# Effects of banking sector and capital market development on the bank lending channel of monetary policy: An ASEAN country case study

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## ARTICLE INFO

## ABSTRACT

This paper examines the bank lending channel of monetary policy transmission and the effect of banking sector and capital market development on the lending channel using the bank-level panel data of 89 commercial banks in five ASEAN countries (Thailand, Malaysia, the Philippines, Singapore and Indonesia) over the period 1999–2011. The results show that monetary policy has a significant effect via the bank lending channel. The higher the capitalization and liquidity of banks, the weaker the effect of monetary policy via the bank lending channel; however, the greater the size of banks, the stronger the bank lending channel. Banking sector development in terms of banking activities and capital market development leads to a weaker effect of monetary policy through the lending channel, while the development of banks in terms of size strengthens the bank lending channel.

## Introduction

The lending channel is an important means of monetary policy transmission which explains the effect of monetary policy via bank loan supply on the economy (Mishkin, 1996). Due to the important role of the banking sector and financial market in bank loans, financial market development, such as banking sector and capital market development, can result in significant effects on the banking sector and credit market (Altunbas, Gambacorta, & Marqués, 2009; Singh, Razi, Endut, & Ramlee, 2008). This raises the important issue of how these changes affect the way in which monetary policy influences the economy via the bank lending channel. However, studies of this issue are still limited and mainly discuss evidence in developed countries such as the US and those in the EU (Altunbas et al., 2009; Aysun & Hepp, 2011; Chatelain et al., 2003;

Ferreira, 2010). Moreover, using the time series data in a bank lending channel study can lead to an identification problem caused by not distinguishing whether the effect of monetary policy on bank loans comes from the loan supply or the loan demand side. Recent studies mainly used bank-level panel data, which account for bank characteristic variables (size, capitalization, liquidity) to control the cross-sectional differences of the effects of monetary policy on loan supply, ensuring the supply side effect of monetary policy shock (e.g. Gambacorta, 2001; Kashyap & Stein, 2000). Most bank-level panel data studies of the lending channel have been conducted on European countries and the US (Gambacorta & Mistrulli, 2004; Kashyap & Stein, 2000), rather than on Asian ones (Agung, Morena, Pramono, & Prastowo, 2002; Ghosh, 2006; Hosono, 2006; Perera, Ralston, & Wickramanayake, 2014; Wu, Luca, & Jeon, 2007; Zulkhibri, 2013).

Given the financial market development in Southeast Asian regions, this market has recently become important, and is becoming an alternative investment funding source

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for investors worldwide. After the Asian financial crisis in 1997, the banking sector and capital market in the ASEAN-5 (Thailand, Malaysia, the Philippines, Singapore and Indonesia) experienced continuous growth. According to Beck, Demirgüç-Kunt, and Levine's (1999) database, the average ratio of private credit by depository money banks to GDP, the ratio of stock market capitalization to GDP, and the ratio of bond market capitalization to GDP grew by 10.63 percent, 4.02 percent, and 3.21 percent, respectively, over the period 1999–2011. This was due to the greater development of the banking sector and capital market and financial reform implemented after the crisis in order to increase domestic funding, stabilize the financial market, and prevent any future crisis (Felman et al., 2011; Niblock, Heng, & Sloan, 2014). Regarding this significant development, we will fill a gap in previous literature by conducting a case study of the ASEAN-5 countries.

In this paper, we examine the bank lending channel of monetary policy transmission in the ASEAN-5 countries (Thailand, Malaysia, the Philippines, Singapore and Indonesia) using the bank-level panel database approach of 89 commercial banks, from the period 1999–2011. We also examine the effect of different bank characteristics on the bank lending channel as well as investigate the effect of financial development, including banking sector and capital market development, on the bank lending channel. This paper has three main contributions. First, as the time series studies of the bank lending channel can cause an identification problem, we conduct a bank-level panel data study by using bank characteristic variables (size, capitalization and liquidity) to control the cross-sectional differences in the effects of monetary policy on loan supply. Second, this paper examines the effect of financial development, including banking sector and capital market development, on the lending channel, which was not the main focus of previous literature and also some papers only focused on the individual aspect (Ferreira, 2010). Third, we fill the gap in prior studies especially regarding study of the effect of banking sector and capital market development on the lending channel, which previously was mostly focused on developed countries such as in the EU and the US (e.g Altunbas et al., 2009; Chatelain et al., 2003; Ehrmann, Gambacorta, Martinez-Pagés, Sevestre, & Worms, 2001; Kashyap & Stein, 1994; Kishan & Opiela, 2000; Matousek & Sarantis, 2009), by introducing a case study of the ASEAN-5 countries. Regarding this, the lending channel and the effect of banking sector and capital market development on this channel in developed countries will be different from those in the ASEAN-5. This is due to the financial markets and banking institutions in developed countries being more financially developed and relatively large in terms of size, liquidity, and capital, compared with those in developing and Southeast Asian regions (Beck, Demirgüç-Kunt, & Levine, 2009; Čihák, Demirgüç-Kunt, Feyen, & Levine, 2012). As a result, the effects of monetary policy and financial development are possibly greater through the lending channel in Southeast Asian regions, as the banks in less-developed financial market will have difficulty in finding alternative funding sources to outweigh the effect of monetary policy on their balance

sheet. Therefore, this research will shed light on a case study of ASEAN-5 countries, which have not been the focus in previous studies. In addition, this study will make a contribution to the understanding of the lending channel, and the effect of financial market development on the channel in the case of Southeast Asian regions, the ASEAN-5 countries, which have differences in financial development and structures, and relatively less developed financial markets compared with the previous studies in financially developed countries. The remainder of the paper will be developed as follows: the next section presents a literature review related to our studies, followed by data description and methodology as well as a discussion of our empirical results. The last section will present the conclusion of the paper.

## Literature Review

The lending channel of monetary policy transmission explains the effect of monetary policy on the economy through bank loan supply. The use of contractionary monetary policy by increasing the policy interest rate will result in an increase in the market interest rates, reducing the money supply. This leads to a reduction in bank deposits and bank loan supply, decreasing investment, expenditures, and economic growth (Mishkin, 1996). This effect of monetary policy through the bank lending channel is relatively low in large, highly capitalized, and highly liquid banks, compared to small, weakly capitalized, and less liquid ones. This is due to the former have a relatively high reputation and liquidity, better risk diversification behavior, and higher creditworthiness than the latter (Ehrmann et al., 2001; Gambacorta & Mistrulli, 2004; Hosono, 2006). This results in greater opportunities for the less financially constrained banks to raise external funding (Altunbas et al., 2009; Kashyap & Stein, 2000), thus weakening the effect of monetary policy on bank loans on them.

Financial market development, involving banking sector and capital market development, is considered to have an effect on the way in which monetary policy passes through the bank lending channel. Gertler and Rose (1996) state that banking sector development can increase the level of financial intermediation in terms of the size and liquidity of financial institutions. This reduces financial costs and raises the balance sheet strength of banks. Capital market development also increases liquidity in the financial market, resulting in higher bank loans and more opportunities for banks to find external funding sources. As a result, banking sector and capital market development can weaken the effect of monetary policy via the bank lending channel. This is due to these developments increasing the size, capital, and liquidity of banks as well as creating more opportunities for them to obtain external funds (Altunbas et al., 2009; Ferreira, 2010; Gertler & Rose, 1996).

For the empirical study of the bank lending channel, a study by applying time series data can lead to an identification problem. As a result, recent empirical studies of the bank lending channel apply the bank-level panel data and add bank characteristic variables to control the cross-

sectional differences of the effects of monetary policy on loan supply. The studies by Kashyap and Stein (1994) stated that an increase in the US policy interest rate will cause a decline in bank loans, confirming the existence of the bank lending channel. Also, this effect is higher, especially in small banks. They pointed out that this is because small banks have fewer opportunities to raise external funds compared with large banks. Kishan and Opiela (2000) found that the policy interest rate has a negative effect on bank loans and this effect is higher in small bank than in large ones. This possibly stems from the lower reputation, poorer risk diversification behavior, and the weak liquid funds of small banks relative to large ones (Ehrmann et al., 2001; Olivero, Li, & Jeon, 2011). Similar results were also found by Ehrmann et al. (2001) and Hosono (2006). Gambacorta and Mistrulli (2004) found a negative effect of policy rate on the loan supply, supporting the lending channel theory and they also showed that higher bank liquidity and capitalization resulted in a weaker effect of monetary policy on bank loans in Italy. This was due to the higher creditworthiness and lower credit risk of the highly capitalized banks. These results are in line with other empirical studies (e.g. Gambacorta, 2001; Haan, 2001; Matousek & Sarantis, 2009; Topi & Vilmunen, 2001).

Some studies in Asian countries also found similar results. Agung et al. (2002) examined the bank lending channel in Indonesia and found that the contractionary monetary policy resulted in a negative effect on bank loans. They also showed that monetary policy had a weaker effect on the bank lending channel when banks have higher capital. Zulkhibri (2013) and Karim, Azman-Saini, and Karim (2011) investigated the Malaysian bank lending channel and they reported the existence of the lending channel as the policy rate had a negative effect on bank loans. They also documented that monetary policy will have less effect via the lending channel when the banks are large and have high capitalization and high liquidity. Similar results were reported by Ghosh (2006) and Wu et al. (2007).

Empirical studies of the effect of banking sector and capital market development on the bank-level panel data study of the lending channel are still limited. Ferreira (2010) examined the effect of the banking sector and capital market development on the bank lending channel in the EU and found that the development effect on the size of banks as well as the bond market and money market instruments development in the EU led to a weaker effect of monetary policy on bank loans. This was possibly due to a greater degree of financial innovation caused by the capital market development as well as a higher bank's size that can extend the external funding opportunity of such a bank. Altunbas et al. (2009) highlighted the effect of capital market development on the bank lending channel. They found that a rise in bank liquidity and securities trading caused by securitization in the EU countries was an important factor affecting the weakening of the bank lending channel. This was due to a development of new financial market instruments that can improve the risk diversification of banks. This increases the external funding of banks and then substitutes for the effect of monetary policy on bank loans. A similar result was found by Aysun

and Hepp (2011) for a case study in the US. Perera et al. (2014) pointed out the effect of banking sector development in terms of the funding pattern on the bank lending channel. They stated that an increase in the bank off-balance sheet activities in the South Asia countries led to a weaker effect of policy interest rate on bank loans as banks can find more alternative sources of funds to outweigh the monetary policy effect.

Overall, the empirical studies of the effect of banking sector and capital market development on the lending channel have been mostly focused on developed countries and only on an individual aspect of development. Therefore, our study will fill this gap by examining the effect of both banking sector and capital market development on the lending channel and also introducing a case study using the ASEAN-5 countries which have not been the focus of previous studies.

### Data and Methodology

We collected the yearly balance sheet data from five ASEAN countries (Thailand, Malaysia, Indonesia, the Philippines, and Singapore) retrieved from the *Bankscope* database for the period 1999—2011, consisting of 89 commercial banks. We followed the merger treatment from Kishan and Opiela (2000), Gambacorta (2001) and Fernández (2004) by using backward aggregation. In this way, we treated the merged banks as a single one throughout the sample period. Overall, our sample includes unbalanced panel data from 1,157 bank-year observations.[1] We collected the data of banking sector and capital market development indicators from the database in Beck, Demirgüç-Kunt, and Levine (1999).[2] The macroeconomic data comprised the policy interest rate in each country, and also the countries' GDP obtained from the *International Financial Statistics* of the IMF. All the data descriptions and statistics are reported in Table 1. Panel A presents the summary statistics of the bank balance sheet samples. Panel B presents the summary statistics of the macroeconomics variables specify by country. We can see that Malaysia has the highest value of banking sector development (98.02% in *FD1* and 111.43% in *FD2*), while; Indonesia has the lowest (77.85% in *FD1* and 22.43% in *FD2*). For capital market development (shown by *FD3*, *FD4*, and *FD5*), we see that Malaysia and Singapore have relatively high values compared to the other countries. The real GDP growth rate in all countries ranges between 4.0 percent and 5.6 percent. The statistical descriptions of the data[3] when dividing the samples into different bank characteristics are reported in Table 2.

The model specification in this paper is divided into two main models as follows.

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[1] The final sample includes 16 banks in Thailand, 39 banks in Indonesia, 16 banks in the Philippines, 13 banks in Malaysia, and 5 banks in Singapore.

[2] The latest updated Beck et al. (1999) database is from April 2013 and this database includes the financial development indicators up until 2011.

[3] Data in this study have already been checked for the non-stationary issue by applying the panel data unit root test. The test confirmed that the data are stationary.

**Table 1**
Summary statistics for the key variables over the period 1999−2011

|  | Mean | Median | Min | Max | SD |
|---|---|---|---|---|---|
| **Panel A: Bank balance sheet sample (746 bank-year observations)** | | | | | |
| Growth of bank loans ($\Delta L_{it}$) | 2.262 | 1.528 | −12.648 | 28.682 | 4.989 |
| Growth of bank deposits ($\Delta D_{it}$) | 1.761 | 1.119 | −8.445 | 19.035 | 3.642 |
| Growth of bank securities ($\Delta S_{it}$) | 2.747 | 0.649 | −82.987 | 185.055 | 26.346 |
| Bank size characteristic ($Size_{it}$) | −0.007 | 0.080 | −5.052 | 5.076 | 2.226 |
| Bank capital characteristic ($Cap_{it}$) | 0.285 | −1.116 | −13.066 | 47.638 | 8.016 |
| Bank liquidity characteristic ($Liq_{it}$) | −0.003 | −0.025 | −0.253 | 0.517 | 0.141 |
| Total assets (Millions US Dollar) | 30,515.05 | 4,305.41 | 0.403 | 1,301,634 | 98,397.35 |
| Liquidity to total assets | 0.247 | 0.211 | 0.014 | 0.843 | 0.159 |
| Bank equity to total assets | 11.170 | 9.319 | −2.281 | 58.423 | 8.048 |
| Tier 1 capital ratio | 15.004 | 12.560 | 3.852 | 136.300 | 10.731 |
| Total capital ratio | 18.427 | 15.195 | 3.432 | 79.041 | 11.174 |
| **Panel B: Macroeconomic variables and financial development indicators (13 years)** | | | | | |
| Deposit banks' assets to total financial assets ($FD1$) − Indonesia | 77.856 | 76.487 | 67.244 | 87.911 | 7.145 |
| Deposit banks' assets to total financial assets ($FD1$) − Malaysia | 98.025 | 98.913 | 93.905 | 99.761 | 2.149 |
| Deposit banks' assets to total financial assets ($FD1$) − Philippines | 91.390 | 91.128 | 86.525 | 95.181 | 2.596 |
| Deposit banks' assets to total financial assets ($FD1$) − Singapore | 97.601 | 97.385 | 97.045 | 98.538 | 0.474 |
| Deposit banks' assets to total financial assets ($FD1$) − Thailand | 97.788 | 97.814 | 97.050 | 98.624 | 0.505 |
| Private credit by depository banks to GDP ratio ($FD2$) − Indonesia | 22.438 | 22.671 | 14.001 | 45.057 | 9.695 |
| Private credit by depository banks to GDP ratio ($FD2$) − Malaysia | 111.438 | 107.588 | 93.764 | 142.848 | 13.779 |
| Private credit by depository banks to GDP ratio ($FD2$) − Philippines | 29.017 | 28.645 | 22.438 | 39.279 | 4.803 |
| Private credit by depository banks to GDP ratio ($FD2$) − Singapore | 96.719 | 95.585 | 79.978 | 109.834 | 9.302 |
| Private credit by depository banks to GDP ratio ($FD2$) − Thailand | 101.359 | 97.329 | 89.554 | 143.304 | 14.228 |
| Stock market capitalization to GDP ($FD3$) − Indonesia | 28.239 | 26.535 | 14.001 | 45.057 | 9.695 |
| Stock market capitalization to GDP ($FD3$) − Malaysia | 133.697 | 132.835 | 107.058 | 155.771 | 13.541 |
| Stock market capitalization to GDP ($FD3$) − Philippines | 46.231 | 45.754 | 28.269 | 73.903 | 12.549 |
| Stock market capitalization to GDP ($FD3$) Singapore | 172.942 | 173.212 | 118.668 | 214.245 | 31.391 |
| Stock market capitalization to GDP ($FD3$) − Thailand | 55.994 | 59.255 | 27.448 | 81.693 | 17.985 |
| Stock market value traded to GDP ($FD4$) − Indonesia | 12.936 | 12.048 | 6.064 | 21.611 | 5.542 |
| Stock market value traded to GDP ($FD4$) − Malaysia | 42.324 | 39.302 | 24.054 | 56.899 | 9.683 |
| Stock market value traded to GDP ($FD4$) − Philippines | 9.754 | 9.900 | 3.338 | 18.344 | 5.096 |
| Stock market value traded to GDP ($FD4$) − Singapore | 107.984 | 103.849 | 64.701 | 153.271 | 32.317 |
| Stock market value traded to GDP ($FD4$) − Thailand | 45.436 | 47.332 | 24.706 | 67.234 | 14.470 |
| Private bond market capitalization to GDP ($FD5$) − Indonesia | 1.678 | 1.609 | 1.202 | 2.345 | 0.368 |
| Private bond market capitalization to GDP ($FD5$) − Malaysia | 47.727 | 47.421 | 32.791 | 62.809 | 9.683 |
| Private bond market capitalization to GDP ($FD5$) − Philippines | 0.677 | 0.705 | 0.210 | 1.068 | 0.323 |
| Private bond market capitalization to GDP ($FD5$) − Singapore | 17.098 | 16.672 | 10.007 | 22.388 | 3.908 |
| Private bond market capitalization to GDP ($FD5$) − Thailand | 11.773 | 11.570 | 10.434 | 13.311 | 0.934 |
| Annual growth of real GDP ($\Delta GDP$) − Indonesia | 4.910 | 5.031 | 0.791 | 6.486 | 1.522 |
| Annual growth of real GDP ($\Delta GDP$) − Malaysia | 5.083 | 5.585 | −1.153 | 8.680 | 2.726 |
| Annual growth of real GDP ($\Delta GDP$) − Philippines | 4.533 | 4.411 | 1.148 | 7.632 | 1.764 |
| Annual growth of real GDP ($\Delta GDP$) − Singapore | 5.626 | 6.773 | −0.952 | 9.112 | 3.831 |
| Annual growth of real GDP ($\Delta GDP$) − Thailand | 4.073 | 4.750 | −2.330 | 7.811 | 2.827 |
| Change of policy interest rate ($\Delta r$) − Indonesia | −0.396 | −0.325 | −5.030 | 4.130 | 2.626 |
| Change of policy interest rate ($\Delta r$) − Malaysia | 0.001 | 0.055 | −1.350 | 0.660 | 0.548 |
| Change of policy interest rate ($\Delta r$) − Philippines | −0.461 | −0.305 | −2.440 | 0.710 | 0.904 |
| Change of policy interest rate ($\Delta r$) − Singapore | −0.157 | −0.105 | −1.490 | 1.290 | 0.871 |
| Change of policy interest rate ($\Delta r$) − Thailand | 0.002 | −0.040 | −1.950 | 2.100 | 1.164 |

**Table 2**
Summary statistics for the bank characteristic sub-sample groups according to size (small/large), capitalization (high/low), and liquidity (high/low)[a]

| Variable (average) | Large banks | Small banks | Well capitalized banks | Poorly capitalized banks | High liquidity banks | Low liquidity banks |
|---|---|---|---|---|---|---|
|  | Mean | Mean | Mean | Mean | Mean | Mean |
| Growth of bank loans ($\Delta L_{it}$) | 0.905 | 2.521 | 2.459 | 2.006 | 2.641 | 1.823 |
| Growth of bank deposits ($\Delta D_{it}$) | 0.662 | 1.999 | 2.313 | 1.412 | 2.023 | 1.471 |
| Growth of bank securities ($\Delta S_{it}$) | 0.737 | 3.643 | 5.697 | 1.775 | 5.550 | 1.303 |
| Bank size characteristic ($Size_{it}$) | 2.466 | −0.786 | −1.104 | 0.463 | −0.224 | 0.102 |
| Bank capital characteristic ($Cap_{it}$) | 2.408 | 0.568 | 0.888 | −0.307 | −0.034 | −6.945 |
| Bank liquidity characteristic ($Liq_{it}$) | 1.253 | 1.475 | 7.999 | 4.985 | 9.560 | −6.937 |
| Total bank assets (Millions US Dollar) | 109,700 | 8,607 | 24,111 | 35,832 | 17,143 | 42,054 |
| Liquidity to total assets ratio | 0.221 | 0.251 | 0.265 | 0.233 | 0.326 | 0.189 |
| Bank equity to total assets | 33.031 | 10.989 | 34.274 | 8.024 | 12.165 | 10.782 |
| Number of banks | 21 | 68 | 33 | 56 | 39 | 50 |

[a] The banks which have size, capitalization, and liquidity measures higher than the median level are considered to be large, highly capitalized, and high liquidity banks; banks where these measures are lower than the median level are considered to be small, weakly capitalized, and low liquidity banks.

*Bank Lending Channel of Monetary Policy Transmission (Baseline Model)*

Given the aim to examine the bank lending channel using the bank-level panel database approach, the model specification is as follows[5]:

$$\Delta L_{i,t} = \alpha_i + \sum_{s=1}^{k} \beta_1 \Delta L_{i,t-1} + \sum_{s=1}^{k} \beta_2 \Delta GDP_{j,t-1}$$
$$+ \sum_{s=1}^{k} \beta_3 \Delta r_{j,t-1} + \sum_{s=1}^{k} \beta_4 X_{i,t-1} + \sum_{s=1}^{k} \beta_5 (\Delta r_{j,t-1}$$
$$\times X_{i,t-1}) + \varepsilon_{it}$$

$$(1)$$

where $\Delta L_{i,t-1}$ is the growth of bank loans of bank i at time $t-1$ and $\Delta GDP_{j,t-1}$ is the real GDP growth rate of country j, at time $t-1$. According to Olivero et al. (2011), this variable is used to control the economic conditions in each country. We expect that the coefficient for this variable will be positive ($\beta_2 > 0$). $\Delta r_{j,t-1}$ is the change of policy interest rate of country j at time $t-1$. Based on the bank lending channel theory, the coefficient ($\beta_3$) is expected to be negative. $X_{i,t-1}$ presents the vector of bank characteristic variables of bank i at time $t-1$ comprising bank size, capitalization, and liquidity calculated as follows[6]:

$$Size_{it} = \ln A_{it} - \frac{1}{N_t} \sum_{i=1}^{N_t} \ln A_{it},$$

$$Liq_{it} = \frac{l_{it}}{A_{it}} - \frac{1}{T} \sum_t \left( \frac{1}{N_t} \sum_i \frac{l_{it}}{A_{it}} \right), \text{ and}$$

$$Cap_{it} = \frac{E_{it}}{A_{it}} - \frac{1}{T} \sum_t \left( \frac{1}{N_t} \sum_i \frac{E_{it}}{A_{it}} \right) \text{ where } Size_{it} \text{ is the bank size}$$

characteristic variable of bank i at time t, $Liq_{it}$ is the bank liquidity characteristic variable of bank i at time t, $Cap_{it}$ is the bank capitalization characteristic variable of bank i at time t,[7] $A_{it}$ is the total assets of bank i at time t, $N_t$ is the number of banks at time t, $l_{it}$ is the bank liquid assets of bank i at time t, T is the time period, and $E_{it}$ is the total equity of bank i at time t. The greater the bank size, liquidity and capitalization, the higher the bank loans and the lower the effect of monetary policy on bank loans. Therefore, we expect the coefficients of these variables to be positive ($\beta_4$ and $\beta_5 > 0$). We estimate model (1) by using the panel data Fixed Effect model. As we are using banking data from different countries, this technique is more preferable than the simple OLS estimator, as it includes the individual specific effect in

the model to control for any unobserved bank-specific effects in different countries and also for borrower heterogeneity among banks (Baltagi, 2008; Hosono, 2006). We also check the robustness of our results by estimating these models using Two-Stage Least Squares estimation (2SLS) by including instrumental variables to control for the possibility of the endogeneity problem.

*Effect of Banking Sector and Capital Market Development on the Bank Lending Channel*

To investigate the effect of banking sector and capital market development on the bank lending channel, we estimate the model as follows[8]:

$$\Delta L_{it} = \alpha_i + \sum_{s=1}^{k} \beta_1 \Delta L_{i,t-1} + \sum_{s=1}^{k} \beta_2 \Delta GDP_{j,t-1}$$
$$+ \sum_{s=1}^{k} \beta_3 \Delta r_{j,t-1} + \sum_{s=1}^{k} \beta_4 X_{i,t-1} + \sum_{s=1}^{k} \beta_5 (\Delta r_{j,t-1}$$
$$\times X_{i,t-1}) + \sum_{s=1}^{k} \beta_6 FD_{j,t-1} + \sum_{s=1}^{k} \beta_7 (FD_{j,t-1}$$
$$\times \Delta r_{j,t-1}) + \varepsilon_{it}$$

$$(2)$$

$FD_{j,t-1}$ measures the banking sector and capital market development indicators of country j at time $t-1$, and we divide these into five indicators (see Beck et al., 1999) as follows: banking sector development represented by $FD1_{j,t-1}$ and $FD2_{j,t-1}$. $FD1_{j,t-1}$ is the ratio of depository banks' assets to total financial assets, representing the development in the banking sector in terms of size. A rise in this indicator shows an increase in bank size relative to other financial institutions. Therefore, the higher this indicator, the greater the ability to issue bank loans and the more opportunity for banks to obtain external funding sources. Thus, lowering this will affect monetary policy on bank loans. The coefficient of this variable and its interaction term with the policy interest rate is expected to be positive ($\beta_6$ and $\beta_7 > 0$). $FD2_{j,t-1}$ is the ratio of private credit by depository money banks to GDP, measuring banking sector development in term of activities. An increase in this indicator represents the banking activities provided to customers in terms of lending services. Therefore, we expect the coefficient of this variable to be positive, as this indicator will lead to a rise in bank loans and will weaken the bank lending channel ($\beta_6$ and $\beta_7 > 0$). The capital market development represented by $FD3_{j,t-1}$, $FD4_{j,t-1}$, and $FD5_{j,t-1}$. $FD3_{j,t-1}$ is the ratio of stock market capitalization to GDP, measuring the development in the capital market in terms of size. $FD4_{j,t-1}$ is the ratio of stock market total value traded to GDP, showing the capital market development in terms of activities, and $FD5_{j,t-1}$ is the ratio of private bond market capitalization to GDP, measuring bond market development. An increase in these capital market developments can cause greater opportunities for banks to obtain other funding sources to offset the effect of monetary policy on bank loans, consequently weakening the bank lending channel. We then expect the coefficients of

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[5] Our baseline model follows the model specification found in various empirical studies (see Altunbas et al., 2009; Ehrmann et al., 2001; Hosono, 2006). The bank-fixed effects and time dummy are included in the model to control for any unobserved individual bank effects and time-variant effects in the country, such as banking and financial crises and business cycles.

[6] We also tested for robustness by dividing the banking sample according to difference characteristics (small/large banks, low/highly capitalized banks, and low/high liquid banks). The findings indicated similar results as for the total sample case.

[7] We also checked for the robustness of the capitalization characteristic variable by using alternative definitions including the total bank capital to asset ratio and the tier 1 bank capital ratio. We found that the results of these alternative variables were similar to the result when using the equity to total asset ratio as $Cap_{it}$.

[8] Our model follows the specification of Olivero et al. (2011) and Altunbas et al. (2009).

these variables to be positive ($\beta_6$ and $\beta_7 > 0$). We estimate model (2) separately, based on the different financial development indicators (*FD1−FD5*) using the panel data Fixed Effect model. We also check the robustness of our results by applying the 2SLS technique.

## Results and Discussion

### Empirical Results of the Bank Lending Channel (Baseline Model)

In Table 3, columns (1) and (2), show the empirical results of the baseline model of the bank lending channel with the results from Fixed Effect estimation[9] (column (1)) and the 2SLS estimation (column (2)). In column (1), we see that the coefficient of $\Delta r_{j,t-1}$ is negative and statistically significant, supporting the bank lending channel theory. The coefficient of $\Delta GDP_{j,t-1}$ is positive and statistically significant as expected. We find that the coefficients of the $Cap_{i,t-1}$ and $Liq_{i,t-1}$ variables, as well as $\Delta r_{t-1} \times Cap_{t-1}$ and $\Delta r_{t-1} \times Liq_{t-1}$, are significantly positive, as expected. These results show that the higher the bank capitalization and liquidity, the greater the bank loan supply and thus the weaker the effect of monetary policy on bank loans. This is possibly because the highly capitalized and high liquid banks have a stronger balance sheet condition compared with the poorly capitalized and low liquidity ones, thus increasing the opportunity to find external funding sources. We can see from Table 2 that highly capitalized and high liquidity banks in the ASEAN-5 countries have a higher proportion of the growth in bank loans, the liquid assets to total assets ratio, and the equity to total assets ratio as well as a higher capitalization and liquidity characteristic compared with those with low capitalization and liquidity. This empirical finding is in line with several studies (see e.g. Gambacorta & Mistrulli, 2004; Haan, 2001; Zulkhibri, 2013). The coefficient of $Size_{t-1}$ is negative but not statistically significant with bank loans and the coefficient of $\Delta r_{t-1} \times Size_{t-1}$, is significantly negative. Although we obtained an unexpected result from the previous literature (Ehrmann et al., 2001; Karim et al., 2011; Kashyap & Stein, 1994; Kishan & Opiela, 2000; Zulkhibri, 2013), Topi and Vilmunen (2001) explain that this possibly comes from the higher bank capital and liquidity in small banks compared with the large ones. Table 2 shows that small banks have a growth in loans and a ratio of liquid assets to total assets relatively higher than the large banks. Therefore, the higher the bank size, the higher the effect of monetary policy on bank loans, thus strengthening the bank lending channel.

Our result from the 2SLS estimation shown in column (2) also indicates a similar result to the Fixed Effect model. This confirms the robustness of our result.

### Empirical Results of the Effect of Banking Sector and Capital Market Development on the Bank Lending Channel

In Table 3, columns (3) to (12), show the empirical results of the fixed effect estimation[9] (see columns 3−7) and 2SLS

(see columns 8−12), respectively, for the effect of banking sector development and capital market development on the bank lending channel. Overall, we still obtain similar results to those from the baseline model. Furthermore, the results show that the coefficient of $\Delta r_{t-1} \times FD1_{t-1}$ is negative and statistically significant. Despite this unexpected result, we consider this is possibly due to the bank balance sheet condition in the ASEAN-5 countries (see Table 2), which shows that small banks have relatively higher growth in loans and liquidity to total assets ratio than the large banks. Therefore, an increase in the development of bank size possibly leads to a reduction in bank loans and thus strengthens the bank lending channel. Regarding the effect of banking sector development in terms of activity (*FD2*), the coefficient of $\Delta r_{t-1} \times FD2_{t-1}$ is positive and statistically significant, as expected. This is because the development of banking activity in terms of the lending activities provided to customers, resulting in a rise in bank lending and a weaker effect of the bank lending channel. This finding is in line with Ferreira (2010). Regarding the effect of capital market development (*FD3−FD5*), the coefficients of $\Delta r_{t-1} \times FD3_{t-1}$, $\Delta r_{t-1} \times FD4_{t-1}$, and $\Delta r_{t-1} \times FD5_{t-1}$ are positive and statistically significant, hence showing that higher capital market development in terms of size, activity, and bond market development, respectively, will lead to a weaker effect of monetary policy on bank loans. This finding is in line with our expectation and also similar with other empirical studies (see Aysun & Hepp, 2011; Ferreira, 2010). Our results from the 2SLS technique were similar to those of from the Fixed Effect estimation, confirming the robustness of our results.

### Empirical Results of an Alternative Measure of the Financial Development Indicator

Our previous studies used the measure of banking sector and capital market development separately. Therefore, we conducted the robustness test by investigating the effect of overall financial development, including the banking and capital market sectors, on the bank lending channel. We applied another four overall financial development indicators, following Beck and Levine (2002) and Vithessonthi (2014), as follows: $FDT1_{it} = FD1_{it} + FD3_{it}$; $FDT2_{it} = FD1_{it} + FD4_{it}$; $FDT3_{it} = FD2_{it} + FD3_{it}$; and $FDT4_{it} = FD2_{it} + FD4_{it}$. The results in Table 4 show that the coefficients of $\Delta r_{t-1} \times FDT1_{t-1}$, $\Delta r_{t-1} \times FDT2_{t-1}$, $\Delta r_{t-1} \times FDT3_{t-1}$ and $r_{t-1} \times FDT4_{t-1}$ are positive and statistically significant in both the Fixed Effect[9] and 2SLS estimation, showing that overall financial development will lead to a weaker effect of monetary policy on bank loans. Other variables in this model also remain evident, as shown in Table 3, columns (3)−(12). However, the coefficient of the policy interest rate ($\Delta r_{t-1}$) is statistically significant and positive. This is possibly due to the effect of the overall financial development which leads to the weakening of the bank lending channel and thus results in the significantly positive value of the coefficient of $\Delta r_{t-1}$. Overall, although development in the size of the banking sector has a stronger effect on the bank lending channel, this negative effect is outweighed when focusing on the overall development of the financial market. This finding is in

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[9] The Hausman test confirmed that the Fixed-Effect Model was preferable to the Random-Effect Model.

**Table 3**
Results of the baseline model of bank lending channel and the effect of banking sector and capital market development on the bank lending channel[a]

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Baseline | Baseline | FD1 | FD2 | FD3 | FD4 | FD5 | FD1 | FD2 | FD3 | FD4 | FD5 |
| | FE | 2SLS | FE | FE | FE | FE | FE | 2SLS | 2SLS | 2SLS | 2SLS | 2SLS |
| $\Delta L_{t-1}$ | 0.073 | 0.045 | 0.058 | 0.073 | 0.064 | 0.067 | 0.075 | 0.039 | 0.515*** | 0.044 | 0.583*** | 0.596*** |
| | (0.081) | (0.138) | (0.081) | (0.077) | (0.081) | (0.081) | (0.081) | (0.135) | (0.135) | (0.136) | (0.097) | (0.102) |
| $\Delta GDP_{t-1}$ | 0.132** | 0.175*** | 0.259** | 0.116 | 0.125 | 0.147 | 0.084 | 0.127* | 0.068 | 0.671 | 0.019 | 0.135* |
| | (0.057) | (0.058) | (0.114) | (0.111) | (0.165) | (0.122) | (0.192) | (0.077) | (0.109) | (0.066) | (0.112) | (0.074) |
| $\Delta r_{t-1}$ | -0.112*** | -0.328** | -0.016 | -0.294* | 0.104 | -0.140** | 0.134 | -0.379 | -0.297* | 0.178 | -0.188* | 0.030 |
| | (0.036) | (0.135) | (0.108) | (0.175) | (0.097) | (0.074) | (0.163) | (0.213) | (0.172) | (0.145) | (0.091) | (0.134) |
| $Size_{-1}$ | -0.018 | -0.079 | -0.297 | -0.583 | -0.184 | -0.131 | -0.154 | -0.053 | 0.217 | -0.157 | -0.180* | -0.164 |
| | (0.277) | (0.106) | (0.338) | (0.375) | (0.308) | (0.342) | (0.321) | (0.090) | (0.457) | (0.098) | (0.098) | (0.197) |
| $Cap_{t-1}$ | 0.176*** | 0.236*** | 0.188** | 0.177** | 0.179** | 0.181** | 0.175** | 0.241*** | 0.234*** | 0.234*** | 0.239*** | 0.269*** |
| | (0.072) | (0.039) | (0.074) | (0.074) | (0.073) | (0.073) | (0.015) | (0.078) | (0.039) | (0.080) | (0.078) | (0.102) |
| $Liq_{t-1}$ | 0.001* | 0.001* | 0.001 | 0.001 | 0.001 | 0.001 | 0.000 | 0.001 | 0.001 | 0.001 | 0.000 | 0.001 |
| | (0.001) | (0.001) | (0.001) | (0.000) | (0.001) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) |
| $\Delta r_{t-1} \times Size_{t-1}$ | -0.055* | -0.054* | -0.065** | -0.051** | -0.052* | -0.057* | -0.054* | -0.086** | -0.050** | 0.000 | -0.012 | -0.069** |
| | (0.032) | (0.033) | (0.029) | (0.023) | (0.030) | (0.028) | (0.033) | (0.044) | (0.024) | (0.000) | (0.063) | (0.031) |
| $\Delta r_{t-1} \times Cap_{t-1}$ | 0.039*** | 0.049*** | 0.044** | 0.044** | 0.040** | 0.041** | 0.039** | 0.051* | 0.049* | 0.055*** | 0.050*** | 0.054*** |
| | (0.017) | (0.018) | (0.018) | (0.019) | (0.017) | (0.017) | (0.017) | (0.029) | (0.030) | (0.019) | (0.030) | (0.019) |
| $\Delta r_{t-1} \times Liq_{t-1}$ | 0.000** | 0.000* | 0.000* | -0.000 | -0.000 | 0.000 | 0.000* | 0.000* | 0.000 | 0.000 | 0.000 | 0.000** |
| | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| $FD_{t-1}$ | | | -0.131 | -0.085*** | 0.015 | 0.029 | 0.011 | -0.111** | -0.000 | -0.004 | 0.000 | -0.015 |
| | | | (0.051) | (0.031) | (0.027) | (0.017) | (0.031) | (0.051) | (0.004) | (0.006) | (0.000) | (0.017) |
| $\Delta r_{t-1} \times FD_{t-1}$ | | | -0.024** | 0.006** | 0.004** | 0.005** | 0.004* | -0.016** | 0.007** | 0.003** | 0.003*** | 0.009** |
| | | | (0.011) | (0.002) | (0.002) | (0.002) | (0.002) | (0.007) | (0.003) | (0.001) | (0.020) | (0.003) |
| Adj. $R^2$ | 0.345 | 0.402 | 0.355 | 0.358 | 0.344 | 0.350 | 0.343 | 0.406 | 0.401 | 0.399 | 0.401 | 0.407 |
| F-statistic | 3.881*** | 4.455*** | 3.934* | 3.979*** | 3.801*** | 3.870*** | 3.783*** | 4.417*** | 4.360*** | 4.326*** | 4.359*** | 4.323*** |
| Observations | 475 | 401 | 475 | 475 | 475 | 475 | 475 | 401 | 401 | 401 | 401 | 401 |

[a] Robust standard errors are reported in parentheses. Symbols *, **, *** indicate that a coefficient is statistically significant at levels of 10 percent, 5 percent, and 1 percent, respectively.

**Table 4**
Effect of the overall financial development measurement on the bank lending channel

| | (1) FDT1 FE | (2) FDT2 FE | (3) FDT3 FE | (4) FDT4 FE | (5) FDT1 2SLS | (6) FDT2 2SLS | (7) FDT3 2SLS | (8) FDT4 2SLS |
|---|---|---|---|---|---|---|---|---|
| $\Delta L_{t-1}$ | 0.081 | 0.078 | 0.073 | 0.073 | 0.047 | 0.044 | 0.047 | 0.044 |
| | (0.081) | (0.081) | (0.081) | (0.080) | (0.135) | (0.138) | (0.059) | (0.138) |
| $GDP_{t-1}$ | 0.192 | 0.223* | 0.155 | 0.170 | 0.037 | 0.189** | 0.012 | 0.033 |
| | (0.161) | (0.128) | (0.170) | (0.125) | (0.135) | (0.056) | (0.154) | (0.119) |
| $\Delta r_{t-1}$ | 0.261* | 0.187** | −0.024 | 0.137** | 0.244 | 0.250* | 0.097 | 0.249* |
| | (0.135) | (0.074) | (0.334) | (0.006) | (0.154) | (0.150) | (0.267) | (0.151) |
| $Size_{-1}$ | −0.343 | −0.174 | −0.125 | −0.135 | 0.399 | 0.454 | −0.219** | −0.237** |
| | (0.387) | (0.326) | (0.351) | (0.346) | (0.454) | (0.332) | (0.093) | (0.099) |
| $Cap_{t-1}$ | 0.178** | 0.182** | 0.179** | 0.181** | 0.235*** | 0.238*** | 0.236*** | 0.238*** |
| | (0.073) | (0.072) | (0.073) | (0.072) | (0.080) | (0.079) | (0.039) | (0.079) |
| $Liq_{t-1}$ | 0.001 | 0.001 | 0.001* | 0.001 | 0.001** | 0.001 | 0.001 | 0.001 |
| | (0.001) | (0.001) | (0.000) | (0.001) | (0.000) | (0.000) | (0.001) | (0.000) |
| $\Delta r_{t-1} \times Size_{t-1}$ | −0.062* | −0.067** | −0.058* | −0.062** | 0.023 | 0.019 | 0.029 | 0.021 |
| | (0.035) | (0.032) | (0.033) | (0.029) | (0.062) | (0.063) | (0.062) | (0.063) |
| $\Delta r_{t-1} \times Cap_{t-1}$ | 0.042** | 0.043** | 0.041** | 0.042** | 0.086*** | 0.051* | 0.049*** | 0.051* |
| | (0.018) | (0.018) | (0.017) | (0.018) | (0.016) | (0.022) | (0.018) | (0.030) |
| $\Delta r_{t-1} \times Liq_{t-1}$ | −0.000 | 0.000* | −0.000 | 0.000 | 0.000 | 0.000 | 0.001* | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| $FD_{t-1}$ | −0.003 | 0.023 | 0.005 | 0.027 | −0.005 | 0.011 | 0.041 | 0.069 |
| | (0.013) | (0.023) | (0.015) | (0.018) | (0.005) | (0.019) | (0.041) | (0.042) |
| $\Delta r_{t-1} \times FD_{t-1}$ | 0.002* | 0.002*** | 0.002* | 0.004** | 0.002* | 0.102*** | 0.004** | 0.007** |
| | (0.001) | (0.001) | (0.001) | (0.002) | (0.001) | (0.022) | (0.002) | (0.003) |
| Adj. $R^2$ | 0.346 | 0.348 | 0.344 | 0.348 | 0.399 | 0.401 | 0.399 | 0.400 |
| *F*-statistic | 3.828*** | 3.851** | 3.797*** | 3.849*** | 4.319*** | 4.355*** | 4.321*** | 4.334*** |
| Observations | 475 | 475 | 475 | 475 | 401 | 401 | 401 | 401 |

line with the theoretical expectation that banking sector and capital market development will improve the balance sheet strengths of banks as well as increase financial market liquidity. Therefore, banks will be able to more easily external funding and this will lower the effect of monetary policy through the lending channel. This result is also supported by empirical studies regarding this aspect (see Altunbas et al., 2009; Aysun & Hepp, 2011; Ferreira, 2010).

## Conclusion and Recommendation

We examined the bank lending channel and the effect of banking sector and capital market development on the channel using the bank-level panel database of 89 commercial banks in the ASEAN-5 countries, over the period 1999–2011. We found that the effect of the policy interest rate on bank loan supply is negative, confirming the existence of the bank lending channel in the ASEAN-5 countries. Higher bank capitalization and liquidity leads to a weaker effect of monetary policy on the lending channel. On the other hand, a greater bank size causes a stronger effect of monetary policy on this channel. We documented that banking sector development in terms of banking activities and the capital market development results in a weakening of the bank lending channel; however, the development of bank size leads to a strengthening of the bank lending channel.

Our study raises several issues from a policy perspective. The results show that banking sector and capital market development can increase the opportunity of banks to obtain external funding sources. Therefore, policy makers can use financial development as one factor to strengthen the bank balance sheet condition as well as to stimulate economic growth. However, policy makers should carefully control and monitor the banking sector and capital market development in the future as this development can possibly create a weaker/stronger effect of the monetary policy on bank loan supply and the economy, thus causing difficulties for policy makers in controlling monetary policy. Moreover, policy makers should be aware of the possibility of credit and liquidity risk and financial fragility when introducing financial market development policies in the future, especially in the more financially constrained banks. An appropriate supervisory system and risk management techniques should be considered among the banks in the ASEAN-5 countries to prevent them suffering from any adverse effects of financial development and monetary policy. Furthermore, the international cooperation of the banking sector, capital markets, and supervisory coordination should be supported to encourage financial and economic stability among the ASEAN-5 countries.

Due to the data limitation, our study used the total bank loan supply to study the effect of monetary policy on bank loans through the lending channel. Further studies could investigate the effect of monetary policy through the lending channel and the effect of financial market development on this channel using bank loan supply data in specific sectors, such as bank loans in the corporate and household sectors, in order to examine the effect of monetary policy on different economic sectors. Future studies of this issue could be focused on individual country case studies.

## Conflict of interest

There is no conflict of interest.

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## References

Agung, J., Morena, R., Pramono, B., & Prastowo, N. J. (2002). The bank lending channel of monetary transmission in Indonesia. In P. Warjiyo, & J. Agung (Eds.), *Transmission mechanisms of monetary policy in Indonesia* (pp. 103–136). Jakarta, Indonesia: Bank of Indonesia.

Altunbas, Y., Gambacorta, L., & Marqués, D. (2009). Securitization and the bank lending channel. *European Economic Review, 53*(8), 996–1009.

Aysun, U., & Hepp, R. (2011). Securitization and the balance sheet channel of monetary transmission. *Journal of Banking & Finance, 35*(8), 2111–2122.

Baltagi, B. H. (2008). *Econometric analysis of panel data* (4th ed.). London, UK: John Wiley & Sons Ltd.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (1999). *A new database on financial development and structure*. World bank policy research working paper (vol. 2146, pp. 1–69). Retrieved from http://www1.worldbank.org/finance/assetss/images/fs02_web.pdf.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2009). *Financial institutions and markets across countries and over time: Data and analysis*. The world bank financial sector discussion paper (vol. 4943, pp. 1–46).

Beck, T., & Levine, R. (2002). Industry growth and capital allocation: Does having a market-or bank-based system matter? *Journal of Financial Economics, 64*(2), 147–180.

Chatelain, J. B., Ehrmann, M., Generale, A., Martinez-Pagés, J., Vermeulen, P., & Worms, A. (2003). Monetary policy transmission in the Euro area: New evidence from micro data on firms and banks. *Journal of the European Economic Association, 1*(2–3), 731–742.

Čihák, M., Demirgüç-Kunt, A., Feyen, E., & Levine, R. (2012). *Benchmarking financial systems around the world*. The world bank financial sector discussion paper (vol. 6175, pp. 1–58).

Ehrmann, M., Gambacorta, L., Martinez-Pagés, J., Sevestre, P., & Worms, A. (2001). *Financial systems and the role of banks in monetary policy transmission in the Euro area*. European central bank working paper series (vol. 105, pp. 1–59).

Felman, J., Gray, S., Goswami, M., Jobst, A. A., Pradhan, M., Peiris, S., et al. (2011). *ASEAN-5 bond market development: Where does it stand? Where is it going?*. International monetary fund working paper (vol. 137, pp. 1–32).

Fernández, V. (2004). *The credit channel in an emerging economy*. Center for Applied Economics, University of Chile, Working Paper (vol. 175, pp. 1–31). Retrieved from http://www.dii.uchile.cl/~cea/sitedev/cea/www/?page=view_publicaciones&langSite=es&agno=2004&id=20040121103243.

Ferreira, C. (2010). The credit channel transmission of monetary policy in the European union: A panel data approach. *Banks & Bank Systems, 5*(2), 230–240.

Gambacorta, L. (2001). *Bank-specific characteristics and monetary policy transmission: The case of Italy*. European central bank working paper series (vol. 103, pp. 1–41).

Gambacorta, L., & Mistrulli, P. E. (2004). Does bank capital affect lending behavior? *Journal of Financial Intermediation, 13*(4), 436–457.

Gertler, M., & Rose, A. (1996). Finance, public policy, and growth. In G. Caprio, Jr., I. Atiyas, & J. Hanson (Eds.), *Financial reform theory and experience* (pp. 17–20). Cambridge, UK: Cambridge University Press.

Ghosh, S. (2006). Monetary policy and bank behavior: Empirical evidence from India. *Political Weekly, 41*(10), 853–856.

Haan, L. D. (2001). *The credit channel in The Netherlands: Evidence from bank balance sheets*. European central bank working paper series (vol. 98, pp. 1–43).

Hosono, K. (2006). The transmission mechanism of monetary policy in Japan: Evidence from banks' balance sheets. *Journal of the Japanese International Economies, 20*(3), 380–405.

Karim, Z. A., Azman-Saini, W. N. W., & Karim, B. A. (2011). The bank lending channel of monetary policy: Dynamic panel data evidence from Malaysia. *Journal of Asia-Pacific Business, 12*(3), 225–243.

Kashyap, A. K., & Stein, J. C. (1994). The impact of monetary policy on bank balance sheets. *The National Bureau of Economic Research, 4821*, 1–63.

Kashyap, A. K., & Stein, J. C. (2000). What do a million observations on banks say about the transmission of monetary policy? *The American Economic Review, 90*(3), 407–428.

Kishan, R. P., & Opiela, T. P. (2000). Bank size, bank capital and the bank lending channel. *Journal of Money, Credit and Banking, 32*(1), 122–140.

Matousek, R., & Sarantis, N. (2009). The bank lending channel and monetary transmission in Central and Eastern European countries. *Journal of Comparative Economics, 37*(2), 321–334.

Mishkin, F. S. (1996). The channels of monetary transmission: Lessons for monetary policy. *The National Bureau of Economic Research, 5464*, 1–29.

Niblock, S. J., Heng, P., & Sloan, K. (2014). Regional stock market and economic development in Southeast Asia. *Asian-Pacific Economic Literature, 28*(1), 47–59.

Olivero, M. P., Li, Y., & Jeon, B. N. (2011). Competition in banking and the lending channel: Evidence from bank-level data in Asia and Latin America. *Journal of Banking & Finance, 35*(3), 560–571.

Perera, A., Ralston, D., & Wickramanayake, J. (2014). Impact of off-balance sheet banking on the bank lending channel of monetary transmission: Evidence from South Asia. *Journal of International Financial Markets, Institutions & Money, 24*(1), 195–216.

Singh, S., Razi, A., Endut, N., & Ramlee, H. (2008). *Impact of financial market developments on the monetary transmission mechanism*. BIS working paper series (vol. 39, pp. 49–99).

Topi, J., & Vilmunen, J. (2001). *Transmission of monetary policy shocks in Finland: Evidence from bank level data on loans*. European central bank working paper series (vol. 100, pp. 1–52).

Vithessonthi, C. (2014). The effect of financial development on bank risk: Evidence from Southeast Asian countries. *International Review of Financial Analysis, 35*, 249–260.

Wu, J., Luca, A. C., & Jeon, B. N. (2007). Transmission of monetary policy via domestic and foreign banks in emerging economics: Evidence from bank-level data. *Journal of International Money and Finance, 30*(6), 1128–1156.

Zulkhibri, M. (2013). Bank characteristics, lending channel and monetary policy in emerging markets: Bank-level evidence from Malaysia. *Applied Financial Economics, 23*, 347–362.