44	238.54	477.21	356.85	478.60	348.62
	Low cap	High cap	Low cap	High cap	Low cap	High cap	Low cap	High cap	Low cap	High cap	Low cap	High cap
Δr_{t-1}	-1.4599**	0.6004	1.2657	0.6910	-0.4371	0.7306	-0.9198**	0.6359	-0.5657***	1.1506	-1.2377**	-0.9246*
	(0.7962)	(0.7493)	(1.3021)	(0.7312)	(0.6531)	(0.6879)	(0.4236)	(0.9645)	(0.2564)	(0.9088)	(0.6240)	(0.5012)
$\Delta r_{t-1} \times size_{t-1}$	-0.5753***	-1.0154	-2.4651**	0.0850	-1.6204	-1.6240	-1.1947	-2.8072	-1.2537	-2.9625	-2.4021**	-0.5566
	(0.2453)	(1.1060)	(1.0063)	(1.3153)	(1.1463)	(1.1118)	(1.1691)	(2.8952)	(1.1556)	(3.5977)	(1.0423)	(2.6827)
$\Delta r_{t-1} \times cap_{t-1}$	0.5345*	2.2381	-1.6058	1.6794	0.8506*	0.5234	1.1080	1.2817	1.9439	1.3941	1.2085***	1.52833
	(0.2643)	(1.7056)	(1.5919)	(1.6124)	(0.4838)	(0.8071)	(1.5685)	(1.6471)	(1.1946)	(1.3215)	(0.5273)	(1.4269)
$\Delta r_{t-1} \times liq_{t-1}$	-0.5226	0.6595	1.4024**	0.8636	0.2437**	0.6025	0.4316**	2.3376	0.2291	2.9246	-0.6681	0.5920
	(0.8956)	(0.8286)	(0.7230)	(0.6159)	(0.1235)	(0.4741)	(0.2031)	(2.3835)	(0.3261)	(2.0315)	(0.8641)	(0.6784)
FI_{t-1}	1.9798	0.8095*	-1.4024	1.4071**	3.7177	-0.5681	-2.0492	-1.2070	0.4629*	0.2645*	-2.7301	0.1045
	(1.7996)	(0.4512)	(1.0351)	(0.7651)	(2.5226)	(0.3154)	(1.7555)	(1.0941)	(0.2460)	(0.1345)	(2.6515)	(0.1086)
$\Delta r_{t-1} \times FI_{t-1}$	-0.8688**	0.8918	0.8747***	0.7920	0.3672*	0.2165*	-0.6554***	-0.4247**	0.2518*	0.1652	0.0008**	0.0199
	(0.4632)	(0.7746)	(0.3642)	(1.3265)	(0.1630)	(0.1132)	(0.3162)	(0.1966)	(0.1360)	(0.1132)	(0.0000)	(0.2499)
Sargan Test	512.34	309.23	514.79	309.02	513.11	309.40	456.42	264.52	516.51	304.13	513.12	296.14

Table 6. Effect of banking competition and banking stability on the bank lending channel when dividing the sample in terms of size, capital and liquidity. (cont.)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	small	**large**	**small**	**large**	**small**	**large**	**small**	**large**	**small**	**large**	**small**	**large**
	cr5	***cr5***	***lerner***	***lerner***	***boone***	***boone***	***npl***	***npl***	***regcap***	***regcap***	***liqasset***	***liqasset***
	Low liq	High liq	Low liq	High liq	Low liq	High liq	Low liq	High liq	Low liq	High liq	Low liq	High liq
Δr_{t-1}	-1.7902***	-0.8615**	-1.0794**	-1.067**	-1.5489	-0.4405	-0.5709*	-1.8816	-1.3828*	-1.5481	-1.2668**	0.9925
	(0.8013)	(0.4561)	(0.5013)	(0.5612)	(2.6599)	(4.7906)	(0.2846)	(2.6377)	(0.7031)	(1.5727)	(0.6245)	(1.1561)
$\Delta r_{t-1} \times size_{t-1}$	0.2011	-0.5405**	0.9283*	-0.4127**	-1.5489**	-0.5767**	-1.1820***	0.9171	-1.3216	-0.8394**	0.5078	-1.4824**
	(2.9856)	(0.2564)	(0.4938)	(0.2145)	(0.7651)	(0.2864)	(0.5302)	(2.0597)	(3.1136)	(0.4011)	(1.1872)	(0.7012)
$\Delta r_{t-1} \times cap_{t-1}$	0.4326*	0.1568*	0.3046	0.6822	1.6002	0.7677	0.7023	0.8471	-1.1428	0.6253	0.4463**	-1.7837
	(0.2315)	(0.0841)	(0.2031)	(1.7844)	(1.4396)	(0.9737)	(1.0315)	(0.7044)	(1.2011)	(0.4112)	(0.2231)	(1.0224)
$\Delta r_{t-1} \times liq_{t-1}$	0.7873*	0.4621*	0.6326**	0.4802***	0.4531***	0.2190*	2.6525	0.7528***	-0.8625	0.3584***	0.9605*	0.9584***
	(0.4046)	(0.2461)	(0.3086)	(0.2210)	(0.2194)	(0.1132)	(1.9456)	(0.2244)	(0.9834)	(0.1134)	(0.5031)	(0.3445)
FI_{t-1}	0.8955***	-1.5286	0.9482	1.5828**	1.9403***	0.9226	1.2091**	1.9196	-1.2007	1.4267	0.0049	0.0000
	(0.3512)	(1.0319)	(0.8235)	(0.7912)	(0.9452)	(1.0822)	(0.6012)	(1.9775)	(1.5959)	(0.8405)	(0.0053)	(0.0000)
$\Delta r_{t-1} \times FI_{t-1}$	0.3204**	0.1481***	0.8779**	1.4872	0.6821*	0.5384*	-0.6705*	-0.5078*	0.5326***	0.8842	0.0828*	-0.9093
	(0.1564)	(0.5135)	(0.4561)	(2.1013)	(0.4015)	(0.2912)	(0.3645)	(0.2611)	(0.2231)	(0.7342)	(0.0462)	(0.6172)
Sargan Test	430.72	437.03	430.34	446.79	430.87	440.17	357.76	357.54	426.14	443.39	417.62	444.63

5. Conclusion and suggestions

This study aimed to examine the bank lending channel and the effect of banking competition and banking stability on it using evidence from Thailand with a bank-level panel database from 1999Q1 to 2016Q4. The results show the existence of the bank lending channel in Thailand and that banking competition and banking stability both have a weakening effect on the bank lending channel. These effects are higher in the financially constrained banks than the less financially constrained ones. The results from the study raise some important policy implications for the country. As we find that banking competition and stability cause a weakening of the bank lending channel, policymakers should consider the effect of this development when controlling and regulating monetary policy, particularly in the latest financial development plan, financial master plan phase III (2016-2020). Moreover, as we find that this effect is relatively higher in the more financially constrained banks, commercial banks should consider their balance sheet condition and financial competition and stability in the market before issuing loans. This is because the effect of monetary policy on them will be comparatively greater than on the banks with relatively less financial constraint. Policymakers and commercial banks should consider suitable risk management techniques and supervisory systems, such as the Basel III capital requirement and payment system regulations, before applying monetary and other financial in the future.

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