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BANK EFFICIENCY, OWNERSHIP STRUCTURE AND REGULATIONS IN VIETNAM

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« La faculté n'entend donner aucune approbation ou improbation aux opinions émises dans les thèses ; ces opinions doivent être considérées comme propres à leurs auteurs. »

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SUMMARY

INTRODUCTORY CHAPTER

In Vietnam, in the context of removing the protection ensured to domestic banks and of opening the financial sector for foreign investors, there are many questions on the banking system such as: how do banks operate under the umbrella of the government? Does the presence of foreign ownership contribute to improve bank performance? How does the central bank prevent excessive risk-taking of bank executives? Those questions are motivations for our thesis to analyze bank operations and efficiency in the context of the presence of foreign investors and of different economic conditions as well as of the interventions of the central bank. This dissertation contains three chapters that are outlined hereafter. The first chapter attempts to measure and explain bank efficiency of domestic commercial banks in Vietnam in a decade of reforms and restructuring of the financial system. The second chapter discusses how banks operate in Vietnam after the banking law has been enacted and the involvement of the central bank into bank operations through its instruments. This chapter analyzes the determinants of net interest margins and the interest rate monitoring policy by the central bank. The last chapter aims to analyze the bank lending channel and the influence of bank capital on the response of bank lending channel to monetary policy and economic conditions.

More precisely, the motivations, research questions and the contributions to the literature of each of these three chapters are briefly presented as follows.

Chapter 1: The impact of economic reforms and ownership structure on bank efficiency

In transitional economies, the financial market is young and less experienced compared with developed economies. The transformation from a central-oriented to a market-oriented economy requires the central governments to reduce their orders and ease their interventions into the operations at firm levels through programs of reforms. The reforms of transitional economies are different from country to country but the banking system is recognized as a primary sector to reform. The reforms of the banking system in Vietnam has caused and continues to cause issues; and the limitation of foreign investors or the delay in the privatization program can affect the development of the banking system. A critical question is whether bank ownership has an impact on bank efficiency in Vietnam. More precisely, does the presence of foreign shareholders improve bank efficiency and have the reforms engaged in the mid 2000's lead to an improvement in Vietnamese banks' efficiency?

In this chapter, we examine the efficiency of Vietnamese commercial banks and its determinants during the 2002-2009 period. There are only few studies that focus on bank efficiency in Vietnam and they consider a shorter period. The contribution of this chapter is first to provide a deeper analysis on bank efficiency in Vietnam from 2002 to 2009, a period during which important reforms have been implemented. Indeed, Vietnam engaged in financial market liberalization and reduced the support to domestic commercial banks based on agreements with WTO. We therefore look into how these reforms have affected bank efficiency. Second, we analyze the impact of bank ownership on efficiency. As Vietnam has progressively removed state ownership and barriers to foreign investors, it is important to study whether private ownership positively impacts bank efficiency and whether foreign ownership (through the presence of at least one foreign shareholder on the board of managers or directors) has improved bank efficiency.

The results show that the efficiency of Vietnamese commercial banks differs depending on bank ownership type; state-owned banks exhibit the lowest efficiency levels in comparison with private banks and banks with foreign shareholders. Since the implementation of more stringent minimum capital rules, bank capitalization has also been an important driver of bank efficiency. Our results have several policy implications and highlight the need to reduce the involvement of the government in the banking industry, and to remove barriers to entry for foreign investors and raise bank capitalization.

Chapter 2: Bank net interest margins, ownership structure and interest rate regulation by the central bank

In this chapter, we study banks' interest margin which is also considered as an indicator of bank performance. The chapter focuses on analyzing how banks perform their intermediation role under the context of various ownership structures and the effects of the central bank's interaction with commercial banks' operations. Influenced by the centrally oriented market, the ownership structure is the most important concern in the Vietnamese banking market as foreign entry has been eased recently, the state-owned banks have a crucial role and dominate the banking market and private banks have less experience in risk management. Consequently, banks set their interest margins differently according to their ownership.

For economic purposes, the central banks employ tools to control the prices of funding sources and the money supply in the economy. Beyond that, they also have to supervise the smooth operations of the financial system. Within modern nations, the primary tool to achieve these goals is open market operations. This tool is to manage the quantity of money directly in circulation through the trading of various financial instruments. But for a developing country, the central bank might employ other tools; it can use the common tools such as increasing the interest rate by fiat, reducing the monetary base or increasing the reserve requirement. Mlachila and Chirwa (2002) argue that *"the removal of credit controls in the developing countries may worsen the quality of loan"* and it could increase the risks of systemic crises. Under the traditional tools, central banks seem to force banks to follow their orders and tend to affect directly bank operations aiming to keep banks under control. If a tool is not able to force banks as the central banks' expectations, those central banks build other tools and require banks to fulfill their requirements. Generally speaking, the central banks should strengthen their abilities to ensure financial stability and have a major and independent voice in the financial stability policy, but there are different situations from country to country to achieve that role.

Our work is the first one to focus on net interest margins (NIM) in Vietnam by considering a sample of 49 banks from 1998 to 2011 and to emphasize that NIM are determined by bank specific factors but also by other monetary policy and macro-economic factors. We specifically focus on how NIM are affected by the central bank through its interest rate policy. This chapter focuses on the method developed by Ho and Saunders (1981) which particularly fits the case of Vietnam. On the one hand, banks provide savings services and other related services to customers under a certain interest rate and charge service fees to their customers (on the supply side). On the other hand, banks lend their available sources of funds to borrowers (demand side) and apply fees to monitor and to prevent any loss, the spread of "prices" between borrowers and depositors standing for banks' compensation. This framework illustrates that banks' main business is to collect deposits and grant loans and that other non-interest generating bank operations (commission and fee activities and trading activities) are much less developed that in other countries.

The results show that only private and state-owned banks transfer their operational costs to their clients. Bank capitalization which reflects bank risk aversion is a significant determinant for foreign and state owned banks only in presence of interest rate regulation; these banks tend to pass the high capital cost to customers. We also show that, in absence of

interest rate control, foreign banks set higher margins when they take higher credit risk while in presence of interest rate regulation private banks cope with higher credit risk without being able to raise their margin accordingly.

Chapter 3: Bank capital and bank lending channel

Capitalization is important for banks in an emerging economy since it is an indicator to ensure the banks' capacities to provide credits to customers and can be linked to some bank prudential ratios (Ehmann et al., 2001, Gambacorta and Mistrulli., 2004, and Van-den-Heuvel, 2006). In the presence of perfect capital markets, banks could raise funds continuously to adjust to the demand for loans and to comply with prudential regulation. But because of financial constraints on imperfect capital markets, banks face difficulties in increasing their funds (debt or equity). Consequently, bank lending capacities are reduced. Moreover, bank prudential regulations require banks to fund a certain proportion of their loans with equity capital. Hence, bank equity is expected to play an important role in the bank lending channel.

Although Vietnamese regulators have not implemented the Basel accords strictly speaking, the central bank imposes minimum capital rules requiring banks to raise their equity level and capital ratios to prevent excessive risk-taking and to stabilize the banking system. Similarly to other transition economies, Vietnam has not developed its capital market and banks therefore face severe difficulties to raise funds (foreign debt and equity) to fulfill the capital requirements. Consequently the banking system can face difficulties if banks cannot increase their capital and reduce their loans to maintain a rational proportion of capital prudential ratio. In somehow, the economy can be altered if enterprises have difficulties to access loans from banks and have to look for more expensive financial sources. The aim of this chapter is to analyze the response of bank lending to monetary policy and also economic conditions changes and specifically the influence played by bank equity in such responses in the context of the Vietnamese banking system. This issue is of particular interest for a transition economy as introducing more stringent capital rules might jeopardize investment and growth.

Our contributions in this chapter are the following. First, this is the first study on the role played by bank equity in the bank lending channel in Vietnam, a transition economy

where the banking system has been affected by the centrally oriented regime for a long time. Second, it provides a deep analysis of the monetary transmission mechanism by using individual bank data in Vietnam with more insightful implications than the aggregate data used in earlier studies.

The results indicate that all types of monetary policy shocks have a negative effect on lending, but that an increase in bank liquidity leads to a lower reduction in loan growth. Bank size also has a negative influence on bank lending. By contrast, liquidity has a positive influence on lending. Finally, economic shocks are identified as important factors of bank loan responses but banks with lower capitalization are less influenced by the business cycle. Hence, the introduction of stricter capital rules can actually be questioned.

CHAPTER 1

THE IMPACT OF ECONOMIC REFORMS AND OWNERSHIP STRUCTURE ON BANK EFFICIENCY[1]

[1] This chapter is an article co-authored with Isabelle Distinguin titled "The impact of economic reforms and ownership structure on bank efficiency: the case of Vietnam"

1. Introduction

The banking sector in transition economies has changed dramatically over the last decades due to deep reforms engaged in those countries. In Vietnam, following the transition from a centrally planned economy to a market economy, the banking system has been transformed from a mono-state owned banking system (the central bank also acted as a commercial bank) to a commercial-oriented system. However, the banking system has remained under the umbrella of the government. For example, the government has protected the domestic commercial banks by imposing limits to foreign shareholding and by limiting branches of foreign banks until 2010. Moreover, foreign investors have been allowed to hold only a low percentage of shares in a commercial bank (a foreign investor cannot hold more than 20% of the total shares of a given entity and total foreign investors' shares must be under 30%).

Consequently, the liberalization of the financial market has been hindered, domestic banks have faced more difficulties to diversify their shareholders to gain benefits from foreign investors and to raise their financial resources. Their operations have not been transparent and have led to an inefficient allocation of capital since they have mainly focused on serving state-owned enterprises (SOE) and government development programs. Besides, Vietnamese commercial banks took advantage of credit expansion fuelled by low interest rates and the economic boom during the first-half of 2000s whilst remaining inefficient.

Thus, under the agreements of Vietnam and the World Trade Organization (WTO), Vietnam had to improve the efficiency of the State's investments. From 2005, Vietnam has engaged in a privatization program of state-owned banks and has progressively removed barriers to entry for foreign investors. A critical question is whether bank ownership has an impact on bank efficiency in Vietnam. More precisely, does the presence of foreign shareholders improve bank efficiency and have the reforms engaged in the mid 2000's lead to an improvement in Vietnamese banks' efficiency?

In this chapter, we examine the efficiency of Vietnamese commercial banks and its determinants during the 2002-2009 period. There are only few studies that focus on bank efficiency in Vietnam and they consider a shorter period. The contribution of this chapter is first to provide a deeper analysis on bank efficiency in Vietnam from 2002 to 2009, a period

during which important reforms have been implemented. Indeed, Vietnam engaged in financial market liberalization and reduced the support to domestic commercial banks based on agreements with WTO. We therefore look into how these reforms have affected bank efficiency. Second, we analyze the impact of bank ownership on efficiency. As Vietnam has progressively removed state ownership and barriers to foreign investors, it is important to study whether private ownership positively impacts bank efficiency and whether foreign ownership (through the presence of at least one foreign shareholder on the board of managers or directors) has improved bank efficiency.

The chapter is organized as follows. Section 2 provides an overview of the banking industry in Vietnam. Section 3 introduces related literature and section 4 describes the methodology employed in this article. In section 5, we present the data and the variables. Results and robustness checks are presented in section 6 and 7. Section 8 concludes the chapter.

2. Overview of the banking system in Vietnam

After the transition from central planning to a market oriented system initiated in 1986, Vietnam faced a lot of difficulties (low productivity, hyperinflation, high deficit and inefficiency of monetary policy); this situation urged Vietnam to reform the financial sector and to reduce the State's investments in state-owned enterprises. In 1989, the two-tier banking system replaced the mono-tier system. The State Bank of Vietnam (SBV) became solely a central bank instead of playing both the roles of a central bank and of a commercial bank. The commercial banking function was transferred to state-owned commercial banks (SOCBs). These banks have been supervised by the SBV through its central bank's function. The SOCBs' operations were decided by the government and served principally state-owned enterprises (SOEs) or government plans (for example, any operation related to foreign trade was the responsibility of the Bank for Foreign and Trade of Vietnam-Vietcombank; or Agribank mainly served in rural areas and supported the agricultural sector and some poverty reduction programs).

As a result of the reform of the banking system initiated in 1989, the government also allowed the establishment of other types of financial institutions such as credit cooperatives and private and joint-stock commercial banks (JSCB)[2]. The reform also allowed limited

[2] JSCB have both public and private shareholders. They are specialized in lending to SME and retail clients.

foreign bank presence through joint-venture banks and foreign bank branches which nevertheless faced restrictions in their activities. From 1989, the financial sector has experienced a boom followed by a burst of financial institutions. There have been thousands of newly founded credit cooperatives (around 7,180) but they have been shut down rapidly mainly due to their risky capital structure, their weak professionalism, and the inappropriate monitoring from the authorities (Vuong, 2010). Consequently, in 1993, there remained around 750 credit cooperatives. Some credit cooperatives have been restructured and became private and joint-stock commercial banks (JSCB). Thus, the number of commercial banks significantly increased between 1991 and 1993 (from 5 banks in 1991 to 48 banks in 1993, including 4 state-commercial banks). However, most of them were unprofitable and accumulated non-performing loans granted to SOEs resulting from inefficient investments (Pham and Vuong, 2009, and Vuong, 2010).

In such a context, the government aimed to improve banks' capacities and competitiveness through reforms of joint-stock banks in 1999 then SOCBs in 2001, and allowed some international institutions (including the International Monetary Fund-IMF and the World Bank-WB) to invest in private banks under a limitation of stakes. These reforms aimed to recapitalize banks, to enhance their profitability and to increase transparency.

At the end of 2005, to speed up the reforms and improve the performance of Vietnamese banks, the government has launched a program, namely "Banking Sector Reform Roadmap" to privatize SOCBs, to improve the competitiveness of JSCBs and to apply international prudential standards (Basel framework) to the banking system in Vietnam. Besides, Vietnam has engaged in removing barriers to entry of foreign investors. Indeed, the reforms and the economic boom initiated in 2006, when Vietnam became a member of WTO, required a reduction of government involvement in the economy and the access of many sectors to foreign investors. The government aimed to equitize SOCBs or partially privatize them and, to support this process; it made the entry of foreign investors easier. Until 2004, foreign banks were only allowed to take a minority share in joint venture banks and establish branches. With the implementation of the credit institutions law of 2004, foreign banks have been allowed to set up a commercial bank in Vietnam. A foreign bank had a right to deposit under 650% of their chartered capital from 2007, raised to 800% in 2008, 900% in 2009, 1000% in 2010 and has had the same right as a domestic bank since 2011. Regarding the investment of foreign investors – under the government's decision of 2007 - the total shares of foreign shareholders cannot exceed 30% of bank shares and one foreign investor cannot hold

more than 20% of bank shares. To improve the competitiveness of Vietnam's domestic banks, foreign presence increased. In November 2006, the government also raised the minimum notional capital levels required for all credit institutions. It required all commercial banks to hold at least VND 3 trillion (USD 143 million) in capital, up from the prior minimum of VND 70 billion (USD 3.3 million). In October 2010, it also increased the required minimum capital adequacy ratio from 8% to 9%.

3. Related Literature

There has been a large number of studies on bank (in)efficiency in developed and developing countries (Weill, 2003; Bonin, Hasan et al., 2005; Havrylchyk. 2006; Tochkov and Nenovsky, 2011; Sun, Harimaya et al., 2013). Studies on bank efficiency in transition economies mainly focus on ownership structure (state, private or public ownership) and on the effects of economic reforms.

Ownership structure is considered as an important determinant of bank efficiency since it is related to bank transparency, operational and risk management, especially in transition economies (Hasan and Marton, 2000; Kraft, Hofler et al., 2002; Weill, 2002; Poghosyan and Borovička, 2007; Anca, Laurent et al., 2008; Karas, Schoors et al., 2008). The rationale is that young banks and state-owned banks have less experience in risk management and other managerial skills. Penetration of foreign investors is often restricted in transition countries and bank managers tend to protect themselves by delaying the privatization process since they lose some power in the bank if it is privatized.

Reforms in transition economies require central governments to reduce their investments in firms and financial institutions. A privatization program is an opportunity for banks (firms) to diversify their ownership structure, gain independence and transparency in their business which is expected to improve their efficiency. Allowing the participation of foreign investors also provides more opportunities for banks to seek financial resources more easily. Such an argument is developed by Grigorian and Manole (2002). They explain that banks controlled by boards which have foreign investors/members have more opportunities to improve risk management and operational techniques by learning from foreign partners. Using a sample of banks from 28 developing countries, Berger et al (2004) find that foreign banks have the highest profit efficiency followed by private domestic banks and then state-owned banks. Bonin et al (2005) also show from experiences of privatization in six transition countries in

Central and Southeastern Europe that foreign-owned banks are generally the most efficient banks, government-owned banks being the least efficient ones. Moreover, the involvement of strategic foreign owners in the privatization process is also expected to improve bank efficiency. Manthos and Nikolaos (2009) study how deregulation of banking system influences bank efficiency. They analyze bank efficiency in 10 transition economies in Europe during reform period (1994-2005). They show that reforms give more opportunities for banks to improve their efficiency and their performance.

Using a single country to analyze bank efficiency is spreading in the literature to avoid any bias stemming from different economic conditions and to focus on some specific conditions prevalent in a given country, especially in developing or transition economies such as Chile, Thailand, Argentina, Philippine, Turkey or Russia (Altunbas, Liu et al., 2000; Bos and Kool, 2004; Berger, Hasan et al., 2007; Tochkov and Nenovsky, 2011). As in other transition economies, the banking industry in Vietnam is young and less developed. But there are only few studies on bank (in)efficiency in Vietnam (Nguyen, 2007; Ngo, 2010; Vu and Turnell, 2010; Minh, Khanh et al., 2012; Ngo, 2012).

Studies on bank efficiency in Vietnam consider a short time period which does not allow an analysis of the impact of the reforms of the mid 2000's. Considering the DEA approach, Nguyen (2007) analyzes a sample of 13 banks from 2001 to 2003 to estimate cost efficiency. Minh et al. (2012) focus on analyzing the super-efficiency of a single state-owned bank with 125 branches during 2007-2010. Vu and Turnell (2010), using the SFA method, estimate cost efficiency of 56 Vietnamese banks from 2000 to 2006. Considering the impact of bank ownership, they find no significant difference between the mean efficiency of commercial banks, joint-venture commercial banks and foreign banks from 2000 to 2006. They justify the use of a cost function by the fact that before any gain or profit has been generated, costs have increased in the first half of 2000s. However, profit efficiency is more appropriate as it combines both costs and revenues in the measurement of efficiency. As emphasized by Maudos et al. (2002) analyzing cost efficiency gives only a partial vision whereas profit efficiency is a more important source of information. Indeed, it embodies revenues and loan performance, rather than just costs or inputs.

Thus, in this chapter, we add to the literature on several points. First, we consider a wider concept of efficiency by measuring profit efficiency rather than cost efficiency. Second, as important reforms have been implemented in Vietnam in the mid-2000s, we study the impact

of these reforms on bank efficiency by considering a study period that enables us to run our analysis before and after the implementation of these reforms. Finally, we study whether foreign ownership and private ownership lead to higher efficiency than state ownership. This is important as Vietnam has progressively engaged in a privatization program and in removing barriers to entry for foreign investors.

4. Methodology

In this study, we divide the analysis of bank efficiency into two stages. In the first stage, we compute bank efficiency scores and compare these scores for private, state-owned and foreign banks. In the second stage, we analyze the determinants of bank efficiency focusing on ownership variables to analyze whether the existence of foreign owners leads to better efficiency.

4.1 Bank efficiency

We analyze the efficiency of Vietnamese commercial banks by estimating inefficiency scores from a profit function using the intermediation approach. Efficiency measures how close to the maximum profit a bank is and the maximum value is determined by best performers in the sample. We follow Humphrey and Pulley (1997) by assuming that banks have some market power in output markets. Thus, profits are a function of both input prices and output quantities but banks choose input quantities and output prices. Because of the deregulation of interest rates and imperfect competitive markets, the intermediation approach is suitable to analyze how banks control input prices and output quantities to optimize their profits. The analysis of profit efficiency shows how banks can reach the maximum profit.

To measure productive efficiency, two common methods are applied i.e. data development and stochastic frontier analysis (DEA and SFA, respectively). We use SFA rather than DEA because it controls for measurement error and other random effects (Lensink et al., 2008; Matoušek and Taci, 2004). More precisely, we employ the Battese and Coelli (1995)'s methodology to calculate the time-varying technical efficiency scores. One of the advantages of this methodology is that it estimates the cost frontier and the coefficient of the efficiency variables simultaneously contrary to the two-step SFA approach developed in Aigner, Lovell et al. (1977)[3]. Besides, it can be estimated for an unbalanced panel and there is

[3] Wang and Schmidt (2002) point out that this two-step approach renders biased coefficients.

no assumption made on the time-functional form contrary to Kumbhakar and Hjalmarsson (1995) or Battese and Coelli (1992).

We estimate efficiency levels by specifying the commonly-used translog functional form and we model the bank as an intermediary who collects funds from savers and allocates those funds to the most profitable projects at minimum costs following Humphrey and Pulley (1997). Based on Battese and Coelli (1995), the profit functional form is defined as:

$$\ln \pi_{it} = \beta_0 + \sum_{j=1}^{2} \beta_j \ln Y_{jit} + \frac{1}{2}\sum_{l=1}^{2}\sum_{k=1}^{2} \beta_{lk} \ln Y_{lit} \ln Y_{kit} + \sum_{j=3}^{4} \beta_j \ln W_{jit} +$$
$$\frac{1}{2}\sum_{l=3}^{4}\sum_{k=3}^{4} \beta_{lk} \ln W_{lit} \ln W_{kit} + \sum_{n=1}^{2}\sum_{m=3}^{4} \beta_{nm} \ln Y_{nit} \ln W_{mit} + \beta_5 \ln z_{it} + \frac{1}{2}\beta_6 \left(\ln z_{it}\right)^2$$
$$+\sum_{j=1}^{2} \beta_{6j} \ln Y_{jit} \ln z_{it} + \sum_{j=3}^{4} \beta_{6j} \ln W_{jit} \ln z_{it} + v_{it} - u_{it}$$

with $\beta_{lk} = \beta_{kl}$ and $\beta_{nm} = \beta_{mn}$.

where: π_{it} - profit, Y_{it} - bank output: total loans and other earning assets, W_{it} -input prices of banks: namely, price of labor (or headcount expenses to total assets) and price of funds (interest expenses to total deposits) and z_{it}: fixed netput (fixed assets) in which i: bank and t: time.

The disturbance term is: $e_{it} = v_{it} - u_{it}$ with $v_{it} \sim iidN(0, \sigma_v^2)$ a random noise and $u_{it} \sim iidN(\mathrm{Z}_{it}\delta, \sigma_u^2)$ is truncated at zero and stands for inefficiency. Efficiency is calculated as TE=exp(-u_{it}).

The homogenous conditions are defined as (Bergman 1997):

i. Inputs: $\beta_3 + \beta_4 = 1$, $\beta_{33} + \beta_{44} + \beta_{34} = 0$ and $\beta_{13} + \beta_{23} + \beta_{14} + \beta_{24} + \beta_{61} + \beta_{62} = 0$

ii. Outputs: $\beta_1 + \beta_2 = 1$, $\beta_{11} + \beta_{22} + \beta_{12} = 0$ and $\beta_{13} + \beta_{23} + \beta_{14} + \beta_{24} + \beta_{63} + \beta_{64} = 0$

the restrictions in (i) and (ii) are to impose linear homogeneity. The restrictions of $\beta_3 + \beta_4 = 1$ and $\beta_1 + \beta_2 = 1$ show that banks have constant return to scale in input or in output during the period under study, respectively.

4.2 Determinants of bank efficiency

The model to estimate the determinants of bank efficiency is:

$$eff_{it} = \alpha_0 + \alpha_m X_{mit} + \alpha_n Z_{nt} + \varepsilon_{it}$$

with *eff*: bank efficiency, X_{mit} : bank-specific variable m of bank i at year t; Z_{nt} :macro-variable n at year t. α_m and α_n are coefficients of bank specific and macro variables, and ε_{it} is the error term.

Since efficiency scores are bounded between 0 and 1, we apply an estimation procedure for fractional dependent variables (the dependent variable is defined in the range of 0 and 1 or from 0% to 100%). More precisely, we apply the methodology proposed by Papke and Wooldridge (1996) instead of using a log-odd procedure in a logistic function. Papke and Wooldridge (1996) argue that the estimation of proportion based on log-odd procedure could generate some problems if the dependent variable is not a proportion from a discrete group size or if any observation takes the value of 0 or 1. The technique developed by Papke and Wooldridge (1996) is based on the quasi-likelihood method. Based on McCullagh and Nelder (1989), the estimation procedure of the parameters is to maximize a log-likelihood Bernouilli function. The advantage of this methodology is that the estimator is consistent and asymptotically normal for any distribution of y conditional on x. The standard errors of β are estimated as in Papke and Wooldridge (1996).

5. Data and variables

Annual bank reports are collected from the Central Bank of Vietnam and completed with Bankscope. Macro variables are collected from the general statistic office of Vietnam (GSO) and the State Bank of Vietnam. Data run from 2002 (after the reforms of the SOCBs to improve the banking system) to the end of 2009 (before foreign banks and their branches could access and provide financial services as domestic banks). The sample includes 37 commercial banks operating in Vietnam (Table 1). There are five state-owned banks and 32 private banks. Due to the privatization process, two state-owned banks were privatized over

the 2007-2008 period and one of these two banks had foreign shareholders in 2008[4]. There are 16 private banks with foreign ownership. More precisely, there are four joint-venture banks, ten banks with foreign shareholders from 2006 and two banks with international organization-shareholders (IMF and World-bank). The sample represents more than 84% of the aggregate bank assets of the banking industry in Vietnam (OECD, 2013).

Table 1: Distribution of banks by type of ownership

Type of banks	Number of banks	Remark
State-owned banks	5	2 banks were IPOs in 2008 in which 1 bank was privatized with foreign shareholders*. 1 bank was privatized without foreign shareholders.
Private banks	32	Among these private banks there are 10 banks with foreign shareholders* since 2006, 4 joint-venture banks between foreign banks and state-owned banks/partners and 2 banks with international organization shareholders (IMF and World Bank).

** Banks with foreign shareholders are defined as banks that have at least one foreign member in the board of managers or directors.*

5.1 Bank efficiency

The log of Profit-before-tax (pbt) is considered as the dependent variable; independent variables are outputs defined in log terms which are log of loans (y_1) and of other earning assets (y_2) and inputs which are the price of funds (w_1) and the price of labor (w_2) (see Table 2). Since most of Vietnamese banks are young and need to invest in infrastructure and in other fixed assets (ATM, branches, core-banking system…) hence reducing banks' capital resources, we define net fixed assets as netput. It represents the long-term commitment of banks to their customers and the willingness of banks to improve their performance. Net fixed assets will have two-side effects on banks' profit, a negative effect for the short-term; banks have less resources left for loans and have to spend more to maintain or to train their employees (new branches, new machines, new technology). But in the long-term, if an

[4] To test the robustness of our results, we have also performed our analysis excluding these two state-owned banks after their privatization. See section 7.

investment is a right decision, it improves bank operation and it is profitable (positive effect on bank profit).

Lack of data from Bankscope and from annual statements of banks to calculate the price of labor in individual bank leads us to use the ratio of personnel expenses to total assets as a proxy of the price of labor (w_1). The expected relationship with efficiency is ambiguous. For the amount of total assets, a bank that has a lower ratio of personnel expenses to total assets could generate more profit and thus have higher efficiency. However, bank efficiency should be higher in presence of better skilled employees that are more expensive. In that case, there could be a positive relationship between personnel expenses and efficiency. The price of funds is the ratio of total interest expenses to total customers deposits (w_2). This variable measures the amount that a bank has to pay for one unit of input (it includes deposit interests and commission fees). If a bank has a lower cost of funds, its profit should be higher and its inefficiency lower.

Table 2: Variables of profit function

Variables	Description	Expected relations
Pbt	Log of profit before tax	
y1	Log of loans	+
y2	Log of other earning assets	+
w1	Log of personal expenses to total assets (price of labors)	-
w2	Log of total interest expenses to total customer deposits and short funds (price of funds)	-
Z	Log of fixed assets	+ or -

5.2 Determinants of bank efficiency

To explain bank efficiency, we select several bank-specific variables. The log of total assets is used as a proxy of bank size (lgTA). It captures the possible cost advantages associated with size and should be positively related to bank efficiency. The ratio of loans to deposits (Loan2deposit) stands for bank liquidity position and is expected to have a negative impact on bank efficiency. The ratio of equity to total assets (CAP) measures capital adequacy. The link with bank efficiency is not clear cut. On the one hand, higher capital ratios can reduce moral hazard between shareholders and debt holders by increasing shareholders

incentives to control risk. This increase in monitoring should have a positive effect on bank's profitability. Using a sample of European banks, Fiordelisi, Marques-Ibanez and Molyneux (2011) find that better capitalized banks are more efficient. In the Chinese case, Pessarossi and Weill (2013) also find that higher capital ratios are associated with higher bank efficiency. On the other hand, higher capital ratios can worsen the agency problems between managers and shareholders and reduce bank profitability. On a sample of US banks, Berger and Bonaccorsi di Patti (2006) find that higher capital ratios have a negative impact on efficiency. In our study, this variable aims to capture the impact of the reform implemented in 2006 that raised the minimum capital required[5].

We also introduce dummy variables to take into account bank ownership and the presence of foreign shareholders. More precisely, the dummy variable PRIVATE takes the value of one if the bank has at least two partners but no foreign member on the board of managers or directors and zero otherwise. The dummy variable FOREIGN takes the value of one for banks that have at least one foreign member on the board of managers or directors and zero otherwise. Thus, the interpretation of these dummy variables is made in comparison with state owned banks. Private banks face more competition than state-owned banks, but private banks can be managed more efficiently than state-owned banks that have complicated managerial structures. The existence of foreign members on the board of managers or directors should improve risk management and managerial skills and hence contribute to higher efficiency. Thus, in line with Weill (2003), Rodrigo and Marcos (2007) and Berger et al. (2007), we expect the dummy variables FOREIGN and PRIVATE to positively affect bank efficiency.

For the macro-variables, we use the growth rate of Gross Domestic Product (GDP), inflation (INF) as in Fethi et al (2008) or Manthos and Nikolaos (2009) and financial depth (FINDEP) defined as domestic credit provided by the banking system to GDP (Grigorian and Manole, 2002). The level of domestic credit by the banking sector is an indicator of the level of banking sector liberalization as well as the level of competition from private banks. The proxy of financial development (or financial liberalization) is the ratio of stock market

[5] As emphasized by Pessarossi and Weill (2013), a reverse causality from efficiency to capital might exist. More efficient bank might be more profitable and accumulate more capital. However, they explain that, in China, as banks were obliged to adapt to the new regulation in a short space of time, the changes in capital ratios can be assumed to be exogenous. The same argument can be applied in the case of Vietnam. Statistics about the evolution of capital during the 2002-2009 period confirm a sharp increase in equity following the reform (see Appendix A). Besides, we have performed the Durbin-Wu-Hausman test for the endogeneity of the variable equity to total assets and found that we cannot reject the exogeneity of the variable (see section 7).

capitalization to GDP (CAPITAL). In young market-oriented economies, banks have more benefited from economic growth and the liberalization of financial markets. The existence of a stock exchange has been an opportunity for banks to expand their customer base as well as to improve their efficiency through the development of stock exchanges. It allows for example diversified ownership and trading on the stock exchange. Except INF and FINDEP which have unclear effects on bank efficiency, the other variables which relate to economic growth and the stock market are expected to have a positive contribution on bank efficiency. Since banks benefit from those developments, they can provide more services to the market and are likely to improve their efficiency. Table 3 summarizes the potential determinants of bank efficiency with the expected sign of the relationship.

Table 3: Determinants of bank efficiency

Variables	Description	Expected effects
lgTA	Log of total assets	+
Loan2deposit	Ratio of loans to total customer deposits	+
PRIVATE	1 if banks have at least two partners/shareholders and no foreign member in board of managers or directors, and 0 otherwise.	+
FOREIGN	1 if banks have at least one foreign member in board of managers or directors, and 0 otherwise.	+
CAP	Equity to total assets ratio	+
GDP	Growth rate of GDP	+
INF	Yearly inflation	+ or -
FINDEP	ratio of the domestic credit provided by banking system to GDP	+ or -
CAPITAL	Capitalization of stock market to GDP	+

Table 4 presents the descriptive statistics of the sample. By using key accounting ratios, the data highlight that banks are on average focused on traditional intermediation activities. The average share of loans in total assets is 55.8% and the average ratio of customer deposits to total assets is 80.6%. However, there is a high heterogeneity across banks as shown by the high standard deviation and extreme values of each ratio. Considering profitability, the average return on assets is equal to 1.4%. Interestingly, we find that 13 banks lend more than the deposits they collect (the ratio of loans to total customer deposits is above 1 or 100%). These banks have been trading on the interbank market and been refinanced by the SBV to cover their excess lending.

Considering macro variables, GDP growth rate is in the range of 5.3 to 8.4% with the mean at 7.3%; but inflation has fluctuated largely from 3.3% to 23.1% with a mean of 8.6%. Inflation has sharply increased in Vietnam since 2004. Two other macro variables have increased overtime and the mean is at 77.35% for the ratio of domestic credit provided by the banking sector to GDP (FINDEP) and 15.67% for the ratio of stock market capitalization to GDP (CAPITAL). This reflects the unstable economic conditions in Vietnam during the period under study. Consequently, there are unpredictable effects of macroeconomic conditions on bank efficiency, especially, the high inflation rate and the high growth rate of GDP could boost banks' performances in the short-term possibly leading to higher efficiency but the outcome in the long-term is unpredictable.

Table 4: Descriptive statistics on the period 2002-2009

Variable	Mean	SD	Min	Max
Pbt2assets (%)	1.524	0.890	0	5.951
Loan2assets (%)	55.876	16.428	0.067	84.477
Earning2assets (%)	32.876	17.628	1.260	96.766
Per2assets (%)	0.665	0.624	0.073	6.525
Inter2loans (%)	9.039	6.901	0.084	90.109
Fixe2assets (%)	1.364	2.551	0.103	26.045
Depo2assets (%)	80.622	10.430	14.355	94.258
CAP (%)	13.392	12.595	2.340	99.840
Loans2dep (%)	71.321	25.367	19.430	210.035
ROAA (%)	1.402	0.855	0.03	7.94
ROAE (%)	13.048	7.174	0.07	44.25
Net interest margins (%)	3.383	1.746	0.51	21.24
INF (%)	8.66	6.14	3.30	23.11
Growth rate of total assets (%)	0.917	3.131	-0.373	41.996
Nominal GDP (current price)*	995,641.4	407,386.9	535,762	1,658,389
GDP (%)	7.3362	1.1207	5.32	8.48
FINDEP (%)	77.35	25.98	44.8	123
CAPITAL (% GDP)	15.67	17.74	0.39	43

**: in Vietnamese dong (VND-Vietnamese currency). Other variables are in percentage. Pbt2assets: ratio of profit-before-tax to total assets; Loan2assets: ratio of loans to total assets; Earning2assets: ratio of other earning assets to total assets; Per2assets: ratio of personnel expenses to total assets; Inter2loans: ratio of total interest expenses to loans; Fixe2assets:ratio of fixed assets to total assets; Depo2assets: ratio of total customer deposits to total assets; Loans2dep: ratio of loans to total customer deposits; CAP: ratio of equity to total assets; ROAA: Return on average assets; ROAE: Return on average equity; INF: Inflation rate; GDP: Gross Domestic Products. FINDEP: ratio of domestic credit provided by banking system to GDP; CAPITAL: capitalization of stock market to GDP.*

6. Results

Important changes have occurred in the macro-environment of the Vietnamese economy in 2005-2006. Vietnam became a member of WTO and there has been an important increase in foreign investors, a boom in the stock market and the real estate market, etc. Thus, we divide our sample period into two sub-periods.[6] The first period runs from 2002 to 2005 with a high economic growth rate (mean of GDP growth rate around 7%), when the banking system recovered from the financial crisis of 1997-1998 and the government issued a program to support banks. Furthermore, during that period, banks benefited from the expansion of the private sector in Vietnam. The second sub-sample goes from 2006 to 2009, which is a period of deep changes after Vietnam became a member of WTO and restructured its banking system by applying new standards and to prepare the full access of foreign banks in 2010. During this period, the government and the central bank reduced their support to domestic banks and removed barriers for foreign banks and their branches in Vietnam.

We first compute bank efficiency scores and compare the mean values for different bank ownership types and sub-periods. Then, we analyze the determinants of bank efficiency during the two sub-periods.

6.1 Bank technical efficiency

The profit function has a quadratic form and some interaction terms between input and output or fixed netput are introduced (see Table 5). The result illustrates that there are individual outputs that are not significant[7]. The input variables are significant and the price of labor shows a positive effect. As explained in section 5, higher personnel expenses can reflect better skilled employees and be associated with higher efficiency.[8]

[6] We ran a test for structural break in 2006 (Chow test) and got a significant statistics that confirms the break in 2006 (see details in Appendix B).
[7] We checked that we cannot reject the hypothesis of constant return to scale in outputs. See Appendix C, homogeneity conditions.
[8] To test the robustness of the estimation, we employ real values to calculate the efficiency levels (see section 7)

Table 5: Estimation of the profit function (Profit before tax)

Model specification

$$\ln \pi_{it} = \beta_0 + \sum_{j=1}^{2} \beta_j \ln Y_{jit} + \frac{1}{2} \sum_{l=1}^{2} \sum_{k=1}^{2} \beta_{lk} \ln Y_{lit} \ln Y_{kit} + \sum_{j=3}^{4} \beta_j \ln W_{jit} +$$
$$\frac{1}{2} \sum_{l=3}^{4} \sum_{k=3}^{4} \beta_{lk} \ln W_{lit} \ln W_{kit} + \sum_{n=1}^{2} \sum_{m=3}^{4} \beta_{nm} \ln Y_{nit} \ln W_{mit} + \beta_5 \ln z_{it} + \frac{1}{2} \beta_6 (\ln z_{it})^2$$
$$+ \sum_{j=1}^{2} \beta_{6j} \ln Y_{jit} \ln z_{it} + \sum_{j=3}^{4} \beta_{6j} \ln W_{jit} \ln z_{it} + v_{it} - u_{it}$$

	Variables	**Parameters**	**Estimates**	**SE**
y1	Total loans	β_1	0.230	0.664
y2	Other earning assets	β_2	0.923	0.652
w1	Price of labor	β_3	3.130**	1.249
w2	Price of fund	β_4	-2.333***	0.774
Z	Fixed netput	β_5	0.428	0.710
sqy1	½*total loans* total loans	β_{11}	0.023	0.102
sqy2	½*other earning assets*other earning assets	β_{22}	0.370***	0.082
y1y2	½*total loans*other earning assets	β_{12}	-0.525***	0.123
sqw1	½*price of labor*price of labor	β_{33}	0.404*	0.233
sqw2	½*price of fund*price of fund	β_{44}	-0.109	0.161
w1w2	½*price of labor*price of fund	β_{34}	-0.559**	0.248
y1w1	total loans*price of labor	β_{13}	-0.434***	0.119
y2w1	other earning assets *price of labor	β_{23}	0.213**	0.101
y1w2	total loans*price of fund	β_{14}	0.082	0.082
y2w2	other earning assets *price of fund	β_{24}	0.016	0.082
sqz	½*fixed netput*fixed netput	β_{55}	0.030	0.108
y1z	total loans*fixed netput	β_{61}	0.027	0.117
y2z	other earning assets *fixed netput	β_{62}	-0.014	0.054
w1z	price of labor*fixed netput	β_{63}	0.178*	0.103
w2z	price of fund*fixed netput	β_{64}	-0.124	0.114
Constant	Constant	β_0	1.944	2.554
$\sigma_{u_{it}}$			2.704	
$\sigma_{v_{it}}$			-3.438	
R^2			0.865	
Observations			221	
Number of banks			37	

Dependent variable: pbt (log of Profit-before-tax). $\sigma_{u_{it}}, \sigma_{v_{it}}$ *are standardized deviations of random-effect and the disturbance. S.E: Standard errors. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.*

Following Battese and Coelli (1995), the technical efficiency scores (TE) are calculated from TE = exp(-u_{it}). The means of efficiency by ownership type and by year are

shown in Table 6 and Table 7. The overall mean of efficiency of domestic commercial banks is at 0.646 (or 64.6%) and the efficiency scores of banks are volatile. There are a few scores close to 1 or 100% (there are 11 banks with efficiency scores above 0.9 and these banks get such high scores in 2006 due to the restructuring of the economy and the credit expansion over the 2005-2006 period).

Table 6: Description of bank efficiency by ownership

Bank ownership	Mean	Std. Dev.	Min	Max
Fully state-owned bank	0.399	0. 272	0. 099	0. 918
Private banks without foreign shareholders	0.684	0. 198	0. 014	0. 941
Banks with foreign shareholders	0.689	0. 179	0. 202	0. 936
Overall mean	**0.646**	**0.226**	**0.014**	**0.941**

Table 7: Description of bank efficiency by year

Year	Mean	Std. Dev.	Min	Max
2002	0.501	0.292	0.014	0.886
2003	0.596	0.228	0.121	0.865
2004	0.590	0.216	0.141	0.844
2005	0.590	0.227	0.112	0.862
2006	0.703	0.192	0.215	0.941
2007	0.706	0.163	0.284	0.912
2008	0.694	0.245	0.112	0.936
2009	0.685	0.208	0.099	0.940
Overall mean	**0.646**			

As shown in Table 7, the yearly means of efficiency scores changed slowly and the peak of bank efficiency is in the year 2007 with a decline later on. The increase and decline might be partially caused by the restructuring of the economy, the credit expansion in 2005-2006 as mentioned above and the stock market bubble until March 2007 followed by a burst. Additionally, the decline in efficiency scores from 2008 can be explained by liquidity problems because SBV has decided to tighten its monetary policy to control the high inflation rate and banks have been hit by the increase of deposit interest rates. The mean differences of efficiency between years are not significant but the mean difference of efficiency between the two sub-periods 2002-2005 and 2006-2009 is significant at the 5% significance level (see appendix D).

Concerning the impact of ownership type on bank efficiency (Table 6), the mean efficiency scores show that state-owned banks are less efficient than private banks without foreign ownership and than banks with foreign investors. Indeed, when we compare state-owned banks with those two types of banks, we obtain significant mean-pairwise comparison statistics that confirm that state-owned banks are less efficient than other banks (see appendix D). State-owned banks play an important role in the banking industry and they receive support from the government and the central bank to play their role. However, it seems that they pay less attention to their efficiency and do not take advantage of their market power. The weakness of state-owned banks is illustrated by a very low mean of efficiency score at 0.399 compared with a mean efficiency score above 0.68 for other banks. More precisely, in the context of a complex organization structure, state-owned banks have branches in all provinces and are agents for the government to donate credits with low interest rates for the provincial or regional development as well as to some specified state-owned organizations. Besides, executives of state-owned banks have less incentives to improve bank efficiency since they are hired as government officers. The complex structure and less incentivizing working environment are possible reasons that cause a delay of privatization process of state-owned banks and explain the lower efficiency of state-owned banks

By contrast, the mean pairwise comparison test indicates that there is no significant difference between private banks with or without foreign shareholders in terms of mean efficiency score. This could be explained by the relatively recent presence of foreign investors or shareholders in Vietnamese banks and the fact that joint-ventures banks face several specific constraints. For example, they are allowed to provide banking services only in large cities.

6.2 Determinants of bank efficiency

To analyze the influence of macro variables and bank ownership on bank efficiency, we employ the efficiency scores calculated previously. From the model specification presented in section 4.2, we estimate the following equation on each sub-period[9]:

$$eff_{it} = \alpha_0 + \alpha_m X_{mit} + \alpha_n Z_{nt} + \delta_1 foreign_{it} + \delta_2 private_{it} + \varepsilon_{it}$$

[9] To test the robustness of the estimations, instead of running the regressions on two sub-periods, we also construct a dummy variable (Break) that takes the value of one during the 2006-2009 period and 0 otherwise (see section 7).

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with X_{mit} bank-specific variables, Z_{nt}: macro-specific variables and *foreign* and *private* the dummy variables taking into account bank ownership.

6.2.1. Determinants of bank efficiency during the period of high economic growth (2002-2005)

Because of high correlation between macro variables during the sub-period 2002-2005 (see Appendix E), we separately analyze the effect of each macro-variable (model 1 to model 4 of Table 8).

Table 8: Determinants of bank efficiency in the sub-period 2002-2005

Model specification: $eff_{it} = \alpha_0 + \alpha_m X_{mit} + \alpha_n Z_{nt} + \delta_1 foreign_{it} + \delta_2 private_{it} + \varepsilon_{it}$

Variables	Coefficient	Model 1	Model 2	Model 3	Model 4
lgTA	α_1	0.303	0.319*	0.283	0.344*
		(0.186)	(0.186)	(0.185)	(0.186)
Loan2deposit	α_2	0.386	0.400	0.367	0.421
		(0.371)	(0.374)	(0.375)	(0.365)
PRIVATE	δ_1	2.267***	2.311***	2.213***	2.377***
		(0.550)	(0.549)	(0.568)	(0.522)
FOREIGN	δ_2	2.082***	2.117***	2.037***	2.170***
		(0.445)	(0.457)	(0.456)	(0.434)
CAP	α_3	0.036*	0.037*	0.035*	0.0397**
		(0.019)	(0.019)	(0.019)	(0.020)
GDP	α_4	-3.017			
		(20.970)			
INF	α_5		-1.708		
			(3.910)		
FINDEP	α_6			0.001	
				(0.011)	
CAPITAL	α_7				-19.930
					(27.400)
Constant	α_0	-4.666**	-4.989**	-4.707**	-5.256***
		(2.053)	(2.001)	(1.887)	(1.981)
Test: $\delta_1 - \delta_2 = 0$					
Chi2		0.390	0.440	0.350	0.500
Prob > chi2		0.533	0.508	0.556	0.479
R^2		0.403	0.405	0.403	0.407
Observations		90	90	90	90

lgTA: log of total assets; Loan2deposit: ratio of loans to total customer deposits; PRIVATE: dummy variable taking the value of 1 if the bank has at least two partners/shareholders and no foreign member in board of managers or directors, 0 otherwise; FOREIGN: dummy variable taking the value of 1 for banks with at least one

*foreign member in board of managers or directors, 0 otherwise; CAP: ratio of equity to total assets; GDP: growth rate of Gross Domestic Product; INF: Inflation rate; FINDEP: ratio of domestic credit provided by banking system to GDP; CAPITAL: capitalization of stock market to GDP. Robust standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.*

The results in Table 8 show that the ratio of loans to total customer deposits (Loan2deposit) and the macro variables are not significant to explain bank efficiency during the sound economic period. By contrast, the ratio of equity to total assets (CAP) has a positive and significant effect on bank efficiency. This finding is similar to those of Fiordelisi et al. (2011) and Pessarossi and Weill (2013). While Fiordelisi et al. (2011) find that banks that have a higher capital ratio can obtain a higher efficiency because they can rely on a stronger capital base. Pessarossi and Weill (2013) argue that banks with higher capital are less prone to moral hazard in shareholders' behavior if the stakes of the latter in the bank are larger. Such findings are not surprising in the case of Vietnam since the banking industry was strongly underdeveloped under the recent reforms and therefore prone to severe asymmetric information problems. Looking back upon the financial crisis at the end of the 1990s, banks in Vietnam had suffered and needed to recover. The increase in capital resources might have been a solution for banks to boost their banking services (or to ensure that they had more capacities to provide loans and to invest in order to expand their subsidies or branches) and their efficiency. The size of the bank (lgTA) is significant in only two out of the four models and only at the 10% level.

The two dummy variables, PRIVATE and FOREIGN, are significant at the one percent level in all the models. The test at the bottom of the table indicates that we cannot reject the equality of the coefficients associated with these two dummy variables (PRIVATE and FOREIGN) implying that private and foreign ownership has the same influence on bank efficiency on this sub-period. Both private banks and banks with foreign ownership have higher efficiency than state-owned banks. During this sub-period, SOCBs and some private banks focused on relationships with the state-owned enterprises (SOEs) instead of lending to the private sector. Under the context that the SOEs were stable and secured as they were under the protection of the government, those banks paid less attention to their risk management and generated low profitability. Sjöholm (2006) states that the inefficient SOEs were a burden for the government and also for the banks when those SOEs were sources of outstanding and non-performing loans. Some private banks and banks with foreign shareholders had opposite results due to restructuring programs and participation of diversified shareholders (including foreign shareholders).

6.2.2. Determinants of bank efficiency after the launch of the "Banking Sector Reform Roadmap" and the reform of the financial system (2006-2009)

In the sub-sample from 2006 to 2009, we perform the same analysis as on the previous sub-period with the separated macro-variables in models 5 to 8.

Table 9: Determinants of bank efficiency in the sub-period 2006-2009

Model specification: $eff_{it} = \alpha_0 + \alpha_m X_{mit} + \alpha_n Z_{nt} + \delta_1 foreign_{it} + \delta_2 private_{it} + \varepsilon_{it}$

Variables	Coefficient	Model 5	Model 6	Model 7	Model 8
lgTA	α_1	0.444***	0.334**	0.431***	0.324**
		(0.116)	(0.115)	(0.122)	(0.114)
Loan2deposit	α_2	0.067	0.017	0.091	0.029
		(0.162)	(0.166)	(0.156)	(0.162)
PRIVATE	δ_1	1.302***	1.127**	1.306***	1.113**
		(0.383)	(0.408)	(0.396)	(0.417)
FOREIGN	δ_2	1.354***	1.111**	1.354***	1.093**
		(0.392)	(0.401)	(0.409)	(0.411)
CAP	α_3	0.053***	0.0450**	0.049**	0.0428**
		(0.015)	(0.016)	(0.015)	(0.015)
GDP	α_4	18.89**			
		(6.370)			
INF	α_5		-1.175		
			(1.121)		
FINDEP	α_6			-0.013*	
				(0.005)	
CAPITAL	α_7				-0.019
					(0.615)
Constant	α_0	-6.810***	-3.927**	-4.090**	-3.930**
		(1.754)	(1.504)	(1.419)	(1.504)
Test: $\delta_1 - \delta_2 = 0$					
Chi2		0.060	0.010	0.050	0.010
Prob > chi2		0.800	0.941	0.822	0.927
R^2		0.259	0.216	0.248	0.209
Observations		130	130	130	130

*lgTA: log of total assets; Loan2deposit: ratio of loans to total customer deposit; PRIVATE: dummy variable taking the value of 1 if the bank has at least two partners/shareholders and no foreign member in board of managers or directors, 0 otherwise; FOREIGN: dummy variable taking the value of 1 for banks with at least one foreign member in board of managers or directors, 0 otherwise; CAP: ratio of equity to total assets; GDP: growth rate of Gross Domestic Products; INF: Inflation rate; FINDEP: ratio of domestic credit provided by banking system to GDP; CAPITAL: capitalization of stock market to GDP. Robust standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.*

Table 9 shows the results. As for the previous period, the bank ownership variables are significant. The PRIVATE and FOREIGN dummy variables have still a positive influence on bank efficiency at the 1% level and their coefficients are not statistically different from each other (see test at the bottom of Table 9). There are several possible explanations for the positive impact of FOREIGN during this sub-period. Firstly, banks that already had foreign stakeholders have benefited from experienced investors and capital resources to improve their efficiency. Secondly, after the boom of the stock market in 2005-2006, many private banks have issued new shares and called for foreign strategic investors; the presence of foreign investors in these banks can be interpreted as a signal that such banks have a strong potential compared to others. The other dummy variable, PRIVATE, indicates that private banks still benefit from restructuring and the improvement of their banking services compared with the inefficient state-owned banks. However, the coefficients associated with these dummy variables are lower than those obtained on the previous sub-period. This might indicate that the reforms and the increasing competition have led state-owned banks to improve their efficiency, even if they are still less efficient than private banks and banks with foreign shareholders.[10]

The capital ratio (CAP) has a positive and significant effect on bank efficiency. Besides, both the levels of significance and the values of the coefficients are higher than those obtained on the 2002-2005 period. This might be explained by the reform implemented in 2006 that raised the minimum notional capital levels required for all credit institutions. Thus, capital was an important concern for banks in order to fulfill the minimum capital requirement imposed by the central bank (SBV) as well as to expand their banking services. Higher equity has been a financial source for banks' operations and for improving their efficiency.

Considering other bank specific variables, bank size (lgTA) is also highly significant with a positive coefficient. As expected, the development of banks contributes to improve their efficiency over this period. When the banking industry is more competitive, banks have to revamp their risk management strategies and to explore other growth opportunities.

Another difference with the results obtained on the 2002-2005 period is that two of the macro variables are significant in this period. About the negative effect of the ratio of domestic credit provided by the banking system to GDP (FINDEP), in the context of new

[10] We have calculated the mean efficiency scores for each category of bank (state-owned, private and foreign) on the two sub-periods. We find that the difference between the mean efficiency of private or foreign banks and state-owned banks has reduced on the 2006-2009 period (see appendix F).

banks established in 2006 and new foreign banks in 2008, there is high competition in banking services and banks have to compete and offer competitive interest rates to attract customers. Consequently, banks' profitability decreased due to higher deposit interest rates and lower credit interest rates, even though the demand for loans increased. That has probably negatively affected bank efficiency. The growth rate of GDP (GDP) shows a positive effect on bank efficiency. Bank efficiency is influenced by the growth of the economy as banks have larger customer bases and they can select better and liable customers to prevent and to reduce non-performing loans. Hence, banks can better manage their risks and have more opportunities to improve their efficiency.

To sum-up, the analysis of these two sub-periods gives different results for the effects of both bank-specific and macro variables on bank efficiency. Firstly, the high significance of bank size on the 2006-2009 sub-period reflects the achievement of the banking system in this sub-period compared to the 2002-2005 period in which bank size is not significant to explain bank efficiency. This might be explained by the fact that, in the 2002-2005 period, banks had difficulties to expand their size since their principal customers were the SOEs, small and medium enterprises and served for some State programs. By contrast, during the 2006-2009 period, banks have benefitted from the reforms and expanded their business while investing in infrastructures and new technologies. Thus, the increase in bank size has been associated with a gain in efficiency.

Secondly, in the second sub-period, two macro-variables play a significant role in explaining bank efficiency: the growth rate of GDP and the ratio of domestic credit provided by banking system to GDP (FINDEP). In line with earlier studies, these results show that banks might benefit from economic growth and they might also be hurt by higher competition driven by other banks and financial institutions penetrating into the market.

Finally, capital resources and ownership structure are important to explain bank performance and bank efficiency over the whole sample period. For young and small banks, capital resources are a priority to invest in infrastructure, new technologies or to fulfill bank regulations. Besides, a diversified ownership structure not only mitigates governance problems but can also be an additional capital resource for banks. Indeed, foreign ownership could be an important opportunity for banks to access financial resources and to obtain experience from foreign investors.

7. Robustness checks

First, to test the robustness of the profit function estimation, we employ real values to calculate the efficiency levels. The estimation of the frontier analysis shows only little difference with the previous one: the significance of price of labor (w1) and the interterm of price of labor with the fixed netput (w1z). The former has lower critical value (10% instead of 5% as previous estimation) and the latter is no longer significant. However, the coefficients are not changed too much and keep the same positive contribution on the profit (see Appendix G).

Second, as emphasized by Pessarossi and Weill (2013), a reverse causality from efficiency to capital might exist. Even if the exogenous change in banks' capital due to new regulations should eliminate the concern about reverse causality, we have checked the exogeneity of the equity to total assets variable by performing the Durbin-Wu-Hausman test for the endogeneity. We find that we cannot reject the exogeneity of the variable (see Appendix H).

Third, as in our sample of banks, two state-owned banks have been privatized over the 2007-2008 period (see Table 1), we checked that excluding these banks from our analysis does not alter our results. The results obtained excluding these two state-owned banks after their privatization are presented in Appendix I.

Finally, instead of running the regressions on two sub-periods, we have constructed a dummy variable (Break) that takes the value of one during the 2006-2009 period and 0 otherwise. We interact this dummy variable with each of the independent variables. Results are presented in Appendix J and lead to the same conclusions.

8. Conclusion

In this chapter, we analyze the efficiency of domestic commercial banks in Vietnam in the context of the reforms of the banking system such as the privatization process for state-owned banks, the removal of barriers for foreign investors to invest in Vietnamese banks and for foreign banks to enter the domestic market. Our results suggest that ownership has a significant impact on bank efficiency and that the reforms implemented in the mid 2000's allowed an increase in bank efficiency in Vietnam. The existence of foreign investors or

shareholders is an opportunity for banks to improve their efficiency. In the case of the Vietnamese banking system which is young and less experienced and has limited financial resources, the foreign investors' investments and experience are solutions to accelerate the development of the banking system. Our results show that private banks and banks with foreign shareholders have higher efficiency scores than state-owned banks. Besides, after the implementation of the reforms in the mid 2000's, state-owned banks have increased their efficiency and reduced the gap with private and foreign banks. This supports the reforms that remove barriers to entry of foreign investors and reduce the involvement of the government. In order to provide incentives for banks to improve their efficiency, the protection provided by the government should be further reduced. Moreover, bank regulation is needed to enhance bank transparency and to improve bank performance. The strong positive link between capital ratios and efficiency that we find in this study after the implementation of higher minimum notional capital level also suggests that the reforms to meet the international capital standards should be beneficial for Vietnamese banks and their efficiency.

APPENDICES

APPENDIX A: **Description of equity by year**

Year	Mean	Std. Dev.	Min	Max
2002	78 390.76	136 917.9	523.19	497 838.1
2003	102 823.4	188 448.9	524.04	719 285.1
2004	119 173.4	222 154.5	525.15	907 971
2005	138 546.7	235 389.4	9 229.59	961 130.7
2006	180 218.8	255 751.9	16 078.34	112 978.4
2007	328 804.3	373 733.5	38 454.46	1 552 760
2008	391 470.6	426 947	40 715.31	1 778 154
2009	508 082.3	501 403	108 377.9	1 986 270
Overall mean	**247 510.8**			

Equity is expressed in Vietnamese dong (VND-Vietnamese currency).

APPENDIX B: Structural break of data by Chow tests

Structural break	***Test statistics(F*)***	***Prob>F***
Chow test	F(1, 177)= 5.87	0.0164

APPENDIX C: Tests for homogeneity conditions

Table C1: Tests for homogeneity conditions in input

Restrictions (H0)	***Chi2***	***Prob>chi2***
$\beta_3 + \beta_4 = 1$	0.03	0.859
$\beta_{33} + \beta_{44} + \beta_{34} = 0$	1.04	0.308
$\beta_{13} + \beta_{23} + \beta_{14} + \beta_{24} + \beta_{61} + \beta_{62} = 0$	2.63	0.104

Table C2: Tests for homogeneity conditions in output

Restrictions (H0)	***Chi2***	***Prob>chi2***
$\beta_1 + \beta_2 = 1$	0.08	0.775
$\beta_{11} + \beta_{22} + \beta_{12} = 0$	1.46	0.227
$\beta_{13} + \beta_{23} + \beta_{14} + \beta_{24} + \beta_{63} + \beta_{64} = 0$	0.72	0.395

APPENDIX D: Comparison tests

Table D1: Mean pair-wise comparison of efficiency by ownership

Description			mean difference	HSD-test
Fully state-owned bank	vs	Private banks	0.285	10.344*
Fully state-owned bank	vs	Banks with foreign shareholders	0.290	10.533*
Private banks	vs	Banks with foreign shareholders	0.005	0.189

*HSD: honestly significant difference. The studentized range critical value (0.05, 3, 247)=3.3345. *: indicates that the mean difference is significant at 5% critical value.*

Table D2: Mean pair-wise comparison of efficiency by year

Year vs year	mean difference	HSD-test
2002 vs 2003	0.095	2.227
2003 vs 2004	0.006	0.143
2004 vs 2005	0.000	0.006
2005 vs 2006	0.113	2.626
2006 vs 2007	0.003	0.071
2007 vs 2008	0.012	0.280
2008 vs 2009	0.008	0.204

*HSD: honestly significant difference. The studentized range critical value (0.05, 8, 242)=3.3345. *: indicates that the mean difference is significant at 5% critical value.*

Table D3: Mean pair-wise comparison of efficiency on two sub-periods (2002-2005 vs *2006-2009)*

Overallmean (2002-2005) vs (2006-2009)	mean difference	HSD-test
0.574 vs 0.697	0.123	5.817*

*HSD: honestly significant difference. The studentized range critical value (0.05, 2, 219)=2.787. *: indicates that the mean difference is significant at 5% critical value.*

APPENDIX E: Correlation matrices

Table E1: Correlation between bank-specific variables

Variables	EFF	lgTA	loan2deposit	CAP	Public	Foreign
EFF	1					
lgTA	0.137	1				
Loan2deposit	-0.070	-0.291	1			
CAP	0.219	-0.543	0.166	1		
PRIVATE	0.209	-0.188	0.029	0.046	1	
FOREIGN	0.287	-0.015	-0.262	0.098	-0.182	1

EFF: profit technical efficiency. lgTA: log of total assets, Loan2deposit: ratio of loans to total customer deposits; PRIVATE: dummy variable taking the value of 1 if the bank has at least two partners/shareholders and no foreign member in board of managers or directors, 0 otherwise; FOREIGN: dummy variable taking the value of 1 for banks with at least one foreign member in board of managers or directors, 0 otherwise.

Table E2: Correlation between macro variables in the sub-sample 2002-2005

Variables	GDP	INF	FINDEP	CAPITAL
GDP	1			
INF	0.8471	1		
FINDEP	0.9774	0.8999	1	
CAPITAL	0.9541	0.8192	0.8868	1

GDP: GDP growth rate; INF: Inflation rate; FINDEP: ratio of domestic credit provided by banking system to GDP; CAPITAL: capitalization of stock market to GDP.

Table E3: Correlation between macro variables in the sub-sample 2006-2009

Variables	GDP	INF	FINDEP	CAPITAL
GDP	1			
INF	-0.318	1		
FINDEP	-0.749	-0.135	1	
CAPITAL	0.132	-0.658	0.555	1

GDP: GDP growth rate; INF: Inflation rate; FINDEP: ratio of domestic credit provided by banking system to GDP; CAPITAL: capitalization of stock market to GDP.

APPENDIX F: Description of bank efficiency by ownership on the two sub-periods

Table F1: Description of bank efficiency by ownership (2002-2005)

Bank ownership	Mean	Std. Dev.	Min	Max
Fully state-owned bank	0.278	0. 196	0. 121	0. 739
Private banks without foreign shareholders	0.638	0. 212	0. 014	0. 886
Banks with foreign shareholders	0.634	0. 160	0. 306	0. 865
Overall mean	**0.573**	**0.238**	**0.014**	**0.886**

Table F2: Description of bank efficiency by ownership (2006-2009)

Bank ownership	Mean	Std. Dev.	Min	Max
Fully state-owned bank	0.528	0. 288	0. 099	0. 918
Private banks without foreign shareholders	0.720	0. 180	0. 116	0. 941
Banks with foreign shareholders	0.717	0. 183	0. 202	0. 936
Overall mean	**0.697**	**0.240**	**0.099**	**0.941**

APPENDIX G: Estimation of profit function (profit before tax) in real values

Model specification

$$\ln \pi_{it} = \beta_0 + \sum_{j=1}^{2} \beta_j \ln Y_{jit} + \frac{1}{2}\sum_{l=1}^{2}\sum_{k=1}^{2} \beta_{lk} \ln Y_{lit} \ln Y_{kit} + \sum_{j=3}^{4} \beta_j \ln W_{jit} +$$
$$\frac{1}{2}\sum_{l=3}^{4}\sum_{k=3}^{4} \beta_{lk} \ln W_{lit} \ln W_{kit} + \sum_{n=1}^{2}\sum_{m=3}^{4} \beta_{nm} \ln Y_{n\mathrm{it}} \ln W_{mit} + \beta_5 \ln z_{it} + \frac{1}{2}\beta_6 (\ln z_{it})^2$$
$$+\sum_{j=1}^{2} \beta_{6j} \ln Y_{jit} \ln z_{it} + \sum_{j=3}^{4} \beta_{6j} \ln W_{jit} \ln z_{it} + v_{it} - u_{it}$$

	Variables	Parameters	Estimates	SE
y1	Total loans	β_1	0.212	0.533
y2	Other earning asset	β_2	0.987*	0.548
w1	Price of labor	β_3	3.031**	1.219
w2	Price of fund	β_4	-2.482***	0.723
Z	Fixed netput	β_5	0.283	0.703
sqy1	½*total loans* total loans	β_{11}	0.019	0.102
sqy2	½*other earning asset*other earning asset	β_{22}	0.376***	0.065
y1y2	½*total loans*other earning asset	β_{12}	-0.538***	0.112
sqw1	½*price of labor*price of labor	β_{33}	0.391*	0.230
sqw2	½*price of fund*price of fund	β_{44}	-0.124	0.139
w1w2	½*price of labor*price of fund	β_{34}	-0.593**	0.241
y1w1	total loans*price of labor	β_{13}	-0.430***	0.104
y2w1	other earning asset *price of labor	β_{23}	0.218**	0.0968
y1w2	total loans*price of fund	β_{14}	0.080	0.0796
y2w2	other earning asset *price of fund	β_{24}	0.020	0.0648
Sqz	½*fixed netput*fixed netput	β_{55}	0.013	0.109
y1z	total loans*fixed netput	β_{61}	0.045	0.117
y2z	other earning asset *fixed netput	β_{62}	-0.016	0.051
w1z	price of labor*fixed netput	β_{63}	0.159	0.096
w2z	price of fund*fixed netput	β_{64}	-0.122	0.082
Constant	Constant	β_0	1.695	2.511
$\sigma_{u_{it}}$			2.862	
$\sigma_{v_{it}}$			-3.483	
R^2			0.863	
Observations			221	
Number of banks			37	

Dependent variable: pbt (log of Profit-before-tax). $\sigma_{u_{it}}$, $\sigma_{v_{it}}$ *are standardized deviations of random-effect and the disturbance. S.E: Standard errors. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. All variables are expressed in real values.*

APPENDIX H: Endogeneity test for capitalization in analysis of determinants of bank efficiency

Model specification

$$eff_{it} = \alpha_0 + \beta_m X_{mit} + \beta_n Z_{nt} + \delta_1 foreign_{it} + \delta_2 private_{it} + \varepsilon_{it}$$

Variables	(Model 1)	(Model 2)	(Model 3)	(Model 4)
CAP	0.006**	0.005*	0.004	0.003
	(0.002)	(0.002)	(0.002)	(0.003)
lgTA	0.068***	0.056***	0.041	0.018
	(0.020)	(0.018)	(0.043)	(0.028)
Loan2deposit	0.076	0.090**	0.089**	0.083*
	(0.046)	(0.044)	(0.043)	(0.045)
PRIVATE	0.263**	0.231**	0.214**	0.201*
	(0.105)	(0.096)	(0.106)	(0.107)
FOREIGN	0.206	0.162	0.147	0.145
	(0.143)	(0.131)	(0.146)	(0.142)
GDP	2.179			
	(1.472)			
INF		0.030		
		(0.203)		
FINDEP			0.001	
			(0.001)	
CAPITAL				0.264**
				(0.132)
Hansen J-stat	0.211	0.082	0.045	0.068
Chi2>p-value	*0.646*	*0.775*	*0.833*	*0.793*
Endogeneity test	0.000	0.036	0.088	0.312
p-value	*0.998*	*0.849*	*0.767*	*0.576*
R^2	0.147	0.133	0.134	0.153
N	219	219	219	219

*lgTA: log of total assets; Loan2deposit: ratio of loans to total customer deposits; PRIVATE: dummy variable taking the value of 1 if the bank has at least two partners/shareholders and no foreign member in board of managers or directors, 0 otherwise; FOREIGN: dummy variable taking the value of 1 for banks with at least one foreign member in board of managers or directors, 0 otherwise; CAP: ratio of equity to total assets; GDP: growth rate of Gross Domestic Product; INF: Inflation rate; FINDEP: ratio of domestic credit provided by banking system to GDP; CAPITAL: capitalization of stock market to GDP. Hasen J-stat: test for the overidentification restriction, H_0: the overidentification restrictions are valid. Endogeneity test: the null hypothesis is the CAP can be treated as an exogenous. Robust standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.*

APPENDIX I: Determinants of bank efficiency in the sub-period 2006-2009 without the two privatized SOCBs

Model specification: $eff_{it} = \alpha_0 + \alpha_m X_{mit} + \alpha_n Z_{nt} + \delta_1 foreign_{it} + \delta_2 private_{it} + \varepsilon_{it}$

Variables	Coefficient	Model 5	Model 6	Model 7	Model 8
lgTA	α_1	0.458***	0.343***	0.451***	0.335***
		(0.126)	(0.128)	(0.131)	(0.128)
Loan2deposit	α_2	0.089	0.042	0.116	0.055
		(0.165)	(0.165)	(0.157)	(0.161)
PRIVATE	δ_1	1.342***	1.148**	1.359***	1.141**
		(0.442)	(0.474)	(0.454)	(0.484)
FOREIGN	δ_2	1.387***	1.131***	1.401***	1.120***
		(0.422)	(0.442)	(0.443)	(0.453)
CAP	α_3	0.054***	0.045***	0.049***	0.042***
		(0.015)	(0.016)	(0.015)	(0.015)
GDP	α_4	18.949***			
		(6.504)			
INF	α_5		-1.145		
			(1.175)		
FINDEP	α_6			-0.013**	
				(0.005)	
CAPITAL	α_7				-0.092
					(0.633)
Constant	α_0	-7.024***	-4.059**	-4.325***	-4.065**
		(1.877)	(1.712)	(1.597)	(1.709)
Test: $\delta_1 - \delta_2 = 0$					
Chi2		0.05	0.01	0.04	0.01
Prob > chi2		0.832	0.937	0.850	0.923
R^2		0.253	0.209	0.243	0.203
Observations		125	125	125	125

*lgTA: log of total assets; Loan2deposit: ratio of loans to total customer deposit; PRIVATE: dummy variable taking the value of 1 if the bank has at least two partners/shareholders and no foreign member in board of managers or directors, 0 otherwise; FOREIGN: dummy variable taking the value of 1 for banks with at least one foreign member in board of managers or directors, 0 otherwise; CAP: ratio of equity to total assets; GDP: growth rate of Gross Domestic Products; INF: Inflation rate; FINDEP: ratio of domestic credit provided by banking system to GDP; CAPITAL: capitalization of stock market to GDP. Robust standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.*

APPENDIX J: Determinants of bank efficiency using interactive period dummy variables

Table J1: Determinants of bank efficiency using interactive period dummy variable

Model specification

$$eff_{it} = \alpha_0 + \beta_m X_{mit} + \beta_n Z_{nt} + \delta_1 foreign_{it} + \delta_2 private_{it} + \delta_3 Break + \delta_l Break * X_{mit} + \delta_k Break * Z_{nt} + \delta_q Break * foreign_{it} + \delta_p Break * private_{it} + \varepsilon_{it}$$

Coefficients		**(Model1)**	**(Model2)**	**(Model3)**	**(Model4)**
lgTA	α_1	0.321	0.335	0.302	0.361
		(0.19)	(0.19)	(0.19)	(0.19)
Loan2deposit	α_2	0.411	0.423	0.392	0.446
		(0.38)	(0.38)	(0.38)	(0.37)
CAP	α_3	0.037	0.038	0.036	0.040
		(0.02)	(0.02)	(0.02)	(0.02)
GDP	α_4	-1.655			
		(20.99)			
PRIVATE	δ_1	2.302***	2.339***	2.249***	2.409***
		(0.56)	(0.56)	(0.58)	(0.54)
FOREIGN	δ_2	2.080***	2.110***	2.036***	2.166***
		(0.45)	(0.46)	(0.46)	(0.44)
Break	δ_3	-1.932	1.054	0.576	1.264
		(2.71)	(2.35)	(2.24)	(2.36)
Break*lgTA	δ_4	0.135	0.014	0.157	-0.013
		(0.20)	(0.20)	(0.20)	(0.20)
Break*Loan2deposit	δ_5	-0.306	-0.363	-0.253	-0.370
		(0.40)	(0.40)	(0.40)	(0.40)
Break*CAP	δ_6	0.017	0.007	0.015	0.004
		(0.02)	(0.02)	(0.02)	(0.02)
Break*GDP	δ_7	19.926			
		(21.11)			
Break*PRIVATE	δ_{10}	-0.974	-1.184	-0.894	-1.252*
		(0.61)	(0.63)	(0.64)	(0.63)
Break*FOREIGN	δ_{11}	-0.702	-0.970	-0.629	-1.026
		(0.54)	(0.54)	(0.57)	(0.55)
INF	α_5		-1.264		
			(3.88)		
Break*INF	δ_8		0.356		
			(4.02)		
FINDEP	α_6			0.002	
				(0.01)	
Break*FINDEP	δ_{12}			-0.015	
				(0.01)	
CAPITAL	α_7				-17.746
					(27.59)
Break*CAPITAL	δ_9				17.628

					(27.58)
Constant	α_0	-4.973*	-5.187*	-4.958*	-5.456**
		(2.10)	(2.04)	(1.95)	(2.04)
$\delta_1 - \delta_2 = 0$					
Chi2		0.670	0.490	0.590	0.540
Prob > Chi2		0.413	0.483	0.440	0.462
R^2		0.373	0.353	0.369	0.352
N		220	220	220	220

*lgTA: log of total assets; Loan2deposit: ratio of loans to total customer deposit; PRIVATE: dummy variable taking the value of 1 if the bank has at least two partners/shareholders and no foreign member in board of managers or directors, 0 otherwise; FOREIGN: dummy variable taking the value of 1 for banks with at least one foreign member in board of managers or directors, 0 otherwise; CAP: ratio of equity to total assets; GDP: growth rate of Gross Domestic Products; FINDEP: ratio of domestic credit provided by banking system to GDP; CAPITAL: capitalization of stock market to GDP. .BREAK: dummy variable that takes the value of 1 over the 2006-2009 and 0 otherwise. Robust standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.*

Table J2: Coefficient tests:

Coefficients	**(Model1)**		**(Model2)**		**(Model3)**		**(Model4)**	
	Chi2	**Prob > Chi2**	**Chi2**	**Prob > Chi2**	**Chi2**	**Prob > Chi2**	**Chi2**	**Prob > Chi2**
$\alpha_1 + \delta_4 = 0$	15.640	0.000	9.280	0.002	14.030	0.000	9.120	0.002
$\alpha_2 + \delta_5 = 0$	0.390	0.533	0.120	0.725	0.720	0.397	0.210	0.647
$\alpha_3 + \delta_6 = 0$	11.590	0.000	7.790	0.005	10.520	0.001	7.860	0.005
$\alpha_4 + \delta_7 = 0$	8.230	0.004						
$\alpha_5 + \delta_8 = 0$			0.670	0.412				
$\alpha_6 + \delta_{12} = 0$					5.770	0.016		
$\alpha_7 + \delta_9 = 0$							0.040	0.850
$\delta_1 + \delta_{10} = 0$	12.270	0.000	8.110	0.004	12.140	0.000	7.830	0.005
$\delta_2 + \delta_{11} = 0$	12.630	0.000	8.120	0.004	12.150	0.000	7.810	0.005

CHAPTER 2

BANK NET INTEREST MARGIN, OWNERSHIP STRUCTURE AND INTEREST RATE REGULATION BY THE CENTRAL BANK[11]

[11] This chapter is jointly written with Isabelle Distinguin and Amine Tarazi. The original article is titled "Bank net interest margin, ownership structure and interest rate regulation by the central bank in Vietnam"

1. Introduction

The banking sector is a key point to facilitate economic growth in transition economies since these economies were reformed from centrally to market oriented economies. After decades of reforms, banks have impeded the progress of restructuring banking activities. The transformation of the banking system is difficult in countries with lack of experience and consultancy, even though most transition economies have received support from the International Monetary Fund (IMF) and the World Bank (WB) to improve banking capacities (Fries and Taci, 2002). Many studies on emerging economies have focused on the determinants of bank net interest margins (NIM) or interest rate spreads to investigate how banks perform their intermediation role. In the case of Vietnam, bank interest margins have fluctuated relatively highly during the last decades[12]. Although lower interest margins do not necessarily imply that banks are more efficient, they are expected to better contribute to economic growth by reducing the cost of financial intermediation in the economy. As such, the banking system in Vietnam is closely monitored by the central bank which has firmly controlled interest rates to influence bank operations. Another specificity of the Vietnamese banking industry is that state-owned commercial banks (SOCBs) still play a crucial role even if the government has launched a program to privatize them since 2005. Foreign banks have been allowed to set up a commercial bank in Vietnam since 2004 but the government has protected the domestic commercial banks by imposing limits to foreign shareholding and by limiting branches of foreign banks until 2010.

The aim of this work is to investigate the determinants of bank NIM in Vietnam taking into account bank ownership and the effects of the central bank's interaction with commercial banks' operations. Due to missing data and some limitations regarding disclosure, there is only one study on NIM in Vietnam which has analyzed bank interest margins in the Philippines over the 2002-2010 period comparing them with 10 other countries in the region including Vietnam (Tan, 2012). Thus, our work is the first one to focus on bank NIM in Vietnam by considering a sample of 49 banks from 1998 to 2011 and to emphasize that the determinants of NIM may differ when bank ownership structure and interest rate policy by the central bank are taken into account. This chapter focuses on the method developed by Ho and Saunders (1981) which particularly fits the case of Vietnam. On the one hand, banks provide

[12] See the evolution of net interest margins in Vietnam in appendix A

savings services and other related services to customers at a certain interest rate and charge service fees to their customers (on the supply side). On the other hand, banks lend their available sources of funds to borrowers (demand side) and apply fees to monitor and to prevent any loss, the spread of "prices" between borrowers and depositors standing for banks' compensation. This framework illustrates that banks' main business is to collect deposits and grant loans and that other non-interest generating bank operations (commission and fee activities and trading activities) are much less developed that in other countries.

The main results show that capitalization that reflects bank risk aversion is a significant determinant of bank NIM whatever bank ownership. However, there are differences in terms of determinants of NIM across banks. Private and state-owned banks probably transfer their inefficiency costs to customers through higher net interest margins. When the intervention of the central bank on interest rates is taken into account, we find that risk aversion is a significant determinant of foreign and state-owned banks' net interest margins only in presence of interest rate regulation. We also find that interest rate control leads private banks to accept higher credit risk without being able to raise their margin accordingly.

The chapter is organized as follows. Section 2 provides some information on the Vietnamese banking system during the period under study and a review of relevant literature. Section 3 presents the methodology and variables used in the study. Section 4 discusses the empirical results and section 5 concludes.

2. Background and Literature review

2.1 The Vietnamese banking system: a general view after a decade of reforms

Before the reform of 1989, the banking system in Vietnam was a mono-tier banking system, in which the State Bank of Vietnam (SBV- the Vietnamese central bank) played two roles - the first role was a central bank and the other role was a commercial bank. In the context of a centrally oriented economy, SBV was operated in a "top-down" approach-meaning that the central bank was an agency of the government and monitored the economy and the financial sector according to the government's view. In line with the economic reforms, the banking system has been transformed into a two-tier system in which SBV continues to solely play the role of a central bank from 1989; SBV is in charge of monetary

policy and other macro-policy. The role of commercial banks has been transferred to two subsidies of SBV (Industrial and Commercial bank of Vietnam, and Vietnam bank for agriculture) and two specified state-owned banks (Bank for investment and development and Bank for foreign trade of Vietnam). These state-owned banks have played a key role in the banking system and for the funding of state-owned enterprises and projects defined by the annual plans of the government. Their share in the domestic banking market has dropped slowly from 75% during the 1990s to approximately 50% in 2010[13].

Even if the banking system was reformed in 1989, banking activities remained underdeveloped and were deficient and many banks were subject to severe problems such as Ponzi-games or high loans to deficient customers (Vuong, 2010). To ensure the stability of the banking system, the banking law was enacted in 1997 and the SBV was required to monitor interest rates. SBV periodically issued ceilings and floors for lending and deposit rates until 2000. Based on the banking law, SBV has generated an instrumental tool to manage the interest rate, namely the prime rate from 2000. The prime rate was an indicator for banks to set up deposit and credit rates with a small adjustment based on durations of deposits or loans (minus or plus a certain proportion according to the duration of contracts). For example, if the prime rate was set to 0.5% per month, banks could charge a rate up to 1% per month for short-term contracts. In an effort to reduce barriers to banks' operations, SBV cancelled the required adjustment of interest rates from 2002. Banks in Vietnam have been able to legally set lending rates as well as deposit rates according to market conditions but the prime rate has remained as a reference for banks to set their interest rates. The liberalization of lending rates did not lead to a noticeable increase in lending rates. This can partly be explained by the fact that 75% of total loans were provided by state-owned banks, which provided loans without taking credit risks fully into account (Camen, 2006).

Until 2004, foreign banks could only establish branches and take a minority share in joint venture banks. At the end of 2005, the "Banking Sector Reform Roadmap" was launched by the government in order to improve the performance of Vietnamese banks. The entry of foreign investors has been facilitated and foreign banks have been allowed to set up a commercial bank in Vietnam.

[13] Vietnam banking sector report, September 2011- Vietcombank Securities (VBSC) and the annual report 2011 of the State-Bank of Vietnam

In the context of the stock market boom and the real estate market bubble in 2006-2007, the demand for loans boosted followed by a credit crunch since customers had given their future properties- shares or real estate- as collaterals for their loans. Banks could not solve their problems quickly in the short term and this caused liquidity problems from the end of 2007. To solve this problem, the SBV again introduced a ceiling interest policy for bank interest rates which could float above or below with a proportion under 150% of the prime rates after 2008. Under the context of the new regulation, banks intended to pay more attention to risk management and charge higher fees to secure their lending, but the liquidity problem remained and banks were on a race to increase their lending capacities via the interbank market. Except state-owned banks which were able to collect funds from the government or the SBV, most banks participated in the interbank market to fulfill their demands for short term resources, especially small and young banks.

2.2 Literature review

In the literature on bank efficiency, net interest margin is considered as an indicator to measure the efficiency of banking activities. Various studies attempt to express the costs of financial intermediation through the difference between the lending and the deposit rates and assume that higher spreads of bank interest rates imply less efficient institutions. But a high margin can also reflect an inadequate regulatory banking environment and a high degree of asymmetric information (Claeys and Vander Vennet, 2008). More precisely, banks can use their market power by setting higher lending rates (Claeys and Vander Vennet, 2008, Maudos and Fernandez de Guevara, 2004, Maudos and Solís, 2009). In that case, the higher interest rate spreads do not reflect bank inefficiency. Higher interest margins can also indicate a higher risk premium (Thorsten et al., 2003). Besides, Gary and Andrew (1998) argue that, in transition economies, there is a necessity for high interest margins that maintain and shield bank values to ensure the stability of the financial system as a whole.

There are two different approaches to analyze the determinants of bank net interest margins. Some studies split the determinants of net interest margins into two components that differently influence net interest margins: bank-specific components and macro factors. The bank specific determinants are explored in a first stage and, in a second stage, the effects of macro factors are analyzed. This approach does not take into account the heterogeneity across banks (Ho and Saunders, 1981, Saunders and Schumacher, 2000). The alternative approach incorporates the bank specific variables and the macro factors in a single-stage analysis taking

into account heterogeneity across banks (Demirguc-Kunt and Huizinga., 1999, Demirguc-Kunt et al., 2003). These two approaches conclude that the net interest margin is explained by both bank performance and macro environment variables.

According to banking theory, banks operate traditionally as a financial intermediary; banks receive money from depositors and provide loans to borrowers. The difference between lending rates and deposit rates is the bank's margin. How banks set their interest margins is a broad topic in the literature. Ho and Saunders (1981) introduce the term "dealership", which explains the intermediary role of banks. They construct a two-step estimation to analyze the determinants of net interest margins. Banks have to decide both optimal deposit and lending interest rates, and banks set fees for provisions of their services. The fees are expected to cover the costs that banks incur for providing their banking services (Entrop et al., 2012, Kit, 1997, Maudos and Fernandez de Guevara, 2004). Hence, banks might transfer their costs to their customers by charging higher fees or setting higher (lower) lending (deposit) rates. Consequently, a bank with a higher operating cost will presumably generate higher interest margins to cover this cost. For example, Maudos and Fernandez de Guevara (2004) find that the fall of NIM in European banking sectors (Germany, France, Italy, Spain and the United Kingdom) is explained by a reduction of operating cost. Entrop et al. (2012) also find that the operating cost has a positive effect on German banks' NIM during the 2000-2009 period.

Beyond operating costs, holding capital is recognized as an opportunity cost for banks. Under regulatory restrictions, banks have to maintain a certain ratio of equity to total assets, and this ratio can also be viewed as a proxy for the degree of risk aversion (Maudos and Fernandez de Guevara, 2004). Thus, banks with a high ratio of equity to total assets, that is banks that are more risk averse, require a higher margin in order to cover the higher cost of equity financing compared to external financing. By contrast, using a sample of 456 banks in Sub-Saharan Africa, Ahokpossi (2013) explains that if a bank has a high ratio of equity to total assets (or well-capitalized bank), it has a low cost of borrowing and a low risk of bankruptcy. Thus, these banks charge low margins. Using a theoretical model Kit (1997) also finds that equity can have a negative effect on the bank interest rate spread.

In order to reduce risk-taking, the reserve requirement is an instrument to protect depositors. This requirement is also recognized as an economic cost of funds or an opportunity cost of holding reserves. It causes a fall in bank capacity to supply loans, whereas banks continue paying depositors. Consequently, banks have higher input prices resulting

from higher reserve requirements (Ho and Saunders, 1981, Maudos and Fernandez de Guevara, 2004). Tan (2012) expresses that reserve is a tax on banks and it limits banks' lending capacities and banks intend to pass this cost/tax to customers. However, his finding shows that reserves have a negative impact on NIM using data of 11 countries in Asia. A reason might be that banks are not able to pass this cost to their customers (Demirgüç-Kunt and Huizinga, 1999).

In the context of bank operations, banks have to pay attention to any kind of risk concerning banking activities. Credit risk is an important determinant of net interest margins (Beck and Hesse, 2009, Maudos and Fernandez de Guevara, 2004, Tarus et al., 2012). Kit (1997) argues that net interest margin is positively related to credit risk in his theoretical study. The term credit risk concerns loan services. If the ratio of loans to total assets is high the bank is supposedly more exposed to loan default risk and the bank charges higher interest margins to cover such risk (Maudos and Fernandez de Guevara, 2004 or Tarus et al., 2012).

Bank ownership is also considered as a factor affecting the decisions of bank executives and impacting banks' performances. Micco et al. (2007) show that bank ownership is an important determinant of bank performance in developing countries whereas its impact is weak in developed countries. As state-owned banks serve principally state-owned enterprises or government plans, they are less efficient and more costly which might lead to higher interest margins. According to Claessens et al. (2001), foreign ownership contributes to improve technology and hence efficiency. In the long term, banks are able to reduce their operational costs and hence lower net interest margins. Martinez Peria and Mody (2004) show that foreign banks have lower interest margins than domestic banks in Latin America. However, as foreign investors look for "high risk/high return" activities, the existence of foreign investors in a bank can still imply that the bank has a higher net interest margin. Tan (2012) obtains results that support this argument. If a bank has foreign investors (foreign investors holding more than 50% of bank shares), its net interest margin is higher than in a bank without foreign investors. Demirguc-Kunt and Huizinga (1999) also find that foreign banks have higher interest margins than domestic banks in developing countries. Fungacova and Poghosyan (2011) find that the determinants of net interest margins of Russian banks vary according to bank ownership.

The determinants of net interest margins are not only bank specific factors, but also the macro environment where banks operate i.e. financial structures, monetary policy, real

prices and economic growth. These macro factors, to some extent, also drive bank interest margins and bank behavior. Ho and Saunders (1981) find that market imperfections and several macro variables influence bank net interest margins. The common macro determinants found in the literature are monetary policy, financial depth, inflation, banking regulations and GDP growth (Aliaga-Dıaz and Olivero, 2005, Claeys and Vennet, 2008, Saunders and Schumacher, 2000). Market structure can also influence bank performance. If banks have a high market power, they can set higher net interest margins. Market power reflects that banks have less incentives to reduce their interest margins and have more power to set higher rates when the market is less competitive (Berger, 1995, Claeys and Vander Vennet, 2008 and Vander Vennet, 2002).

As a whole, both macro and bank specific factors are found to explain bank interest margins. In this chapter, we investigate the determinants of Vietnamese banks' NIM considering these factors and taking into account several dimensions which are specific to this country which has recently started its transition towards a market economy. Specifically, we suspect that these determinants might differ according to several factors. Given the importance of state-owned banks and the recent development of foreign banks in Vietnam, the impact of some interest margins determinants should differ across state-owned banks, private banks and foreign banks. Besides, we also consider the impact of the central bank's intervention on bank interest rates on the determinants of NIM. Indeed, during the 1998-2011 period, there have been important changes in terms of interest rates regulation.

3. Data and Methodology

3.1 Methodology

Our approach is to consider that banks are connecting depositors and borrowers following Ho and Saunders (1981). Differently from other methodologies which focus on analyzing the actual bank portfolio behavior or explain the bank interest rate spread based on the bank specific factors to achieve a maximum profit goal, Ho and Sauders (1981) argue that the volatilities of bank spread can be also explained by the macro conditions. Banks have to decide their interest rates not only from their operations but also have to adjust their interest rate periodically according to the macro conditions. Under this framework, the banks are risk-averse and charge a spread. Hence, NIM is dominated and affected by bank-specific as well as other factors depending on current market conditions.

The empirical specification focuses on the analysis of net interest margins (NIM) assumed to be a function of bank specific and macro factors. Besides, because the determinants of NIM might be different for state-owned banks, foreign and private banks we interact each bank specific variable with dummy ownership variables. .

NIM =F(Operational efficiency; Reserve; Credit risk; Capital base; Ownership; Ownership(Operational efficiency; Reserve; Credit risk; Capital base); Market competition; Inflation: GDP; Money supply)*

In the mathematic form:

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{5j} state_{it} * X_{it} + \beta_{6j} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

in which: nim_{it} is the net interest margin of bank *i* at time *t*.

X_{it} are bank-specific variables of bank *i* at time *t* with coefficients β_j.

$foreign_{it}$ and $state_{it}$: dummy ownership variables.

Z_t are macro variables that affect bank interest margins at time *t* with the coefficient β_k.

And u_{it} is error term.

We estimate this model using pooled and static panel regressions with random effects.

In order to analyze whether the central bank intervention on bank interest rates has an impact on the determinants of NIM, we then estimate the model on two sub-samples: in absence (2002-2008) and in presence (1998-2001 and 2009-2011) of interest rate regulation by the central bank.

3.2 Data and selected variables

Data are collected from Bankscope – Bureau van Dijk (hereafter, Bankscope) and annual reports of banks from 1998 to 2011 for 49 banks[14]. The sample covers above 86% of the aggregate loans granted by the Vietnamese banking industry (VPBank Securities, 2014). Due to the Asian financial crisis of 1997 and the banking law enacted the same year Vietnamese banks were required to adopt strict reforms from 1998. The banking system had more than 10 years to transform and improve its capacities before restrictions on the banking

[14] See more details in the appendix B.

activities were totally released for foreign banks from 2010. The sample period covers all the changes in the banking system from 1998 to 2011 to investigate their impact on NIM. The macro data (inflation, the growth rate of GDP and money supply- M2) come from World Bank indicators.

Table 1 Definition of variables

Variable	Definition	Expected effect	Data source
NIM	Difference between interest income and interest expense to total average assets.		Bankscope
Bank-specific variables			
OVERHEAD[1]	Ratio of overhead expenses to total assets	+	Bank annual reports
RESERVE	Non-earning assets to total average assets	-or +	Bankscope and bank annual reports
LIQ2DEPO[2]	Liquidity assets to Customer deposit and short term funding	-	Bankscope and bank annual reports
LOAN2ASSET	Total loans to total assets	+	Bankscope
CAP	Ratio of equity to total assets	+	Bankscope and bank annual reports
FOREIGN	Dummy variable that is defined at 1 if the foreign investors hold at least 50% of shares, 0 for otherwise	+	
STATE	Dummy variable that is defined at 1 if the state holds at least 50% of shares, 0 for otherwise	+	
Market concentration			Bankscope and bank annual reports
HHI	The Herfindahl-Hirschman Index calculated from the total assets of banks	+	
Macroeconomic environment			
GDPR	The growth rate of the Gross Domestic Product.	+	General Statistic Office of Vietnam
INFLATION	The annual inflation rate.	+	General Statistic Office of Vietnam
M2GDP	Money supply to gross domestic product	-	International Financial Statistics of International Monetary Fund (IMF)

[1]: Operational efficiency. [2]: Variable introduced in robustness checks.

Table 1 provides the definitions and sources of the variables used in this study. The set of independent variables includes bank specific variables as well as macro variables.

3.2.1 Dependent variable

The net interest margin (NIM) variable is defined as the difference between interest income and interest expense as a percentage of total average assets.

3.2.2 Independent variables

Operational efficiency. Operational efficiency (or operational inefficiency) is an indicator to measure how banks manage their operational costs. In line with Demirgüc and Huizinga (1999), Tan (2012) and Ahokpossi (2013), we use the proportion of overhead expenses to total assets as a proxy for operational efficiency (OVERHEAD). If banks are inefficient with a high cost ratio, the margin tends to be larger to pass operational inefficient costs to customers. Because the banking system in Vietnam is relatively young, overhead expenses play an important role to promote banks' development. A positive sign is expected for this variable because investment in human resources leads to high costs and banks might transfer this cost to customers.

Reserve. Reserve requirement is defined as an opportunity cost to bank lending capacities. The higher the reserve rate is, the lower bank lending capacity will be. Due to missing data, we use the proportion of non-earning assets to total average assets (RESERVE) as a proxy of reserve requirement. If RESERVE raises that implies that bank lending sources fall, but if banks have market power, they can pass this cost to their customers. Therefore, the effects of RESERVE on NIM can be negative if banks are not able to transfer this cost to customers and positive if they can.

Credit risk. If credit risk increases, bank default risk will be higher and NIM is set at a higher level to cover this risk. Unfortunately, loan loss provisions are not recorded fully in annual reports of banks and in Bankscope. Thus, we use the total loans to total assets ratio (LOAN2ASSET) as a proxy for credit risk as proposed by Maudos and Fernandez de Guevara (2004). Hanweck and Ryu (2005) also employ the ratio of loans to total earning assets as a credit risk variable. The expected effect of LOAN2ASSET on NIM is positive.

Capital base. Vietnam has not applied the Basel standards yet but regulators introduced some regulatory restrictions on bank minimum chartered capitals from 1998 and then other requirements were issued in 2006. In the context of an emerging market, capital is not only a

critical issue for firms but also for banks. Besides that, the central bank has introduced a schedule requiring banks to gradually increase their capital to prevent risk-taking and in which statutory capital is a basic requirement[15]. To fulfill the statutory capital requirement, Vietnamese banks have not much funding sources and thus raising equity might be a suitable choice. To capture the impact of the capital base of Vietnamese banks on NIM, we employ the ratio of equity to total assets (CAP) as a proxy of capitalization. In line with Entrop, Memmel et al.(2012), Ferguson and Stevenson (2007), and Kasman et al. (2010), the expected sign of CAP is positive, the higher the ratio is, the higher charge customers have to pay to banks which leads to an increase in net interest margins of banks.

Ownership. We classify the ownership structure into three categories: state-owned banks, private banks and foreign banks. We use two dummy variables to take into account the different ownership structures in the banking system, FOREIGN and STATE. These two dummy variables indicate the presence of foreign or state shareholders as the priority shareholder in bank ownership structures.

FOREIGN. We create a dummy variable for foreign ownership. If foreign investors hold at least 50% of the shares of a bank, the dummy variable- FOREIGN- is 1 and 0 otherwise. We assume that due to unstable macro policies, foreign investors invest in high-interest-margin banks ("high risk/high return" strategy).

STATE. We generate a dummy variable (namely STATE) to capture ownership by the government which is 1 for state-owned banks, that is banks in which the government holds at least 50% of the shares of the bank, and 0 otherwise. The government aims to keep state-owned banks as key players in the banking system; there are 5 state-owned commercial banks[16]. Compared to other banks, state-owned banks benefit from the support from the government and SBV. Therefore a positive relationship with net interest margin is expected.

Market concentration. The market structure variable is defined as the Herfindahl-Hirschman Index (HHI). If market concentration is high, banks might have greater market power and might collude to increase their interest rate spread. Consequently, the net interest margin is

[15] From 2006, banks in Vietnam have to fulfill a certain amount of the statutory capital based on the features of banks.
[16] There are two SOCBs privatized in 2007 and 2008, but the government still holds more than 50% of those banks' shares. To the end of 2011, the central bank held 77.11% of Vietcombank' shares and 80.30% of Viettinbank's share (Annual reports of banks in 2011).

expected to increase. We hence expect a positive effect of market concentration on net interest margins.

Inflation. We employ the annual inflation rate (INFLATION). In line with previous studies, inflation can be considered as a type of banks' cost. If the inflation rate increases, banks will have to adjust the deposit rate to keep their depositors and then the loan rate will be adjusted to recover the loss caused by inflation. Because bank executives are risk averse, they will require higher interest rates to prevent any future loss caused by higher inflation. Our hypothesis is that if inflation increases, NIM will also increase and at a higher speed.

GDP. Economic growth is also recognized as an important determinant of bank net interest margins. Banks might benefit from higher aggregate demand and develop their activities faster. Hence, the GDP growth rate (GDPR) is expected to have a positive impact on net interest margins.

Money supply. Money supply will affect bank interest rates and possibly interest margins. If the central bank increases money supply, the interest rate will fall. Borrowers will not accept a loan if banks set a higher lending rate when they can obtain cheaper funds from the interbank market or the central bank. Therefore, banks have to reduce their interest margins. The proxy to capture money supply is computed as the ratio of money supply to GDP (M2GDP) with the hypothesis that an increase in money supply will lead to a lower NIM.

3.3 Descriptive statistics

Table 2a presents some general descriptive statistics of the sample and Table 2b presents these descriptive statistics separately for private, foreign and state-owned banks.

The mean of NIM is 3.28 and the standard deviation is at 1.79. In the data set, there are 8 banks, which have at least 50% of foreign ownership in joint-venture banks or new 100% foreign banks; the mean of NIM for foreign banks is 3.529 and the mean of NIM for state-owned banks is 2.914. State-owned banks have a significantly lower NIM than private and foreign banks (see Appendix C). State-owned banks dominate the Vietnamese economy and they benefit from government funds and from the central bank through low interest rates and a large customer base. However, state-owned banks seem to operate inefficiently. A possible explanation is that state-owned banks lend mostly to state-owned enterprises and

have more risky loans than other types of banks, especially for a development bank and a social bank which have means of NIM under 1%.

By using key bank specific variables, the data highlight that banks are on average focused on loan activities and are highly capitalized. The mean of total loans to total assets ratio (LOAN2ASSET) is above 54.5% which illustrates that lending activities are still an important component of banks' businesses and the mean of the capitalization ratio (CAP)[17] is above 14%. However, there is a high heterogeneity across banks according to their ownership structure. The average share of loans is over 63% for state-owned banks, over 53% for private banks but less than 49% for foreign banks. Regarding the capitalization ratio, the highest mean is for foreign banks (26.14%) while the lowest one is for state-owned banks (7.65%).

In table 2, we can see that NIM is sometimes negative (two banks) and so is the equity ratio (one bank). Negative values appear for some banks due to their specific roles. Regarding NIM, this is due to increase in bad debts (Vietnam Export and Import Bank[18]) and low-performance borrowers (inefficient state-enterprises or lending to infrastructure projects of the government by the Development Bank). Concerning the equity ratio, like other state-owned banks, the Agriculture and rural development bank is a specialized bank which serves the rural area and promotes community development programs; this can probably explain the poor level of capital in 2001 and in 2002 while this bank remains under the umbrella of the government.

We also compare means of NIM in absence and in presence of interest rate monitoring by the central bank (see Appendix C) and find that there is no significant difference. During the period without interest rate regulation (2002-2008), the mean of NIM is 3.256 while when the central bank intervenes in interest rates, the mean is 3.315.

[17] Some new banks have a ratio above 85% in the first two years of business and this proportion drops deeply in the following years. We checked that dropping these observations does not affect our results (see 4.3.).
[18] The negative interest margins and the losses of banks are discussed in "Bank prospectus" of Vietnam Export and Import bank 2009.

Table 2a Descriptive statistics for Vietnamese commercial banks on average from 1998 to 2011

Variable	Mean	S.D	Min	Max
NIM	3.284	1.792	- 1.003	21.201
Growth rates of some banking items (%)				
Total assets	0.675	2.398	-0.800	42.056
Total customer deposits and short-term funds	0.676	1.509	-0.859	15.409
Total loans	0.559	1.052	-0.859	11.326
Overhead expenses	0.517	0.629	-0.775	5.113
Total earning assets	0.718	3.266	-0.795	60.184
Non-earning assets	1.629	13.241	-0.868	249.758
Liquidity assets	0.857	2.731	-0.885	39.479
Equity	0.555	1.308	-3.139	16.572
Derived bank-specific variables (%)				
OVERHEAD	1.674	1.601	0.297	23.751
RESERVE	8.970	7. 094	0.919	55.992
LOAN2ASSET	54.501	16.975	3.665	91.893
CAP	14.265	14.067	-0.699	100
Market concentration				
HHI	1294.34	485.49	726.391	2013.805
Macro variables				
GDPR	6.84	1.13	4.80	8.48
INFLATION	7.570	6.567	-1.7	23.1
M2GDP	77.136	33.586	24.2	125.1

NIM: Net interest margin*; OVERHEAD:* ratio of overhead expenses to total assets; *RESERVE*: ratio of non-earning asset to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total asset. *HHI*: the market concentration; *GDPR*: The growth rate of the Gross Domestic Product; *M2GDP*: percentage of the ratio of money and quasi money supply to gross domestic product.

Table 2b Descriptive statistics by ownership structure for Vietnamese commercial banks on average from 1998 to 2011

Variable	STATE banks				PRIVATE banks				FOREIGN banks			
	Mean	S.D	Min	Max	Mean	S.D	Min	Max	Mean	S.D	Min	Max
NIM	2.914	1.662	-1.003	8.863	3.331	1.904	-0.816	21.201	3.529	1.214	1.076	7.57
Growth rates of some banking items (%)												
Total assets	0.267	0.262	-0.800	1.614	0.822	2.849	-0.354	42.056	0.463	0.876	-0.373	5.414
Total customer deposits& short-term funds	0.383	0.948	-0.859	7.688	0.746	1.618	-0.451	15.409	0.709	1.522	-0.417	6.774
Total loans	0.276	0.336	-0.859	2.244	0.651	1.202	-0.317	11.326	0.471	0.748	-0.271	3.482
Overhead expenses	0.298	0.228	-0.652	0.918	0.594	0.690	-0.775	5.113	0.413	0.597	-0.165	3.737
Total earning assets	0.267	0.278	-0.795	1.713	0.894	3.912	-0.345	60.184	0.409	0.587	-0.379	2.433
Non-earning assets	0.622	1.094	-0.866	6.211	1.099	3.019	-0.750	38.964	5.805	35.973	-0.868	249.758
Liquidity assets	0.350	0.670	-0.730	4.396	0.937	2.812	-0.885	39.479	1.132	3.822	-0.506	25.135
Equity	0.491	1.826	-3.139	13.171	0.604	1.242	-0.106	16.572	0.389	0.619	-0.293	2.098
Derived bank-specific variables (%)												
OVERHEAD	1.521	0.736	0.297	3.185	1.562	1.283	0.348	17.085	2.458	3.082	0.585	23.751
RESERVE	6.237	4.555	0.919	25.935	10.169	7.075	0.956	55.992	6.346	8.206	0.920	46.900
LOAN2ASSET	63.298	15.614	20.404	91.531	53.506	16.024	11.383	91.893	48.164	19.296	3.665	82.544
CAP	7.654	11.811	-0.699	82.690	13.596	11.504	3.226	100	26.144	9.104	9.104	94.285

NIM: Net interest margin*; OVERHEAD:* ratio of overhead expenses to total assets; *RESERVE*: ratio of non-earning asset to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets.

4. Results

We analyze the determinants of net interest margins of Vietnamese banks by using pooled regressions and static panel regressions with random effects. Moreover, since there exists correlations between macro-variables (HHI, inflation and the M2GDP[19]), these variables are not introduced together and thus each model is presented under three versions. We first run our analysis on the whole period focusing on the impact of ownership structure on the determinants of NIM. We then investigate the impact on these determinants of the central bank intervention on interest rates. Indeed, even if the mean of NIM is not significantly affected by the intervention of the central bank on interest rates, this does not imply that the determinants remain the same.

4.1 Determinants of net interest margins

Table 3 presents the results of pooled regressions (columns 1-3) and random effects panel regressions (columns 4-6). Tests of coefficients at the bottom of the table indicate the significance of the explanatory variables for state-owned and foreign banks.

Table 3 Determinants of net interest margins by ownership structure

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variables		Pool OLS			GLS random effects		
		(1)	(2)	(3)	(4)	(5)	(6)
OVERHEAD	β_1	1.015***	1.071***	1.067***	1.023***	1.086***	1.079***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.017*	0.014	0.015	0.016*	0.012	0.013
		(0.062)	(0.118)	(0.101)	(0.075)	(0.157)	(0.117)
LOAN2ASSET	β_3	-0.004	-0.002	-0.001	-0.005	-0.001	-0.0001
		(0.257)	(0.615)	(0.692)	(0.277)	(0.862)	(0.969)
CAP	β_4	0.037***	0.034***	0.036***	0.025***	0.025***	0.028***
		(0.000)	(0.000)	(0.000)	(0.004)	(0.003)	(0.001)
STATE	β_5	-0.026	0.341	0.327	-0.935	-0.163	-0.175

[19] See in the appendix D.

		(0.972)	(0.641)	(0.654)	(0.365)	(0.873)	(0.863)
FOREIGN	β_6	0.824	0.862	0.887	0.080	0.392	0.450
		(0.185)	(0.157)	(0.145)	(0.911)	(0.576)	(0.522)
STATE*OVERHEAD	β_{15}	0.701***	0.603***	0.596***	0.397	0.096	0.120
		(0.001)	(0.003)	(0.003)	(0.125)	(0.704)	(0.636)
FOREIGN*OVERHEAD	β_{16}	-1.060***	-1.136***	-1.133***	-1.028***	-1.100***	-1.093***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE*RESERVE	β_{25}	-0.022	-0.033	-0.030	-0.003	-0.017	-0.013
		(0.492)	(0.302)	(0.349)	(0.908)	(0.510)	(0.615)
FOREIGN*RESERVE	β_{26}	-0.006	-0.001	-0.001	0.032	0.038*	0.038*
		(0.741)	(0.923)	(0.928)	(0.122)	(0.055)	(0.058)
STATE*LOAN2ASSET	β_{35}	-0.016	-0.019**	-0.019*	-0.004	-0.008	-0.008
		(0.100)	(0.048)	(0.051)	(0.739)	(0.503)	(0.492)
FOREIGN*LOAN2ASSET	β_{36}	0.011	0.010	0.010	0.013	0.004	0.004
		(0.212)	(0.243)	(0.250)	(0.207)	(0.659)	(0.688)
STATE*CAP	β_{45}	0.018	0.0241*	0.022	0.051***	0.058***	0.055***
		(0.198)	(0.095)	(0.116)	(0.001)	(0.000)	(0.000)
FOREIGN*CAP	β_{46}	0.007	0.012	0.010	0.029**	0.032**	0.029**
		(0.554)	(0.320)	(0.394)	(0.030)	(0.014)	(0.026)
GDPR	β_7	0.147***	0.137***	0.120**	0.211***	0.202***	0.183***
		(0.005)	(0.007)	(0.017)	(0.000)	(0.000)	(0.000)
INFLATION	β_8	0.029***			0.029***		
		(0.002)			(0.000)		
HHI	β_9		-0.0006***			-0.0007***	
			(0.000)			(0.000)	
M2GDP	β_{10}			0.010***			0.011***
				(0.000)			(0.000)
Constant	β_0	0.056	1.063**	-0.583	-0.227	0.721	-1.164**
		(0.906)	(0.022)	(0.236)	(0.648)	(0.127)	(0.022)
$\beta_{15}+\beta_1=0$		1.716***	1.673***	1.663***	1.419***	1.182***	1.199***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{16}+\beta_1=0$		-0.045	-0.065	-0.066	-0.005	-0.014	-0.014
		(0.382)	(0.198)	(0.192)	(0.913)	(0.769)	(0.766)
$\beta_{25}+\beta_2=0$		-0.004	-0.018	-0.014	0.013	-0.005	0.0003
		(0.880)	(0.549)	(0.633)	(0.622)	(0.840)	(0.989)
$\beta_{26}+\beta_2=0$		0.010	0.012	0.013	0.048**	0.051***	0.052***
		(0.562)	(0.488)	(0.460)	(0.011)	(0.005)	(0.004)
$\beta_{35}+\beta_3=0$		-0.021**	-0.022**	-0.021**	-0.009	-0.009	-0.008
		(0.021)	(0.017)	(0.021)	(0.435)	(0.431)	(0.451)
$\beta_{36}+\beta_3=0$		0.006	0.008	0.008	0.007	0.003	0.003
		(0.412)	(0.294)	(0.278)	(0.389)	(0.681)	(0.662)
$\beta_{45}+\beta_4=0$		0.056***	0.058***	0.058***	0.077***	0.083***	0.083***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{46}+\beta_4=0$		0.045***	0.047***	0.046***	0.055***	0.058***	0.057***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R^2		0.593	0.611	0.612			
N		412	412	412	412	412	412

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for foreign ownership – the dummy takes the value of one if foreign shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for state ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDPR*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the

ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Whereas the ownership dummies (STATE and FOREIGN) are not significant, the impact of several explanatory variables differs according to bank ownership. There is only one variable that is a significant determinant of NIM for all banks: the ratio of equity to total assets (CAP). It has a positive and significant impact on NIM for all private, state-owned and foreign banks. This result is consistent with earlier studies (Ferguson and Stevenson, 2007, Entrop et al., 2012, Fungacova and Poghosyan, 2011) showing that higher net interest margins are to some extent caused by higher capital ratios. This indicates that banks with higher risk aversion set higher interest margins. Because equity is more expensive than other sources of funding banks might be passing the extra burden to customers.

In line with Tan (2012), Aokpossi (2013) and Fungacova and Poghosyan (2011), OVERHEAD has a positive effect on NIM but only for private and state-owned banks. These banks appear to transfer the overhead expenses to their customers. Banks have recently invested in new technology and infrastructures, these investments have pushed up bank costs. An increase in the overhead ratio is an indicator which probably illustrates that bank operational inefficiency is higher. Banks want to reduce this high cost and they pass that cost to customers to cover the operational inefficiency.

State-owned banks differ from the other banks in terms of credit risk. LOAN2ASSET has a significant and negative impact on NIM only for state-owned banks. This result is in line with Williams (2007) and Fungacova and Poghosyan (2011). This can be explained by the fact that depositors ask for a higher interest rate if the bank's exposure to credit risk is higher which restrains NIM. This could also reflect the fact that state-owned banks do not price credit risk efficiently as they have to participate in social projects and lend to public enterprises. State-owned banks lend mostly to state-owned enterprises as well as long-term projects (including infrastructures of transportation) and some government development programs but they also lend at lower interest rates. Furthermore, customers of state-owned banks are considered as inefficient customers and thus such banks have more risky loans than other types of banks,

Concerning macro variables, HHI has a negative impact on NIM which is surprising. However, Cetorelli and Gambera (2001) argue that, in a concentrated market, banks promote young firms by taking more risk and setting cheap loan rates to establish a long-term relationship with such firms. In less concentrated market (higher competition), such a policy is less pursued because firms tend to switch from one bank to the other. Indeed, the private sector had difficulties to access loans from banks before 2000s. Most of private enterprises were established from the beginning of 2000's. The large customers were the state-owned organizations. The state-owned organizations could borrow easily from state-owned banks with low interest rates, while the private banks had a small market share and needed to establish a long-term relationship with their customers by credits with low interest rates. As an evidence of the positive effect of economic development on NIM, banks have higher net interest margins when the growth rate of GDP is higher. This can be explained by the fact that banks have more opportunities to raise their loans. Indeed, the Vietnamese economic growth rate was 5-8% per year over the 2000's with the creation of many new establishments. Similarly INFLATION has a positive and significant influence on NIM. When INFLATION increases, banks also raise their interest rates to recover their losses (see more in Demirgüç-Kunt et al., 2003 and Tarus et al., 2012). M2GDP has also a positive effect on NIM. As banks benefit from cheaper funding sources from the government they could be setting a larger spread leading to an increase in NIM. More precisely, the government needs to invest into infrastructures and to finance some social programs as well as the government expenses. As the agent of the government, the central bank increased the money supply to the economy via banks with low interest rates (M2GDP has been increased from 2007 over 100%[20] and reached 125% in 2010). Even if banks had cheaper financial resources from the government, because of the high demand for credits and banks' market power, they intend to increase the credit interest rates.

Thus, our results suggest that there are differences in terms of the determinants of NIM across banks with different ownerships; only capitalization appears as an important determinant of banks' NIM for all types of ownership. However, as in Vietnam the central bank (SBV) can intervene into banks' operations through interest rate regulations, the determinants of NIM might

[20] It indicates the proportion of the broad money M2 to the GDP.

also differ depending on the period under study. Indeed, the monitoring role of SBV has been tightened during distressed economic conditions such as after the financial crisis in 1997-1998 or after the burst of the stock and real estate market in Vietnam in 2005-2007. We thus investigate the determinants of NIM separately for the periods with and without interest rate regulation.

4.2 Impact of the central bank intervention on interest rates on the determinants of net interest margins

After the banking law was enacted (1997), the SBV monitored interest rates and it stopped in 2002 in order to reduce barriers to banks' operations. However following the stock market boom and the real estate market bubble, the SBV again introduced a ceiling interest policy for bank interest rates after 2008. We therefore investigate whether the determinants of NIM differ depending on the existence of interest rate monitoring by the SBV. Besides, we analyze the changes for the different types of banks (state-owned, private and foreign). We thus estimate our model in absence (2002-2008) and in presence (1998-2001 and 2009-2011) of regulation by the central bank.

Table 4a Determinants of net interest margins by ownership structure in absence of interest rate regulation

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variables		Pool OLS			GLS random effects		
		(1)	(2)	(3)	(4)	(5)	(6)
OVERHEAD	β_1	1.015***	1.018***	1.019***	0.968***	0.976***	0.972***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	-0.014	-0.015	-0.015	-0.025	-0.026*	-0.024
		(0.334)	(0.317)	(0.316)	(0.107)	(0.096)	(0.122)
LOAN2ASSET	β_3	0.002	0.003	0.003	-0.002	-0.0007	0.0001
		(0.572)	(0.511)	(0.462)	(0.722)	(0.901)	(0.982)
CAP	β_4	0.033***	0.033***	0.033***	0.043***	0.042***	0.043***
		(0.002)	(0.003)	(0.002)	(0.000)	(0.000)	(0.000)
STATE	β_5	-0.084	-0.078	-0.084	-2.157	-2.259	-2.353
		(0.939)	(0.943)	(0.939)	(0.148)	(0.131)	(0.117)
FOREIGN	β_6	-0.776	-0.712	-0.667	-1.301	-1.175	-1.116
		(0.466)	(0.505)	(0.532)	(0.210)	(0.259)	(0.288)
STATE*OVERHEAD	β_{15}	0.899***	0.889***	0.876***	0.579	0.548	0.558
		(0.001)	(0.001)	(0.002)	(0.116)	(0.139)	(0.131)
FOREIGN*OVERHEAD	β_{16}	-0.340	-0.364	-0.384	-0.828	-0.899	-0.938
		(0.591)	(0.567)	(0.546)	(0.185)	(0.149)	(0.132)
STATE*RESERVE	β_{25}	0.030	0.031	0.032	0.054*	0.055*	0.057*
		(0.484)	(0.476)	(0.455)	(0.094)	(0.085)	(0.074)
FOREIGN*RESERVE	β_{26}	0.049**	0.049**	0.048**	0.084***	0.084***	0.082***
		(0.044)	(0.045)	(0.050)	(0.000)	(0.000)	(0.000)
STATE*LOAN2ASSET	β_{35}	-0.023	-0.023	-0.023	0.009	0.011	0.013
		(0.103)	(0.102)	(0.107)	(0.646)	(0.584)	(0.535)
FOREIGN*LOAN2ASSET	β_{36}	0.022	0.022	0.021	0.035*	0.034*	0.034*
		(0.128)	(0.134)	(0.136)	(0.088)	(0.095)	(0.089)
STATE*CAP	β_{45}	-0.031	-0.031	-0.032	0.011	0.010	0.004
		(0.439)	(0.443)	(0.428)	(0.781)	(0.805)	(0.913)
FOREIGN*CAP	β_{46}	-0.036	-0.036	-0.036	-0.034	-0.034	-0.036
		(0.213)	(0.207)	(0.204)	(0.175)	(0.179)	(0.155)
GDPR	β_7	0.315***	0.188**	0.180**	0.474***	0.306***	0.298***
		(0.009)	(0.035)	(0.044)	(0.000)	(0.000)	(0.000)
INFLATION	β_8	0.0243			0.032***		
		(0.136)			(0.007)		
HHI	β_9		-0.0003			-0.0005***	
			(0.126)			(0.004)	
M2GDP	β_{10}			0.007*			0.008***
				(0.099)			(0.005)
Constant	β_0	-1.322	0.356	-0.700	-2.327***	-0.104	-1.536**
		(0.232)	(0.679)	(0.410)	(0.008)	(0.888)	(0.035)
$\beta_{15}+\beta_1=0$		1.913***	1.907***	1.894***	1.547***	1.523***	1.529***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{16}+\beta_1=0$		0.674	0.654	0.634	0.140	0.077	0.033
		(0.284)	(0.298)	(0.313)	(0.822)	(0.901)	(0.957)
$\beta_{25}+\beta_2=0$		0.015	0.015	0.017	0.028	0.029	0.032

	(0.706)	(0.706)	(0.678)	(0.329)	(0.316)	(0.249)
$\beta_{26}+\beta_2=0$	0.034*	0.033*	0.032	0.058***	0.058***	0.058***
	(0.082)	(0.093)	(0.102)	(0.001)	(0.001)	(0.001)
$\beta_{35}+\beta_3=0$	-0.020	-0.020	-0.019	0.007	0.010	0.013
	(0.126)	(0.134)	(0.150)	(0.708)	(0.595)	(0.517)
$\beta_{36}+\beta_3=0$	0.025*	0.025*	0.025*	0.032*	0.033*	0.035*
	(0.065)	(0.064)	(0.061)	(0.093)	(0.088)	(0.075)
$\beta_{45}+\beta_4=0$	0.002	0.002	0.001	0.054	0.052	0.048
	(0.956)	(0.956)	(0.968)	(0.164)	(0.179)	(0.217)
$\beta_{46}+\beta_4=0$	-0.002	-0.003	-0.002	0.008	0.008	0.007
	(0.926)	(0.907)	(0.912)	(0.707)	(0.717)	(0.735)
adj. R^2	0.670	0.670	0.671			
N	218	218	218	218	218	218

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for foreign ownership – the dummy takes the value of one if foreign shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for state ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDPR*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4b Determinants of net interest margins by ownership structure when the central bank intervenes on interest rates

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variables		**Pool OLS**		**GLS random effects**			
		(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
OVERHEAD	β_1	1.191***	1.308***	1.323***	1.137***	1.254***	1.272***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.032***	0.036***	0.037***	0.018	0.022**	0.023**
		(0.007)	(0.002)	(0.002)	(0.112)	(0.048)	(0.040)
LOAN2ASSET	β_3	-0.015**	-0.014**	-0.014**	-0.014**	-0.014**	-0.014**
		(0.028)	(0.027)	(0.025)	(0.037)	(0.037)	(0.035)
CAP	β_4	0.066***	0.060***	0.061***	0.067***	0.061***	0.063***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE	β_5	0.455	1.121	1.150	-0.079	0.644	0.670
		(0.639)	(0.245)	(0.231)	(0.941)	(0.558)	(0.542)
FOREIGN	β_6	1.429*	1.615*	1.664**	1.041	1.348	1.410
		(0.094)	(0.053)	(0.045)	(0.240)	(0.127)	(0.110)
STATE*OVERHEAD	β_{15}	0.236	0.112	0.092	0.295	0.116	0.093

		(0.424)	(0.701)	(0.750)	(0.344)	(0.710)	(0.765)
FOREIGN*OVERHEAD	β_{16}	-1.279***	-1.404***	-1.418***	-1.227***	-1.346***	-1.362***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE*RESERVE	β_{25}	-0.063	-0.102**	-0.103**	-0.046	-0.0842*	-0.084*
		(0.194)	(0.036)	(0.034)	(0.325)	(0.067)	(0.064)
FOREIGN*RESERVE	β_{26}	0.112	0.118	0.113	0.145	0.152	0.146
		(0.323)	(0.284)	(0.303)	(0.172)	(0.138)	(0.154)
STATE*LOAN2ASSET	β_{35}	-0.001	-0.006	-0.005	0.0005	-0.003	-0.002
		(0.891)	(0.665)	(0.688)	(0.970)	(0.831)	(0.862)
FOREIGN*LOAN2ASSET	β_{36}	0.007	0.004	0.005	0.007	0.001	0.002
		(0.612)	(0.726)	(0.710)	(0.617)	(0.904)	(0.891)
STATE*CAP	β_{45}	-0.002	0.004	0.002	-0.001	0.006	0.005
		(0.900)	(0.817)	(0.886)	(0.942)	(0.733)	(0.801)
FOREIGN*CAP	β_{46}	-0.020	-0.013	-0.014	-0.019	-0.012	-0.013
		(0.226)	(0.441)	(0.393)	(0.288)	(0.512)	(0.450)
GDPR	β_7	0.240**	0.164	0.103	0.235**	0.156	0.093
		(0.039)	(0.140)	(0.357)	(0.023)	(0.107)	(0.337)
INFLATION	β_8	0.056***			0.057***		
		(0.000)			(0.000)		
HHI	β_9		-0.0007***			-0.0007***	
			(0.000)			(0.000)	
M2GDP	β_{10}			0.010***			0.011***
				(0.000)			(0.000)
Constant	β_0	-0.879	0.699	-0.821	-0.600	0.994	-0.591
		(0.328)	(0.406)	(0.338)	(0.477)	(0.207)	(0.464)
$\beta_{15}+\beta_1=0$		1.427***	1.419***	1.415***	1.431***	1.369***	1.364***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{16}+\beta_1=0$		-0.87*	-0.096*	-0.053*	-0.090*	-0.091*	-0.090*
		(0.098)	(0.064)	(0.066)	(0.098)	(0.094)	(0.098)
$\beta_{25}+\beta_2=0$		-0.031	-0.066	-0.066	-0.027	-0.061	-0.061
		(0.516)	(0.165)	(0.163)	(0.551)	(0.168)	(0.168)
$\beta_{26}+\beta_2=0$		0.144	0.154	0.150	0.163	0.174*	0.168*
		(0.200)	(0.160)	(0.171)	(0.122)	(0.087)	(0.097)
$\beta_{35}+\beta_3=0$		-0.016	-0.020*	-0.020	-0.014	-0.017	-0.017
		(0.185)	(0.098)	(0.103)	(0.302)	(0.191)	(0.203)
$\beta_{36}+\beta_3=0$		-0.007	-0.009	-0.009	-0.007	-0.012	-0.012
		(0.541)	(0.433)	(0.439)	(0.591)	(0.339)	(0.343)
$\beta_{45}+\beta_4=0$		0.064***	0.064***	0.064***	0.065	0.068***	0.068***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{46}+\beta_4=0$		0.045***	0.047***	0.047***	0.047	0.049***	0.049***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R^2		0.573	0.594	0.596			
N		194	194	194	194	194	194

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for foreign ownership – the dummy takes the value of one if foreign shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for state ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDPR*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In absence of interest rate regulation by the central bank (table 4a), we find, as previously, a significant and positive influence of OVERHEAD on NIM for both private and state-owned banks implying that such banks transfer their operational costs to their clients through higher interest margins. We also find that RESERVE is only a significant determinant for foreign banks. The ratio of equity to total assets is only significant for private banks meaning. An interesting result is also that during this period, credit risk (LOAN2ASSET) has a positive and significant impact on NIM for foreign banks. This suggests that foreign banks that take more credit risk are able to price it correctly and set higher NIM in absence of interest rate regulation by the central bank.

Table 4b provides the results when the central bank intervenes on interest rates. Like previously, OVERHEAD has a significant and positive influence on NIM for both private and state-owned banks. However, for foreign banks, this variable becomes significant but only at the 10% level and with a negative coefficient. Whereas the ratio of equity to total assets (CAP) was significant only for private banks in absence of interest rate control, it is highly significant for all banks in the presence of controlled interest rates. All banks with higher risk aversion set a higher NIM. RESERVE has the expected positive and significant coefficient for private banks. Finally, results for credit risk (LOAN2ASSET) are totally different as this variable has a significant and negative effect on NIM for private banks- a finding consistent with the results of William (2007) and Fungacova and Poghosyan (2011). This can be explained by the fact that, when the central bank controls bank interest rates, if banks want to preserve their market share, they have to cope with credit risk without being able to raise their margin. Another possibility is that, to increase market shares and to attract more customers, private banks might have been willing to accept higher credit risk without adjusting their margins. In Table 4a and 4b, the influence of the macro variables on NIM remains as expected.

Thus, even if interest rate monitoring by the central bank does not significantly impact the mean of NIM of Vietnamese banks, it does affect the determinants of their NIM. Indeed, whereas we find that private and state-owned banks transfer their operational costs to their clients through higher interest margins in all cases, the impact of other determinants differ depending on the presence or absence of central bank intervention on interest rates. More

precisely, risk aversion proxied by bank capitalization is an important determinant of NIM of foreign and state-owned banks only in the presence of central bank monitoring. Concerning credit risk, whereas foreign banks set higher margins when they take higher risk in absence of monitoring by the central bank, we find that when the central bank intervenes, private banks' NIM are negatively affected by credit risk. This means that interest rate control leads banks to set a lower NIM than what would be expected when they take higher credit risk.

4.3 Robustness analysis

In this chapter, to analyze the consistency of our estimations, we conduct several robustness checks.

First, we replace the ratio of loans to total assets (LOAN2ASSET) by the ratio of liquid assets to customer deposits and short-term funds (LIQ2DEPO). This is a proxy for liquidity risk and allows to measure whether liquidity problems have an impact on NIM. Indeed, banks usually use their liquidity as a refinancing source when they have to repeatedly refinance their assets and risk is higher if the mismatch between assets' and liabilities' average maturities is wider. The results are similar to those obtained in the main analysis and the liquidity risk variable (LIQ2DEPO) has a negative effect on NIM for state-owned and foreign banks in absence of interest rate regulation. Hence, banks with better liquidity conditions (high value of LIQ2DEPO) attempt to charge lower rates to their customers. By contrast, banks with poorer liquidity conditions charge higher rates to offset higher liquidity risk (see Appendix E).

Second, to check whether our results are stable, we run our regressions without the macro variables but with year dummies (see Appendix F). Results are consistent with those obtained on the main regressions.

Additionally, we also perform other estimations in which we drop negative observations of NIM (see Appendix G) or observations of the ratio of equity to total assets above 85% which correspond to new banks in their first two years of business (see Appendix H). Our conclusions are consistent with those previously obtained.

Finally, we run the regressions on the sub-sample of private banks and add individual fixed effects. The results are similar to those obtained on the main regressions[21] (see Appendix I).

5. Conclusion

The aim of this study is to investigate the determinants of bank interest margins in Vietnam taking into account bank ownership type and the role played by the central bank in driving and limiting the extent to which banks can adjust the rates they charge to borrowers and the interest they pay to depositors. The results show that banks have pursued different strategies in their intermediation role. Private and state-owned banks try to transfer their operational costs to customers via fees and higher margins to prevent losses while foreign banks set higher margins when their reserve ratio is higher in absence of the interest rate regulation. This partially explains the intervention of the central bank, banks having more power than their customers to negotiate interest rates. In presence of interest rate regulation by the central bank, bank capitalization positively affects the net interest margins of banks whatever their ownership type. Presumably, under such conditions financial resources are expensive for all types of banks since the central bank intervenes on the interest rates and banks do not have many options to comply with capital regulation. We also find that, in order to preserve their market share, private banks do not raise their margin to properly offset higher credit risk exposure.

As a whole, this chapter shows that interest rate control by the central bank differently affects bank interest margins depending on bank ownership structure. It also indicates that under interest rate control banks tend to pass their costly operations to customers, each type of bank pursuing different strategies to transfer their costs to the customers. Because, such a policy is likely to be introduced again from time to time in Vietnam, the central bank should account for the different impact it might have on the margin setting behavior of banks depending on their ownership type. The central bank plays an important role to balance the power of each participant in the market and should monitor the interest rates and fees applied to customers strictly, the central bank can take a firmly control on banks which attempt to use their market power to charge higher fees from customers. According to the finding, bank capital and liquidity

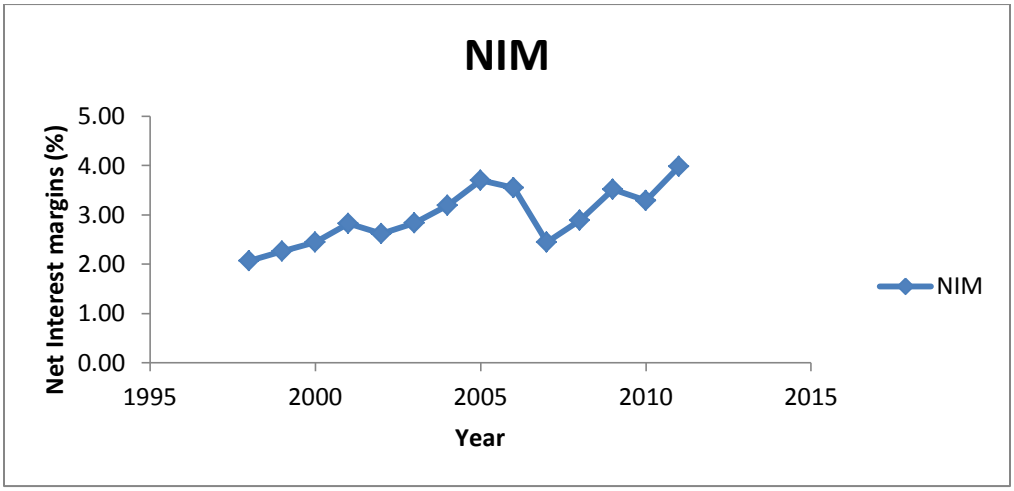
[21] We do not perform the regressions on the sub-samples of state-owned banks or foreign banks due to an insufficient number of observations.

are important for bank operations and recognized as the shields to maintain bank portfolios- it reflects that the central bank should pay more attention to the prudential regulations to ensure that banks can protect themselves from any shock of the monetary policy or the economic shocks. At the bank level, banks should develop banking services to diversify banks' revenues instead of providing the intermediation role as a predominant activity.

APPENDICES

APPENDIX A: Net interest margins and interest rate spreads in Vietnam over the period 1998-2011

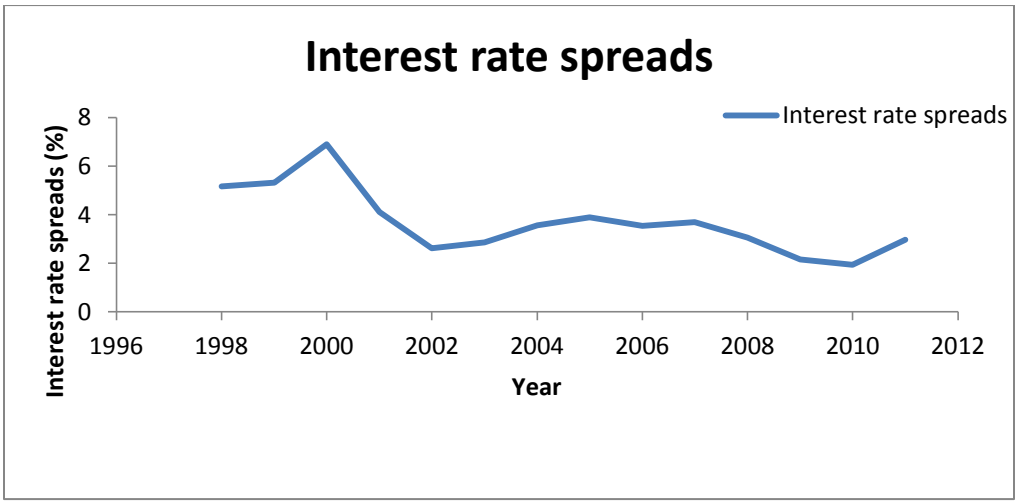
Graph 1: Evolution of net interest margins over the period 1998-2011



Source: Federal Reserve Economic Data – Economic Research Division

(access link on November 3rd 2014 http://research.stlouisfed.org/fred2/series/DDEI01VNA156NWDB)

Graph 2: Evolution of the interest rate spreads over the period 1998-2011



Source: World Development Indicators (Version: updated on October 17th 2014)

Interest rate spreads= aggregate lending rates-aggregate deposit rates

APPENDIX B: Description of types of banks

Type of bank	*Number of banks*	*Remark*
State-owned banks	***7***	
State-owned commercial banks	***5***	*Two commercial banks have equitized from 2007 and 2008, but the government remains the major shareholder*
Specialized banks	***2***	*Development and social banks*
Private banks	***34***	
Foreign banks	***8***	
Joint-venture commercial banks	*3*	
100% foreign banks	*5*	*One bank transferred from joint-venture to 100% foreign bank in 2008*
Total	**49**	

Source: the website of State Bank of Vietnam

APPENDIX C: Mean and mean-difference tests of NIM

By ownership structure

Group	vs	Group	Group means		Mean diff	FH-test	p-value
STATE	vs	Private	2.914	3.331	0.417	2.518*	0.075
STATE	vs	FOREIGN	2.914	3.529	0.615	2.728*	0.054
Private	vs	FOREIGN	3.331	3.529	0.198	1.066	0.451

Fisher-Hayter pairwise comparisons for ownership studendized range critical value 0.01, 0.05 and 0.10 at (2, 412[22])=3.660 ; 2.779 and 2.331, respectively.

In the presence and in the absence of the interest rate monitoring

Group	vs	Group	Group means		Mean diff	t-statictics	Test	p-value
0	vs	1	3.256	3.015	-0.05	-0.331	-0.05<0	0.370
0	vs	1	3.256	3.015	-0.05	-0.331	-0.05#0	0.740
0	vs	1	3.256	3.015	-0.05	-0.331	-0.05>0	0.629

0 : the period absence of the monitoring interest rate, 1 : the period presence of the monitoring interest rate.

[22] (k, df): k- number of groups and df- degree of freedom.

APPENDIX D: Correlations among variables

Bank-specific variables

	OVERHEAD	RESERVE	LOAN2ASSET	CAP
OVERHEAD	1			
RESERVE	-0.092	1		
LOAN2ASSET	0.007	-0.134	1	
CAP	0.384	-0.119	-0.167	1

Macro-specific variables

	HHI	INFLATION	GDPR	M2GDP
HHI	1			
INFLATION	-0.647	1		
GDPR	0.078	-0.178	1	
M2GDP	-0.975	0.571	-0.018	1

OVERHEAD: ratio of overhead expenses to total assets; *RESERVE*: ratio of non-earning assets to total assets; LOAN2ASSET: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDPR*: the growth rate of Gross Domestic Products; *M2GDP*: percentage of the ratio of money and quasi money supply to gross domestic products.

APPENDIX E: Replacing the ratio of loans to total assets (LOAN2ASSET) by the ratio of liquid assets to customer deposits and short-term funds (LIQ2DEPO)

Full sample

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variables		**Pool OLS**			**GLS random effects**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
OVERHEAD	β_1	1.008***	1.077***	1.074***	1.016***	1.089***	1.084***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.018*	0.014	0.015*	0.018**	0.012	0.014
		(0.052)	(0.115)	(0.098)	(0.037)	(0.135)	(0.103)
LIQ2DEPO	β_3	0.050	-0.029	-0.044	0.099	-0.010	-0.035
		(0.860)	(0.918)	(0.875)	(0.737)	(0.970)	(0.902)
CAP	β_4	0.037***	0.034***	0.036***	0.024***	0.025***	0.028***
		(0.000)	(0.000)	(0.000)	(0.010)	(0.005)	(0.002)
STATE	β_5	0.148	0.369	0.317	-0.806	-0.412	-0.495
		(0.796)	(0.510)	(0.570)	(0.272)	(0.567)	(0.491)
FOREIGN	β_6	1.424***	1.372***	1.389***	0.740	0.614	0.644
		(0.000)	(0.000)	(0.000)	(0.162)	(0.242)	(0.220)
STATE*OVERHEAD	β_{15}	0.162	0.035	0.052	0.279	0.002	0.039
		(0.490)	(0.877)	(0.819)	(0.315)	(0.992)	(0.884)
FOREIGN*OVERHEAD	β_{16}	-1.058***	-1.150***	-1.147***	-1.025***	-1.112***	-1.106***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE*RESERVE	β_{25}	-0.016	-0.026	-0.023	-0.006	-0.017	-0.012
		(0.596)	(0.391)	(0.457)	(0.804)	(0.504)	(0.636)
FOREIGN*RESERVE	β_{26}	-0.009	-0.003	-0.003	0.028	0.038*	0.037*
		(0.636)	(0.853)	(0.861)	(0.166)	(0.054)	(0.056)
STATE*LIQ2DEPO	β_{35}	-1.495***	-1.457***	-1.376**	-0.649	-0.380	-0.285
		(0.008)	(0.008)	(0.011)	(0.308)	(0.534)	(0.641)
FOREIGN*LIQ2DEPO	β_{36}	-0.096	-0.030	-0.014	-0.171	-0.070	-0.044
		(0.739)	(0.914)	(0.959)	(0.568)	(0.805)	(0.876)
STATE*CAP	β_{45}	0.031**	0.037**	0.034**	0.054***	0.059***	0.056***
		(0.032)	(0.011)	(0.017)	(0.000)	(0.000)	(0.000)
FOREIGN*CAP	β_{46}	0.010	0.016	0.013	0.035**	0.038***	0.034**
		(0.449)	(0.230)	(0.300)	(0.013)	(0.005)	(0.012)
GDPR	β_7	0.150***	0.143***	0.125**	0.213***	0.206***	0.186***
		(0.004)	(0.005)	(0.013)	(0.000)	(0.000)	(0.000)
INFLATION	β_8	0.033***			0.031***		
		(0.000)			(0.000)		
HHI	β_9		-0.0006***			-0.0007***	
			(0.000)			(0.000)	
M2GDP	β_{10}			0.010***			0.011***
				(0.000)			(0.000)
Constant	β_0	-0.265	0.964**	-0.753*	-0.564	0.668*	-1.216***
		(0.530)	(0.023)	(0.077)	(0.162)	(0.093)	(0.003)
$\beta_{15}+\beta_1=0$		1.170***	1.113***	1.127***	1.294***	1.091***	1.123***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

$\beta_{16}+\beta_1=0$	-0.049	-0.072	-0.072	-0.008	-0.022	-0.022
	(0.337)	(0.154)	(0.152)	(0.858)	(0.639)	(0.645)
$\beta_{25}+\beta_2=0$	0.001	-0.011	-0.007	0.011	-0.004	0.001
	(0.954)	(0.691)	(0.799)	(0.658)	(0.849)	(0.955)
$\beta_{26}+\beta_2=0$	0.008	0.010	0.011	0.047**	0.051***	0.051***
	(0.642)	(0.546)	(0.513)	(0.013)	(0.005)	(0.004)
$\beta_{35}+\beta_3=0$	-1.444***	-1.486***	-1.420***	-0.548	-0.390	-0.320
	(0.003)	(0.002)	(0.002)	(0.331)	(0.472)	(0.556)
$\beta_{36}+\beta_3=0$	-0.045	-0.059**	-0.058**	-0.070***	-0.081***	-0.079***
	(0.104)	(0.030)	(0.033)	(0.006)	(0.001)	(0.001)
$\beta_{45}+\beta_4=0$	0.069***	0.071***	0.071***	0.079***	0.085***	0.084***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{46}+\beta_4=0$	0.047***	0.050***	0.050***	0.060***	0.064***	0.063***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R^2	0.596	0.615	0.616			
R^2 within				0.647	0.680	0.678
R^2 between				0.376	0.366	0.378
R^2 overall				0.594	0.608	0.610
N	413	413	413	413	413	413

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for foreign ownership – the dummy takes the value of one if foreign shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for state ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDPR*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In absence of interest rate regulation

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variables		**Pool OLS**			**GLS random effects**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
OVERHEAD	β_1	1.027***	1.037***	1.034***	0.920***	0.937***	0.932***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	-0.016	-0.017	-0.016	-0.024	-0.026*	-0.023
		(0.281)	(0.262)	(0.281)	(0.103)	(0.090)	(0.119)
LIQ2DEPO	β_3	0.00001	-0.040	-0.051	0.290	0.218	0.204
		(1.000)	(0.908)	(0.884)	(0.425)	(0.548)	(0.576)
CAP	β_4	0.031***	0.031***	0.032***	0.041***	0.041***	0.042***
		(0.005)	(0.005)	(0.004)	(0.000)	(0.000)	(0.000)
STATE	β_5	0.533	0.516	0.455	-0.354	-0.389	-0.523
		(0.536)	(0.549)	(0.596)	(0.728)	(0.702)	(0.607)
FOREIGN	β_6	1.184	1.227	1.255	1.251	1.304	1.368
		(0.360)	(0.344)	(0.333)	(0.372)	(0.352)	(0.330)
STATE*OVERHEAD	β_{15}	-0.035	-0.041	-0.017	0.261	0.248	0.316
		(0.923)	(0.909)	(0.961)	(0.552)	(0.572)	(0.468)
FOREIGN*OVERHEAD	β_{16}	-0.283	-0.312	-0.318	-0.568	-0.633	-0.642
		(0.640)	(0.607)	(0.601)	(0.308)	(0.256)	(0.250)
STATE*RESERVE	β_{25}	0.026	0.027	0.029	0.041	0.042	0.044
		(0.519)	(0.505)	(0.466)	(0.181)	(0.168)	(0.147)
FOREIGN*RESERVE	β_{26}	0.048**	0.048**	0.047**	0.082***	0.083***	0.081***
		(0.044)	(0.045)	(0.049)	(0.000)	(0.000)	(0.000)
STATE*LIQ2DEPO	β_{35}	-1.855***	-1.799***	-1.723***	-1.454*	-1.356*	-1.219
		(0.005)	(0.007)	(0.009)	(0.072)	(0.094)	(0.134)
FOREIGN*LIQ2DEPO	β_{36}	-1.922*	-1.893*	-1.897*	-2.460*	-2.406*	-2.441*
		(0.083)	(0.088)	(0.088)	(0.066)	(0.072)	(0.068)
STATE*CAP	β_{45}	-0.019	-0.019	-0.022	0.018	0.019	0.014
		(0.630)	(0.624)	(0.581)	(0.612)	(0.604)	(0.687)
FOREIGN*CAP	β_{46}	-0.019	-0.020	-0.020	-0.013	-0.013	-0.014
		(0.512)	(0.494)	(0.476)	(0.559)	(0.557)	(0.514)
GDPR	β_7	0.349***	0.191**	0.183**	0.464***	0.292***	0.285***
		(0.004)	(0.033)	(0.042)	(0.000)	(0.000)	(0.000)
INFLATION	β_8	0.030*			0.034***		
		(0.056)			(0.004)		
HHI	β_9		-0.0004*			-0.0005***	
			(0.057)			(0.004)	
M2GDP	β_{10}			0.007*			0.008***
				(0.064)			(0.007)
Constant	β_0	-1.458	0.673	-0.536	-2.407***	-0.059	-1.411**
		(0.158)	(0.408)	(0.486)	(0.002)	(0.928)	(0.021)
$\beta_{15}+\beta_1=0$		0.992***	0.995***	1.016***	1.181***	1.184***	1.247***
		(0.005)	(0.005)	(0.004)	(0.006)	(0.005)	(0.003)
$\beta_{16}+\beta_1=0$		0.744	0.724	0.715	0.351	0.303	0.289
		(0.214)	(0.227)	(0.234)	(0.523)	(0.582)	(0.599)
$\beta_{25}+\beta_2=0$		0.009	0.009	0.012	0.016	0.016	0.020
		(0.801)	(0.800)	(0.736)	(0.561)	(0.559)	(0.453)

$\beta_{26}+\beta_2=0$	0.032*	0.031	0.031	0.057***	0.057***	0.057***
	(0.099)	(0.109)	(0.112)	(0.001)	(0.001)	(0.001)
$\beta_{35}+\beta_3=0$	-1.854***	-1.839***	-1.774***	-1.164	-1.137	-1.014
	(0.001)	(0.001)	(0.002)	(0.110)	(0.119)	(0.165)
$\beta_{36}+\beta_3=0$	-1.922*	-1.932*	-1.948*	-2.170*	-2.187*	-2.237*
	(0.068)	(0.067)	(0.065)	(0.090)	(0.087)	(0.080)
$\beta_{45}+\beta_4=0$	0.012	0.011	0.010	0.060*	0.060*	0.057*
	(0.752)	(0.757)	(0.786)	(0.087)	(0.085)	(0.099)
$\beta_{46}+\beta_4=0$	0.012	0.011	0.011	0.027	0.027	0.027
	(0.654)	(0.674)	(0.670)	(0.170)	(0.170)	(0.168)
adj. R^2	0.683	0.683	0.682			
R^2 within				0.803	0.804	0.802
R^2 between				0.553	0.549	0.551
R^2 overall				0.689	0.689	0.688
N	218	218	218	218	218	218

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for foreign ownership – the dummy takes the value of one if foreign shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for state ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDPR*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

When the central bank intervenes on interest rates

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variables		**Pool OLS**			**GLS random effects**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
OVERHEAD	β_1	1.146***	1.282***	1.298***	1.101***	1.235***	1.254***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.034***	0.039***	0.039***	0.019*	0.024**	0.025**
		(0.005)	(0.001)	(0.001)	(0.095)	(0.031)	(0.024)
LIQ2DEPO	β_3	0.479	0.695	0.711	0.506	0.703	0.725
		(0.411)	(0.223)	(0.212)	(0.416)	(0.251)	(0.236)
CAP	β_4	0.060***	0.052***	0.054***	0.059***	0.052***	0.054***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE	β_5	0.341	0.798	0.898	0.079	0.555	0.679
		(0.695)	(0.351)	(0.295)	(0.933)	(0.560)	(0.477)
FOREIGN	β_6	1.928***	2.104***	2.179***	1.514**	1.689**	1.779**
		(0.008)	(0.003)	(0.002)	(0.039)	(0.021)	(0.015)
STATE*OVERHEAD	β_{15}	0.130	-0.019	-0.044	0.204	0.009	-0.022
		(0.673)	(0.950)	(0.883)	(0.536)	(0.977)	(0.946)
FOREIGN*OVERHEAD	β_{16}	-1.248***	-1.396***	-1.411***	-1.211***	-1.353***	-1.371***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE*RESERVE	β_{25}	-0.052	-0.092*	-0.093*	-0.044	-0.085*	-0.086*
		(0.284)	(0.056)	(0.052)	(0.342)	(0.066)	(0.061)
FOREIGN*RESERVE	β_{26}	0.077	0.075	0.070	0.114	0.099	0.092
		(0.464)	(0.464)	(0.493)	(0.251)	(0.299)	(0.333)
STATE*LIQ2DEPO	β_{35}	-0.358	-0.342	-0.426	-0.793	-0.676	-0.798
		(0.777)	(0.781)	(0.728)	(0.551)	(0.602)	(0.537)
FOREIGN*LIQ2DEPO	β_{36}	-0.531	-0.764	-0.781	-0.566	-0.783	-0.805
		(0.363)	(0.181)	(0.171)	(0.363)	(0.202)	(0.189)
STATE*CAP	β_{45}	0.007	0.015	0.014	0.008	0.017	0.016
		(0.705)	(0.408)	(0.456)	(0.667)	(0.388)	(0.434)
FOREIGN*CAP	β_{46}	-0.007	0.004	0.003	-0.001	0.011	0.009
		(0.686)	(0.787)	(0.854)	(0.944)	(0.534)	(0.605)
GDPR	β_7	0.274**	0.185*	0.114	0.256**	0.165*	0.094
		(0.019)	(0.099)	(0.310)	(0.011)	(0.084)	(0.323)
INFLATION	β_8	0.066***			0.064***		
		(0.000)			(0.000)		
HHI	β_9		-0.0008***			-0.0008***	
			(0.000)			(0.000)	
M2GDP	β_{10}			0.012***			0.012***
				(0.000)			(0.000)
Constant	β_0	-1.983**	-0.198	-1.946**	-1.566**	0.174	-1.600**
		(0.018)	(0.805)	(0.016)	(0.040)	(0.810)	(0.028)
$\beta_{15}+\beta_1=0$		1.276***	1.262***	1.253***	1.304***	1.244***	1.231***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{16}+\beta_1=0$		-0.101*	-0.114**	-0.112**	-0.109**	-0.118**	-0.116**
		(0.060)	(0.030)	(0.032)	(0.050)	(0.036)	(0.039)
$\beta_{25}+\beta_2=0$		-0.017	-0.052	-0.053	-0.025	-0.061	-0.061
		(0.710)	(0.259)	(0.252)	(0.585)	(0.177)	(0.173)

$\beta_{26}+\beta_2=0$	0.111	0.114	0.110	0.133	0.123	0.117
	(0.288)	(0.265)	(0.281)	(0.176)	(0.195)	(0.216)
$\beta_{35}+\beta_3=0$	0.120	0.353	0.285	-0.287	0.027	-0.072
	(0.914)	(0.746)	(0.793)	(0.806)	(0.981)	(0.949)
$\beta_{36}+\beta_3=0$	-0.052*	-0.069**	-0.069**	-0.060**	-0.080***	-0.079***
	(0.074)	(0.016)	(0.016)	(0.026)	(0.002)	(0.002)
$\beta_{45}+\beta_4=0$	0.067***	0.068***	0.068***	0.067***	0.069***	0.070***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{46}+\beta_4=0$	0.053***	0.057***	0.057***	0.057***	0.064***	0.063***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R^2	0.561	0.584	0.585			
R^2 within				0.588	0.619	0.621
R^2 between				0.710	0.671	0.672
R^2 overall				0.591	.0611	0.613
N	195	195	195	195	195	195

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for foreign ownership – the dummy takes the value of one if foreign shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for state ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDPR*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

APPENDIX F: Replacing macro variables by year dummies

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j5} foreign_{it} * X_{it} + year_t + u_{it}$$

(X_{it}: bank-specific variables)

Variables		Pool OLS			GLS random effects		
		Full	FIXED=0	FIXED=1	Full	FIXED=0	FIXED=1
		(1)	(2)	(3)	(4)	(5)	(6)
OVERHEAD	β_1	1.053***	1.029***	1.298***	1.063***	0.990***	1.236***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.014	-0.016	0.037***	0.011	-0.029*	0.022*
		(0.137)	(0.290)	(0.002)	(0.197)	(0.070)	(0.053)
LOAN2ASSET	β_3	-0.001	0.003	-0.013**	-0.001	-0.001	-0.013*
		(0.700)	(0.533)	(0.040)	(0.726)	(0.784)	(0.057)
CAP	β_4	0.039***	0.032***	0.064***	0.032***	0.040***	0.066***
		(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)
FOREIGN	β_5	0.751	-0.849	1.767**	0.338	-1.376	1.497*
		(0.221)	(0.436)	(0.035)	(0.614)	(0.190)	(0.092)
STATE	β_6	0.269	-0.096	1.115	-0.132	-2.273	0.606
		(0.713)	(0.931)	(0.247)	(0.892)	(0.129)	(0.581)
STATE*OVERHEAD	β_{15}	0.601***	0.869***	0.109	0.179	0.526	0.097
		(0.003)	(0.002)	(0.707)	(0.473)	(0.155)	(0.754)
FOREIGN*OVERHEAD	β_{16}	-1.115***	-0.338	-1.384***	-1.081***	-0.795	-1.319***
		(0.000)	(0.599)	(0.000)	(0.000)	(0.210)	(0.000)
STATE*RESERVE	β_{25}	-0.023	0.030	-0.098**	-0.011	0.054*	-0.077*
		(0.474)	(0.488)	(0.045)	(0.678)	(0.097)	(0.091)
FOREIGN*RESERVE	β_{26}	0.004	0.050**	0.084	0.038*	0.088***	0.112
		(0.816)	(0.042)	(0.447)	(0.060)	(0.000)	(0.277)
STATE*LOAN2ASSET	β_{35}	-0.018*	-0.022	-0.005	-0.009	0.011	-0.002
		(0.062)	(0.113)	(0.692)	(0.453)	(0.577)	(0.879)
FOREIGN*LOAN2ASSET	β_{36}	0.011	0.022	0.005	0.007	0.032	0.002
		(0.193)	(0.134)	(0.699)	(0.474)	(0.117)	(0.876)
STATE*CAP	β_{45}	0.018	-0.029	-0.0002	0.048***	0.015	0.002
		(0.197)	(0.476)	(0.991)	(0.001)	(0.704)	(0.908)
FOREIGN*CAP	β_{46}	0.007	-0.031	-0.017	0.023*	-0.026	-0.017
		(0.539)	(0.280)	(0.297)	(0.071)	(0.308)	(0.355)
Constant	β_0	1.834***	1.195***	1.360***	1.860***	1.407***	1.625***
		(0.000)	(0.004)	(0.002)	(0.000)	(0.004)	(0.000)
YEAR		YES	YES	YES	YES	YES	YES
$\beta_{15}+\beta_1=0$		1.654***	1.898***	1.406***	1.242***	1.515***	1.322***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{16}+\beta_1=0$		-0.062	0.691	-0.086*	-0.017	0.194	-0.083
		(0.222)	(0.277)	(0.095)	(0.715)	(0.758)	(0.129)
$\beta_{25}+\beta_2=0$		-0.009	0.013	-0.061	0.0001	0.024	-0.055
		(0.767)	(0.740)	(0.200)	(0.996)	(0.398)	(0.216)
$\beta_{26}+\beta_2=0$		0.019	0.034*	0.121	0.050***	0.059***	0.134
		(0.311)	(0.092)	(0.272)	(0.006)	(0.001)	(0.190)
$\beta_{35}+\beta_3=0$		-0.020**	-0.019	-0.019	-0.011	0.009	-0.015
		(0.027)	(0.149)	(0.126)	(0.346)	(0.622)	(0.252)
$\beta_{36}+\beta_3=0$		0.010	0.025*	-0.008	0.005	0.030	-0.010

	(0.209)	(0.065)	(0.508)	(0.530)	(0.122)	(0.412)
$\beta_{45}+\beta_4=0$	0.058***	0.003	0.064***	0.080***	0.056	0.068***
	(0.000)	(0.933)	(0.000)	(0.000)	(0.155)	(0.000)
$\beta_{46}+\beta_4=0$	0.047***	0.0007	0.046***	0.056***	0.014	0.048***
	(0.000)	(0.979)	(0.000)	(0.000)	(0.549)	(0.000)
adj. R^2	0.611	0.667	0.597			
R^2 within				0.690	0.810	0.629
R^2 between				0.423	0.528	0.728
R^2 overall				0.621	0.672	0.633
N	412	218	194	412	218	194

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for foreign ownership – the dummy takes the value of one if foreign shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for state ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

APPENDIX G: Dropping negative values of nim

Full sample

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variables		**Pool PLS**			**GLS random effects**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
OVERHEAD	β_1	1.007***	1.063***	1.058***	1.025***	1.085***	1.078***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.018**	0.015*	0.015*	0.015*	0.011	0.013
		(0.047)	(0.097)	(0.081)	(0.083)	(0.172)	(0.129)
LOAN2ASSET	β_3	-0.003	-0.0008	-0.0005	-0.003	0.0001	0.0006
		(0.397)	(0.821)	(0.886)	(0.409)	(0.977)	(0.889)
CAP	β_4	0.037***	0.034***	0.035***	0.024***	0.024***	0.026***
		(0.000)	(0.000)	(0.000)	(0.005)	(0.004)	(0.002)
STATE	β_5	-0.529	-0.245	-0.256	-0.960	-0.226	-0.249
		(0.471)	(0.733)	(0.722)	(0.342)	(0.819)	(0.802)
FOREIGN	β_6	0.839	0.875	0.897	0.093	0.391	0.440
		(0.162)	(0.135)	(0.126)	(0.894)	(0.567)	(0.522)
STATE*OVERHEAD	β_{15}	0.342	0.192	0.198	0.315	0.016	0.046
		(0.136)	(0.397)	(0.380)	(0.227)	(0.948)	(0.856)
FOREIGN*OVERHEAD	β_{16}	-1.053***	-1.128***	-1.124***	-1.030***	-1.098***	-1.092***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE*RESERVE	β_{25}	-0.015	-0.024	-0.021	0.001	-0.012	-0.008
		(0.640)	(0.436)	(0.502)	(0.970)	(0.639)	(0.760)
FOREIGN*RESERVE	β_{26}	-0.006	-0.001	-0.001	0.034*	0.039**	0.039**
		(0.748)	(0.920)	(0.926)	(0.090)	(0.043)	(0.045)
STATE*LOAN2ASSET	β_{35}	-0.0006	-0.001	-0.001	-0.001	-0.004	-0.004
		(0.955)	(0.922)	(0.918)	(0.929)	(0.745)	(0.727)
FOREIGN*LOAN2ASSET	β_{36}	0.010	0.009	0.009	0.012	0.004	0.003
		(0.247)	(0.279)	(0.284)	(0.231)	(0.682)	(0.701)
STATE*CAP	β_{45}	0.024*	0.030**	0.029**	0.053***	0.059***	0.057***
		(0.084)	(0.028)	(0.037)	(0.000)	(0.000)	(0.000)
FOREIGN*CAP	β_{46}	0.007	0.0128	0.011	0.030**	0.033**	0.030**
		(0.518)	(0.284)	(0.358)	(0.022)	(0.010)	(0.019)
GDPR	β_7	0.123**	0.116**	0.099**	0.192***	0.187***	0.168***
		(0.015)	(0.017)	(0.041)	(0.000)	(0.000)	(0.000)
INFLATION	β_8	0.026***			0.026***		
		(0.003)			(0.001)		
HHI	β_9		-0.0006***			-0.0007***	
			(0.000)			(0.000)	
M2GDP	β_{10}			0.009***			0.010***
				(0.000)			(0.000)
Constant	β_0	0.221	1.162***	-0.412	-0.089	0.768*	-0.987**
		(0.637)	(0.010)	(0.390)	(0.854)	(0.097)	(0.049)
$\beta_{15}+\beta_1=0$		1.348***	1.254***	1.256***	1.339***	1.101***	1.124***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

$\beta_{16}+\beta_1=0$	-0.045	-0.065	-0.065	-0.005	-0.013	-0.013
	(0.360)	(0.181)	(0.178)	(0.918)	(0.772)	(0.773)
$\beta_{25}+\beta_2=0$	0.003	-0.009	-0.005	0.016	-0.0005	0.005
	(0.912)	(0.757)	(0.863)	(0.527)	(0.982)	(0.841)
$\beta_{26}+\beta_2=0$	0.011	0.013	0.013	0.050***	0.051***	0.052***
	(0.513)	(0.460)	(0.430)	(0.007)	(0.004)	(0.003)
$\beta_{35}+\beta_3=0$	-0.004	-0.001	-0.001	-0.005	-0.004	-0.003
	(0.702)	(0.849)	(0.869)	(0.684)	(0.737)	(0.749)
$\beta_{36}+\beta_3=0$	0.006	0.008	0.008	0.008	0.004	0.004
	(0.387)	(0.272)	(0.260)	(0.355)	(0.631)	(0.610)
$\beta_{45}+\beta_4=0$	0.061***	0.064***	0.064***	0.077***	0.084***	0.084***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{46}+\beta_4=0$	0.045***	0.046***	0.046***	0.055***	0.057***	0.056***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R^2	0.593	0.611	0.611			
R^2 within				0.657	0.686	0.684
R^2 between				0.384	0.381	0.393
R^2 overall				0.595	0.612	0.612
N	405	405	405	405	405	405

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for FOREIGN ownership – the dummy takes the value of one if FOREIGN shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for STATE ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDP*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In absence of interest rate regulation

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variables		**Pool OLS**			**GLS random effects**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
OVERHEAD	β_1	1.025***	1.030***	1.028***	0.974***	0.981***	0.977***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	-0.015	-0.016	-0.016	-0.026*	-0.026*	-0.024
		(0.295)	(0.277)	(0.286)	(0.098)	(0.088)	(0.116)
LOAN2ASSET	β_3	0.003	0.003	0.004	-0.001	-0.0004	0.0004
		(0.543)	(0.469)	(0.422)	(0.753)	(0.944)	(0.933)
CAP	β_4	0.032***	0.032***	0.033***	0.043***	0.042***	0.043***
		(0.003)	(0.003)	(0.002)	(0.000)	(0.000)	(0.000)
STATE	β_5	-1.011	-1.006	-1.003	-2.483	-2.587*	-2.667*
		(0.378)	(0.380)	(0.381)	(0.100)	(0.088)	(0.080)
FOREIGN	β_6	-0.781	-0.702	-0.658	-1.309	-1.178	-1.119
		(0.458)	(0.506)	(0.533)	(0.206)	(0.258)	(0.286)
STATE*OVERHEAD	β_{15}	0.257	0.244	0.242	0.307	0.280	0.306
		(0.483)	(0.506)	(0.508)	(0.430)	(0.471)	(0.430)
FOREIGN*OVERHEAD	β_{16}	-0.351	-0.379	-0.397	-0.831	-0.905	-0.946
		(0.576)	(0.546)	(0.528)	(0.179)	(0.142)	(0.125)
STATE*RESERVE	β_{25}	0.041	0.042	0.044	0.060*	0.062*	0.063**
		(0.334)	(0.324)	(0.302)	(0.057)	(0.051)	(0.044)
FOREIGN*RESERVE	β_{26}	0.049**	0.049**	0.048**	0.085***	0.085***	0.083***
		(0.041)	(0.043)	(0.047)	(0.000)	(0.000)	(0.000)
STATE*LOAN2ASSET	β_{35}	0.005	0.005	0.005	0.022	0.024	0.025
		(0.752)	(0.751)	(0.753)	(0.312)	(0.276)	(0.259)
FOREIGN*LOAN2ASSET	β_{36}	0.022	0.021	0.021	0.034*	0.033	0.034*
		(0.127)	(0.135)	(0.136)	(0.093)	(0.101)	(0.095)
STATE*CAP	β_{45}	-0.021	-0.021	-0.023	0.011	0.009	0.003
		(0.592)	(0.596)	(0.566)	(0.784)	(0.811)	(0.924)
FOREIGN*CAP	β_{46}	-0.034	-0.034	-0.035	-0.032	-0.032	-0.034
		(0.236)	(0.228)	(0.219)	(0.196)	(0.201)	(0.174)
GDPR	β_7	0.368***	0.210**	0.200**	0.504***	0.327***	0.319***
		(0.002)	(0.018)	(0.024)	(0.000)	(0.000)	(0.000)
INFLATION	β_8	0.030*			0.034***		
		(0.063)			(0.004)		
HHI	β_9		-0.0004*			-0.0005***	
			(0.058)			(0.003)	
M2GDP	β_{10}			0.008*			0.009***
				(0.050)			(0.003)
CONSTANT	β_0	-1.791	0.298	-0.977	-2.575***	-0.245	-1.733**
		(0.106)	(0.726)	(0.249)	(0.003)	(0.737)	(0.017)
$\beta_{15}+\beta_1=0$		1.281***	1.273***	1.269***	1.280***	1.261***	1.282***
		(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
$\beta_{16}+\beta_1=0$		0.674	0.650	0.630	0.142	0.076	0.030
		(0.278)	(0.296)	(0.311)	(0.817)	(0.901)	(0.960)
$\beta_{25}+\beta_2=0$		0.025	0.026	0.028	0.034	0.035	0.039
		(0.529)	(0.527)	(0.489)	(0.228)	(0.216)	(0.163)

$\beta_{26}+\beta_2=0$	0.033*	0.032*	0.031	0.059***	0.059***	0.059***
	(0.087)	(0.099)	(0.108)	(0.001)	(0.001)	(0.001)
$\beta_{35}+\beta_3=0$	0.008	0.009	0.009	0.020	0.023	0.025
	(0.611)	(0.585)	(0.570)	(0.337)	(0.270)	(0.236)
$\beta_{36}+\beta_3=0$	0.025*	0.025*	0.025*	0.032*	0.033*	0.034*
	(0.063)	(0.061)	(0.057)	(0.096)	(0.091)	(0.076)
$\beta_{45}+\beta_4=0$	0.011	0.010	0.009	0.054	0.051	0.047
	(0.776)	(0.777)	(0.797)	(0.168)	(0.185)	(0.226)
$\beta_{46}+\beta_4=0$	-0.001	-0.002	-0.002	0.010	0.009	0.009
	(0.960)	(0.935)	(0.938)	(0.657)	(0.668)	(0.688)
adj. R^2	0.659	0.659	0.660			
R^2 within				0.809	0.811	0.809
R^2 between				0.517	0.509	0.510
R^2 overall				0.669	0.669	0.670
N	215	215	215	215	215	215

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for FOREIGN ownership – the dummy takes the value of one if FOREIGN shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for STATE ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDP*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

When the central bank intervenes on interest rates

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variables		**Pool OLS**			**GLS random effects**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
OVERHEAD	β_1	1.150***	1.263***	1.277***	1.115***	1.233***	1.250***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.032***	0.036***	0.036***	0.018*	0.022**	0.023**
		(0.004)	(0.001)	(0.001)	(0.098)	(0.037)	(0.030)
LOAN2ASSET	β_3	-0.011*	-0.011*	-0.011*	-0.011	-0.011*	-0.011*
		(0.087)	(0.071)	(0.065)	(0.101)	(0.084)	(0.078)
CAP	β_4	0.061***	0.056***	0.057***	0.061***	0.056***	0.058***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE	β_5	0.147	0.685	0.705	-0.309	0.359	0.378
		(0.873)	(0.455)	(0.441)	(0.765)	(0.733)	(0.719)
FOREIGN	β_6	1.460*	1.625**	1.668**	1.074	1.367	1.423*
		(0.067)	(0.038)	(0.033)	(0.203)	(0.105)	(0.091)
STATE*OVERHEAD	β_{15}	0.098	-0.051	-0.069	0.139	-0.058	-0.079
		(0.736)	(0.860)	(0.811)	(0.655)	(0.852)	(0.800)
FOREIGN*OVERHEAD	β_{16}	-1.237***	-1.357***	-1.370***	-1.205***	-1.324***	-1.340***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE*RESERVE	β_{25}	-0.052	-0.085*	-0.085*	-0.040	-0.075*	-0.076*
		(0.261)	(0.066)	(0.063)	(0.366)	(0.083)	(0.082)
FOREIGN*RESERVE	β_{26}	0.111	0.117	0.113	0.143	0.150	0.144
		(0.297)	(0.259)	(0.277)	(0.152)	(0.123)	(0.139)
STATE*LOAN2ASSET	β_{35}	0.003	0.002	0.002	0.007	0.005	0.006
		(0.805)	(0.883)	(0.851)	(0.641)	(0.709)	(0.675)
FOREIGN*LOAN2ASSET	β_{36}	0.003	0.001	0.001	0.003	-0.0008	-0.0004
		(0.821)	(0.915)	(0.894)	(0.783)	(0.952)	(0.973)
STATE*CAP	β_{45}	0.005	0.011	0.009	0.005	0.013	0.011
		(0.776)	(0.518)	(0.577)	(0.767)	(0.495)	(0.556)
FOREIGN*CAP	β_{46}	-0.016	-0.009	-0.010	-0.013	-0.007	-0.009
		(0.315)	(0.550)	(0.495)	(0.435)	(0.675)	(0.600)
GDPR	β_7	0.209*	0.140	0.083	0.204**	0.133	0.074
		(0.058)	(0.187)	(0.434)	(0.038)	(0.156)	(0.431)
INFLATION	β_8	0.052***			0.054***		
		(0.000)			(0.000)		
HHI	β_9		-0.0006***			-0.0006***	
			(0.000)			(0.000)	
M2GDP	β_{10}			0.009***			0.010***
				(0.000)			(0.000)
Constant	β_0	-0.678	0.784	-0.602	-0.416	1.066	-0.411
		(0.423)	(0.327)	(0.460)	(0.604)	(0.158)	(0.596)
$\beta_{15}+\beta_1=0$		1.248***	1.211***	1.207***	1.254***	1.175***	1.170***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{16}+\beta_1=0$		-0.086*	-0.094*	-0.093*	-0.089*	-0.090*	-0.089*
		(0.081)	(0.054)	(0.056)	(0.085)	(0.082)	(0.086)
$\beta_{25}+\beta_2=0$		-0.019	-0.040	-0.048	-0.021	-0.053	-0.052
		(0.665)	(0.276)	(0.276)	(0.619)	(0.213)	(0.216)

$\beta_{26}+\beta_2=0$	0.143	0.153	0.149	0.162	0.172*	0.167*
	(0.177)	(0.139)	(0.149)	(0.105)	(0.075)	(0.084)
$\beta_{35}+\beta_3=0$	-0.007	-0.009	-0.008	-0.003	-0.005	-0.005
	(0.564)	(0.468)	(0.485)	(0.781)	(0.675)	(0.700)
$\beta_{36}+\beta_3=0$	-0.007	-0.009	-0.009	-0.007	-0.012	-0.012
	(0.504)	(0.397)	(0.403)	(0.573)	(0.327)	(0.332)
$\beta_{45}+\beta_4=0$	0.066***	0.067***	0.067***	0.006***	0.069***	0.069***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{46}+\beta_4=0$	0.045***	0.047***	0.046***	0.047***	0.049***	0.049***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R^2	0.585	0.601	0.602			
R^2 within				0.599	0.620	0.620
R^2 between				0.721	0.716	0.719
R^2 overall				0.616	0.631	0.632
N	190	190	190	190	190	190

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for FOREIGN ownership – the dummy takes the value of one if FOREIGN shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for STATE ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDP*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

APPENDIX H: Dropping values of the ratio equity to total assets higher than 85%

Full sample

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variables		Pool OLS			GLS random effects		
		(1)	(2)	(3)	(4)	(5)	(6)
OVERHEAD	β_1	1.015***	1.072***	1.068***	1.023***	1.088***	1.081***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.017*	0.014	0.015	0.016*	0.012	0.013
		(0.063)	(0.120)	(0.102)	(0.072)	(0.156)	(0.115)
LOAN2ASSET	β_3	-0.004	-0.002	-0.00159	-0.005	-0.0006	-0.00002
		(0.258)	(0.625)	(0.702)	(0.277)	(0.886)	(0.996)
CAP	β_4	0.037***	0.034***	0.036***	0.025***	0.025***	0.028***
		(0.000)	(0.000)	(0.000)	(0.004)	(0.003)	(0.001)
STATE	β_5	-0.025	0.349	0.334	-0.934	-0.139	-0.152
		(0.972)	(0.634)	(0.647)	(0.365)	(0.891)	(0.881)
FOREIGN	β_6	0.823	0.860	0.886	0.135	0.477	0.535
		(0.186)	(0.158)	(0.145)	(0.850)	(0.495)	(0.446)
STATE*OVERHEAD	β_{15}	0.701***	0.601***	0.594***	0.398	0.088	0.112
		(0.001)	(0.003)	(0.003)	(0.123)	(0.728)	(0.657)
FOREIGN*OVERHEAD	β_{16}	-1.064***	-1.145***	-1.142***	-1.040***	-1.117***	-1.110***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE*RESERVE	β_{25}	-0.022	-0.033	-0.030	-0.003	-0.018	-0.013
		(0.492)	(0.298)	(0.345)	(0.908)	(0.495)	(0.603)
FOREIGN*RESERVE	β_{26}	-0.006	-0.001	-0.001	0.032	0.039*	0.038*
		(0.742)	(0.925)	(0.930)	(0.118)	(0.051)	(0.054)
STATE*LOAN2ASSET	β_{35}	-0.016	-0.020**	-0.019*	-0.004	-0.008	-0.008
		(0.101)	(0.047)	(0.051)	(0.735)	(0.492)	(0.481)
FOREIGN*LOAN2ASSET	β_{36}	0.010	0.008	0.008	0.010	0.001	0.0008
		(0.251)	(0.326)	(0.334)	(0.305)	(0.909)	(0.937)
STATE*CAP	β_{45}	0.019	0.024*	0.022	0.051***	0.058***	0.055***
		(0.198)	(0.093)	(0.114)	(0.001)	(0.000)	(0.000)
FOREIGN*CAP	β_{46}	0.009	0.017	0.015	0.036**	0.040***	0.037***
		(0.485)	(0.214)	(0.265)	(0.012)	(0.003)	(0.006)
GDPR	β_7	0.148***	0.139***	0.121**	0.215***	0.208***	0.188***
		(0.005)	(0.006)	(0.015)	(0.000)	(0.000)	(0.000)
INFLATION	β_8	0.029***			0.029***		
		(0.002)			(0.000)		
HHI	β_9		-0.0006***			-0.0007***	
			(0.000)			(0.000)	
M2GDP	β_{10}			0.010***			0.011***
				(0.000)			(0.000)
Constant	β_0	0.049	1.059**	-0.610	-0.259	0.689	-1.236**
		(0.918)	(0.023)	(0.217)	(0.602)	(0.143)	(0.015)
$\beta_{15}+\beta_1=0$		1.716***	1.672***	1.662***	1.421***	1.176***	1.193***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{16}+\beta_1=0$		-0.048	-0.073	-0.073	-0.016	-0.028	-0.028
		(0.354)	(0.158)	(0.152)	(0.746)	(0.556)	(0.557)
$\beta_{25}+\beta_2=0$		-0.004	-0.019	-0.015	0.013	-0.005	-0.00002
		(0.880)	(0.542)	(0.626)	(0.617)	(0.823)	(0.999)
$\beta_{26}+\beta_2=0$		0.010	0.012	0.013	0.049***	0.051***	0.052***
		(0.562)	(0.489)	(0.460)	(0.010)	(0.005)	(0.004)

$\beta_{35}+\beta_3=0$	-0.021**	-0.022**	-0.021**	-0.009	-0.009	-0.008
	(0.022)	(0.017)	(0.021)	(0.432)	(0.427)	(0.447)
$\beta_{36}+\beta_3=0$	0.005	0.006	0.007	0.005	0.0005	0.0007
	(0.474)	(0.395)	(0.376)	(0.548)	(0.995)	(0.931)
$\beta_{45}+\beta_4=0$	0.056***	0.058***	0.058***	0.077***	0.084***	0.083***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{46}+\beta_4=0$	0.047***	0.051***	0.051***	0.061***	0.066***	0.065***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R^2	0.591	0.609	0.610			
R^2 within				0.646	0.680	0.678
R^2 between				0.436	0.424	0.435
R^2 overall				0.590	0.603	0.605
N	411	411	411	411	411	411

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for FOREIGN ownership – the dummy takes the value of one if FOREIGN shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for STATE ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDP*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In absence of interest rate regulation

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6 foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6} foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variable		Pool OLS			GLS random effects		
		(1)	(2)	(3)	(4)	(5)	(6)
OVERHEAD	β_1	1.015***	1.018***	1.019***	0.968***	0.976***	0.972***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	-0.014	-0.015	-0.015	-0.025	-0.026*	-0.024
		(0.334)	(0.317)	(0.316)	(0.107)	(0.096)	(0.122)
LOAN2ASSET	β_3	0.002	0.003	0.003	-0.002	-0.0007	0.0001
		(0.572)	(0.511)	(0.462)	(0.722)	(0.901)	(0.982)
CAP	β_4	0.033***	0.033***	0.033***	0.043***	0.042***	0.043***
		(0.002)	(0.003)	(0.002)	(0.000)	(0.000)	(0.000)
STATE	β_5	-0.084	-0.078	-0.084	-2.157	-2.259	-2.353
		(0.939)	(0.943)	(0.939)	(0.148)	(0.131)	(0.117)
FOREIGN	β_6	-0.776	-0.712	-0.667	-1.301	-1.175	-1.116
		(0.466)	(0.505)	(0.532)	(0.210)	(0.259)	(0.288)
STATE*OVERHEAD	β_{15}	0.899***	0.889***	0.876***	0.579	0.548	0.558
		(0.001)	(0.001)	(0.002)	(0.116)	(0.139)	(0.131)
FOREIGN*OVERHEAD	β_{16}	-0.340	-0.364	-0.384	-0.828	-0.899	-0.938
		(0.591)	(0.567)	(0.546)	(0.185)	(0.149)	(0.132)
STATE*RESERVE	β_{25}	0.030	0.031	0.032	0.054*	0.055*	0.057*
		(0.484)	(0.476)	(0.455)	(0.094)	(0.085)	(0.074)
FOREIGN*RESERVE	β_{26}	0.049**	0.049**	0.048**	0.084***	0.084***	0.082***
		(0.044)	(0.045)	(0.050)	(0.000)	(0.000)	(0.000)
STATE*LOAN2ASSET	β_{35}	-0.023	-0.023	-0.023	0.009	0.011	0.013
		(0.103)	(0.102)	(0.107)	(0.646)	(0.584)	(0.535)
FOREIGN*LOAN2ASSET	β_{36}	0.022	0.022	0.021	0.035*	0.034*	0.034*
		(0.128)	(0.134)	(0.136)	(0.088)	(0.095)	(0.089)
STATE*CAP	β_{45}	-0.031	-0.031	-0.032	0.011	0.010	0.004
		(0.439)	(0.443)	(0.428)	(0.781)	(0.805)	(0.913)
FOREIGN*CAP	β_{46}	-0.036	-0.036	-0.036	-0.034	-0.034	-0.036
		(0.213)	(0.207)	(0.204)	(0.175)	(0.179)	(0.155)
GDPR	β_7	0.315***	0.188**	0.180**	0.474***	0.306***	0.298***
		(0.009)	(0.035)	(0.044)	(0.000)	(0.000)	(0.000)
INFLATION	β_8	0.024			0.032***		
		(0.136)			(0.007)		
HHI	β_9		-0.0003			-0.0005***	
			(0.126)			(0.004)	
M2GDP	β_{10}			0.007*			0.008***
				(0.099)			(0.005)
Constant	β_0	-1.322	0.356	-0.700	-2.327***	-0.104	-1.536**
		(0.232)	(0.679)	(0.410)	(0.008)	(0.888)	(0.035)
$\beta_{15}+\beta_1=0$		1.913***	1.907***	1.894***	1.547***	1.523***	1.529***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{16}+\beta_1=0$		0.674	0.654	0.634	0.140	0.077	0.033
		(0.284)	(0.298)	(0.313)	(0.822)	(0.901)	(0.957)
$\beta_{25}+\beta_2=0$		0.015	0.015	0.017	0.028	0.029	0.032
		(0.706)	(0.706)	(0.678)	(0.329)	(0.316)	(0.249)
$\beta_{26}+\beta_2=0$		0.034*	0.033*	0.032	0.058***	0.058***	0.058***
		(0.082)	(0.093)	(0.102)	(0.001)	(0.001)	(0.001)
$\beta_{35}+\beta_3=0$		-0.030	-0.020	-0.019	0.007	0.010	0.013
		(0.126)	(0.134)	(0.150)	(0.708)	(0.595)	(0.517)

$\beta_{36}+\beta_3=0$	0.025*	0.025*	0.025*	0.032*	0.033*	0.035*
	(0.065)	(0.064)	(0.061)	(0.093)	(0.088)	(0.075)
$\beta_{45}+\beta_4=0$	0.002	0.002	0.001	0.054	0.052	0.048
	(0.956)	(0.956)	(0.968)	(0.164)	(0.179)	(0.217)
$\beta_{46}+\beta_4=0$	-0.002	-0.003	-0.002	0.008	0.008	0.007
	(0.926)	(0.907)	(0.912)	(0.707)	(0.717)	(0.735)
adj. R^2	0.670	0.670	0.671			
R^2 within				0.803	0.805	0.804
R^2 between				0.534	0.526	0.527
R^2 overall				0.671	0.670	0.671
N	218	218	218	218	218	218

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for FOREIGN ownership – the dummy takes the value of one if FOREIGN shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for STATE ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDP*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

When the central bank intervenes on interest rates

Model specification

$$nim_{it} = \beta_0 + X_{it}\beta_j + \beta_5 state_{it} + \beta_6\, foreign_{it} + \beta_{j5} state_{it} * X_{it} + \beta_{j6}\, foreign_{it} * X_{it} + Z_t\beta_k + u_{it}$$

(X_{it}: bank-specific variables, Z_t: market and macro variables)

Variable		**Pool OLS**			**GLS random effects**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
OVERHEAD	β_1	1.191***	1.312***	1.327***	1.137***	1.258***	1.276***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.032***	0.036***	0.036***	0.018	0.021*	0.022**
		(0.007)	(0.002)	(0.002)	(0.111)	(0.050)	(0.041)
LOAN2ASSET	β_3	-0.014**	-0.014**	-0.014**	-0.014**	-0.014**	-0.014**
		(0.028)	(0.030)	(0.027)	(0.037)	(0.040)	(0.037)
CAP	β_4	0.066***	0.060***	0.061***	0.067***	0.061***	0.063***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE	β_5	0.455	1.159	1.185	-0.079	0.686	0.709
		(0.638)	(0.226)	(0.215)	(0.941)	(0.530)	(0.516)
FOREIGN	β_6	1.462*	1.670**	1.719**	1.080	1.410	1.473*
		(0.086)	(0.044)	(0.038)	(0.222)	(0.109)	(0.093)
STATE*OVERHEAD	β_{15}	0.235	0.102	0.083	0.294	0.095	0.073
		(0.425)	(0.723)	(0.773)	(0.343)	(0.756)	(0.811)
FOREIGN*OVERHEAD	β_{16}	-1.291***	-1.425***	-1.439***	-1.243***	-1.374***	-1.390***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE*RESERVE	β_{25}	-0.063	-0.103**	-0.104**	-0.045	-0.085*	-0.085*
		(0.196)	(0.033)	(0.032)	(0.328)	(0.061)	(0.059)
FOREIGN*RESERVE	β_{26}	0.125	0.136	0.130	0.146	0.149	0.143
		(0.271)	(0.218)	(0.236)	(0.168)	(0.139)	(0.157)
STATE*LOAN2ASSET	β_{35}	-0.001	-0.006	-0.005	0.0005	-0.003	-0.002
		(0.890)	(0.648)	(0.673)	(0.973)	(0.819)	(0.853)
FOREIGN*LOAN2ASSET	β_{36}	0.001	-0.002	-0.002	0.003	-0.003	-0.003
		(0.898)	(0.856)	(0.879)	(0.826)	(0.793)	(0.811)
STATE*CAP	β_{45}	-0.002	0.004	0.002	-0.001	0.007	0.005
		(0.898)	(0.805)	(0.878)	(0.941)	(0.710)	(0.783)
FOREIGN*CAP	β_{46}	-0.012	-0.001	-0.002	-0.010	0.001	-0.0005
		(0.492)	(0.948)	(0.875)	(0.595)	(0.935)	(0.979)
GDPR	β_7	0.247**	0.174	0.110	0.241**	0.165*	0.099
		(0.033)	(0.117)	(0.322)	(0.019)	(0.085)	(0.303)
INFLATION	β_8	0.056***			0.057***		
		(0.000)			(0.000)		
HHI	β_9		-0.0007***			-0.0007***	
			(0.000)			(0.000)	
M2GDP	β_{10}			0.011***			0.011***
				(0.000)			(0.000)
Constant	β_0	-0.930	0.656	-0.919	-0.648	0.967	-0.687
		(0.300)	(0.432)	(0.281)	(0.441)	(0.214)	(0.389)
$\beta_{15}+\beta_1=0$		1.426***	1.413***	1.410***	1.430***	1.353***	1.349***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{16}+\beta_1=0$		-0.099*	-0.113**	-0.112**	-0.106*	-0.115**	-0.114**
		(0.064)	(0.031)	(0.033)	(0.055)	(0.037)	(0.039)
$\beta_{25}+\beta_2=0$		-0.030	-0.067	-0.067	-0.026	-0.063	-0.062
		(0.521)	(0.155)	(0.154)	(0.557)	(0.154)	(0.155)
$\beta_{26}+\beta_2=0$		0.157	-.171	0.167	0.164	0.171*	0.165*
		(0.164)	(0.118)	(0.127)	(0.118)	(0.089)	(0.099)
$\beta_{35}+\beta_3=0$		-0.016	-0.020*	-0.020	-0.014	-0.017	-0.017
		(0.186)	(0.096)	(0.101)	(0.301)	(0.190)	(0.202)

$\beta_{36}+\beta_3=0$	-0.013	-0.016	-0.016	-0.011	-0.018	-0.017
	(0.329)	(0.191)	(0.198)	(0.405)	(0.175)	(0.179)
$\beta_{45}+\beta_4=0$	0.064***	0.064***	0.064***	0.065***	0.068	0.068***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\beta_{46}+\beta_4=0$	0.053***	0.059***	0.058***	0.056***	0.062***	0.062***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adj. R^2	0.571	0.596	0.598			
R^2 within				0.589	0.625	0.626
R^2 between				0.756	0.735	0.735
R^2 overall				0.603	0.625	0.626
N	193	193	193	193	193	193

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD* : ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *FOREIGN*: dummy variable for FOREIGN ownership – the dummy takes the value of one if FOREIGN shareholders hold more than 50% of total shares and zero otherwise; *STATE*: dummy variable for STATE ownership – the dummy takes the value of one if the government holds more than 50% of the bank's equity and zero otherwise; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDP*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

APPENDIX I: Determinants of the net interest margins of private banks

Model specification

$nim_{it} = \beta_0 + X_{it}\beta_j + Z_t\beta_k + u_{it}$ *(X_{it}: bank-specific variables, Z_t: market and macro variables)*

Variables		**Pool OLS**			**GLS fixed effects**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
OVERHEAD	β_1	1.013***	1.085***	1.079***	1.055***	1.124***	1.115***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.018*	0.013	0.014	0.016	0.010	0.012
		(0.074)	(0.181)	(0.150)	(0.109)	(0.272)	(0.206)
LOAN2ASSET	β_3	-0.004	-0.001	-0.0009	-0.003	0.001	0.002
		(0.273)	(0.759)	(0.828)	(0.531)	(0.726)	(0.647)
CAP	β_4	0.038***	0.033***	0.035***	0.015	0.017*	0.020**
		(0.000)	(0.000)	(0.000)	(0.147)	(0.080)	(0.042)
GDPR	β_7	0.150**	0.152**	0.132**	0.228***	0.232***	0.210***
		(0.025)	(0.018)	(0.038)	(0.000)	(0.000)	(0.000)
INFLATION	β_8	0.025**			0.023**		
		(0.032)			(0.017)		
HHI	β_9		-0.0007***			-0.0008***	
			(0.000)			(0.000)	
M2GDP	β_{10}			0.011***			0.012***
				(0.000)			(0.000)
Constant	β_0	0.072	1.076*	-0.843	-0.280	0.616	-1.490**
		(0.901)	(0.054)	(0.163)	(0.637)	(0.261)	(0.015)
adj. R^2		0.572	0.599	0.598	0.568	0.615	0.611
N		285	285	285	285	285	285

Dependent variable- *NIM (net interest margin)*: difference between interest income and interest expense to total average assets. *OVERHEAD*: ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDPR*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In absence of interest rate regulation

Model specification

$nim_{it} = \beta_0 + X_{it}\beta_j + Z_t\beta_k + u_{it}$ (X_{it}: *bank-specific variables,* Z_t: *market and macro variables)*

Variables		**Pool OLS**			**GLS fixed effects**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
OVERHEAD	β_1	1.027***	1.032***	1.030***	1.016***	1.025***	1.019***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	-0.016	-0.017	-0.016	-0.026	-0.026	-0.023
		(0.335)	(0.313)	(0.319)	(0.136)	(0.127)	(0.171)
LOAN2ASSET	β_3	0.003	0.003	0.004	0.002	0.003	0.004
		(0.576)	(0.500)	(0.452)	(0.735)	(0.570)	(0.490)
CAP	β_4	0.032***	0.032***	0.032***	0.032***	0.031***	0.033***
		(0.008)	(0.009)	(0.007)	(0.008)	(0.010)	(0.006)
GDPR	β_7	0.365**	0.200*	0.189*	0.594***	0.424***	0.414***
		(0.021)	(0.074)	(0.091)	(0.000)	(0.000)	(0.000)
INFLATION	β_8	0.031			0.033**		
		(0.130)			(0.019)		
HHI	β_9		-0.0004			-0.0005**	
			(0.115)			(0.012)	
M2GDP	β_{10}			0.009*			0.008**
				(0.099)			(0.017)
Constant	β_0	-1.781	0.415	-0.950	-3.376***	-1.136	-2.590***
		(0.212)	(0.689)	(0.373)	(0.001)	(0.173)	(0.003)
adj. R^2		0.670	0.670	0.671	0.766	0.768	0.767
N		155	155	155	155	155	155

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD*: ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDPR*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

When the central bank intervenes on interest rates

Model specification

$nim_{it} = \beta_0 + X_{it}\beta_j + Z_t\beta_k + u_{it}$ (X_{it}: *bank-specific variables,* Z_t: *market and macro variables)*

Variables		**Pool OLS**			**GLS fixed effects**		
		(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
OVERHEAD	β_1	1.192***	1.333***	1.349***	1.109***	1.249***	1.266***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RESERVE	β_2	0.032**	0.034***	0.035***	0.009	0.014	0.015
		(0.017)	(0.007)	(0.005)	(0.502)	(0.282)	(0.250)
LOAN2ASSET	β_3	-0.015**	-0.013*	-0.013*	-0.018*	-0.015*	-0.016*
		(0.043)	(0.064)	(0.058)	(0.078)	(0.094)	(0.082)
CAP	β_4	0.065***	0.058***	0.059***	0.031	0.038	0.044
		(0.000)	(0.000)	(0.000)	(0.282)	(0.162)	(0.111)
GDPR	β_7	0.161	0.119	0.046	0.100	0.070	-0.002
		(0.297)	(0.407)	(0.748)	(0.468)	(0.575)	(0.983)
INFLATION	β_8	0.054***			0.055***		
		(0.006)			(0.003)		
HHI	β_9		-0.0008***			-0.0009***	
			(0.000)			(0.000)	
M2GDP	β_{10}			0.013***			0.014***
				(0.000)			(0.000)
Constant	β_0	-0.346	1.114	-0.737	0.944	2.223**	0.184
		(0.766)	(0.285)	(0.496)	(0.420)	(0.034)	(0.868)
adj. R^2		0.481	0.534	0.534	0.321	0.419	0.411
N		130	130	130	130	130	130

Dependent variable- *NIM (net interest margin):* difference between interest income and interest expense to total average assets. *OVERHEAD*: ratio of overhead expenses to total assets; *RESERVE* : ratio of non-earning assets to total assets; *LOAN2ASSET*: ratio of loans to total assets; *CAP*: ratio of equity to total assets; *HHI*: the market concentration; *INFLATION*: the inflation rate; *GDPR*: the growth rate of the Gross Domestic Product; *M2GDP* : percentage of the ratio of money and quasi money supply to gross domestic product. *p*-values in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

CHAPTER 3

BANK CAPITAL AND BANK LENDING CHANNEL[23]

[23] This chapter is from an article titled: "Bank capital and bank lending channel: an empirical study of Vietnamese banks"

1. Introduction

In the money transmission mechanism, equity capital is generally not considered as a major component of the bank lending channel. Early studies analyze how monetary policy affects the role of reserves and their impact on the supply of loans, which can also be considered by determining the volume of demand deposits (Van-den-Heuvel, 2006). There are few studies that discuss the role of bank capital in the money transmission mechanism. For example, Ehmann et al (2001) assume that bank capital is linked to the level of loans; or Gambacorta and Mistrulli (2004) analyze the influence of bank capital on the response of lending to a change in monetary policy. In the presence of perfect capital markets, banks could raise funds continuously to adjust to the demand for loans and to comply with prudential regulation. But because of financial constraints on imperfect capital markets, banks face difficulties in increasing their funds (debt or equity). Consequently, bank lending capacities are reduced. Moreover, bank prudential regulations require banks to fund a certain proportion of their loans with equity capital. Hence, bank equity is expected to play an important role in the bank lending channel.

The aim of this chapter is to analyze the response of bank lending to monetary policy and also economic conditions changes and specifically the influence played by bank equity in such responses in the context of the Vietnamese banking system. Although Vietnamese regulators have not implemented the Basel accords strictly speaking, the central bank imposes minimum capital rules requiring banks to raise their equity level and capital ratios to prevent excessive risk-taking and to stabilize the banking system. Similarly to other transition economies, Vietnam has not developed its capital market and banks therefore face severe difficulties to raise funds (foreign debt and equity) to fulfill the capital requirements. Consequently the banking system can encounter severe problems if banks cannot increase their capital and reduce their loans to maintain a satisfactory prudential capital ratio. Besides, the bank lending channel plays an important role for economic development in Vietnam. The private sector has significantly evolved from the beginning of 2000s; new firms were family businesses and were of small size.

Our contributions in this chapter are the following. First, this is the first study on the role played by bank equity in the bank lending channel in Vietnam, a transition economy where the banking system has been affected by the centrally oriented regime for a long time. Second, it provides a deep analysis of the monetary transmission mechanism by using

individual bank data in Vietnam with more insightful implications than the aggregate data used in earlier studies.

The results indicate that bank lending negatively responds to a monetary policy change and interacts positively with GDP shocks. Specifically, bank equity -a proxy for bank capitalization- has a negative influence on loan growth suggesting that bank regulation might be a heavy burden for banks. By contrast, liquidity appears as a valuable internal financial source allowing banks to maintain, to some extent, their lending activities when they face a tighter monetary policy.

The chapter is organized as follows. Section 2 provides information on monetary policy and regulatory capital requirements in Vietnam. Section 3 discusses related literature and presents the methodology applied in this work. Section 4 describes the data and the variables used in the empirical investigation. Section 5 discusses the main results and reports robustness analysis. The last section concludes the chapter.

2. Monetary policy and capital requirements in Vietnam

Under the reforms of the financial system, Vietnam enacted the law of the central bank and another law for financial institutions in 1997, in which the central bank (the State Bank of Vietnam- SBV) announces a monthly prime rate (or the base interest rate as defined by the SBV). By law, the prime rate is defined as a monetary policy instrument to ease or to tighten monetary conditions. Additionally, the prime rate also plays another role as a base rate for financial institutions and banks to set their interest rates. The prime rate was officially implemented for the first time in 2000, and the last announcement of the SBV regarding the prime rate was in November 2010[24]. This rate has served until February 2011 and banks have since then set their interest rates by complying with other rules and namely ceiling rules regarding deposit rates[25].

Beside the prime rate, the SBV employs other monetary policy instruments to control the financial market: discount policy, open market operations and reserve requirements. The discount policy includes discount rates and refinance rates. These rates allow banks to access funds by quotas. The open market operations, which started in 2000, are recognized as the

[24] Circulation number 2868/QD-NHNN dated 29 November 2010.
[25] Circulation number 02/2011/TT-NHNN dated 03 March 2011 on the ceiling deposit rate for Vietnamese currency.

critical monetary instrument to control liquidity. The last instrument- reserve requirements- was considered as an important instrument for the demand for deposits.

Regarding capital regulation, the Vietnamese banking system had not applied the international standards until 2005. Indeed, the SBV issued the first bank prudential rules in August 1999 and then amended them in April 2005[26]. These capital regulations were not strictly applied until 2010 when the SBV required banks to record their capital ratios more frequently and to comply with minimum capital ratio rules[27]. Beyond capital ratio rules, the government also regulates the level of bank statutory capital according to bank ownership structures and specialized banking services. The first regulation was enacted in 1998 to prevent a chaos of the banking system after the financial crisis in Thailand in 1997. Most banks had increasing bad debts and were weakly capitalized (Pham and Vuong, 2009). The other statutory regulation was issued in 2006 to restructure the banking system and increase bank capacity and liability. Due to a cool down of the stock market from 2005 and the limitation on external funds, banks had not much choices to increase their capital other than to increase their equity. The favorite method of Vietnamese banks is to retain profits that are transferred to new shares for current shareholders and strategic investors (except for the 100% foreign banks which have to satisfy the statutory capital rule when established). Credit growth is therefore an important indicator to banks and the central bank. For this purpose the SBV plans annual targets for banks' credit growth.

3. Related literature and methodology

3.1 Related literature

Several studies focus on the impact of a tightening of monetary policy on bank lending (Bernanke and Gertler (1995); Guiso, Kashyap et al. (1999); Kashyap and Stein (2000); Ehrmann, Gambacorta et al. (2001)). Bernanke and Gertler (1995) argue that a monetary policy tightening typically influences interest rates which lead to a drop in real GDP and in the price level. They state that monetary policy hardly influences short-term interest rates. Angeloni, Mojon et al. (2002) study the monetary transmission mechanism in European countries from 1970 to 2000 with aggregated data and bank level data to see whether

[26] Circulation number 457/2005/QD-NHNN dated 19 April 2005 on the capital adequacy ratios of financial institutions.
[27] Circulation number 13/2010/TT-NHNN dated 20 May 2010 on prudential regulations for financial institutions.

monetary policy induced a change in the GDP as well as in bank loan supply. The results indicate that monetary policy negatively influences real price (CPI) and the GDP, and the responses of loan volumes are different among countries; Ireland has a positive response of loan volume to monetary policy, while other countries have negative effects. Cottarellí, Ferrí et al. (1995) employ the inflation and the prime rates to analyze the influence of monetary policy on the bank lending rate in Italy by using aggregated data. They find that the inflation and prime rates have positive effects on bank lending rates in Italy. Using data on Europe, Altunbas, Fazylov et al. (2002) also show that monetary shocks significantly impact on loan supply and real output.

In a theoretical study, Thakor (1996) investigates the relationship between loans, capital requirements and monetary policy by analyzing banks' behavior. Banks decide their loans based on the risks they might endure and the regulations that they have to comply with. Gale (2010) explains that the minimum capital requirement is an important rule to prevent excessive risk-taking of banks' executives and this type of regulation is also recognized as a stabilizing factor for the financial sector. Indeed, he argues that the charter values (equity) reflect the amount of loans banks can supply. He indicates that raising the deposit rate or lowering the loan rate has the effect of lowering bank charter values. In other words, this can explain the presence of bank capital in the monetary transmission mechanism, in which the tightening of monetary policy causes a fall in bank profits. Under the context of bank capital regulations, banks might raise their capital to meet the capital requirements. In presence of an imperfect market of bank equity, banks choose to reduce their loan portfolio when issuing new shares is costly (Thakor, 1996; Bolton and Freixas, 2000 and Gale and Ozgur, 2005). Banks attempt to shift their risks to firms when their charter value declines and this forces the government to impose a minimum capital requirement to prevent excessive risk-taking. More precisely, Peydró (2010), in a discussion of Bernanke and Gertler (1995)'s article, definitely points out that bank capital can affect bank lending and correlates with the business cycle.

Recent studies on the monetary transmission mechanism have focused on the bank lending (or credit) channel by taking into consideration the role of bank capital. Such studies analyze the response of bank lending to monetary policy - as well as to changes in economic conditions - for banks with different levels of capital (Bolton and Freixas, 2000; Ruby and Opiela, 2000; Emann et al., 2001; Gambacorta and Mistrulli, 2004; Van-den-Heuvel, 2006). Ruby and Opiela (2000) employ a sample of 13,042 banks in the US from 1980 to 1995. They focus on the equity to total assets ratio and form different groups of banks based on their

capital ratio - undercapitalized (ratio<8%), adequately capitalized (8% ≤ ratio <10%) and well-capitalized (ratio≥ 10%). The results show that the better banks are capitalized, the lower is the reaction of bank lending to monetary policy. Van-den-Heuvel (2006) also uses the same classification of banks to analyze the bank capital channel. By emphasizing capital market imperfections, he shows that monetary policy can effectively change the supply of bank loans through its impact on bank equity. For low-capitalized banks, the impact of monetary policy is delayed but the impact of monetary policy shocks on lending is larger than for well-capitalized banks. In a theorical study of the monerary transmission mechanism Bolton and Freixas (2006) also argue that banks issue new equity only if the loan rate exceeds the cost of increasing equity. Ehrmann et al. (2001) analyze the bank lending channel in Europe (France, Germany, Italy and Spain) and do not find a significant influence of bank capital (the ratio of equity to total assets) on the response of bank lending to monetary policy, GDP and real prices. The results indicate that capitalisation does not play an important role in distinguishing banks' reactions. Gambacorta and Mistrulli (2004), using a sample of Italian banks, analyze the effects of capital on banks' response to various economic shocks. Their results indicate that bank capital influences the way banks react to GDP shocks. Bank capital matters in the propagation of different types of shocks to lending because of the presence of regulatory capital constraints and imperfections in the equity market.

The monetary transmission mechanism in Vietnam is rarely studied. Le and Pfau (2009) and Nguyen (2012) analyze monetary transmission to the economy by using aggregate data. Another study, by Pham (2014), investigates the determinants of bank lending behavior in Vietnam by considering individual bank data. More specifically, Pham (2014) looks into both lending growth and deposit growth of 39 commercial banks in Vietnam during the 2008-2012 period. His conclusion is that loan growth is determined by economic growth and the government bond rate. Moreover, equity growth has a critical effect on state-owned banks and the liquidity constraint is significant to explain loan supply in private banks in Vietnam. However, the role played by bank equity in the bank lending channel in Vietnam is not analyzed in his study.

3.2 Methodology

In line with Stephen and Glenn (1995), Kashyap and Stein (1994), Gambacorta and Mistrulli (2004); Gambacorta and Marques-Ibanez (2011), Bolton and Freixas (2000), we design a framework to test whether banks with different capitalization react differently to

monetary policy and to GDP shocks. Whereas Stephen and Glenn (1995) consider that the monetary transmission mechanism is affected by bank debt and the monetary policy conducted in the previous period, other studies consider more macro environment variables and bank specific variables to examine the effect of monetary policy on the bank lending channel and the responses of bank lending to shocks on other factors. Moreover, as Berrospide and Edge (2010) and Peydró (2010), we incorporate the interaction of the capital ratio with the real price (inflation) and the business cycle. As in Ehrmann et al., (2001) and Gambacorta and Mistrulli (2004), we consider the lagged value of the bank specific-variables to avoid an endogeneity bias.

The empirical model is defined as followed:

$$\Delta lgloan_{it} = \alpha_i + \beta_1 \Delta lgloan_{it-1} + \beta_2 \Delta MP_t + \beta_3 inflation_t + \beta_4 gdp_t + \beta_5 cap_{t-1} + \beta_6 cap_{t-1} * \Delta MP_{t-1} + \beta_7 cap_{t-1} * inflation_{t-1} + \beta_8 cap_{t-1} * gdp_{t-1} + \delta_j X_{jit-1} + \varepsilon_{it} \quad \text{(Model A)}$$

with i=1,…,N (N=number of banks) and t=1,…,T (T= number of years)

$\Delta lgloan_{it}$= change in the natural logarithm of loans of bank i in year t

MP_t=monetary policy indicator. Previous studies use rates that are set by an authorized department (central banks). We employ the monthly base rate (or the prime rate) which is set by the Vietnamese State Bank. It is expected to have a negative effect on loan growth (Ehrmann et al., 2001, Gambacorta and Mistrulli, 2004).

gdp_t= growth rate of the Gross Domestic Product.

$inflation_t$= inflation rate

Inflation and the growth rate of GDP are used to control for loan demand effects. A rise in inflation can cause a higher bank lending rate, under the risk-averse hypothesis; banks will narrow down their loan growth to prevent losses. The loan growth should be negatively linked with the inflation rate and positively with the growth rate of GDP.

cap_{it}= measure of capital of bank i at year t.

Because of missing data, instead of using the capital adequacy ratios we consider the equity to total assets ratio. The Vietnamese central bank imposes equity to remain at a certain level if banks want to expand their credit services. Thus, the expected relationship with loan growth is positive. The capital indicator is normalized with respect to the average across all banks in the

sample in order to obtain a variable that sums to zero over all observations (Ehrmann et al., 2001; Gambacorta and Mistrulli, 2004):

$$cap_{it} = \frac{equity_{it}}{Totalassets_{it}} - \frac{1}{T}\left(\sum_t \left(\frac{1}{N_t}\sum_i \frac{equity_{it}}{Totalassets_{it}}\right)\right) \qquad (1)$$

This leads to the averages of the interaction terms $cap_{t-1} * \Delta MP_{t-1}$, $cap_{t-1} * \text{inflation}_{t-1}$ and $cap_{t-1} * gdp_{t-1}$ to be equal to zero. The coefficients β_2, β_3 and β_4 will be interpretable as the average effects of monetary policy, inflation and GDP, respectively. We assume that the coefficients of the interaction terms are positive because banks with a larger capital ratio should react less strongly to a monetary policy change and inflation and more strongly to GDP shocks.

X_{jit}= control variables of bank *i* at year *t*. The set of control variables includes a size indicator given by the log of total assets and a liquidity indicator defined as the ratio of liquid assets to total assets. Banks can use their liquidity as an internal temporary source to maintain their loans (Ruby and Opiela, 2000). Hence, the expected influence of bank liquidity on the bank lending channel is positive. For the same reason as for the capital indicator, the liquidity indicator is normalized with respect to its average across all banks in the sample. Size is normalized with respect to the mean of each single period to remove trends (if present) due to the fact that size is measured in nominal values.

$$size_{it} = \log Totalassets_{it} - \frac{1}{N_t}\sum_i \log Totalassets_{it} \qquad (2)$$

$$liq_{it} = \frac{liquidity_{it}}{TA_{it}} - \frac{1}{T}\left(\sum_t \left(\frac{1}{N_t}\sum_i \frac{liquidity_{it}}{TA_{it}}\right)\right) \qquad (3)$$

Table 1 gives the description of the variables and the expected effects.

Table 1: Variables and expected effects

Variables	Description	Expected effects
lgloan	Log of loans	
cap	Normalized ratio of equity to total assets	+
liq	Normalized ratio of liquid assets to total assets	+
size	Normalized log of total assets	+
Gdp	Growth rate of Gross Domestic Product	+
inflation	The inflation rate	+or-
MP	The monetary policy rate- annual mean of the monthly prime rate	-
cap*MP	Interaction term among cap variable and monetary policy	+
cap*gdp	Interaction term among cap variable and gdp	+
cap*inflation	Interaction term among cap variable and inflation	+
liq*MP	Interaction term among liquidity and monetary policy	+
size*MP	Interaction term among size and monetary policy	+

In addition, we add other specifications as introduced in Ehrmann et al. (2001). Bank size and bank liquidity are interacted with the monetary policy variable in order to allow for asymmetric responses of bank lending to monetary policy depending on these characteristics.

With these interaction terms, we can test whether bank size and bank liquidity magnify the influence of monetary policy on bank lending.

Model A can be re-written as follows (namely Model (B)):

$$\Delta lgloan_{it} = \alpha_i + \beta_1 \Delta lgloan_{it-1} + \beta_2 \Delta MP_t + \beta_3 inflation_t + \beta_4 gdp_t + \beta_5 cap_{t-1} + \beta_6 cap_{t-1} * \Delta MP_{t-1} + \beta_7 cap_{t-1} * inflation_{t-1} + \beta_8 cap_{t-1} * gdp_{t-1} + \delta_j X_{jit-1} + \kappa_j X_{jit-1} * \Delta MP_{t-1} + \varepsilon_{it}$$

where κ_j are the coefficients of the interaction terms of size and liquidity with the monetary policy variable. The interaction terms of the two bank specific variables (size and liquidity) are introduced separately in order to measure the effects of each variable on bank lending[28]. Following the literature, we assume that small or less liquid banks react more strongly to the monetary policy change than a bank with a high value of the respective bank characteristic. We thus expect positive coefficients on the interaction terms.

[28] See details in Ehrmann et al. (2001) and Gambacorta and Mistrulli (2004).

The models are estimated using the GMM estimator by Arellano and Bover (1995) and Blundell and Bond (1998). The estimation procedure is the two-step system GMM with the Windmeijer (2005) correction for the standard errors.

4. Data

Our sample consists of 43 banks from 2000 to 2011. It accounts for 90% of the total assets of the Vietnamese banking industry. Individual bank data are collected from the bank annual reports and BankScope. The macro variables are from the World Bank Indicator database, the prime rate is the annual mean of monthly prime rates available on SBV's website.

Table 2a: Descriptive statistics

Variables	Mean	Std. Dev.	Min	Max
lgloan	8.712	1.706	4.843	12.949
liquid2ta (%)	32.140	15.434	2.651	85.188
equity2ta (%)	12.733	9.753	-0.699	67.803
lgTA	9.372	1.698	1.658	13.19
Gdp (%)	7.055	1.009	5.32	8.48
Inflation (%)	8.665	6.731	-1.7	23.1
Baserate (%)	8.326	1.266	7.091	11.682

lgloan: log of loans, *liquid2ta*: ratio of liquid assets to total assets, *equity2ta*: ratio of equity to total assets, *lgTA*: log of total assets, *gdp*: the growth rate of Gross Domestic Product, *inflation*: inflation rate (or real price), *baserate*: the prime rate/monetary policy rate.

Table 2b: Descriptive statistics of bank-specific variables over year

Year	Banks	Statistics	lgloan	liquid2ta	equity2ta	lgTA
2000	21	Mean	7.231	33.324	15.635	7.918
		Std. Dev.	*1.663*	*21.985*	*15.625*	*1.606*
2001	22	Mean	7.437	34.879	13.035	8.091
		Std. Dev.	*1.629*	*20.306*	*13.139*	*1.572*
2002	25	Mean	7.592	29.993	11.775	8.134
		Std. Dev.	*1.585*	*17.017*	*9.931*	*1.557*
2003	25	Mean	7.930	30.603	9.548	8.455
		Std. Dev.	*1.527*	*15.400*	*4.845*	*1.488*
2004	27	Mean	8.179	34.274	9.241	8.713
		Std. Dev.	*1.460*	*16.667*	*4.738*	*1.405*
2005	29	Mean	8.325	34.258	10.625	8.876
		Std. Dev.	*1.530*	*16.183*	*7.833*	*1.516*
2006	34	Mean	8.403	40.018	14.552	9.084

		Std. Dev.	*1.573*	*16.017*	*10.423*	*1.472*
2007	35	Mean	9.147	37.828	10.962	9.879
		Std. Dev.	*1.323*	*16.403*	*4.101*	*1.194*
2008	38	Mean	9.125	29.960	16.096	9.825
		Std. Dev.	*1.437*	*13.387*	*10.949*	*1.332*
2009	41	Mean	9.505	27.118	14.325	10.156
		Std. Dev.	*1.306*	*11.189*	*11.111*	*1.282*
2010	38	Mean	9.817	27.253	13.233	10.567
		Std. Dev.	*1.475*	*8.663*	*10.029*	*1.453*
2011	28	Mean	10.049	28.407	12.006	10.871
		Std. Dev.	*1.493*	*9.234*	*8.039*	*1.525*

lgloan: log of loans, *liquid2ta*: ratio of liquid assets to total assets, *equity2ta*: ratio of equity to total assets, *lgTA*: log of total assets, *gdp*: the growth rate of Gross Domestic Product, *inflation*: inflation rate (or real price), *baserate*: the prime rate.

Table 2a gives the descriptive statistics of the main bank specific variables. The mean value of the equity to total assets ratio is above 12% and the liquid assets ratio around 30%. There is one bank that presents a negative ratio of the ratio of equity to total assets. This bank's annual report indicates that it is a specialized state-owned bank serving the government's poverty program mainly in the agricultural sector and rural areas. This bank endured severe losses in 2001 and 2002 and was bailed out by the government.

The descriptive statistics of bank specific variables are also given by year in Table 2b. Because size exhibits a trend, the variable introduced in the regressions is normalized based on the formula introduced in the previous section (equation 2)).

Table 3: Correlation matrix between bank specific variables and macroeconomic variables

	Δlgloan	liq	size	cap	ΔMP	gdp	inflation
Δlgloan	1						
liq	0.114	1					
size	-0.119	-0.131	1				
cap	-0.028	0.099	-0.616	1			
ΔMP	-0.208	0.035	0.018	-0.039	1		
gdp	0.223	0.235	-0.001	-0.135	0. 264	1	
inflation	-0.214	-0.076	0.029	0.043	0.618	-0. 338	1

Δlgloan : The loan growth, *liq*: ratio of liquid assets to total assets (normalized), *size*: log of total assets (normalized), *cap*: ratio of equity to total assets (normalized), ΔMP : change of monetary policy/prime rate, *gdp*: growth rate of Gross Domestic Products, *inflation*: inflation rate/real price.

As mentioned above, to avoid endogeneity problems, we employ the lag of bank specific variables. Tables 3 present the correlation matrices of the variables introduced in the regressions[29].

5. Results

5.1 Empirical results

The baseline estimation is defined as in model A in the previous section and we also conduct additional estimations (namely Liquidity, Size, and Liquidity and Size based on the model B) by adding interaction terms between monetary policy and liquidity or between monetary policy and size or between monetary policy and size and liquidity, respectively. The results are shown in Table 4.

Table 4: Responses of bank lending channel

Model specification:

Model A:

$$\Delta \text{lgloan}_{it} = \alpha_i + \beta_1 \Delta \text{lgloan}_{it-1} + \beta_2 \Delta MP_t + \beta_3 \text{inflation}_t + \beta_4 gdp_t + \beta_5 cap_{t-1} + \beta_6 cap_{t-1} * \Delta MP_{t-1} + \beta_7 cap_{t-1} * \text{inflation}_{t-1} + \beta_8 cap_{t-1} * gdp_{t-1} + \beta_9 liq_{it-1} + \beta_{10} size_{it-1} + \varepsilon_{it}$$

Model B

$$\Delta lgloan_{it} = \alpha_i + \beta_1 \Delta lgloan_{it-1} + \beta_2 \Delta MP_t + \beta_3 inflation_t + \beta_4 gdp_t + \beta_5 cap_{t-1} + \beta_6 cap_{t-1} * \Delta MP_{t-1} + \beta_7 cap_{t-1} * inflation_{t-1} + \beta_8 cap_{t-1} * gdp_{t-1} + \delta_j X_{jit-1} + \kappa_j X_{jit-1} * \Delta MP_{t-1} + \varepsilon_{it}$$

Variables	Model A	Model B		
		Liquidity	Size	Liquidity and Size
L. Δlgloan	0.039	0.058	0.058	0.044
	(0.034)	(0.045)	(0.050)	(0.079)
L.liq	0.011***	0.011***	0.010***	0.012***
	(0.001)	(0.002)	(0.001)	(0.002)
L.size	-0.138***	-0.129***	-0.153***	-0.120*
	(0.039)	(0.041)	(0.022)	(0.070)
ΔMP	-0.042***	-0.046***	-0.039***	-0.044***
	(0.005)	(0.008)	(0.007)	(0.008)
gdp	0.083***	0.082***	0.079***	0.079***
	(0.014)	(0.016)	(0.015)	(0.016)

[29] As shown in Table 3, some correlations between variables are above 50%- size with capitalization, and monetary policy with inflation. We drop size or inflation in the estimations as a robustness test to ensure that these correlations do not influence the main results (see section 5.2.).

inflation	-0.004	-0.003	-0.006*	-0.004
	(0.003)	(0.003)	(0.004)	(0.003)
L.cap	-0.066***	-0.062***	-0.068***	-0.062***
	(0.019)	(0.021)	(0.024)	(0.023)
L.cap* ΔMP	-0.144	-0.232*	-0.162	-0.261*
	(0.112)	(0.122)	(0.112)	(0.135)
L.cap*gdp	101.840***	93.122***	106.258***	94.587***
	(26.90)	(29.57)	(32.92)	(34.34)
L.cap*inflation	0.059	0.077	0.040	0.077*
	(0.042)	(0.049)	(0.039)	(0.046)
L.liq* ΔMP		0.084***		0.084***
		(0.023)		(0.019)
L.size* ΔMP			-0.002	-0.002
			(0.002)	(0.003)
Constant	-0.110	-0.126	-0.065	-0.096
	(0.118)	(0.139)	(0.129)	(0.154)
Sargan (χ^2)	27.654	28.410	29.928	27.743
p-value	0.995	0.994	0.989	0.995
AR(1) (z-score)	-3.245	-2.714	-3.397	-2.460
p-value	0.001	0.007	0.001	0.013
AR(2) (z-score)	-1.083	-1.066	-0.965	-1.047
p-value	0.278	0.286	0.334	0.295
N	271	271	271	271

X_{jit-1}**:** represents liquidity or size or both liquidity and size, Δlgloan : the loan growth, *liq*: ratio of liquid assets to total assets (normalized), *size*: log of total assets (normalized), *cap*: ratio of equity to total assets (normalized), ΔMP : change of monetary policy/prime rate, *gdp*: growth rate of Gross Domestic Product, *inflation*: inflation rate/real price. *Sargan:* the test of overidentifying restrictions, *AR(#):* autocorrelation tests in 1 and 2 order, p-value in italics. Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Consistent with earlier studies (Farinha and Robalo Marques, 2001, Gambacorta and Mistrulli, 2004, Gambacorta and Marques-Ibanez, 2011, Ehrmann et al., 2001, Chatelain, Ehrmann et al., 2001), the results reflect a monetary policy tightening negatively impacts loan supply. A tighter monetary policy reduces banks' financial sources for lending grants and banks need to narrow down their loan growth rate due to an increase in funding cost. With a limitation of funding sources, Vietnamese banks mostly depend on the interbank market and the primary market for their funding. If the monetary policy changes, banks ought to use their internal financial sources- liquidity or bank capitalization (equity) to maintain their operations. At the macro level, it also reflects that the central bank can use the interest rate instrument to drive the economy periodically via the lending channel. For example, if the credit expansion is too high due to the low interest rate or due to the high consumption, a tightening policy can be implemented to cool down the economy and reduce the risk-taking of banks. Although there are some insignificant estimated coefficients of the interaction between capitalization and monetary policy ($cap*\Delta MP$), when it is significant the signs are negative-

contrary to the expected sign. It suggests that lending might react more importantly to monetary changes for banks with a higher level of capitalization.

In the additional estimations, the interaction term between monetary policy and size is not significant, as in Ehrmann et al (2001) size is not a useful indicator for the bank lending channel. For the interaction term between monetary policy and liquidity ($liq^{*}\Delta MP$), the results indicate that banks with higher level of liquidity can shield their loan portfolio better than banks with a lower level of liquidity. It can be stated that lending activities of banks with higher liquidity ratios are less affected by a tighter monetary policy; this is consistent with standard results in the monetary transmission channel literature.

The positive coefficient of *gdp* shows that an increase in GDP leads banks to extend their loans as it produces a loan demand shift. Vietnam has reformed and boosted its economy from 2000 with GDP growth of around 6-7% per year; and as mentioned in the first section of this chapter, private enterprises have low capitalization and mostly need more financial sources to expand their business. Consequently, banks have benefited from such trends. Another macro variable, inflation, shows an insignificant coefficient. The results show a high and stable positive coefficient of the interaction term $cap^{*}gdp$. This reflects that the credit supply of banks with lower capitalization is less influenced by the economic shock, while the interaction term between capitalization and the real price ($cap^{*}\text{inflation}$) is not significant in all estimations.

In terms of bank specific variables, the results obtained for the size and capitalization (cap) variables are not the expected ones as the coefficients are negative. These unexpected results are not due to correlation issues. Indeed, if we drop the size (capitalization) variable, capitalization (size) is still negatively and significantly related to loan growth (section 5.2.). There is one reason which can explain the negative impact of size on lending growth in Vietnam: the loan supply is the most important part of the activity of small banks whereas bigger banks can diversify their operations and bank services. It probably explains the negative effect of size on bank lending. For capitalization, as mentioned above, banks with a higher capital ratio are more influenced by monetary policy in Vietnam, but the loan growth seems to be higher for banks with a lower capital ratio. As mentioned in the preceding section, capitalization (cap) reflects the intensity of prudential regulation and reduces risk-taking incentives of banks' executives. In Vietnam, banks have to firmly fulfill their statutory capital as scheduled by the government and they do not have much external funding sources. Banks increase their capital via retained profits and via new issuance of shares. But in the

meantime, under the context of risk-aversion, they need to shield their capital by preventing riskier loans. Banks increase their capitalization but loan growth is reduced; there is a negative effect of *cap* on bank lending. Besides, in Vietnam, the stock market is young and unstable and has fluctuated dramatically over the 2005-2008 period. Banks have difficulties to access foreign credit that is restricted under bank regulations. In this context, banks' shareholders are careful to protect themselves with low risk loan portfolio.

Concerning liquidity (*liq*), its effect is as expected and it implies that banks can use liquidity to maintain their loan portfolio. Banks use liquidity as an internal source after a monetary policy tightening.

In conclusion, bank lending negatively responds to a monetary change and banks with higher capital ratios might be more influenced by monetary changes than banks with lower capital ratios. Also, economic shocks are identified as important determinants of bank loan responses but banks with lower capitalization are less influenced by the business cycle. As bank specific variables, liquidity plays an important role as an internal funding tool to maintain bank lending when there is a monetary policy tightening. Capital regulation is necessary to avoid excessive risk-taking but higher capitalization has a negative influence on bank loan growth.

5.2 Further issues and robustness analysis

In this section, we perform several robustness tests to check the stability of our results and investigate further issues.

In the first robustness analysis, due to the presence of correlations among *cap* and *size* and among ΔMP and *inflation*, we run different regressions in which we exclude *size* or *inflation* or both *size* and *inflation* to see whether these correlations can generate unstable results for the response of bank lending channel to monetary policy and bank capitalization. Results are presented in table 5 in which column (1) and (4) exclude size and inflation, column (2) and (5) drop size and column (3) and (6) exclude inflation. We obtain similar results. Monetary policy tightening leads to a reduction in loan growth, the interaction term between capitalization and monetary policy is negative and significant from column (3) to (6), and the interaction between liquidity and monetary policy still shows a positive effect. There is a change for the inflation variable which becomes significant at the highest critical value (1%) in columns (2) and (5) while it is not significant or only at 10% in our main analysis. The lagged dependent variable becomes also significant in four columns.

Table 5: Response of banking lending channel after dropping size or inflation or both variables

Model specification:

Model A:

$$\Delta \text{lgloan}_{it} = \alpha_i + \beta_1 \Delta \text{lgloan}_{it-1} + \beta_2 \Delta MP_t + \beta_3 \text{inflation}_t + \beta_4 gdp_t + \beta_5 cap_{t-1} + \beta_6 cap_{t-1} * \Delta MP_{t-1} + \beta_7 cap_{t-1} * \text{inflation}_{t-1} + \beta_8 cap_{t-1} * gdp_{t-1} + \beta_9 liq_{it-1} + \beta_{10} size_{it-1} + \varepsilon_{it}$$

Model B

$$\Delta lgloan_{it} = \alpha_i + \beta_1 \Delta lgloan_{it-1} + \beta_2 \Delta MP_t + \beta_3 inflation_t + \beta_4 gdp_t + \beta_5 cap_{t-1} + \beta_6 cap_{t-1} * \Delta MP_{t-1} + \beta_7 cap_{t-1} * inflation_{t-1} + \beta_8 cap_{t-1} * gdp_{t-1} + \delta_j X_{jit-1} + \kappa_j X_{jit-1} * \Delta MP_{t-1} + \varepsilon_{it}$$

Variables	**Model A**			**Model B**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
L. Δlgloan	0.135***	0.111***	0.080***	0.159***	0.029	0.079
	(0.033)	(0.038)	(0.018)	(0.041)	(0.060)	(0.048)
L.liq	0.006***	0.008***	0.009***	0.007***	0.014***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
L.size			-0.155***			-0.153***
			(0.032)			(0.024)
ΔMP	-0.058***	-0.042***	-0.052***	-0.062***	-0.035***	-0.053***
	(0.002)	(0.006)	(0.002)	(0.004)	(0.007)	(0.003)
gdp	0.117***	0.087***	0.096***	0.113***	0.070***	0.098***
	(0.005)	(0.014)	(0.006)	(0.008)	(0.015)	(0.006)
inflation		-0.007***			-0.009***	
		(0.002)			(0.002)	
L.cap	-0.060***	-0.036**	-0.067***	-0.055***	-0.050**	-0.055***
	(0.013)	(0.016)	(0.014)	(0.016)	(0.021)	(0.016)
L.cap* ΔMP	-0.054	-0.046	-0.037*	-0.088*	-0.200*	-0.071***
	(0.045)	(0.089)	(0.019)	(0.047)	(0.119)	(0.025)
L.cap*gdp	105.836***	70.859***	106.091***	98.669***	89.224***	92.575***
	(19.74)	(21.38)	(18.70)	(24.14)	(26.27)	(21.13)
L.cap*inflation		-0.005			0.043	
		(0.039)			(0.041)	
L.liq* ΔMP				0.088***	0.077***	0.077***
				(0.015)	(0.016)	(0.020)
Constant	-0.440***	-0.173	-0.245***	-0.422***	0.012	-0.285***
	(0.038)	(0.114)	(0.048)	(0.053)	(0.142)	(0.046)
Sargan (χ^2)	32.565	30.062	31.075	31.712	25.092	31.130
	0.979	0.991	0.983	0.984	0.999	0.983
AR(1) (z-score)	-3.555	-3.514	-3.273	-3.455	-3.185	-3.206
	0.000	0.000	0.001	0.000	0.001	0.001
AR(2) (z-score)	-0.599	-0.631	-1.142	-0.661	-0.751	-1.148
	0.549	0.528	0.253	0.509	0.452	0.251
N	271	271	271	271	271	271

In the first column of each model (column (1) and (4)), we drop both size and inflation variables. (2) and (5) are estimated without the size variable. The inflation variable is not included in (3) and (6). X_{jit-1}**:** represents

liquidity or size or both liquidity and size, Δlgloan : the loan growth, *liq*: ratio of liquid assets to total assets (normalized), *size*: log of total assets (normalized), *cap*: ratio of equity to total assets (normalized),, ΔMP : change of monetary policy/prime rate, *gdp*: growth rate of Gross Domestic Products, *inflation*: inflation rate/real price. *Sargan:* the test of overidentifying restrictions, *AR(#):* autocorrelation tests in 1 and 2 order, p-value in italics. Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Second, as the lagged dependent variable is not significant in the main analysis, we drop this variable from the model in the table 6. Results are consistent with those previously obtained in the main analysis.

Table 6: Response of the bank lending channel without the presence of the previous growth rate of loans as independent variable

Model specification:

Model A:

$$\Delta \text{lgloan}_{it} = \alpha_i + \beta_1 \Delta MP_t + \beta_2 \text{inflation}_t + \beta_3 gdp_t + \beta_4 cap_{t-1} + \beta_5 cap_{t-1} * \Delta MP_{t-1} + \beta_6 cap_{t-1} * \text{inflation}_{t-1} + \beta_7 cap_{t-1} * gdp_{t-1} + \beta_8 liq_{it-1} + \beta_9 size_{it-1} + \varepsilon_{it}$$

Model B:

$$\Delta lgloan_{it} = \alpha_i + \beta_1 \Delta MP_t + \beta_2 inflation_t + \beta_3 gdp_t + \beta_4 cap_{t-1} + \beta_5 cap_{t-1} * \Delta MP_{t-1} + \beta_6 cap_{t-1} * inflation_{t-1} + \beta_7 cap_{t-1} * gdp_{t-1} + \delta_j X_{jit-1} + \kappa_j X_{jit-1} * \Delta MP_{t-1} + \varepsilon_{it}$$

Variables	**Model A**	**Model B**		
		Liquidity	**Size**	**Liquidity and size**
L.liq	0.012***	0.011***	0.010***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)
L.size	-0.130***	-0.133***	-0.160***	-0.160***
	(0.033)	(0.044)	(0.050)	(0.031)
ΔMP	-0.035***	-0.043***	-0.041***	-0.039***
	(0.006)	(0.004)	(0.004)	(0.006)
gdp	0.072***	0.085***	0.087***	0.072***
	(0.015)	(0.014)	(0.013)	(0.017)
inflation	-0.006*	-0.003	-0.004	-0.005*
	(0.003)	(0.002)	(0.002)	(0.003)
L.cap	-0.051***	-0.066***	-0.052***	-0.052***
	(0.013)	(0.013)	(0.017)	(0.014)
L.cap* ΔMP	-0.109	-0.185	-0.065	-0.170
	(0.115)	(0.125)	(0.099)	(0.108)
L.cap*gdp	78.707***	104.557***	84.869***	83.536***
	(18.12)	(18.71)	(27.30)	(18.97)
L.cap*inflation	0.046	0.051	0.017	0.033
	(0.049)	(0.052)	(0.035)	(0.039)
L.liq* ΔMP		0.078***		0.064***
		(0.019)		(0.017)
L.size* ΔMP			-0.001	-0.003

			(0.002)	(0.002)
Constant	-0.000	-0.128	-0.125	-0.049
	(0.128)	(0.121)	(0.109)	(0.143)
Sargan (χ^2)	28.624	30.190	31.037	29.359
p-value	0.995	0.991	0.987	0.993
AR(1) (z-score)	-2.999	-2.943	-2.940	-2.945
p-value	0.003	0.003	0.003	0.003
AR(2) (z-score)	-1.221	-1.216	-1.334	-1.206
p-value	0.222	0.223	0.182	0.227
N	271	271	271	271

X_{jit-1}**:** represents liquidity or size or both liquidity and size, Δlgloan : the loan growth, *liq*: ratio of liquid assets to total assets (normalized), *size*: log of total assets (normalized), *cap*: ratio of equity to total assets (normalized), ΔMP : change of monetary policy/prime rate, *gdp*: growth rate of Gross Domestic Product, *inflation*: inflation rate/real price. *Sargan:* the test of overidentifying restrictions, *AR(#):* autocorrelation tests in 1 and 2 order, p-value in italics. Standard errors are in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Next, following Ehrmann et al. (2001), we add a new interaction term of monetary policy, liquidity and size (*liq*size*ΔMP*). This extended estimation is run to analyze whether the effect of liquidity depends on bank size (and vice-versa) when monetary policy changes. The table 8 presents results of these extended estimations. The lagged dependent variable has a positive effect on bank lending and the added term *liq*size*ΔMP* is not significant for all the estimations but when it is significant, the coefficient is negative which is consistent with Ehrmann et al. (2001)'s results for Germany. The result indicates that the effect of liquidity depends on bank size; it is stronger for smaller banks.

Table 7: Robustness analysis of the response of the bank lending channel with the interaction term of the monetary policy, liquidity and size.

Model specification:

Model A:

$$\Delta \text{lgloan}_{it} = \alpha_i + \beta_1 \Delta MP_t + \beta_2 \text{inflation}_t + \beta_3 gdp_t + \beta_4 cap_{t-1} + \beta_5 cap_{t-1} * \Delta MP_{t-1}$$
$$+ \beta_6 cap_{t-1} * \text{inflation}_{t-1} + \beta_7 cap_{t-1} * gdp_{t-1} + \beta_8 liq_{it-1} + \beta_9 size_{it-1} + \gamma liq_{it-1} * \text{size}_{t-1} * \Delta MP_{t-1} + \varepsilon_{it}$$

Model B:

$$\Delta lgloan_{it} = \alpha_i + \beta_1 \Delta MP_t + \beta_2 inflation_t + \beta_3 gdp_t + \beta_4 cap_{t-1} + \beta_5 cap_{t-1} * \Delta MP_{t-1}$$
$$+ \beta_6 cap_{t-1} * inflation_{t-1} + \beta_7 cap_{t-1} * gdp_{t-1} + \gamma\ liq_{it-1} * \text{size}_{t-1} * \Delta MP_{t-1} + \delta_j X_{jit-1} + \kappa_j X_{jit-1} * \Delta MP_{t-1} + \varepsilon_{it}$$

Variables	**Model A**	**Model B**		
		Liquidity	**Size**	**Liquidity and size**
L. Δlgloan	0.085***	0.110***	0.119***	0.132***
	(0.021)	(0.033)	(0.023)	(0.028)
L.liq	0.011***	0.009***	0.008***	0.008***
	(0.002)	(0.002)	(0.001)	(0.001)
L.size	-0.092**	-0.094*	-0.119***	-0.107**
	(0.043)	(0.049)	(0.029)	(0.042)
ΔMP	-0.042***	-0.057***	-0.053***	-0.055***
	(0.006)	(0.005)	(0.008)	(0.005)
gdp	0.078***	0.100***	0.100***	0.093***
	(0.015)	(0.0146)	(0.019)	(0.014)
inflation	-0.004	0.000	-0.001	-0.001
	(0.002)	(0.002)	(0.003)	(0.002)
L.cap	-0.053***	-0.038**	-0.034*	-0.028
	(0.019)	(0.018)	(0.020)	(0.029)
L.cap* ΔMP	-0.018	-0.014	-0.015	0.029
	(0.111)	(0.116)	(0.109)	(0.178)
L.cap*gdp	89.776***	71.860***	65.048**	64.659*
	(28.30)	(25.25)	(31.47)	(37.81)
L.cap*inflation	0.010	0.003	-0.009	-0.054
	(0.0414)	(0.045)	(0.030)	(0.073)
L.liq* ΔMP		0.093***		0.084***
		(0.026)		(0.019)
L.size* ΔMP			-0.006	-0.005*
			(0.004)	(0.002)
L.liq*size* ΔMP	$-4*10^{-4}$	$-2*10^{-4}$**	$-4*10^{-4}$**	$-6*10^{-4}$*
	$(2*10^{-4})$	$(1*10^{-4})$	$(2*10^{-4})$	$(2*10^{-4})$
Constant	-0.111	-0.323***	-0.319**	-0.282***
	(0.127)	(0.112)	(0.162)	(0.105)
Sargan (χ^2)	28.563	30.131	29.335	28.899
p-value	0.995	0.991	0.993	0.994
AR(1) (z-score)	-3.368	-3.245	-3.442	-3.311
p-value	0.001	0.001	0.000	0.001
AR(2) (z-score)	-1.040	-1.083	-1.009	-1.043
p-value	0.298	0.278	0.312	0.297
N	271	271	271	271

X_{jit-1}**:** represents liquidity or size or both liquidity and size, Δlgloan : the loan growth, *liq*: ratio of liquid assets to total assets (normalized), *size*: log of total assets (normalized), *cap*: ratio of equity to total assets (normalized), ΔMP : change of monetary policy/prime rate, *gdp*: growth rate of Gross Domestic Product, *inflation*: inflation rate/real price. Z_{it-1}: denotes the interaction term of liquidity and size. *Sargan:* the test of overidentifying restrictions, *AR(#):* autocorrelation tests in 1 and 2 order, p-value in italics. Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

We also follow Ehrmann et al. (2001) and add the interaction terms between liquidity or between size and gdp or inflation. Table 8 illustrates these further estimations.

Table 8: Response of the bank lending channel with the liquidity and size variables interacted with the GDP and inflation

Model specification:

$$\Delta \text{lgloan}_{it} = \alpha_i + \beta_1 \Delta \text{lgloan}_{it-1} + \beta_2 \Delta MP_t + \beta_3 \text{inflation}_t + \beta_4 gdp_t + \beta_5 cap_{t-1} + \beta_6 cap_{t-1} * \Delta MP_{t-1} + \beta_7 cap_{t-1} * \text{inflation}_{t-1} + \beta_8 cap_{t-1} * gdp_{t-1} + \beta_9 liq_{it-1} + \beta_{10} size_{it-1} + \beta_{14} size_{it-1} * \Delta MP_{t-1} + \beta_{15} size_{it-1} * \text{inflation}_{t-1} + \beta_{16} size_{it-1} * gdp_{t-1} + \varepsilon_{it}$$

$$\Delta \text{lgloan}_{it} = \alpha_i + \beta_1 \Delta \text{lgloan}_{it-1} + \beta_2 \Delta MP_t + \beta_3 \text{inflation}_t + \beta_4 gdp_t + \beta_5 cap_{t-1} + \beta_6 cap_{t-1} * \Delta MP_{t-1} + \beta_7 cap_{t-1} * \text{inflation}_{t-1} + \beta_8 cap_{t-1} * gdp_{t-1} + \beta_9 liq_{it-1} + \beta_{10} size_{it-1} + \beta_{11} liq_{it-1} * \Delta MP_{t-1} + \beta_{12} liq_{it-1} * \text{inflation}_{t-1} + \beta_{13} liq_{it-1} * gdp_{t-1} + \varepsilon_{it}$$

Variables	**Size**		**Liquidity**	
	(1)	(2)	(3)	(4)
L. Δlgloan	0.004	0.094*	0.111***	0.144***
	(0.064)	(0.050)	(0.032)	(0.035)
L.liq	0.011***	0.011***	0.073**	0.073***
	(0.002)	(0.001)	(0.023)	(0.023)
L.size	-0.080	-0.189	-0.095*	-0.143***
	(0.239)	(0.208)	(0.050)	(0.055)
ΔMP	-0.039***	-0.045***	-0.051***	-0.046***
	(0.007)	(0.007)	(0.007)	(0.006)
gdp	0.083***	0.100***	0.089***	0.085***
	(0.014)	(0.015)	(0.019)	(0.017)
inflation	-0.004	-0.006*	-0.001	-0.006*
	(0.002)	(0.003)	(0.004)	(0.003)
L.cap	-0.069***	-0.060**	-0.054	-0.043
	(0.026)	(0.025)	(0.034)	(0.027)
L.cap* ΔMP	-0.104	-0.016	-0.203	-0.121
	(0.141)	(0.130)	(0.179)	(0.127)
L.cap*gdp	109.567***	98.915***	87.416**	78.654**
	(36.65)	(36.78)	(41.75)	(39.05)
L.cap*inflation	0.027	-0.011	0.050	0.017
	(0.048)	(0.056)	(0.076)	(0.054)

L.liq* ΔMP			0.338**	0.280*
			(0.133)	(0.143)
L.liq*gdp			-0.008***	-0.008***
			(0.002)	(0.002)
L.liq*inflation			-0.090*	-0.072
			(0.047)	(0.052)
L.size* ΔMP	0.012	0.012*		
	(0.009)	(0.006)		
L.size*gdp	-0.006	0.000		
	(0.028)	(0.026)		
L.size*inflation	-0.007	-0.006*		
	(0.004)	(0.003)		
Constant	-0.070	-47.360***	-0.202	-37.721***
	(0.137)	(15.30)	(0.161)	(11.01)
Sargan (χ^2)	29.308	29.746	29.638	26.425
p-value	0.991	0.989	0.990	0.997
AR(1) (z-score)	-2.641	-3.009	-3.501	-3.502
p-value	0.008	0.002	0.000	0.000
AR(2) (z-score)	-1.159	-0.896	-0.951	-0.702
p-value	0.246	0.370	0.342	0.483
YEAR DUMMY	*NO*	*YES*	*NO*	*YES*
N	271	271	271	271

The model is estimated based on the model B. In the columns (2) and (4) the year dummies are added. X_{jit-1}: represents liquidity or size or both liquidity and size, Δlgloan: the loan growth, *liq*: ratio of liquid assets to total assets (normalized), *size*: log of total assets (normalized), *cap*: ratio of equity to total assets (normalized), ΔMP: change of monetary policy/prime rate, *gdp*: growth rate of Gross Domestic Product, *inflation*: inflation rate/real price. *Sargan:* the test of overidentifying restrictions, *AR(#):* autocorrelation tests in 1 and 2 order, p-value in italics. Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The results for the main variables do not change, although the estimated coefficients of size and capitalization are not significant in two estimations, but their signs remain as previously. The new terms are not significant in all estimations- except liq*gdp which has a negative and highly significant effect on bank lending. The significant coefficient of liq*gdp indicates that banks with higher ratios are less influenced by the business cycle.

Then, under the context of the government's umbrella for state-owned banks, we generate a dummy variable (*state*) that takes into account the government's shares in Vietnamese banks. It captures whether banks with state ownership are better off in terms of loan supply. The dummy *state* gets 1 if the government holds more than 50% of bank shares and zero otherwise. The results are shown in table 9.

Table 9: Response of the bank lending channel taking into account the presence of state ownership

Model specification:
Model A:

$$\Delta \text{lgloan}_{it} = \alpha_i + \beta_1 \Delta \text{lgloan}_{it-1} + \beta_2 \Delta MP_t + \beta_3 \text{inflation}_t + \beta_4 gdp_t + \beta_5 cap_{t-1} + \beta_6 cap_{t-1} * \Delta MP_{t-1} + \beta_7 cap_{t-1} * \text{inflation}_{t-1} + \beta_8 cap_{t-1} * gdp_{t-1} + \beta_9 liq_{it-1} + \beta_{10} size_{it-1} + \phi state_i + \varepsilon_{it}$$

Model B:

$$\Delta lgloan_{it} = \alpha_i + \beta_1 \Delta lgloan_{it-1} + \beta_2 \Delta MP_t + \beta_3 inflation_t + \beta_4 gdp_t + \beta_5 cap_{t-1} + \beta_6 cap_{t-1} * \Delta MP_{t-1} + \beta_7 cap_{t-1} * inflation_{t-1} + \beta_8 cap_{t-1} * gdp_{t-1} + \delta_j X_{jit-1} + \kappa_j X_{jit-1} * \Delta MP_{t-1} + \phi state_i + \varepsilon_{it}$$

Variables	**Model A**	**Model B**		
		Size	**Liquidity**	**Size and Liquidity**
L. Δlgloan	0.005	0.023	-0.028	0.012
	(0.061)	(0.041)	(0.058)	(0.048)
L.liq	0.011***	0.012***	0.013***	0.013***
	(0.002)	(0.001)	(0.003)	(0.002)
L.size	-0.148***	-0.069	-0.140**	-0.074
	(0.044)	(0.056)	(0.054)	(0.050)
State	-0.388*	-0.548*	-0.344	-0.712***
	(0.202)	(0.299)	(0.257)	(0.237)
ΔMP	-0.040***	-0.039***	-0.031***	-0.036***
	(0.009)	(0.007)	(0.010)	(0.006)
gdp	0.092***	0.085***	0.078***	0.073***
	(0.019)	(0.014)	(0.022)	(0.015)
inflation	-0.005	-0.005	-0.008**	-0.008**
	(0.004)	(0.003)	(0.004)	(0.003)
L.cap	-0.054**	-0.047**	-0.051**	-0.045**
	(0.017)	(0.021)	(0.025)	(0.021)
L.cap* ΔMP	-0.110	-0.161	-0.150	-0.225
	(0.115)	(0.120)	(0.141)	(0.146)
L.cap*gdp	84.944***	80.066***	80.262**	73.425**
	(23.89)	(27.44)	(32.52)	(28.54)
L.cap*inflation	0.040	0.039	0.057	0.055
	(0.046)	(0.052)	(0.063)	(0.058)
L.liq* ΔMP		0.072***		0.062***
		(0.026)		(0.022)
L.size* ΔMP			-0.001	-0.002
			(0.002)	(0.002)
Constant	-0.105	-0.055	0.055	0.053
	(0.182)	(0.127)	(0.199)	(0.133)
Sargan (χ^2)	27.470	28.625	28.459	26.710
p-value	0.994	0.991	0.992	0.996
AR(1) (z-score)	-2.478	-2.847	-2.612	-2.852
p-value	0.013	0.004	0.009	0.004

AR(2) (z-score)	-1.216	-1.061	-1.255	-0.975
p-value	0.224	0.288	0.209	0.329
N	271	271	271	271

X_{jit-1}**:** represents liquidity or size or both liquidity and size, Δlgloan : the loan growth, *liq*: ratio of liquid assets to total assets (normalized), *size*: log of total assets (normalized), *cap*: ratio of equity to total assets (normalized), ΔMP : change of monetary policy/prime rate, *gdp*: growth rate of Gross Domestic Product, *inflation*: inflation rate/real price. State: dummy variable that takes the value of one for banks in which the state holds at least 50% of shares. *Sargan:* the test of overidentifying restrictions, *AR(#):* autocorrelation tests in 1 and 2 order, p-value in italics. Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The results show for the main variables do not change and *state* is significant in three out of four estimations and the sign of its coefficient is negative. This can reflect the fact that the state-owned banks have lower loan growth due to a high competition with other types of banks.

6. Conclusion

This study focuses on the bank lending channel in Vietnam and the response of banks to capitalization/equity shocks under imperfect markets of debts and bank equity. There is a link between bank lending channel to the development of the private sector and the Vietnamese economy. Indeed, the development of the private sector contribute a certain development to Vietnam, the private firms/entrerprises are small and medium sizes, their demand for capital are large, but the markets of debts and equity are imperfect and those firms/enterprises cannot develop and the economy can be hearted thus banks are risky when they cannot fulfill their capital requirement for the loan growth and cannot prevent in an uncertain condition of the capital market. The results show that monetary policy is effective in influencing bank lending. Monetary policy is taken into account through the prime rate and negatively affects loan growth when there is any tightening policy. Besides, the bank lending channel is influenced not only by monetary policy but also by economic shocks.

Under the context of young markets, the Vietnamese banking market remains less developed while the reforms in 2000's firmly require banks to improve their capacities as well as their risk management. These reforms have given more challenges for banks since they have little experience and financial sources are limited. Capitalization is a necessary indicator to measure banks' health and to reduce bank executives' risk-taking incentives. Indeed, highly capitalized banks attempt to prevent riskier loans and reduce their loan growth. In line with earlier studies, liquidity appears as an important internal financial source to maintain bank

lending and it seems to be an important factor to maintain banks' credit supply when there is a monetary policy tightening.

The state-owned banks received supports from the government and have been defined as key-players in the Vietnamese banking market, but they lost their monopoly power due to a highly competitive market with new established banks and the entrance of foreign banks after the government lifted barriers to foreign banks and their branches from 2006. Consequently, state-owned banks have lower loan growth.

CONCLUDING CHAPTER

In the context of the economic development and the opening to foreign investors of specific sectors which were been protected by the government, the analysis of the banking industry in Vietnam is of particular interest. The banking system has some weaknesses and needs to be improved with time; there is a need to focus on bank efficiency and on implementing more reforms and restructuring programs to strengthen bank capacities. These are the main motivations of this dissertation. In this chapter, we provide the overall conclusions, implications of each finding, remarks and limitations of the dissertation.

At first, by studying the efficiency of domestic commercial banks in Vietnam, we show that ownership has a significant effect on bank efficiency, the presence of foreign investors or shareholders can be an opportunity for banks to gain experience from those investors or shareholders to improve their efficiency. Besides, foreign investors can also contribute to improving bank capital standards. The results indicate that state-owned banks are the less efficient banks, although their efficiency has improved over time to close the gap with private banks and banks with foreign shareholders. It implies that the privatization process is probably a motivation for state-owned banks to improve efficiency. Turning to the effects of the economic reforms on bank efficiency, banks did not benefit from the high economic growth rate over 2002-2005 due to their inefficient customers- small and medium enterprises and state-owned enterprises; or because they provided credits to some State programs. But over the period 2006-2009- the period of reforms, banks paid more attention to develop their infrastructures or new technology to improve their banking products and to compete with other banks. Consequently, banks benefited more from economic development. To have more incentives to improve bank efficiency and to make a transparent banking market in Vietnam, the support of the government should be reduced as well as their shares in the private banks and it might be argued that state-owned banks should be fully privatized. Turning to the bank regulations, banks can have more freedom to access foreign capital sources for their development and the regulations should be more focused on the enhancement of bank transparency and performance. The positive relationship found between bank capital and efficiency suggests that bank regulation should meet international capital standards to strengthen bank efficiency.

In the second chapter, we discuss the determinants of bank interest margins taking into account bank ownership type and the role played by the central bank in monitoring bank interest rates. In this chapter, we find that banks follow different strategies in their intermediation role. Private and state-owned banks attempt to transfer their operational costs

and extend their gap of interest rates to prevent losses while foreign banks have larger gaps if the reserve ratio is higher in absence of the interest rate regulation. It implies that banks have more power than their customers to negotiate interest rates. To balance the relationship between banks and customers, the central bank plays an important role and it should monitor the interest rates and fees applied to customers strictly. Besides, prudential regulation needs to focus on each tier of capital, liquidity and non-performing loans to reduce excessive risk-taking of bank executives in absence of the central bank's intervention on the interest rates.

In the last chapter, we analyze the bank lending channel and the response of banks to capitalization/equity shocks under imperfect market of debts and bank equity. More precisely, the bank lending channel is affected negatively by a tighter monetary policy and it also indicates that bank capital is a necessary factor to prevent excessive risk taking of banks' executives; banks with higher capital ratios attempt to reduce the riskier loans. Besides, liquidity is an internal financial source for banks if the central bank has a tighter monetary policy, it can be viewed as a shield for banks to maintain their loan portfolio in presence of a tighter policy. Interestingly, state-owned banks receive more support from the government and are key-players in the banking market, but their loan growth is reduced after the new banks have established and the entrance of foreign bank has been more easier from 2006. A possible explanation is that such banks progressively lose their monopoly power due to an increasingly competitive market with new established banks and the entrance of foreign banks. Since bank loans are important for the economy and the private sector, the central bank needs to closely observe banks' loan growth. Besides, capital regulation could be adapted to comply with international standards. This should not only prevent excessive risk-taking of banks, but it could also be a necessary condition to enable Vietnamese banks to access foreign capital markets in case of insufficient capital sources on the domestic market. Moreover, the bank liquidity ratio should be strictly regulated to avoid liquidity problems that could destabilize the banking system.

To sum up, ownership structure, bank capital and bank regulation are recognized as the key components to explain bank performance in Vietnam. To improve banks' capacities and performances as well as to maintain the stability of the banking system, the government and the central bank should reduce their shares in state-owned banks as well as in private banks. It is not only to make banks more independent but also to have a transparent market. Concerning bank capital, the central bank should allow banks to access foreign capital for their development and hence promote foreign shareholdings. In terms of regulations,

regulators can refer to international standards for the domestic banking system i.e. the Basel Accords. That will allow the market to be more stable with more stable and efficient banks if they can fulfill those requirements.

This dissertation cannot cover all aspects of the banking system in Vietnam due to missing data, therefore it could contain some limitations. For example, in the first chapter, we cannot collect the number of employees of each bank which can be a bias for state-owned banks which have low wages and a very large number of employees due to a complex organization structure and such banks are very large compared to their competitors. Obviously, the price of labor cannot capture correctly the overhead expenses of each bank. In the second chapter, banks have not recorded their non-performing loans fully In the third chapter, the prime rate has been abandoned since 2011 and the central bank employs open market operations (OMO) to partially replace the prime rate. Future studies could usefully compare how these two monetary policy instruments operate in the money transmission mechanism.

BIBLIOGRAPHY

1. Annual report (2011). State Bank of Vietnam. www.sbv.gov.vn

2. Annual report (2011). Vietcombank. www.vietcombank.com.vn

3. Annual report (2011). Vietinbank. www.vietinbank.vn

4. Ahokpossi, C. (2013). "Determinants of Bank Interest Margins in Sub-Saharan Africa." Working Paper No. 13/34: 21.

5. Aigner, D., et al. (1977). "Formulation and estimation of stochastic frontier production function models." Journal of Econometrics 6(1): 21-37.

6. Aliaga-Dıaz, Roger, and Marıa Pıa Olivero. "The cyclical behavior of net interest margins: evidence from the United States banking sector." Manuscript, North Carolina State University (2005).

7. Altunbas, Y., et al. (2000). "Efficiency and risk in Japanese banking." Journal of Banking & Finance 24(10): 1605-1628.

8. Altunbas, Y., et al. (2002). "Evidence on the bank lending channel in Europe." Journal of Banking & Finance 26(11): 2093-2110.

9. Anca, P.-P., et al. (2008). "Banking Competition and Efficiency: A Micro-Data Analysis on the Czech Banking Industry." Comp Econ Stud 50(2): 253-273.

10. Angeloni, I., et al. (2002). Monetary Transmission in the Euro Area: Where Do We Stand?, European Central Bank.

11. Angeloni, I., et al. (2003). Monetary Transmission in the Euro Area: Does the Interest Rate Channel Explain it All?, National Bureau of Economic Research, Inc.

12. Arellano, M., and O. Bover. 1995. Another look at the instrumental variable estimation of error-components models. Journal of Econometrics 68: 29-51.

13. Arellano, M., and S. Bond. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies 58: 277-297.

14. Bank prospectus (2009). Vietnam Export & Import bank. www.eximbank.com.vn

15. Battese, G. E. and T. J. Coelli (1992). "Frontier production functions, technical efficiency and panel data: With application to paddy farmers in India." Journal of Productivity Analysis 3(1): 153-169.

16. Battese, G. E. and T. J. Coelli (1995). "A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data." Empirical Economics 20(2): 325-332.

17. Beck, T., Hesse, H. 2009. "Why are interest spreads so high in Uganda? Journal of Development Economics 88, 192-204

18. Berger, A. N. (1995). "The Profit-Structure Relationship in Banking--Tests of Market-Power and Efficient-Structure Hypotheses." Journal of Money, Credit and Banking 27(2): 404-431.

19. Berger, A. N. and E. Bonaccorsi di Patti (2006). "Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry." Journal of Banking & Finance 30(4): 1065-1102.

20. Berger, A. N., et al. (2004). "Further evidence on the link between finance and growth: An international analysis of community banking and economic performance." Journal of financial Services Research 25: 169-202

21. Berger, A. N., et al. (2007). "Bank ownership and efficiency in China: what will happen in the world's largest nation?". Journal of Banking and Finance 33: 113-130

22. Bergman, M. A. (1997). "The restricted profit function and the application of the generalised Leontief and the translog functional forms." International Journal of Production Economics 49(3): 249-254.

23. Bernanke, B. S. and M. Gertler (1995). "Inside the Black Box: The Credit Channel of Monetary Policy Transmission." National Bureau of Economic Research Working Paper Series No. 5146.

24. Berrospide, J. M. and R. M. Edge (2010). "The Effects of Bank Capital on Lending: What Do We Know, and What Does It Mean?" International Journal of Central Banking 6(4).

25. Blundell, R. and S. Bond (1998). "Initial conditions and moment restrictions in dynamic panel data models." Journal of Econometrics 87(1): 115-143.

26. Bolton, P. and a. X. Freixas (2000). Corporate finance and the monetary transmission mechanism, Department of Economics and Business, Universitat Pompeu Fabra.

27. Bonin, J. P., et al. (2005). "Bank performance, efficiency and ownership in transition countries." Journal of Banking & Finance 29(1): 31-53.

28. Bos, J. W. B. and C. J. M. Kool (2004). Bank Efficiency the Role of Bank Strategy and Local Market Conditions, Netherlands Central Bank, Research Department.

29. Camen, U.(2006). “Monetary Policy in Vietnam: The case of a transition country” in “Monetary Policy in Asia: approaches and implementation”, BIS Papers, Vol. 31, pp. 232-252, Bank for International Settlements, Basle, Switzerland.

30. Cetorelli, N. and M. Gambera (2001). “Banking Market Structure, Financial Dependence and Growth: International Evidence from Industry Data”. The Journal of Finance, 56: 617–648

31. Chatelain, J.-B., et al. (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.

32. Claessens, S., Kunt, D., Huizinga, H. (2001). "How does foreign entry affect domestic banking markets?" Journal of banking and Finance 25, 891-911

33. Claeys, S. and R. Vander Vennet (2008). "Determinants of bank interest margins in Central and Eastern Europe: A comparison with the West." Economic Systems 32(2): 197-216.

34. Cottarellí, C., et al. (1995). Bank Lending Rates and Financial Structure in Italy: A case study. IMF Working Paper. I. M. Fund, Monetary and Exchange Affairs Department. WP/95/38.

35. Demirgüç-Kunt, A. and H. Huizinga (1999). "Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence." World Bank Economic Review 13(2): 379-408.

36. Demirgüç-Kunt, A., et al. (2003). "Regulations, Market Structure, Institutions, and the Cost of Financial Intermediation". National Bureau of Economic Research, Inc.

37. Ehrmann, M., et al. (2001). Financial systems and the role of banks in monetary policy transmission in the euro area, European Central Bank.

38. Entrop, O., et al. (2012). "Determinants of bank interest margins: Impact of maturity transformation". Deutsche Bundesbank, Research Centre.

39. Farinha, L. and C. Robalo Marques (2001). The bank lending channel of monetary policy: identification and estimation using Portuguese micro bank data, European Central Bank.

40. Ferguson, M. F. and a. B. A. Stevenson (2007). "What's Different About Banks? Depositor Discipline and Active Monitoring." Available at SSRN: http://ssrn.com/abstract=891446.

41. Fethi, M. D., et al. (2008). "Determinants of Bank Efficiency in the Transition Economies in Europe: A Comparison of Frontier Techniques with Panel Data." SSRN eLibrary.

42. Fiordelisi, F., et al. (2011). "Efficiency and risk in European banking." Journal of Banking & Finance 35(5): 1315-1326.

43. Fries, S. and a. A. Taci (2002). "Banking reform and development in transition economies." European Bank for reconstruction and Development Working paper 71.

44. Fungáčová, Zuzana & Poghosyan, Tigran, 2011. "Determinants of bank interest margins in Russia: Does bank ownership matter?" Economic System, Elsevier, vol. 35(4), pages 481-495.

45. Gale, D. (2010). "Capital Regulation and Risk Sharing." International Journal of Central Banking 6(34): 187-204.

46. Gale, D. and O. Ozgur (2005). "Are Bank Capital Ratios too High or too Low? Incomplete Markets and Optimal Capital Structure." Journal of the European Economic Association 3(2-3): 690-700.

47. Gambacorta, L. and a. D. Marques-Ibanez (2011). The bank lending channel: lessons from the crisis, Bank for International Settlements.

48. Gambacorta, L. and a. P. E. Mistrulli (2004). "Does bank capital affect lending behavior?" Journal of Financial Intermediation 13(4): 436-457.

49. Gary, G. and W. Andrew (1998). "Banking in transition economies: does efficiency require instability?" Proceedings (Aug): 621-655.

50. Grigorian, D. A. and V. Manole (2002). "Determinants of commercial bank performance in transition - an application of data envelopment analysis", The World Bank.

51. Guiso, L., et al. (1999). "Will a common European monetary policy have asymmetric effects?" Economic Perspectives(Q IV): 56-75.

52. Hanweck, G. and L. Ryu (2005). "The sensitivity of Bank net Interest Margins and Profitability to Credit, Interest-Rate, and Term-Structure Shocks Across Bank Product Specializations." Division of Insurance and Research- FDIC Working Paper Series 2005-02.

53. Hasan, I. and K. Marton (2000). "Development and Efficiency of the Banking Sector in a Transitional Economy: Hungarian Experience," Bank of Finland, Institute for Economies in Transition.

54. Havrylchyk, O. (2006). "Efficiency of the Polish banking industry: Foreign versus domestic banks." Journal of Banking & Finance 30(7): 1975-1996.

55. Ho, T. S. Y. and a. A. Saunders (1981). "The Determinants of Bank Interest Margins: Theory and Empirical Evidence." The Journal of Financial and Quantitative Analysis 16(4): 581-600.

56. Humphrey, D. B. and L. B. Pulley (1997). "Banks' Responses to Deregulation: Profits, Technology, and Efficiency." Journal of Money, Credit and Banking 29(1): 73-93.

57. Karas, A., et al. (2008). Are private banks more efficient than public banks? Evidence from Russia, Bank of Finland, Institute for Economies in Transition.

58. Kashyap, A. and J. C. Stein (1993). "Monetary Policy and Bank Lending." National Bureau of Economic Research Working Paper Series No. 4317.

59. Kashyap, A. K. and J. C. Stein (1994). "The Impact of Monetary Policy on Bank Balance Sheets." National Bureau of Economic Research Working Paper Series No. 4821.

60. Kashyap, A. K. and J. C. Stein (1995). The role of banks in the transmission of monetary policy. NBER reporter. N. B. o. E. R. W. P. Series.

61. Kashyap, A. K. and J. C. Stein (2000). "What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?" The American Economic Review 90(3): 407-428.

62. Kasman, A., et al. (2010). "Consolidation and commercial bank net interest margins: Evidence from the old and new European Union members and candidate countries." Economic Modelling 27(3): 648-655.

63. Kit, P. W. (1997). "On the determinants of bank interest margins under credit and interest rate risks." Journal of Banking & Finance 21(2): 251-271.

64. Kraft, E. and D. TirtIroglu (1998). "Bank Efficiency in Croatia: A Stochastic-Frontier Analysis." Journal of Comparative Economics 26(2): 282-300.

65. Kumbhakar, S. C. and L. Hjalmarsson (1995). "Labour-Use Efficiency in Swedish Social Insurance Offices." Journal of Applied Econometrics 10(1): 33-47.

66. Le, H. V. and W. D. Pfau (2009). "VAR Analysis of the Monetary Transmission Mechanism in Vietnam." Applied Econometrics and International Development 9(1): 165-179.

67. Lensink, R., et al. (2008). "Bank efficiency and foreign ownership: Do good institutions matter?" Journal of Banking & Finance 32: 834–844.

68. Manthos, D. D. and I. P. Nikolaos (2009). "Determinants of bank efficiency: evidence from a semi-parametric methodology." Managerial Finance 35(3): 260-275.

69. Martinez Peria, M., Mody, A. (2004) "How foreign participation and market concentration impact bank spreads: evidence from Latin America." Journal of Money Credit and Banking 36, 511-537.

70. Matoušek, R. and A. Taci (2004). "Banking efficiency in transition economies: Empirical evidence from the Czech Republic." Economics of Planning 37(3): 225–244.

71. Maudos, J. and J. Fernandez de Guevara (2004). "Factors explaining the interest margin in the banking sectors of the European Union." Journal of Banking & Finance 28(9): 2259-2281.

72. Maudos, J. and L. Solís (2009). "The determinants of net interest income in the Mexican banking system: An integrated model." Journal of Banking & Finance 33(10): 1920-1931.

73. Maudos, J., Pastor, J.M., Perez, F., Quesada, J. (2002). "Cost and profit efficiency in European banks." Journal of International Financial Markets, Institutions and Money 12, 33-58.

74. McCullagh, P. and a. J. A. Nelder (1989). "Generalized Linear Models. Generalized Linear Models". S. Edition. New York, Chapman and Hall.

75. Minh, N., et al. (2012). "A new approach for ranking efficient units in Data Envelopment Analysis and Application to a Sample of Vietnamese Agricultural Bank Branches." American Journal of Operations Research 2: 126-136.

76. Mlachila, M., and E.W. Chirwa, 2002, "Financial Reforms and Interest Rate Spreads in the Commercial Banking System in Malawi," IMF Working Paper No. 02/6 (Washington: International Monetary Fund).

77. Micco, A., Panizza, U., Yanez, M. (2007). "Bank ownership and performance. Does politics matter?". Journal of Banking & Finance 31, 219-241.

78. Ngo, D. T. (2010) Evaluating the eficiency of Vietnamese Banking System: An application using Data Envelopment Analysis. January 2011 15

79. Ngo, D. T. (2012). "Measuring the Performance of the Banking System: Case of Vietnam (1990-2010)." Journal of Applied Finance and Banking 2(2): 289-312.

80. Nguyen, C. V. (2012). "Asymmetric responses of commercial bank to monetary policy in a transitional economy: the case of Vietnam." Journal of Applied Finance and Banking 2(3): 237-269.

81. Nguyen, V.H. (2007). "Measuring Efficiency Of Vietnamese Commercial Banks: An Application Of Data Envelopment Analysis (DEA). Technical Efficiency and Productivity Growth in Vietnam." Hanoi, Vietnam, Publishing House of Social Labour: 11.

82. OECD (2013), Southeast Asian Economic Outlook 2013: With Perspectives on China and India, OECD Publishing. http://dx.doi.org/10.1787/saeo-2013-en. ISBN 978-92-64-18724-5. Chapter 2, page 227.

83. Papke, L. E. and J. M. Wooldridge (1996). "Econometric Methods for Fractional Response Variables with an Application to 401(K) Plan Participation Rates." Journal of Applied Econometrics 11(6): 619-632.

84. Pessarossi, P. and Weill, L. (2013) "Do Capital Requirements Affect Bank Efficiency? Evidence from China" (November 8, 2013). BOFIT Discussion Paper No. 28/2013

85. Peydró, J.-L. (2010). "Discussion of "The effect of Bank Capital on Lending: What do we Know, and What Does It Mean?"." International Journal of Central Banking 6(4).

86. Pham, D. V. (2014). The determinants of Vietnamese banks' lending behavior: a theoretical model and empirical evidence The seventh Vietnam Economist Annual Meeting Hochiminh city, Vietnam.

87. Pham, M. C. and Q. H. Vuong (2009). Viet Nam – ups and downs and development. Hanoi, Vietnam, National Political Publishing house.

88. Poghosyan T. and Borovicka J. (2007). "Banking Efficiency in Emerging Economies: The Impact of Ownership Endogeneity and EU Accession" CERGE-EI Discussion paper Series-189

89. Rodrigo, F. and V. Marcos (2007). "Is Ownership Structure a Determinant of Bank Efficiency?", Central Bank of Chile.

90. Ruby, P. K. and T. P. Opiela (2000). "Bank Size, Bank Capital, and the Bank Lending Channel." Journal of Money, Credit and Banking 32(1): 121-141.

91. Saunders, A. and a. L. Schumacher (2000). "The determinants of bank interest rate margins: an international study." Journal of International Money and Finance 19: 813-832.

92. Sjöholm, F. (2006). "State owned enterprise and equitization in Vietnam." EIJS Working Paper Series, The European Institute of Japanese Studies(No 228).

93. Stephen, D. O. and D. R. Glenn (1995). "Is there a bank lending channel for monetary policy?" Economic Review: 1-20.

94. Sun, J., et al. (2013). "Reginal economic development, strategic investors, and efficiency of Chinese city commercial banks." Journal of Banking & Finance 37: 1602-1611.

95. Tan, T. B. P. (2012). "Determinants of Credit Growth and Interest Margins in the Philippines and Asia." IMF working paper WP/12/123(6).

96. Tarus, D. K., et al. (2012). "Determinants of Net Interest Margins of Commercial Banks in Kenya: A Panel Study." Procedia Economics and Finance 2(0): 199-208.

97. Thakor, A. V. (1996). "Capital requirements, monetary policy, and aggregate bank lending: theory and empirical evidence." Journal of Finance 51(1): 279-324.

98. Thorsten, B., et al. (2003). Bank Concentration and Crises, National Bureau of Economic Research, Inc.

99. Tochkov, K. and N. Nenovsky (2011). "Institutional Reforms, EU Accession, and Bank Efficiency in Transition Economies: Evidence from Bulgaria." Emerging Markets Finance and Trade, Vol. 47, No. 1, 2011.

100. Van-den-Heuvel, S. (2006). The Bank Capital Channel of Monetary Policy, Society for Economic Dynamics.

101. Vander Vennet, R. V. (2002). "Cost and Profit Efficiency of Financial Conglomerates and Universal Banks in Europe." Journal of Money, Credit and Banking 34(1): 254-282.

102. Vietcombank securities (September 2011). "Vietnam banking sector report". Researchand analysis department. http://www.vcbs.com.vn

103. VPBank Securities (January 2014). "The Vietnamese banking sector report- Version January 2014". www.VBBS.com.vn

104. Vu, H. T. and S. Turnell (2010). "Cost efficiency of the Banking sector in Vietnam: A Baysian Stochastic Frontier Approach with Regularity Constraints." Asian Economic Journal 24(2): 115-139.

105. Vuong, Q. H. (2010). Financial Markets in Vietnam's Transition Economy: Facts, Insights, Implications, VDM Verlag Dr. Müller

106. Wang, H.-j. and P. Schmidt (2002). "One-step and two-step estimation of the effects of exogenous variables on technical efficiency levels," Journal of Productivity Analysis 18(2): 129-144.

107. Weill, L. (2002). "Does restructuring improve banking efficiency in a transition economy?" Applied Economics Letters 9(5): 279-281.

108. Weill, L. (2003). "Banking efficiency in transition economies: The role of foreign ownership." Economics of Transition 11(3): 569-592.

109. Williams, Barry, Factors Determining Net Interest Margins in Australia: Domestic and Foreign Banks. Financial Markets, Institutions & Instruments, Vol. 16, No. 3, pp. 145-165, August 2007.

110. Windmeijer, F. (2005). "A finite sample correction for the variance of linear efficient two-step GMM estimators." Journal of Econometrics 126(1): 25-51.

111. Zissis, Carin. "The Surging Vietnamese Economy." Oct 2006. Council on Foreign Relations. Nov 2014.

CONTENTS

Abstract

This dissertation is composed of three chapters. The first chapter analyzes the impact of ownership structure and the reforms implemented in the mid 2000's on the efficiency of commercial banks in Vietnam. The results show that the efficiency differs depending on ownership type; state-owned banks have the lowest efficiency levels in comparison with private banks and banks with foreign shareholders. Since the implementation of more stringent minimum capital rules, bank capitalization has also been an important driver of bank efficiency. The second chapter discusses how banks in Vietnam set their interest margins with a particular focus on bank ownership and interest rate regulation by the central bank. The results show that only private and state-owned banks transfer their operational costs to their clients. Bank capitalization which reflects bank risk aversion is a significant determinant for foreign and state owned banks only in presence of interest rate regulation; these banks tend to pass the high capital cost to customers. We also show that, in absence of interest rate control, foreign banks set higher margins when they take higher credit risk while in presence of interest rate regulation private banks cope with higher credit risk without being able to raise their margin accordingly. The last chapter investigates the impact of monetary policy and economic conditions on bank lending for different levels of bank capitalization. The results indicate that all types of monetary policy shocks have a negative effect on lending but that an increase in bank liquidity leads to a lower reduction in loan growth. Finally, banks with lower capitalization are less influenced by the business cycle.

Keywords: *Efficiency, ownership structure, interest rate regulation, transition economies, bank lending, bank capital, monetary transmission*

Résumé

Cette thèse se compose de trois chapitres. Le premier chapitre analyse l'impact de la structure actionnariale et des réformes mises en œuvre dans les années 2000 sur l'efficacité des banques commerciales au Vietnam. Les résultats montrent que l'efficacité diffère selon le type de structure actionnariale ; les banques d'État ont des niveaux d'efficacité plus bas en comparaison avec les banques privées et les banques avec des actionnaires étrangers. Depuis la mise en œuvre de règles minimales de fonds propres plus strictes, la capitalisation des banques a également été un moteur important de l'efficacité de la banque. Le deuxième chapitre traite de la façon dont les banques au Vietnam fixent leurs marges d'intérêt avec un accent particulier sur la structure actionnariale des banques et la réglementation des taux d'intérêt par la banque centrale. Les résultats montrent que seules les banques privées et publiques transfèrent leurs coûts opérationnels à leurs clients. La capitalisation bancaire qui reflète l'aversion au risque des banques est un déterminant significatif pour les banques étrangères et d'Etat uniquement en cas de réglementation des taux d'intérêt; ces banques ont tendance à répercuter le coût élevé du capital sur les clients. Nous montrons aussi que, en l'absence de contrôle des taux d'intérêt, les banques étrangères fixent des marges plus élevées quand elles prennent un risque de crédit plus élevé alors qu'en présence de la réglementation des taux d'intérêt les banques privées font face à un risque de crédit plus élevé sans pouvoir augmenter leur marge en conséquence. Le dernier chapitre étudie l'impact de la politique monétaire et des conditions économiques sur les prêts bancaires pour les différents niveaux de capitalisation des banques. Les résultats indiquent que tous les types de chocs de politique monétaire ont un effet négatif sur les prêts, mais que l'augmentation de la liquidité bancaire conduit à une réduction plus faible de la croissance des prêts. Enfin, les banques dont la capitalisation est plus faible sont moins influencées par le cycle économique.

Mots clés *: efficience, structure actionnariale, réglementation des taux d'intérêt, économies en transition, prêts bancaires, capital, transmission de la politique monétaire.*