Corporate governance of banks in Vietnam and their roles on banks' risk-taking and efficiency

A thesis presented in partial fulfilment of the requirements for the degree of

Doctor of Philosophy
in
Banking Studies

At Massey University, Manawatu Campus,
New Zealand.

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2020

Abstract

This thesis comprises three essays that investigate the effectiveness of corporate governance mechanisms associated with recent Vietnamese banking reform on Vietnamese banks' risk-taking and efficiency. The thesis uses a hand-collected dataset on accounting and corporate governance data from annual statements published by commercial banks during the 2006-2016 period.

The first essay examines the role of foreign directors on bank risk-taking, using data from 32 commercial banks in Vietnam in the 2006-2016 period. Our findings suggest foreign directors increased bank risk-taking after 2011. The relationship is robust after taking account of potential endogeneity problems and different measures of bank risk-taking. The explanation is that foreign directors are motivated to encourage management to increase risk-taking to earn short-term returns when there is uncertainty in macroeconomic conditions. Other characteristics such as female directors, family related directors, and board size on risk-taking are also discussed. There is no evidence showing that foreign directors are more or less risk-averse in listed banks vs unlisted banks or in state-owned banks vs private banks.

The second essay investigates the impact of female directors on boards on bank efficiency, using data from 32 commercial banks, covering the 2006-2016 period. The relationship is estimated by employing one-stage stochastic frontier analysis, using the Battese and Coelli (1995) (BC95) approach. The two-stage distributional free approach proposed by Cornwell, Schmidt, and Sickles (1990) (CS90) is employed as a robustness check. The result shows a robust relationship between female directors and cost-efficiency. This suggests that female directors are associated with a decrease in cost efficiency. A possible explanation is that female directors are less experienced in management than male directors and have less access to environmental resources that benefit firms.

The third essay examines the impact of mergers and acquisitions (M&As) on bank efficiency, using a balanced panel dataset from 22 commercial banks over the 2008-2016 period. The study employs two-stage DEA window analysis. Our findings suggest that there is no significant relationship between M&As and bank efficiency, which is not surprising given the small number of M&A events so far. However, there is evidence that Vietnamese banks experienced less improvement in efficiency after M&As. A possible explanation for this is that the M&As might not be not driven by profit-maximization, but by the government

encouragement to rescue weak banks. Also, the combined entities need to spend additional resources on resolving the bad debts transferred from the weak, targeted banks.

Acknowledgements

This thesis would not have been possible, and my four-year Ph.D. journey would not have been so fruitful and enjoyable, without the help and support from people around me. Therefore, I would like to begin this acknowledgement by expressing my sincere gratitude to my main supervisor, Prof. David Tripe and my co-supervisor, Dr. Jing Liao for their invaluable guidance and comments. I also would like to express my heartfelt appreciation to both supervisors for their strong support and encouragement during my Ph.D. candidature. Without their assistance, this work would not have been completed.

I would like to give my immense thanks and acknowledgement to the New Zealand Ministry of Foreign Affairs and Trade for providing me the scholarship to study a Ph.D. in New Zealand; Massey Business School for its financial support for presenting my papers at academic conferences; and the New Zealand scholarship officers, who are very helpful and responsive. I also gratefully acknowledge Massey Business School for providing me opportunities to gain experience in teaching and research. I thank all staff in the School of Economics and Finance, Massey Business School, for creating a friendly academic environment, which makes me feel at home. I thank our school administrators, who are always there to provide assistance with paperwork and logistics.

I would like to express my special acknowledgement and gratitude to the University of Groningen, especially to Prof. Niels Hermes, for sponsoring me to attend a one-week intensive course on "Corporate governance and the effectiveness of boards", which has broadened my knowledge of corporate governance.

I thank my Ph.D. fellows, Phung Trang, Saba, Emily, Mai, Salah, Sandra, Nikkil, and Odmaa for their friendship and the time we spent together.

I owe my parents a great debt of gratitude for their love and support throughout my life. It is to them that I dedicate this thesis.

Tran Thi Minh Trang

Thesis related research outcomes

Three refereed conference papers have been produced from this thesis as follows.

Tran Trang, David Tripe, and Jing Liao (2018): *The effect of minority foreign ownership on Vietnamese bank efficiency: A one-stage stochastic frontier approach.* Paper presented at the North American Productivity Workshop X, June 12-15, 2018, Miami, USA. The paper was also accepted for presentation at the Asia-Pacific productivity conference (APPC), July 04-06, 2018, Seoul, Korea.

Tran Trang, David Tripe, and Jing Liao (2018): *Board effectiveness and bank soundness: How board diversification affects risk-taking.* Paper presented at the INFINITI conference 2018 Asia-Pacific, December 10-11, 2018, Sydney, Australia.

Tran Trang, David Tripe, and Jing Liao (2019): *The effect of merger to Vietnamese bank efficiency: A two-step DEA window analysis approach*. Paper presented at the 23th New Zealand Finance Colloquium, February 13-15, 2019 Lincoln University, Christchurch, New Zealand, at the INFINITI conference on international finance, June 9-11, 2019, Glasgow, UK, and at the EWEPA Conference, London, 11-13 Jun 2019. The paper was also accepted for presentation at the 9th International conference of the Financial Engineering and Banking Society (FEBS), 30 May - 1 June, 2019, Prague, Czech Republic.

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List of Abbreviations

3SLS	Three stage least squared regression analysis
AMC	Asset Management Company
ATM	Automated teller machine
Basel	International banking regulations set by the Basel Committee on Bank Supervision
BC95	A one-stage stochastic frontier analysis approach following Battese and Coelli (1995)
CAMELS	Capital adequacy, quality of assets, quality of management, earnings, liquidity, and sensitivity to market risks
CEO	Chief executive officer
COO	Chief operating officer
CG	Corporate governance
CI	Cost-to-income ratio
CS90	Two-stage distribution free approach following Cornwell, Schmidt, and Sickles (1990)
DATC	Debt and Asset Trade Company
DEA	Data envelopment analysis
DMU	Decision making unit
ETA	Capital-to-asset ratio
FB	Foreign bank
FBB	Foreign bank branch
GDP	Gross domestic product
IFRS	International Financial Reporting Standards
IPO	Initial public offering
JSCB	Joint-stock commercial bank
JVB	Joint-venture bank
LS93	Model proposed by Lee and Schmidt (1993)
LTD	Loan-to-deposit ratio
M&A	Mergers & acquisitions
MNPL	Non-performing loan

OECD	The Organisation for Economic Co-operation and Development
OLS	Ordinary least squares
ROA	Return-on-asset ratio
ROE	Return-on-equity ratio
RPT	Related parties transactions
S.D	Standard deviation
SBV	State bank of Vietnam
SFA	Stochastic frontier analysis
SOB	State-owned bank
UK	The United Kingdom
US	The United States
UVBTA	The US-Vietnam Bilateral Trade Agreement
VND	Vietnamese dong (Vietnamese currency)
VRS	Variable returns to scale
WB	World Bank
WTO	World Trade Organization

Chapter 1. General introduction

As developing countries are usually characterised by undeveloped capital markets, the financial system plays a very important role in allocating capital for economic growth. It is also the main trustee for the economy's savings. Reflecting this importance, it is essential to ensure that financial resources are efficiently allocated. Sound corporate governance is believed to support that outcome because, first, it provides mechanisms in which suppliers of capital "assure themselves of getting a return on their investment" (Shleifer & Vishny, 1997, p. 737). Second, it provides lines of defence to prevent bank managers from investing in bad projects (Laeven, 2013). From a management perspective, good corporate governance could increase access to, and reduce the cost of, accessing external capital as well as improve firm operational performance, leading to less risk of financial crisis, better functioning financial markets, and a better relationship with all stakeholders (Claessens & Yurtoglu, 2013; Doidge, Karolyi, & Stulz, 2007). Many blame failures and weaknesses in corporate governance in safeguarding against taking excessive risks by banks, to an important extent, for the 2007-2008 global financial crisis (Kirkpatrick, 2009; Klomp & De Haan, 2012). The Basel Committee on Banking Supervision also requires jurisdictions to understand, develop and apply strong corporate governance for financial entities. Given the important role of corporate governance in the financial sector, this thesis aims to explore some corporate governance mechanisms in the Vietnamese domestic banks and their impacts on the banks' risk-taking and efficiency.

1.1. Corporate governance definitions and an overview of corporate governance mechanisms

The term corporate governance is defined differently, depending on one's perspective. Gillan and Starks (1998) define corporate governance (hereafter referred to as CG) from a broad perspective as a system of laws, rules, organisation and processes to control and monitor a firm. From the maximising shareholders' wealth perspective, considered as a "narrow" definition, CG is a combination of internal mechanisms in which capital providers will earn benefits on their investment (Shleifer & Vishny, 1997). Hence, the broad definition goes beyond the governance structure that aims to protect shareholders' interests. According to Claessens and Yurtoglu (2013), the broad definition is suitable for comparative studies, which investigate how the difference in the legal framework affect the behaviour choices by investors, firms, and others. In contrast, for single country studies, the narrow definition of

CG seems to be the logical one as it provides a theorical foundation to understand how the operation of the board determines firm outcomes, or the relationship between the executive compensation and firm outcomes (Claessens & Yurtoglu, 2013). The narrow definition of corporate governance is employed in this thesis, which investigates the relationship between internal governance mechanisms and bank outcomes.

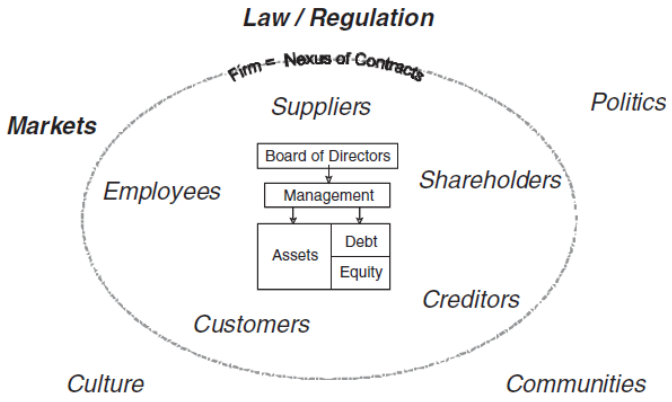
Irrespective of the definition used, corporate governance mechanisms are set up to deal with governance issues. According to Hart (1995), governance issues occur when there are agency problems involving members of the organisation, and it is too costly to resolve the agency problems through a complete contract. In contrast, Jensen and Meckling (1976) argue that when one or more persons (the principal(s)) delegate the decision-making authority to another person (the agent) to implement work for the principal(s), it is very likely that agency problems will occur if both parties are self-interested. In financial economics, agency problems arise when: (1) A conflict of interest between the agent and the principal exists and the principal finds it hard or expensive to oversee the agency's decision-making; or (2) the principal and the agent have different levels of risk appetite, which results in the two parties preferring different actions (Eisenhardt, 1989). Thus, agency theory can be applied where there is separation between ownership and control (Shleifer & Vishny, 1997).

Researchers in corporate governance usually divide agency problems/conflicts into two categories: The conflict of interest between shareholders and management, or the agent-principal conflict (Hart, 1995); and the conflict of interest between majority and minority shareholders, or the principal-principal conflict (Dharwadkar, George, & Brandes, 2000; Young, Peng, Ahlstrom, Bruton, & Jiang, 2008). Donaldson and Davis (1991) indicate that when the interests of the managers and shareholders are aligned by a suitable incentive scheme, shareholders' interests can be protected. Young et al. (2008), on the other hand, propose that once there are several large shareholders who jointly control the firm, and no shareholder is large enough to influence other shareholders, the principal-principal conflict will be mitigated.

Corporate governance mechanisms addressing those conflicts in the literature are often separated into two groups; internal mechanisms, and external mechanisms. While the board of directors (the board) is considered to be at the centre of internal mechanisms in place to mitigate agency conflicts, laws/regulations and market forces are the governance environment in which firms are involved. Figure 1, adapted from Gillan and Starks (1998),

broadly illustrates these relationships. The internal governance system includes the board (and its effectiveness), the risk committee, the management (and the managerial incentives), and internal control systems and provisions. The external governance includes, but is not limited to, laws/regulations promulgating corporate governance and market forces (such as the market for corporate control, labour markets, and the development of the capital markets).

Figure 1.1: Corporate governance of the firm: Beyond the balance sheet. Adapted from Gillan and Starks (1998)



In the majority of corporations, there are agency conflicts owing to the separation of ownership and control. Boards of directors are voted by shareholders and have fiduciary obligations to shareholders. Boards have the responsibility to provide business strategy and monitor the management of a firm to be in line with shareholders' values. In contrast, the management team, acting as shareholders' agents, is hired by the board to run the day-to-day businesses. As the board has the authority to hire, fire, and compensate the senior management team, it acts as the first line of defence to ensure that management is conducted for the benefit of shareholders. Many, therefore, view boards as the lynchpin of the internal corporate governance system (Gillan & Starks, 1998). Thus, it is pivotal that the board is effective in safeguarding against improper management and protect shareholders' value. This is especially true in the financial sector, which has diffuse debtholders (depositors) and where the free-rider problem is prominent.[1]

Macey and O'Hara (2003) provide a very good discussion of how banks are different from non-financial firms. For example, by nature, banking businesses are opaque and complex,

[1] Depositors usually deposit relatively small amounts and are covered by deposit insurance and, thus, have less incentive to monitor banks' operations, which weakens corporate governance.

especially in the context of advanced and ever-changing technologies. The complexity of banking businesses could cause difficulties for boards in properly monitoring banks' businesses. In addition, it is also easy for banks to hide the problems of non-performing loans just by expanding the asset side on the balance sheet (by giving loans to customers). Nevertheless, the determinants to ensure that a board could do a good job is still an empirical question. The following sections provide a brief overview of the main corporate governance mechanisms in the banking sector.

To align the interests of agents with those of investors, Jensen and Meckling (1976) argue that by establishing proper incentives for the agent, the divergences from the principals' interests can be minimised and the agent will act for the interest of the principals. Pay-performance sensitivity contracts, such as equity-based compensation, bonus pay and option contracts are therefore viewed as mechanisms providing incentives to managers to behave in the shareholders' interest. Nevertheless, the scale of the 2007-2008 financial crisis has posed the question: Do equity compensation incentives help to align the interests of shareholders and managers, as evidence shows that the incentives seem to provoke banks' managers to take excessive risks (Kirkpatrick, 2009).

A rich literature has been devoted to investigating the efficiency of the board and manager incentive mechanisms in financial firms in bringing about value to shareholders (i.e. bank performance) and monitoring bank risk. These studies examine the effects of board characteristics such as size, gender diversity, ethnic diversity, board quality, and board independence, as well as the impact of pay-performance sensitivity on banks' performance and risk-taking. Even though empirical studies provide mixed results on these effects, depending on the period investigated, the country studied and so on, the literature provides evidence that corporate governance affects banks' performance and level of risk-taking. Haan and Vlahu (2016) and John, De Masi, and Paci (2016) provide excellent reviews of these studies.

Regarding external governance mechanisms, laws/regulations, the market for corporate control and the development of capital markets are among the most important external mechanisms determining the governance quality of a country. These factors are perhaps among the most important determinants that shape corporate governance in the financial sectors differently from other non-financial sectors. Owing to the distinctive characteristics of the banking sector, including high interconnectedness, strong externalities, and its great

importance to the economy, regulators are more concerned with the governance of banks and its effect on bank performance (Adams & Mehran, 2003). In addition, depositors usually neglect supervising the banks' businesses, knowing that their rights will be protected because: (1) The government usually intervenes to rescue problem banks to prevent a collapse of the banking system; and (2) there is usually a deposit insurance entity in place. These factors are regarded as weakening corporate governance mechanisms and intensifying the free-rider problems in financial institutions (Gillan & Starks, 1998). In contrast, there are also regulatory provisions on corporate governance designed specifically for financial institutions. For instance, while concentrated ownership is considered to be a mechanism to align the interests of agent and principal, in banks, concentrated ownership could intensify the conflicts between majority and minority shareholders, and between majority shareholders and depositors. Many countries, therefore, regulate the concentration of bank ownership (Caprio & Levine, 2002). Macro prudential policies, on the other hand, could alter banks' risk appetite and lower systemic risks.

The market for corporate control, such as proxy contests, friendly mergers and takeovers, and hostile takeovers, is also considered an important external governance mechanism. If a firm is operating at less than its potential, in countries where the market for corporate control is developed, it is very likely that the firm will be taken over by an acquirer and the incumbent managers will be replaced. Due to the threat of being discarded, managers are forced to act in line with the interests of shareholders. Nevertheless, Adams and Mehran (2003) argue that because it is usually required to have approval from the authorities to undertake M&As in the banking sector, the market for corporate control is basically absent. In contrast, mergers could lead to a change in performance of the acquirer owing to synergy processes.

Other market factors affecting firms' internal governance that could be mentioned are the development of the capital markets, accounting requirements, and the labour markets for CEOs. If the capital markets are developed, public firms are more motivated to adhere with good corporate governance practices, including timely and transparent information, because they can attract capital with better terms. Likewise, a competitive labour market will have a disciplining effect to force CEOs, boards and senior executives to work with more diligence to protect their jobs and reputation.

1.2. Rationales for conducting a study of corporate governance of the Vietnamese banking sector

Since the occurrence of the global financial crisis in 2007-2008, the Vietnamese government has made efforts to reform the economy. One of these efforts is to improve corporate governance practices of Vietnamese public firms. The Vietnamese government has selectively adopted the OECD "best practice" recommendations for good corporate governance in the latest legal document on corporate governance of public firms.[2] For example, it is required that a board of directors must have one third of its members as independent directors, and firms must consider gender in deciding the composition of the board. Even though the "one-third of board as independent directors" requirement is less likely to make the board hold managers to account, it is still considered an improvement in corporate governance regulations as, before this, there was no regulation on independent directors on the board.

However, owing to the differences in legal protection of investors and the level of economic and financial development, the quality of corporate governance practices varies widely among countries (Doidge et al., 2007). In addition, even though corporate governance practices in advanced market economies, such as the Anglo-Saxon, the German, or the Japanese models of corporate governance, are considered the best, the corporate governance issues are not perfectly resolved, which was confirmed with the explosion of the financial crisis originally in the US in mid-2007. Hence, the presence of significant financial crises pose the question: Are "best-practice" governance mechanisms adopted from developed markets effective in a developing country context?

Vietnam remains a relevant research subject because, first, it has a large population[3] with a good record of rapid economic growth and political stability. The Vietnamese banking industry has great potential for development given the large population and low level of financial inclusion. Therefore, foreign investors who seek high-growth markets in which to invest will find it valuable to understand the development in the banking sector in Vietnam. Second, Vietnam has a different institutional and cultural environment compared to Western countries, as well as other countries in Asia, as we elaborate in the following paragraphs.

[2] Decree No. 71/2017/ND-CP regarding guidelines on corporate governance of public companies.
[3] According to the World Bank, Vietnam's population reached about 95 million in 2017.

Third, Vietnam is undergoing corporate governance reform.[4] In developing new regulations, Vietnam must consider two pressures, one from "best practices" around the world which are mainly based on best practices in developed Western countries (i.e. the Anglo-American system), and the other from country-specific characteristics that might influence the "best practices" to work as intended. Therefore, this study not only contributes to expanding the literature by exploring the question in the national context but, more importantly, "stimulate major institutional changes in places where they need to be made" (Shleifer & Vishny, 1997, p. 738). Literature regarding corporate governance of the Vietnamese banking system is, to date, very limited.

In contrast, banks are different from non-banking firms, so it is possible that the findings for the non-banking firms may not apply to the banking sector. There are more stakeholders in banks than in non-financial firms, including depositors, debtholders, shareholders, the government and central bank (lender of last resort and to support national economic development), and sometimes a deposit insurance entity. Hence, regulators in many countries set detailed standards of conduct for bank directors and managers, and banks need to meet these requirements. There are some studies that have found differences in board characteristics between banking and non-banking firms. For example, Adams and Mehran (2003) find that bank boards are larger and have more independent directors than non-bank boards. Kroszner and Strahan (2001) document that bank boards are larger and have fewer insiders than non-bank boards.

Numerous studies on corporate governance in banks have focused on Western settings, especially in the US/UK context (John et al., 2016) or transition countries in Europe (Haan & Vlahu, 2016). These studies share a common background as: (i) The countries investigated are either characterised as having strong minority investors' protection (US/UK) or very different cultures compared to Asian countries; and (ii) the studies mainly deal with the conflict of interest between principals and their agents, where shareholders (the principals) are diffused and the managers (agents of the principals) control the firm. Meanwhile, La Porta, Lopez-de-Silanes, and Shleifer (1999) find that in 27 developed countries investigated, only slightly more than one-third of firms were widely held, while nearly half the firms were either state-controlled or family-controlled. In addition, because formal institutions such as information disclosures, accounting requirements, and law enforcement

[4] The government has issued several new laws, which include more articles on corporate governance, such as a New Law on Credit Institutions in 2010, Law revising the 2006 Law on Securities in 2010.

are either absent or inefficient in emerging countries, standard corporate governance has little institutional support to work as intended (Young et al., 2008). Therefore, exploring the corporate governance phenomena within a national context will provide insight into the relationship between firms' internal governance and outcomes, given a country's institutional and cultural particularities. Indeed, a country's institutional environment influences the implementation of corporate governance by firms as firms seek to comply with governance statutes (Hambrick, Werder, & Zajac, 2008).

There is wide consensus among researchers that the institutional and legal environment has important consequences for corporate governance (Aguilera & Jackson, 2010; Doidge et al., 2007; Kroszner & Strahan, 2001; Oehmichen, 2018). Doidge et al. (2007) argue that firms are motivated to adhere to good corporate governance because they can access external finance on better terms. Therefore, in countries with low economic and financial development, firms will find it optimal to invest less in corporate governance. In such cases, the protection of minority shareholders will depend largely on protection at country-level (Doidge et al., 2007). Ahrens, Filatotchev, and Thomsen (2011), on the other hand, argue that in the common law system, investors can count on the legal system to protect their rights by legal action through the court system if board and managers are self-interested, while in civil law countries, investors rely more on network-based governance to protect their rights.

On the other hand, culture also plays an important role in defining corporate governance practices in the world. Tayeb (1994) recognises three aspects of culture, which are: (i) Cultural values and attitudes are different from one society to another; (ii) different cultural groups behave differently, even under the same circumstances; and (iii) culture plays an important role in framing work organisations. For example, cultural differences can explain the difference in corporate governance practices between the Anglo-American model (i.e. agency theory), where the conflicts of agents and management are prominent, and the Japanese model (i.e. stewardship theory) - "the model of man is based on a steward whose behaviour is ordered such that pro-organizational, collectivistic behaviours have higher utility than individualistic, self-serving behaviours" (Davis, Schoorman, & Donaldson, 1997, p. 24). Indeed, Doidge et al. (2007) find that country characteristics are more associated with the difference in governance ratings in different countries than firm observable characteristics.

While Vietnam shares some commonality with Asian emerging countries, it does have some distinctive institutional features. Vietnam is characterised by (i) weak institutional trust and law enforcement, (ii) restricted managerial labour markets, and (iii) limited capital markets, like other Asian emerging countries (Oehmichen, 2018). Witt and Redding (2013) show that Vietnam has similar scores in terms of government effectiveness, and regulatory quality as China, Indonesia, and the Philippines, and a little lower than Malaysia and Thailand. In addition, the main ownership form in Asian countries[5] is family ownership, or both state and family ownership (Witt & Redding, 2013). Nevertheless, in terms of informal institutional characteristics, such as cultural and religious identity, Vietnam is very different from many other Asian emerging countries. For example, the majority of Vietnamese, similar to the Chinese, do not follow any religion, while many Indonesian and Malaysian people are Muslim, and the majority of Filipinos are Catholic. Vietnam also does not have strong elite groups as in Thailand, Malaysia, Indonesia, the Philippines or India (Oehmichen, 2018). Perhaps, the country that shares the most similarity in terms of formal and informal institutions with Vietnam is China. For instance, Vietnam and China both orient the economy towards privatisation to increase efficiency of state-owned enterprises. Both countries have been undergoing drastic economic and legal reforms. Last, but not least, both countries have state-owned banks dominating the banking sector.[6]

However, compared to China, the institutional infrastructure in place to support corporate governance mechanisms in Vietnam very much lags. First, Vietnam has very weak investor protection. According to Witt and Redding (2013), as at 2012, Vietnam's investor protection index scores 3 out of 10, outperforming only the Philippines and Laos. China's investor protection index is better, scoring 5 out of 10. In terms of stock markets, the capital market in China is very large compared to Vietnam. The stock exchanges in the two main stock markets in China, Shanghai and Shenzhen, are ranked at 4th and 8th globally as of 2016.[7] Foreign investors' capital inflows into the Chinese capital market were at 183 billion USD at the end of 2017[8] while, in Vietnam, the amount of foreign capital inflow stood at 2.46

[5] These countries are Vietnam, Malaysia, Indonesia, the Philippines, Thailand, China, India, Hong Kong, and Singapore. Only Japan has public ownership as the main type.
[6] As at 2015, state-owned banks in Vietnam accounted for around half of the lending (54%) and deposit (48.5%) shares of the banking system, and state-owned banks accounted for nearly half (47.1%) of the banking assets (Source: Data published on the website of the State Bank of Vietnam).
[7] https://www.jerseylaw.je/publications/Documents/IoLJournal/2017_1/FutureChineseMarkets.pdf
[8] https://www.bloomberg.com/news/articles/2018-01-24/foreign-investors-boosted-china-stock-holdings-by-81-in-2017

billion USD for the whole of 2018.[9] In 2009, Chinese initial public offerings (IPOs) raised more than 55 billion USD, compared to 24 billion USD raised by United States' IPOs.[10] Thus, firms in China are more motivated to adopt good corporate governance mechanisms to attract capital. In terms of accounting requirements, China is again well ahead of Vietnam. Since 2007, around 90% of Chinese accounting standards (CAS) have been in line with International Financial Reporting standards (IFRS) and International Accounting Standards (IAC).[11] In addition, listed firms in China must hire a certified public accountant to audit their annual financial statements. In contrast, up to 2014, Vietnamese firms' financial statements were required to conform to 26 Vietnamese accounting standards, which are not in line with IFRS. Only recently, in 2014, the Vietnam government issued new circulars, 200/2014/TT-BTC and 202/2014/TT-BTC, that introduce 26 VAS based on IFRS. Auditors in Vietnam only need to fulfil the requirements of the Vietnam Ministry of Finance to be able to audit firms' financial statements. Lastly, the corporate governance framework in Vietnam is still at an early stage, since Vietnam is only starting to learn the concept of corporate governance (Witt & Redding, 2013). The World Bank assessed that, for the majority of Vietnamese firms, their knowledge of corporate governance is just at a basic level[12] and the incentive to institute strong governance structures has been largely absent.[13] Recently, the Vietnam government has made an effort to reform its institutional framework to be in line with "best practices" in the world, with the 2015 Law on Security and 2010 Law on Credit institutions setting out rules for good corporate governance.

Nevertheless, Vietnamese banks do adjust to the weak CG institutional environment by voluntarily adopting selective corporate governance measures. For example, banks were eager to be involved in the foreign strategic partnership programme. This partnership is considered a governance mechanism to monitor controlling shareholder,[14] and may convince minority shareholders that their rights will not be exploited. Many banks in Vietnam also choose to hire more reputable external auditors to confirm that their information released to the public is reliable. Given that these auditors want to protect their reputation, banks are less likely to be able to manipulate the audited information, and will also be more motivated to enhance their own corporate governance to paint a good image for the public. Another

[9] https://en.nhandan.org.vn/business/item/7537002-vietnam-sees-new-movement-of-fdi-inflows.html
[10] https://www.jerseylaw.je/publications/Documents/IoLJournal/2017_1/FutureChineseMarkets.pdf.
[11] https://www.hongdaservice.com/blog/3-things-you-must-know-about-chinese-accounting-standards
[12] According to a recent survey carried out by the International Financial Corporation (IFC) in 2011.
[13] Corporation Governance Review of the Vietnamese Banking Sector, the World Bank, March 2013.
[14] The detail of this strategic partnership is elaborated in Chapter 3.

mechanism is banks listing on the stock market, thereby subjecting themselves to more regulations on CG and information disclosure. Again, the country's legal and enforcement environment can influence the effectiveness of these governance mechanisms (Claessens & Yurtoglu, 2013).

To sum up, the Vietnam institutional context gives firms less incentive to adopt good corporate governance, due to: (i) A small and underdeveloped capital market; and (ii) the lack of formal institutional infrastructure for good corporate governance. Therefore, this thesis examines the question: given the lack of market forces and legal frameworks for good corporate governance in Vietnam, are internal corporate governance mechanisms effective? The thesis aims to answer this question by investigating some selected governance mechanisms on Vietnamese bank outcomes.

1.3. Overview of the thesis and its contribution

In this thesis, we aim to examine three main questions regarding the effectiveness of some selected corporate governance mechanisms in Vietnamese banks: First, we consider the effect of foreign directors on bank risk-taking. Specifically, how do foreign directors acting as an internal corporate governance mechanism impact banks' risk-taking?. Second, we investigate the effect of female board members. In particular, are women directors acting as a mechanism that influences board decision-making and, bank cost-efficiency. The third question asks: Can mergers create value for acquirers' shareholders by improving the combined entity's technical efficiency. This question belongs to a different aspect of corporate governance; the market for corporate control, which is regarded as a mechanism to substitute money-wasting managers (Tirole, 2010). Nevertheless, the market for corporate control is largely absent in the banking sector (Adams & Mehran, 2003). Thus, the third question relates to corporate governance in the sense that M&As normally lead to the replacement of some/all existing directors and the management team in the merged entity and the transfer of leadership positions from the merging entity to the combined entity. Therefore, this question is investigated under the assumption that mergers lead to a change in the corporate governance of the combined entity, as a result of the change in the board and is, hence, likely to influence the efficiency of the combined entity.

The three research questions are constructed under consideration of specific characteristics of the Vietnamese banking sector during the period investigated. These characteristics are, first, the increasing participation of foreign financial entities in the Vietnamese domestic

banks following the relaxation in regulations and the introduction of the foreign strategic partnership programme. Second, there is a wave of mergers starting from 2011 in response to an initiative from the government to clean up the fragmented financial market. Third, gender equality is an important goal pursued by many nations, including Vietnam. Even though the government has not given a quota on the minimum participation of women in leadership positions, in the latest legal document on corporate governance in listed firms[15], it is required that firms consider the gender factor in leadership positions.

The three research questions are investigated in light of several existing theories providing linkage between boards of directors and firm outcomes, which are agency theory and resource dependency theory. The agency theory depicts the conflicts of interests between principals (shareholders) and agents (managers) owing to the separation of ownership and control. The board of directors acts as an important internal governance mechanism that monitors and advises the management, to ensure that managers are working to maximise shareholders' wealth. Each director is viewed as an individual with his specific accumulation of knowledge, skills, and experience that will promote "cognitive conflicts" and avoid the "groupthink" problem in the board decision-making process. Thus, the board could mitigate agency conflicts. In contrast, the difference in board members could lead to lower cohesion and more conflicts on the board, which lowers the effectiveness of the decision-making process. Resource dependency theory, on the other hand, portrays the board as a connection between the firm and its external environment. Under this theory, the board provides access to external resources and the contingencies required by those resources that the firm requires. Pfeffer and Salancik (2003) illustrate a director's responsibility as "when an organization appoints an individual to a board, it expects the individual will come to support the organization, will concern himself with its problems, will variably present it to others and will try to aid it" (p.163). The two theories not only provide a foundation for the argument that boards of directors are important to organisational performance, but board composition matters as well, as individual directors can bring to the table different values such as networks, information, knowledge, experience, and so on.

Vietnam provides a valuable opportunity to explore the effects of governance on bank performance and stability for two main reasons. First, Vietnam has distinctive institutional settings compared to other developing countries, which provide us with an opportunity to

[15] Degree No.71/2017/ND-CP (Article 13) on guidelines on corporate governance of public companies.

examine the effectiveness of internal governance mechanisms where external mechanisms are largely absent. The study's findings also have important implications for both academics and practitioners. For academics, the study contributes to the understanding of corporate governance mechanisms of banks in Vietnam and its relationships with bank performance and risk-taking. This study enriches the literature on the corporate governance of banks from a developing country perspective, with its distinctive institutional characteristics. For bank regulators and bankers in Vietnam, the research should provide evidence for effectively designing a corporate governance legal framework for the banking sector and corporate governance mechanisms in the banks.

Second, in the last ten years there have been major changes in governance mechanisms of the banking sector, as a result of some important economic events; the Asian financial crisis in 1997 and economic integration to the world economy starting in the 2000s, and the global financial crisis in 2007. More especially, in 2011, the Vietnamese government started an economic reform programme to restructure the banking and public sectors. In the banking sector, in the next several years, the Vietnamese government issued many legal documents to enhance the sustainability of the banking sectors. This creates an opportunity to investigate how government policies might influence internal corporate governance mechanisms in Vietnamese banks.

This section and the following provide a brief overview of the three research questions. The first study examines whether foreign directors increase bank risk-taking. Foreign directors in this study are representatives from financial institutional investors, who own from 15% to 20% of the total shares of a Vietnamese bank, to represent the rights of the investors. To the best of our knowledge, there are very few studies on this topic. We could identify only two recent studies in the Chinese context.[16] However, the results are not consistent; one study finds no relationship, while the other finds a negative relationship. This study is conducted in relation to the insights of agency theory. Owing to the relatively high ownership that an institutional foreign investor has in a domestic bank, the foreign directors have an incentive to monitor and influence the management to maximise shareholder value. Thus, from the agency theory perspective, foreign directors mitigate the agency conflicts. In contrast, it is known that, owing to the moral hazard associated with the presence of deposit insurance in the banking sector, shareholders are incentivised to increase risk-taking to earn short-run

[16] Cheng, Geng, and Zhang (2016) and Dong, Girardone, and Kuo (2017).

profits because they do not have to bear the consequence of the bank failure. As foreign directors are better at representing shareholders, they are motivated to increase bank risk-taking. There is also an argument that good corporate governance travels around the world through institutional investors. This argument could be explained by the human capital theory and the resource dependency theory. As foreign directors might have access to different resources that the bank requires and own different characteristics compared to their domestic counterparts, it is reasonable to expect that foreign directors would be beneficial to bank performance. However, the two theories do not pinpoint a clear direction for the foreign director-bank risk-taking relationship. Thus, this study uses the basis of the insight of the agency theory to formulate its research question. Data for this study is collected from 32 domestic banks' annual reports, covering the 2006-2016 period. The sample accounts for 92% of the total assets of all Vietnamese commercial banks. To measure the level of bank risk-taking, three different types of bank risk measures are employed, which are: Z-score, a proxy for bank insolvency risk; equity-to-asset ratio, as a proxy for capital risk; and loan-to-deposit ratio to capture liquidity risk. Non-performing loans are not used as an indicator of credit risk because the data for non-performing loans in Vietnam is unreliable, mainly due to the different regulations on loan classifications issued in the investigation period. To test the relationship between foreign directors on boards and the level of bank risk-taking, we use panel data regression with firm and year fixed effects. Other board characteristics variables are also included, such as board size, the ratio of female directors, and the ratio of independent directors on board. The study also employs a two-stage Heckman analysis and propensity score matching to account for the potential endogeneity concerns in the results.

The second study investigates the impact of board gender diversity on bank efficiency. The ratio of female directors on a board is a proxy for board gender diversity. The question is posed under the context of the recent trend in promoting gender equality in leadership by enacting boardroom gender quotas in European developed countries. Nevertheless, practitioners argue that if women in leadership positions do not add value to firms, the promotion of gender equality in leadership might just be tokenism (Carter, D'Souza, Simkins, & Simpson, 2010). Fortunately, it is widely documented that men and women are different psychologically. Adams and Ferreira (2009) find that women are more diligent and are tougher monitors than male directors. Therefore, it is expected that female directors would impact firm performance differently compared to their male counterparts. There are a number of studies examining the relation between board gender diversity and bank

performance. The majority of studies use accounting ratios as proxies for banks' profitability. In addition, literature on the effect of board gender diversity on firm performance is predominantly conducted in Western countries and the results are very mixed. Some studies find no or a negative effect of board diversity on firm performance as board diversity decreases the communication and collaboration within the board, while other studies find a positive effect on firm performance as competent female directors can bring a different set of skills to the board (see more detail in the literature review in Chapter 4). We therefore expand the literature by (i) investigating the role of female directors under the insight of resource dependency theory, and (ii) measuring bank profitability using efficiency instead of accounting data as in previous studies. The resource dependency theory implies that directors on a board provide access to resources and environmental contingencies that firms require for their development; and that directors who have more access to important resources that firms require would have more power over the firms operations. Based on this theory, we hypothesise that, due to the Vietnamese-specific social norms, female directors have relatively less access to resources than their male counterparts; therefore, female directors may negatively impact firms' performance.

To estimate bank efficiency, a one-stage stochastic frontier analysis (SFA) following the Battese and Coelli (1995) approach (BC95), and a two-stage distribution free approach following Cornwell et al. (1990) (CS90) are employed as a robustness check. Efficiency is considered superior to accounting measures of profitability like ROA, ROE, or revenue-to-asset ratio, as it takes into account more information (i.e. the input-output relationship) than any simple accounting measure. Specifically, the BC95 and CS90 approaches take into account inputs, measured by the cost of labour, the cost of deposit, and the cost of other earning assets, relative to outputs, measured by the total loans and other fixed assets. To the best of our knowledge, the majority of the existing literature on efficiency employs a two-stage stochastic frontier analysis approach. In this study, we employ both one-stage and two-stage stochastic frontier approaches. The one-stage framework is believed to provide a more precise frontier than the two-stage framework (Wang & Schmidt, 2002). However, there are more tools to address endogeneity problems in the two-stage framework than in the one-stage framework. We try our best to address any potential endogeneity problem given the available framework in each method. The study uses a hand-collected dataset from financial statements of 32 Vietnamese commercial banks, in the 2006-2016 period. The data is

deflated using the 2010 deflator to rule out the effect of inflation and take into account changes in quantities only.

The third essay answers the question of whether mergers and acquisitions (M&As) could lead to an efficiency improvement in the combined entities. To maximise shareholders' wealth, it is important for the board of the merging bank to ensure that M&A transactions are done to make the firm more profitable. In addition, M&As lead to a change in the top management in the merged bank. As, from the resource dependency theory perspective, directors provide linkages to external environments such as information and channels of communicating with environmental contingencies, the change in board composition would provide the combined entity with access to additional environmental resources that are beneficial to the firm's development. Therefore, M&As might likely lead to an increase in efficiency. There are studies on the relation between M&As and bank efficiency, however, the majority of the studies are conducted in developed countries such as the US and Europe. This study contributes to the existing literature from a developing country context. To investigate the relation between M&As and efficiency, two-stage data envelopment (DEA) window analysis is employed. First, technical efficiency is estimated using DEA window analysis. Second, technical efficiency is treated as the dependent variable and is regressed on M&As dummy and other control variables. Different from SFA, DEA is a non-parametric technique, where the frontier is formed by connecting the most efficient banks. To measure the inefficiency of an individual bank, its efficiency is compared with the efficiency of the banks on the frontier. DEA is regarded as a method that works well with a relatively small sample size. The data used in this study is also deflated using the 2010 deflator.[17]

1.4. Outline of the thesis

The reminder of the thesis is constructed as follows: Chapter 2 presents an overview of the development of the Vietnamese banking sector; the research details, including the literature reviews and answers to the three hypothesis questions, are reported in Chapter 3, 4, and 5; Chapter 6 provides a discussion of the findings, and the conclusion.

[17] The 2010 deflator is chosen for convenience. The World Bank provides a series of GDP deflators for each country over the years. The base year (the GDP deflator = 100) that the World Bank chose for Vietnam is 2010.

Chapter 2. The development of the Vietnamese banking sector

2.1. Characteristics of the Vietnamese banking sector

The composition of the Vietnam banking sector is summarised in Tables 2.1 and 2.2. Table 2.1 shows the diversification and expansion of the banking sector since 1990, from only four state-owned banks in 1990 to 46 commercial banks (including SOBs, JSCBs, JVBs, and FBs) and 49 foreign bank branches in 2017.

Table 2.1: Banking sector in Vietnam during the 1990-2017 period

This table displays the change in the proportion of bank types in the Vietnamese banking sector over the 1990-2017 period. In 2015, three technically default joint stock banks were purchased by the State Bank of Vietnam (SBV) for zero dong, and one state-owned bank was merged into another state-owned bank. Thus, the number of state-owned banks increased from five in 2005 to seven in 2015. According to WTO provisions, 100% foreign-owned banks have been permitted since 01 April 2007. Hence, in 2008, the first five FBs were licensed. There were three more FBs licensed in 2016 (of which, one FBB and one JVB were converted to FBs), and one more established in 2017, increasing the number of FBs from five in 2015 to nine in 2017.

	1990	1999	2005	2015	2017
State-owned commercial banks (SOBs)[18]	4	5	5	7	7
Joint stock commercial banks (JSCBs)		48	37	28	28
Joint-venture banks (JVBs)		4	5	3	2
Foreign-owned banks (FBs)		0	0	5	9
Foreign banks' branches (FBBs)		26	31	50	49
Total	4	83	78	93	95

(Source: Author compiled from Annual reports of SBV)

The banking sector is characterised by SOBs dominating the banking system, as shown in Table 2.2. The SOBs (excluding 3 JSCB absorbed by the SBV in 2015) alone accounted for 44.0% of the total banking assets as of 2018. In terms of market share, the SOBs are also dominant in the market. As of 2017, SOBs account for 47.7% of total deposits and 48.3% of total loans to customers, although the share have been decreasing over time. The SOBs are in the process of privatisation, but the process is quite slow and the Government is committed to hold at least a 51% stake in these SOBs. In particular, at the end of 2018, 14 years after the announcement of the equalisation programme,[19] the State still owns 77.1% and 64.5%

[18] SOBs are banks that have more than 50% shares owned by the State.

[19] On May 2006 the government announced a decision to "equitise," or partially privatise, the SOCBs to reduce the government ownership of all SOCBs to 51% by 2010.

of the shareholdings of Vietcombank and Vietinbank, respectively. In BIDV and Agribank the State still owns 95.3% and 100% of shares, respectively. Among these state-owned banks, Vietcombank and Vietinbank have strategic foreign investors. Meanwhile, JSCBs have rapidly increased their market shares, from 15% in 2005 to 41.3% in 2017 of total lending, and from 16% in 2005 to 42.4% in 2017 of total deposits. Local banks in total hold 90% of the market share, while the foreign sector (including joint-venture banks) accounts for a modest portion of the market (less than 10%).

Table 2.2: Distribution of the assets, lending and deposit markets of the banking sector (%)

This table shows the changes in the lending, deposit, and total asset shares of different types of Vietnamese banks during the 2005-2018 period. Data for 2005 are taken from Thong (2012). The remaining data is calculated by the author from SBV's 2017 and 2018 annual reports.

	Lending shares (%)		Deposit shares (%)		Asset shares (%)	
	2005	2017	2005	2017	2008	2018
SOBs	73	48.3	75	47.7	52.6	44.0
JSCBs	15	41.3	16	42.4	31.3	41.2
JVBs, FBs, and FBBs	10	7.8	8.0	9.1	11.4	10.3
Total	98	97.4	99	99.2	95.3	95.5

Vietnam is at its peer (i.e. middle income countries) level in terms of financial depth as measured by the percentage of money supply to gross domestic product (GDP) and the percentage of domestic credit to private sector to GDP, which captures the development of financial intermediaries in the banking sector. In contrast, access to financial services is relatively low compared to the peer group countries, owing to the low number of bank branches per 100,000 adults (3.4 versus 11.8, respectively) and ATMs per 100,000 adults (24.3 versus 36.1, respectively). Thus, the Vietnamese banking industry has great potential given the large population (nearly 96 million as of 2017) and the low level of financial inclusion. Investment in mobile banking, internet banking, and other technology applications would open the door for banks to approach great numbers of domestic customers. This gives foreign investors with financial capacities, experiences and expertise great opportunities to do business and earn profits in Vietnam.

Table 2.3: Vietnam financial development compared to its peers

This table shows the level of Vietnamese financial development compared to similar countries in Asia and to middle income countries measured by the broad money-to-GDP ratio, domestic credit to private sector, numbers of banks branches per 100,000 adults, and number of ATMs per 100,000 adults. Middle income countries are defined by the World Bank.

	Broad money/GDP (%)		Domestic credit to private sector (% of GDP)		Bank branches per 100,000 adults		ATMs per 100,000 adults	
	2005	2017	2005	2017	2012	2017	2005	2017
Vietnam	71	155.3	60.5	130.7	3.1	3.4	3.5	24.3
China	151.1	202.6	111.8	155.8	7.6	8.8	9.6	81.5
Indonesia	43.4	39.9	26.4	37.8	16.9	16.9	10.5	55.6
Malaysia	125	124.2	106.5	118.8	11.1	10.1	28.2	46.8
Philippines	50.4	79.0	29.1	48.7	8.0	9.0	12.4	28.3
Thailand	104.1	124.3	93.8	145	11.8	11.9	40.6	117.3
Middle income (as defined by the WB)	73.8	129.3	52.9	100.7	10.2	11.8	10.9	36.1

(Source: World Bank database)

To sum up, the banking sector in Vietnam is characterised by the dominance of the state-owned banks in terms of lending, deposits and total assets. Private banks have to compete strongly with each other and with foreign banks to attract customers. In contrast, access to financial services in Vietnam is relatively low given the large population. A higher access to formal financial systems could potentially boost economic growth and productivity over the long term (Demirguc-Kunt, Klapper, & Singer, 2017). Thus, the Vietnamese banking industry has great potential to increase revenue by increasing the level of financial inclusion. Indeed, 90% of the income of Vietnamese banks comes from lending activities.

2.2. The Vietnam banking reforms

Over the past two decades, the Vietnam banking system has been undergoing many reforms to enhance the competitiveness and efficiency of the banking sector. According to Claessens (1996), there are two types of banking reform approaches; new bank entry, and rehabilitation of existing state-owned banks. The entry approach is characterised by new bank entry associated with financial sector liberalisation, as well as the privatisation of state-owned banks. The rehabilitation approach is characterised by the recapitalisation of existing state banks, with limited break-ups, limited privatisation, and limited bank entry. Depending on

the circumstances, Vietnam follows either the rehabilitation or entry approach; however, the country tends to mainly adopt the rehabilitation approach.

2.2.1. The period of "adaption of market economy" from 1990 to 1999

Beginning with the 1990 Ordinance on Banks, Credit cooperatives and Financial companies, the Vietnam banking system has moved from a one-tier to a two-tier system, whereby the central bank's functions (monetary policy and oversight of commercial banks) and commercial bank's functions (fund mobilisation and allocation) are separated. The 1990 Ordinance set the path for the establishment of private joint stock banks and the entry of foreign banks via foreign bank branch setups or joint-ventures with domestic banks. Shortly after that, in 1997, the Law on Credit institutions was passed to replace the 1990 Ordinance, as was the Law on State Bank of Vietnam. The two laws have created the legal corridor for credit institutions to operate in Vietnam and for SBV to function as the central bank. During this 1990-1999 period, SBV adopted a restriction on loan-deposit rate spreads to indirectly control loans and deposit rates. SOBs granting directed credits to state-owned enterprises were also very common.

The above-mentioned regulatory reform has resulted in the lowering of administrative and legal barriers to entry into the banking system for both joint stock commercial banks and foreign banks (*see Table 2.1*). As SOBs dominated the banking system - accounting for 75% of total assets and 70% of credit to the economy as of 2000 - the remaining private commercial banks have had to compete strongly to survive.

2.2.2. The first banking restructuring from 2000 to 2007

Given the practice of directed credit to SOEs during the 1990s, non-performing loans (NPLs) associated with SOEs increased sharply in late 2000. Furthermore, following a period of destructive competition among the JSCBs, bank consolidation and mergers occurred. This resulted in a fall in the number of banks, from 48 JSCBs in 1999 to 37 JSCBs in 2006. To stabilise the banking system, the government launched a restructuring programme in 2000, using multiple tools.

The government established internal Asset Management Companies (AMCs) for four SOBs in 2000 to manage bad debts. However, due to the fact that the bad debt transferred to the AMCs still appeared on the bank's consolidated balance sheets, AMCs were believed to have no significant effect on solving the bad debts. In addition to AMCs, in 2003, the

government set up a Debt and Asset Trade Company (DATC). Unlike AMCs, DATC was a commercial organisation, and its profit would be generated from selling bad assets purchased from SOEs. Likewise, DATC is believed to have operated inefficiently, mainly due to lack of infrastructure for selling the bad debts. On the other hand, from 2001 to 2005, the government granted additional charter capital to SOBs in the form of non-transferable government bonds in order to recapitalise them. Additionally, the Vietnam Bank of Social Policy and the Bank for Development were established in 2000 and 2006, respectively, with an aim to separate commercial businesses with directed credits. As a result, directed lending and credits to SOEs were reduced, from 90% of total credit in the early 1990s to 31.4% by March 2007. The government also emphasised the need to privatise SOEs to prevent "a possible massive collapse of state-owned enterprises" as highlighted by Prime Minister Phan Van Khai at a national meeting conducted on March 15-16, 2004, in Hanoi. To meet the government's goal, SBV designed a privatisation plan for SOBs, with the aim of privatising all SOCBs by 2010. Up to 2010, only the Vietnam Commercial Bank (VCB) and Vietnam Industrial Bank went public in December 2007 and July 2009, respectively.[20,21]

Since 2000, the Vietnam government has aimed to promote private sectors and move towards a more market-based economy. Thus, in 2002, a market-based interest rate mechanism was adopted, which allows commercial banks to freely decide on all lending and deposit rates based on negotiating with customers. However, according to the 1995 Civil Code (Article 473), the lending rates are capped floating rates, which should not be higher than 150% of the base rate announced by SBV. On the other hand, with the participation in the two milestone agreements, the US-Vietnam Bilateral Trade Agreement (UVBTA) in 2001, and the WTO in January 2007, Vietnam has been gradually opening the banking system to foreign investors, to meet the requirements upon entrance. Under the UVBTA framework, the Vietnam government is committed to liberalising the banking sector by 2010; joining the WTO, Vietnam enjoys the most favoured nation rule, which extends the scope of this commitment. According to WTO provisions, 100% foreign-owned banks have been permitted since 01 April 2007; although the maximum equity held by foreign institutions and individuals in a Vietnamese JSCB is 30% of the bank's chartered capital, unless a different percentage is specifically allowed by SBV. This means that foreign investment in the domestic banking market has increased through two channels; purchasing

[20] https://vnexpress.net/kinh-doanh/vietinbank-len-san-voi-ten-ctg-2699997.html;
[21] BIDV went public in 2014. Hence, to date (2019) three out of four state-owned banks are public (only Agribank is not published).

stakes in the Vietnamese JSCBs, and establishing 100% foreign owned banks in Vietnam. In 2008, the first five 100% foreign-owned banks were licensed. Foreign strategic investment in domestic JSCBs was also buoyant so that, within just three years, from 2005-2007, eight successful transactions had taken place.

A complex web of cross-ownership has also been created between banks and non-bank firms and between banks (Appendix 1). This ownership complexity formed during the process of acquisition of JSCBs by private, non-bank firms or the establishment of banks by SOEs conglomerates, and the cross-shareholdings among banks. There are three main factors that led to this process. First, private, non-bank firms wanted to take advantage of the affiliated banks as an immediate channel to raise credit to finance their activities in the form of purchasing long-term corporate bonds, or through contribution of the firms' equity capital. Second, both non-bank and banking firms wanted to exploit opportunities from the banking sector that was booming during the monetary easing period (1999-2007). Third, in November 2006, the government issued decision No.141/2006/ND-CP promulgating the list of the legal capital level of credit institutions, which requires JSCBs to maintain their actual equity capital at an amount of at least 1,000 billion VND by the end of 2008 and 3,000 billion VND by the end of 2010. In order to rapidly increase equity capital, JSCBs called for investments from firms and other banks. Without adequate supervision, this complex web can threaten the healthiness and stability of the banking system. For instance, some controlling shareholders might take advantage of cheap credit from depositors to fund business activities in firms where they or their related parties are owners, exposing the banking sector to high credit risk and systemic risk.

2.2.3. The current banking restructuring from 2008 to the end of 2018

After a period of monetary easing from 2002-2007 (with an average of nearly 30% YoY growth), the inflation rate, according to the General Statistics Office of Vietnam, rose markedly, from 8.3% in 2007 to 23.12% in 2008. At the same time, the global financial crisis hit the economy. As a result, the economy has been affected deeply.[22] Macroeconomic conditions in Vietnam deteriorated quickly with increasing dollarisation, a frozen real estate market, and a sharp decline of the stock market. Under those circumstances, the banking sector experienced a hard time. Since many SOEs and banks were involved in business in

[22] http://documents.worldbank.org/curated/en/532401468173044270/How-deep-was-the-impact-of-the-economic-crisis-in-Vietnam-A-focus-on-the-informal-sector-in-Hanoi-and-Ho-Chi-Minh-City

real estate and the stock market during the boom period, NPLs in the banking sector were rising dramatically. In the 2008-2011 period, while the M2 growth rate was on average 26.56%, NPLs grew at a rate of 51% YoY. On 31 May 2012, SBV published two different numbers for NPLs ratio, representing different accounting methods of classification of NPLs. According to reports from credit institutions, the NPL ratio of the system was 4.47% as of total gross loans; however, according to the calculation by SBV, the NPL ratio was 8.6%. The SBV did not provide details of how they calculated the ratio. Almost at the same time, Fitch Ratings announced that the number was much higher, at 13% of the total gross loans. Regardless of the inconsistency in published numbers, such a high rate of NPLs rang alarm bells over the health of the banking system. On the other hand, since 2012, the Vietnam police have arrested a number of bankers from some commercial banks; for example, Vietnam Bank for Agriculture and Development, Asia Commercial Bank, Vietnam Construction Bank, Ocean Bank, and GP Bank: for committing economic crimes involving fraud, corruption, abuse of power and rights, and conducting illegal businesses. These events resulted in erosion of customers' confidence in the banking system and threatening the sustainability of the banking system.

Hence, the government issued Decision 254/QD-TTg dated March 01, 2012 on approving the Scheme on "Restructuring the credit institution system in the 2011-2015" to restructure the banking system. According to Decision 254, the restructuring programme aims at: Improving the operational efficiency and safety of local banks; enhancing market discipline in banking activities; and diversifying structure in the types, ownership, and sizes of the banking system to be more consistent with international standards. To achieve the goals, SBV focuses on delivering three tools: First, resolving bad debts in the system; second, encouraging (in some cases, forcing) bank mergers and acquisitions to become more competitive entities; and third, encouraging foreign banks to cooperate with domestic banks to help domestic banks improve governance and risk management, develop products, and utilise the modern technologies of foreign banks, through the so called "strategic foreign partnership" programme. After the issuance of Decision 254, there were three main changes in the Vietnamese banking sectors.

First, there was an increase in the presence of foreign direct investment in the industry. Before 2007, the presence of foreign banks in Vietnam was limited to joint ventures,[23] with

[23] Joint-ventures were established the result of the cooperation between the two governments involved to promote economic and financial cooperation.

Vietnamese SOBs and FBBs only. Being FBBs, they were not allowed to accept deposits or provide lending. As a result, the presence of FBBs in the Vietnamese markets was focused on getting to know the local market and regulations. The new opportunity was opened to foreign financial entities when the government introduced the foreign partnership programme in 2007. The programme aimed to take advantage of the superior management skills brought about by foreign financial entities to improve the capacity of the local banks. Consequently, foreign investors enthusiastically embraced this opportunity as a chance to increase their presence in the Vietnam financial market. It was expected that corporate governance and risk management of local banks would improve after taking on the foreign partnership programme, and consequently, enhance the efficiency of the local banks. Foreign investors also found great potential in the Vietnamese market and expected to earn profits from their investment. From 2007 to 2012, there were 12 successful introductions of foreign strategic partnerships in local banks, of which eight transactions took place in the 2005-2007 period. Foreign entities could appoint senior members to sit in important management positions in the local banks to represent their rights. However, the government limited the participation of foreign financial entities at up to 15% shareholdings in a local bank. From 2014,[24] the limit was increased to 20% of shareholdings. This regulation is regarded as tying foreign investors' hands in improving the governance and performance of the local banks.

In the period since 2015, we have witnessed the divestment of ownership from foreign investors. There are several reasons explaining the phenomenon. First and most importantly, since 2012, the Vietnamese economy has been experiencing hard times. The macroeconomic conditions have been characterised by a high non-performing loan ratio in the banking sector as a result of the burst in the asset bubble, high inflation rate, decline in the stock and real estate markets, and a slowdown in economic growth. The stability of the political environment has also been affected by the waves of arrests of corrupt leaders from state-owned enterprises, as well as leaders from domestic banks, due to their improper management, incurring severe losses for the banks. After a period of investment, foreign investors left the local bank with no gain, due to the decline in the stock market. Second, there are changes in strategy of foreign entities such as ANZ, leading them to divest their investments in South-East Asian countries to focus on their core business lines. Third, since 2016, Vietnamese authorities have allowed the establishment of 100% foreign-owned banks. As a result, some foreign banks withdrew their investment in the local banks to focus the

[24] According to Decision No. 01/2014/NĐ-CP.

resources on opening a 100% foreign bank in Vietnam. To date, there are nine foreign banks established in Vietnam.

In the meantime, there was a wave of mergers and acquisitions in Vietnam, initiated by the government as another effort to restructure the banking sector. Unlike the cross-country M&As in other South-East Asian nations after 1997, the M&As were between domestic bigger banks and weak banks. The M&As, in the government's plan, would be conducted in two phases. The first phase is to encourage bigger banks to take over weak banks. This serves two main purposes. First, the government wants to ensure the soundness of the banking system by not letting weak banks fail. In addition, because all the rights and obligations of the weak banks will be transferred to the newly combined banks, the more robust bank would help to resolve the bad debts transferred from the weak bank. Second, the government wants to make the Vietnamese banking sector less fragmented. By consolidating small and weak banks with bigger banks, the number of commercial banks has declined from 42 banks before 2012 to 34 banks after 2012. Banks involved in this restructuring process (i.e. merged with a weak bank) would receive some favourable treatment from the government. For example, these banks would receive support from the authority in foreclosing on collateral. The banks would also be allocated higher lending growth limits than would otherwise be allowed. In effect, the government banned weak banks from lending and allocated lending growth limits to each bank based on their previous performance to curb credit growth.

The second phase started in 2015, with the mergers of relatively healthier banks. The aim of this phase is to increase the competition of local banks with foreign banks, as well as with other banks in the region. Vietnam still has many small banks, which compete against each other in a small market. Apart from the four state-owned banks that account for around 50% of the total lending and deposits, the remaining 28 banks are competing with each other and with foreign banks to attract the remaining part of the market pie. The M&A wave is still going on in Vietnam, and experts predict that in the near future (i.e. after 2019) there will be more mergers in Vietnam. In addition to domestic M&As, the government also encourages foreign entities to purchase 100% weak Vietnamese banks. Thus far, none of these deals have been done.

The banking sector has shown positive indicators since 2016, such as a low official NPL ratio (less than 3% of the outstanding loans)[25], and improvement in ROA, ROE and revenue. In 2016 and 2017, there were a further four 100% foreign banks established, increasing the total number of foreign banks in Vietnam to nine.

2.3. Development in corporate governance in Vietnam

Besides the introduction of the strategic partnership programme, with the aim to increase governance and risk management in the Vietnamese local banks, the government has shown the awareness and effort, still limited however, to enhance corporate governance practices in the Vietnamese banks. Corporate governance is a relatively new concept in Vietnam. Up to 2005, some Vietnamese scholars still tried to find an equivalent Vietnamese term for "corporate governance" since, in the Vietnamese language, there is no term which conveys such a broad conception of corporate governance (Hai & Nunoi, 2008). Indeed, the Law on Enterprise enacted in 2005 is regarded as the first legal document that "forms the foundation for the Vietnamese corporate governance system" (Hai & Nunoi, 2008, p. 6). On the other hand, a number of economic crimes such as accounting fraud, insider trading or power and authority abuse, which can link to failures of corporate governance setting, have occurred so far. This has drawn the attention of policy makers and scholars to corporate governance issues in Vietnam.

The WB had its first assessment of Vietnam's corporate governance policy framework in 2006, and updated their assessment in 2013[26]. The WB assesses the corporate governance framework according to five key practical areas in the OECD principles, namely; the rights and equitable treatment of shareholders and other financial stakeholders, the role of stakeholders, disclosure and transparency, and the responsibilities of the board. Their scores suggest that the Vietnamese corporate governance framework is not as strong as that of Indonesia, Malaysia or Thailand, and more or less the same as in the Philippines. They find many major weaknesses in Vietnamese corporate governance in state-owned firms in particular, and in firms in general:

[25] Nevertheless, a lot of bad debts were actually just transferred from the local banks' statement to VAMC's statement. Those bad debts will be returned to the banks if, after five years after the transferral, they arenot resolved.

[26] Report on the Observance of Standards and Codes (ROSC), Corporate Governance Country Assessment Vietnam, August 2013.

"Overall, the corporate governance of many SOEs remains poor, with weaknesses in terms of transparency, board professionalism, and how the state acts as owner which is exercised in an opaque matter including through state economic groups (SEG), which have limited accountability and significant cases of poor performance …"

and

"Shareholders ability to participate in the general meeting of shareholders (GMS) is limited by a short of notice report, often inadequate information provided before the meeting, and limited opportunities to ask questions or alter the agenda….Even with cumulative voting, in many companies smaller shareholders cannot influence board composition. Thresholds for approval of major and related party transactions (RPT) are high and only occasionally used…There is no "shadow director" concept, and it's difficult to hold accountable an individual who may have control in a company but no formal role…Accounting standards are based on years old versions of International Financial Reporting Standards (IFRS) and will not converge to current IFRS for some time. Disclosure of indirect control and beneficial ownership is poor, disclosure of RPTs tends to be incomplete, and risk factors and trends affecting the company are often not disclosed….Independent members still do not play a significant role in too many boards. Boards do not have audit committees, but instead have separate inspection committees, which in practice are often not effective in overseeing audit, compliance, or company finances."

(Source: Report on the Observance of Standards and Codes (ROSC), Corporate Governance Country Assessment Vietnam, August 2013, p.2-3)

The Asian Development Bank also conducts a survey of 529 companies in six South-East Asian countries (Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam)[27] using scorecards covering the five areas of the OECD principles. The survey shows that Vietnam's CG mean score has increased continuously in the 2012-2015 period, signalling better corporate government mechanisms and continuous efforts by firms in implementing

[27] ASEAN Corporate Governance Scorecard, Country Report and Assessments 2015, Joint Initiative of the ASEAN Capital Markets Forum and the Asian Development Bank, 2017.

good corporate governance. However, the assessment also reveals many weaknesses in all aspects of corporate governance.

After the 2007-2008 global financial crisis, the Vietnamese government shows an effort to improve the governance framework in Vietnam. Starting from 2010, important legal documents are issued to reform the institutional framework to be more in line with "best practices" around the world in terms of the board of directors, the internal audit team, and the managers, among other aspects. The new Law on Credit Institutions issued in 2010 and the Law on Security issued in 2015, set out more rules for good corporate governance. The first document is applied to all banks operating in Vietnam, while the second one applies to listed firms. In addition, in November 2017, the National Assembly passed various amendments to the 2010 Law on Credit Institutions, with focuses on; (i) transparency and risk prevention for the banking sector, and (ii) restructuring, rescue, and liquidation of a problem credit institution. For example, the power to dismiss and appoint internal audit managers in a bank is now transferred from the Board to the Inspection Committee. This is to guarantee the impartiality of the internal audit section. The Chair of the board and general directors can no longer hold leadership positions at both a bank and another business. This is to prevent the problem of tunnelling and to ensure the safety of the entire banking system. The new law also provides for banks to declare bankruptcy, as well as covering merger and consolidation plans, dissolution plans, and bankruptcy plans of weak banks. Appendix 2 provides a detailed summary of the legal requirements of corporate governance applicable to join stock commercial banks provided in the Law on Credit Institutions. Nevertheless, as law enforcement is rather weak in Vietnam, it is not obvious whether these regulations have a real impact on corporate governance practices in domestic banks.[28] In addition, the SBV also shows efforts in enhancing the strength of the domestic banks to withstand shocks and management risks. For example, banks are required to have sufficient capital to cover credit risks, market risks, and operational risks in accordance with Basel II regulations. Banks also need to adhere to stricter regulations set out in Circular No.13/2010/TT-NHNN on loan classification, provisioning, and the use of provisions to deal with credit risks in banking operations.

To sum up, after a long period of monetary easing from 2000-2007, Vietnam has been implementing financial reforms to ensure the stability and promote the effectiveness of the

[28] Banks are adhering to the law, in order to avoid punishment; however, the effects of these regulations might not be realised in their actual operations.

banking system from 2009. The reform programmes focus on two main areas: Restructuring and equalisation of the SOBs; and restructuring of JSCBs; as well as improving the regulatory framework to improve management and governance in banks. In the last decade, many new regulations have been issued, including new regulations on corporate governance.

Given the Vietnamese banking sector's background, in the following chapters, details of research questions are presented. Chapter 3 answers the question of whether foreign directors on boards affect bank risk-taking; and Chapter 4 explores the question of whether board gender diversity improves bank efficiency. The effect of mergers on bank efficiency is investigated in Chapter 5.

Chapter 3. Board effectiveness and bank soundness: Do foreign directors increase bank risk-taking?

3. 1. Introduction

The board of directors is a key governance mechanism in banks, in place to minimise agency costs (De Andres & Vallelado, 2008; Pathan & Faff, 2013). This is because boards are regarded as the first line of governance mechanisms to monitor and advise management. In addition, owing to the more diffused stakeholders in banks, the monitoring function is more important in banks than in non-banking firms (John et al., 2016). In this regard, Fama and Jensen (1983) argue that the board is not an effective control if it is not able to limit the decision discretion of an individual top manager. This argument refers to the agency conflicts between the board and management, from the perspective of protecting shareholders' rights. However, there were severe negative externalities for the economy and taxpayers in bailing out failed banks in the aftermath of the 2008-2009 global financial crisis. These externalities have turned policymakers and academics' attention to revisiting the question of the roles of bank boards from a wider perspective. As a result, the guidelines for corporate governance principles for banks issued in 2015 by the Bank for International Settlements suggest that "the primary objective of bank corporate governance should be safeguarding stakeholders, shareholders' interest in conformity with public interest on a sustainable basis. Among stakeholders, shareholders' interest would be secondary to depositors' interest" (p. 3). Tirole (2010) also suggests that firms need to hold duties towards creditors as part of their corporate social responsibility. In addition, one of the main factors contributing to the crisis itself is believed to be the excessive risk-taking in banks (Acharya, Cooley, Richardson, & Walter, 2010). Therefore, from the public interest perspective, it is important that boards safeguard banks from taking excessive risks, as the board has the ultimate responsibility in risk management and is generally responsible for designing strategic decisions in most firms (Akbar, Kharabsheh, Poletti-Hughes, & Shah, 2017; Srivastav & Hagendorff, 2016).

Unfortunately, while bank boards are expected to protect debtholders' interests, they are not motivated to do so. Prior studies suggest that board and shareholders have a tendency to encourage risk-taking for shareholders' returns, especially in high-leverage firms, at the expense of the debtholders (Erkens, Hung, & Matos, 2012; Ertugrul & Hegde, 2008; Jeitschko & Jeung, 2005; Jensen & Meckling, 1976). This is because, in high leverage firms,

shareholders will reap the benefits if the risky project is successful and debtholders will bear the losses if the risky project fails (Ertugrul & Hegde, 2008). Jeitschko and Jeung (2005) additionally argue that financial sectors that have deposit insurance in place are likely to be exposed to moral hazard. That is, in the presence of deposit insurance, a risk-neutral shareholder (i.e. a well-diversified investor) prefers the riskier asset, because the riskier asset gives a possibly higher mean return and higher option value (i.e higher-risk, higher-return assets). Akbar et al. (2017) confirm the risk-taking nature of boards by suggesting that boards focus more on the short-term than long-term objectives of their organisations.

Given the role of boards in risk management, it is important to investigate how boards relate to risk-taking. In this chapter the impact of foreign directors on bank risk-taking is examined. Foreign directors are representatives from institutional investors, involved in foreign strategic partnerships with Vietnamese domestic banks. Those investors are international banks and international financial organisations, and own from 15% to 20% of the total shares in the domestic banks. There is evidence that board composition affects the way the board exercises its functions, and hence affects firm outcomes (Carter et al., 2010). Therefore, it is very likely that foreign directors influence the level of risk-taking in domestic banks. The focus on this variable is motivated by the theory that good corporate governance travels around the world through international institutional investment (Aggarwal, Erel, Ferreira, & Matos, 2011). Foreign institutions improve corporate governance practices across countries because institutional investors usually own enough shares to provide them sufficient incentives to monitor managers (Gillan & Starks, 2003). Cornett, Marcus, Saunders, and Tehranian (2007) further argue that institutions which have neither existing, nor potential business relations, with firms are better fitted to discipline and impose controls on corporate managers, as they may be less prone to pressure from protecting relations with the firms in which they invest.[29] Indeed, Aggarwal et al. (2011) find evidence of the positive relationship between ownership by foreign institutions and a corporate governance index in a sample consisting of non-US firms from 33 developed countries in the 2003-2008 period. Furthermore, they also find that firms with foreign institutional investment are associated with higher performance, measured by Tobin's Q.

This study contributes to the literature investigating the influence of foreign institutional investments on corporate governance and firm outcomes, from a different perspective. First,

[29] These institutional investors are labelled *pressure-insensitive.*

the study contributes to the literature on the role of institutional investors in financial firms. The banking sector differs from non-financial sectors in the sense that "the special corporate governance problems of banks weaken the case for making shareholders the exclusive beneficiaries of fiduciary duties" (Macey & O'Hara, 2003, p. 97). These "special corporate governance problems" in banks include the moral hazard associated with the presence of deposit insurance and the conflict of interests between debtholders (i.e. depositors) and shareholders. Second, there are relatively few studies on the effect of foreign directors on risk-taking. Third, the study is conducted from a developing country perspective.

The chapter is organised as follows. Section 3.2 provides the background to the presence of foreign directors in a domestic bank. Section 3.3 discusses the literature on the roles of foreign directors on bank risk-taking. Section 3.4 describes the methodology and 3.5 the data. Section 3.6 discusses the descriptive statistics and Section 3.7 reports the main empirical results. Section 3.8 reports the robustness tests. Section 3.9 investigates the channels through which foreign directors might have an effect on bank risk-taking and Section 3.10 concludes.

3.2. The introduction of foreign strategic partnership in Vietnam

In response to two milestone agreements, the UVBTA in 2001, and the WTO in January 2007, Vietnam has been gradually opening its banking system to foreign investors. According to WTO provisions, 100% foreign-owned banks have been permitted since 01 April 2007. The Vietnamese Government also introduced the so-called "strategic partnership" policy beginning in early 2007, right after becoming the 150th member of the WTO. The strategic partnership programme aims to take advantage of advanced technologies and management skills of foreign investors to improve the efficiency and competitiveness of the banking system. In April 2007, the authority issued Decree 69/2007/ND-CP (the decree was later replaced by Decree 01), which allows large international banks to become strategic foreign investors of local banks. A 'foreign strategic investor' is defined by Decree 01[30] as " a foreign organization which has financial capacity and has a written commitment of competent person to bind its long-term benefit with Vietnamese credit institutions and support Vietnamese credit institutions in transferring

[30] Decree 01/2014/ND-CP dated 3 January 2014 on the purchase by foreign investors of shareholding in Vietnamese credit institutions (Decree 01) as the replacement of Decree 69/2007/ND-CP dated 20 April 2007 (Decree 69). Decree 69 capped the maximum share of a strategic foreign investor at 15%, while decree 01 raises this threshold to 20%.

modern technologies; developing banking products and services, raising the administration and financial capacity". However, the maximum equity held by foreign institutions and individuals in a Vietnamese JSCB is 30%, with a maximum of 20% held by an individual foreign strategic investor, unless otherwise provided by the SBV. The Vietnam government encourages foreign banks to purchase a 100% share of weak banks.[31]

With deregulation, coupled with the prospect of the fast growing financial sector and the large market for retail banking, foreign direct investment in the financial sector became a hot trend from 2007 until late 2012. Foreign investors invested in the domestic banking market through two channels; purchasing stakes in Vietnam JSCBs, and establishing 100% foreign-owned banks in Vietnam. Seven out of nine foreign banks had established branches in Vietnam some time before they established 100% foreign-owned banks in Vietnam. Foreign investment in domestic JSCBs was also buoyant during the period from 2005-2007, when eight transactions took place, even though at this time they were not considered as strategic investors. There were seven foreign strategic investments between 2008 and 2012. One interesting fact is that among those investments, three investments happened in banks with family-controlled ownership, meaning family members hold important positions in the board of directors and the board of management, and also hold more than 50% of the total shares in those banks.[32] The total assets of the domestic banks invested in (fifteen banks) accounted for 43% of the total assets of the banking sector as at the end of 2012.

In the 2012-2019 period, seven foreign strategic investors divested from domestic banks. Specifically, first, ANZ divested from Saigon Thuong Tin Bank in 2012 as part of its strategy to not expand further in the South-East Asia region, and to focus on its core businesses.[33] Second, Overseas Chinese Banking Corporation (OCB) sold its shares in Vietnam Prosperity Bank to existing domestic investors of the bank in 2013. Third, Fullerton Financial Holdings Ltd (FFH), a financial investment company belonging to Temasek group (Singapore), divested from MeKong Development Bank in 2015, right before it was merged into Maritime Bank. Fourth, HSBC divested from Vietnam Technological and Commercial Bank in 2017. At the beginning of 2018, there were two divestments, which were Standard

[31] Weak banks are banks categorised as weak by SBV. However, the criteria for the categorisation are not published, and no such purchases have yet occurred.
[32] Those banks are Southern Bank (PNB), Asia Commercial bank (ACB) and Sai gon Thuong tin Bank (STB).
[33] At the end of 2017, ANZ Vietnam (a 100% ANZ owned bank) successfully sold their retail banking to Shinhan Bank reflecting its policy to retreat from retail business in Asia, significantly in response to home country regulatory change.

Chartered Bank from Asia Commercial Bank, and BNP Paribas from Orient Commercial Bank (Oricombank). The divestment by OCB, HSBC, and Standard Chartered share a common factor: these divestments occurred before or right after those financial institutions established their own foreign banks in Vietnam. According to a representative from HSBC, establishing 100% foreign banks brings about many advantages, such as the foreign bank can open more ATMs or branches and be treated as a domestic bank.[34] In addition, under the Basel III capital accord, for claims on banks in countries with sovereigns rated BB+ to B-, the risk weight for the capital adequacy ratio calculation will be 100%. Thus, for foreign banks such as ANZ, HSBC, Standard Chartered, Overseas Chinese Banking Corporation, Societe Generale and BNP Paribas that are implementing Basel III, it became more costly to invest in Vietnam, which motivated them to divest from their partnerships. In March 2019, Societe Generale completed its divestment from Sea Bank after ten years of being a strategic investor. Thus, by September, 2019, seven out of fifteen strategic investors will have divested from the domestic banks. In the remaining eight cases, two strategic investors have become minority investors after the domestic banks invested in being merged into other domestic banks. Appendix 3 provides a summary of these transactions.

On the other hand, there has been no new strategic investment since 2013. This probably reflects: (1) The not so sound condition of the Vietnamese banking sector in particular[35] and the whole economy in general; (2) the treatment of non-controlling stakes in other banks under Basel III capital rules;[36] and (3) domestic banks' need to focus on raising capital and resolving bad debts after decades of expanding loans to customers, lowering their short-term profits. The period from 2011-2015 showed the attempt of the Government to restructure the banking sector and resolve high bad debts.

In Vietnam, participation in these joint ventures is covered by shareholder agreements, which usually cover the terms under which the foreign strategic partner will provide the local institution with technical services to improve business performance, including sending experts to the local institution, training local staff and offering business opportunities. In all cases, the strategic investors assigned one, two or three representatives who have experience in finance to sit on the board or management of the domestic bank to represent their rights.

[34] http://www.bbc.com/vietnamese/business/2014/11/141107_banks_branches_closed
[35] In 2012 the non-performing loan ratio stood at 8.82%, which is a very high ratio.
[36] Under the Basel III capital accord, for claims on banks in countries with sovereigns rated BB+ to B-, the risk weight for capital adequacy ratio calculation is 100%.

Those representatives are foreign citizens residing in Vietnam while they are holding the position. Additionally, in eleven out of fifteen cases of foreign strategic partnership, representatives from foreign owners sit on both the board of managers and the board of directors. In fact, an interview with a foreign strategic investor who has invested in both Vietnam and China suggests that boards face a heavy workload, reflecting limited capability at lower levels within the banks and a lack of delegated authority in Vietnam and, to a lesser extent, in China.[37] On the other hand, as foreign strategic investors are all financial entities (see Appendix 3), they are regarded as institutional shareholders. It is expected from the Vietnamese government that strategic investors improve Vietnamese bank efficiency and risk management through two main channels: (1) Improving corporate governance and management performance; and (2) transferring superior skills to the local banks through training activities. Hence, directors from foreign investing entities are expected to play a positive role in improving management performance and corporate governance of local Vietnamese banks.

3.3. Literature review and hypothesis development

The proportion of foreign directors on the board is used as a proxy for the effect of foreign institutional investors on the domestic bank. The following section reviews existing studies on the role of foreign directors on bank risk-taking from the agency theory and resource dependency theory perspectives. Hypotheses are then formulated based on this review.

The board of directors is a decision-making group, therefore, the presence of foreign directors could influence how the board conducts its function of monitoring and advising managers. The presence of foreign directors could mitigate the agency conflict because a more diverse board performs better at monitoring and controlling managers, as they are less likely to be obligated to managers (Carter et al., 2010). Furthermore, foreign directors are not appointed by controlling shareholders, thus they mitigate the potential expropriation of value of minority shareholders from majority owners, especially in countries where the institutional protection of minority shareholders is poor (Young et al., 2008). From this viewpoint, it is very likely that domestic boards with more foreign directors are beneficial to shareholders. Foreign directors also have different cumulative stocks of education, skills, and experience compared to domestic directors. Thus, foreign directors could improve the

[37] We had a talk with a foreign director, who sat in the board of a Vietnamese domestic bank to represent the ownership of the foreign financial entity.

heterogeneity of ideas in board discussions and protect the board from the "groupthink" problem, which in turn could increase the effectiveness of board decision-making. Third, foreign directors could improve firm outcomes through: (i) Providing linkage to external environmental resources that firms require, according to resource dependency theory[38]; and (ii) improving corporate governance practices in the domestic banks. A number of studies, mostly conducted in the Chinese context, have found that foreign institutional investors improve banks' performance (Berger, Hasan, & Zhou, 2009; Jiang, Yao, & Feng, 2013; Lin & Zhang, 2009; Sun, Harimaya, & Yamori, 2013), which is consistent with Aggarwal et al. (2011). Nevertheless, Berger et al. (2009) suggest that this effect may be the result of specific institutional settings in China, which ensure the interests of minority foreign investors in exercising their control in the invested bank's businesses.

In contrast, there are reasons that foreign directors may prefer more risk taking, especially in countries that have deposit insurance in place, like Vietnam. First, from the shareholder value-maximisation perspective, shareholders are motivated to take higher risks to earn higher short-term value in the presence of deposit insurance; hence, foreign directors would be motivated to encourage managers to take more risks. García-Meca, García-Sánchez, and Martínez-Ferrero (2015), in a cross-country study on the effect of board diversity on bank performance, additionally postulate that foreign directors may motivate managers to take more risks to increase shareholders' returns because they do not have to take responsibility for the social cost of bank failure. Second, institutional investors are believed to have sufficient incentives to monitor managers. Pathan (2009) argues that a strong bank board[39] that represents the shareholders' interests better, will have a greater risk-taking appetite. Therefore, as foreign directors are representatives of foreign institutional investors, they would assert more control and influence over managers to increase risk-taking.

Nevertheless, studies investigating the role of foreign directors of bank boards in risk-taking are very limited. Srivastav and Hagendorff (2016), reviewing the literature on bank governance and risk-taking, report no studies on the role of foreign directors on bank risk-taking. We only encountered two recent studies on the effect of foreign institutional investors on bank risk-taking in the Chinese context.

[38] More detail of resource dependency theory is available in Chapter 4.
[39] He defines "strong boards" as small board size, more independent directors, and non-restrictive shareholders rights.

Cheng et al. (2016) study the effect of minority foreign investment on Chinese bank risk-taking in the 1994-2014 period. The presence of foreign investors in a Chinese domestic bank is captured using a dummy variable, which equals 1 if banks have introduced foreign strategic investors and 0 otherwise. They find that foreign strategic investors lower bank risks, including liquidity risk, asset quality, and credit risk (the non-performing loan-to-total loan ratio) as a result of the spill-over and monitoring effects, with the exception of insolvency risk (i.e the coefficient of the dummy variable representing the presence of foreign strategic investors using the bank Z-score is not statistically significant). Their results are robust after addressing the endogeneity problem.

Dong et al. (2017) also study Chinese banks' data for 2003-2011. They investigate the impact of board characteristics on bank efficiency and risk-taking. Instead of using a dummy variable, they use the proportion of foreign directors on board. However, they do not find any relationship between the foreign director ratio and the non-performing loan-to-total loan ratio.

In the context of Vietnam, we believe that foreign directors have a higher risk appetite than domestic directors because domestic banks in Vietnam are more exposed to traditional businesses such as lending, while foreign directors have experience and knowledge in more complicated financial products. Although foreign directors might improve board effectiveness in decision-making, it does not mean that they are motivated to minimise risk-taking in banks; rather, they are there to ensure the investments generate value for the investing entities. Given the mixed results and the context of Vietnam, we expect that foreign directors would encourage the invested banks to increase risk-taking to maximise shareholders' wealth. Thus, we propose the following hypothesis:

H1: Foreign directors on boards representing the foreign strategic partners increase bank risk-taking.

Moreover, there are reasons to believe that there was a structural break during the period investigated. In January 2011, the Eleventh Vietnam National Party Congress was held and two important documents, the Socio-Economic Development Strategy for 2011–2020 and the Socio-Economic Development Plan for 2011–2015, were prepared with an emphasis on restructuring the Vietnamese economy toward increasing efficiency in investment and

sustainable growth.[40] Since then, restructuring of the economy has been taken place, including restructuring of state-owned firms and the banking system. In the banking sector, two main changes are: (i) The issuance of new regulations with many new policies targeting the banking sector (see Appendix 2); and (ii) uncertainty in the financial sectors stemming from a high level of accumulated bad debts, the wave of mergers since 2011, and a series of major banking trials starting in 2016 aimed at bankers involved in corruption and nepotism. We expect the structural change starting from 2011 to decrease risk-taking levels by banks, because the new regulations require domestic banks to: (i) Increase capital; and (2) be more conservative in loan classifications and provisioning. The government also requires domestic banks to focus on resolving the existing bad debts.

In contrast, owing to an increasing uncertainty in the economy, foreign directors might change their behaviours to increase risk-taking for short-term profits before they can divest their stakes. Indeed, in the 2012-2019, seven foreign strategic investors divested from domestic banks (more details are reported in section 3.2).

To confirm there was a structural break in year 2011, we use Chow's breakpoint test. The test show that there was a structural break in year 2011 at 0.0001% of confidence level. Thus, we have the following hypothesis:

H2: The higher the ratio of foreign directors on board was, the more risk-taking the bank experienced after 2011.

In contrast, if foreign directors affect board decision-making, in turn, influence the level of risk-taking in banks, we would expect foreign directors to be associated with more risk-taking in banks with strong boards, following Pathan (2009). Pathan (2009) argues that strong boards are better at monitoring and influencing managers for shareholders, while shareholders in high-leverage firms prefer to take high risk (Jensen & Meckling, 1976). Pathan (2009) defines "strong boards" as small boards and boards with more independent directors. In the Vietnamese context, we argue that foreign directors would be associated with more risk-taking in banks with more independent directors, because boards with more independent directors represent shareholders' interests better. Also, it is possible that independent directors are busy with their other positions and may not have in-depth knowledge of the business of the bank, therefore, they are more easily influenced by foreign

[40] http://siteresources.worldbank.org/INTEAPHALFYEARLYUPDATE/Resources/550192-1287417391641/EAP_Update_Oct2010_vn.pdf

directors. Likewise, we argue that foreign directors influence decision-making on a board with family related directors easier than in a more diversified board. This is because, even though family related directors could mitigate agency conflicts and maximise firm value, boards with more family related directors might suffer from the "groupthink" problem; hence the decision-making processes become easier to be influenced by foreign directors. Thus we have the following hypothesis:

H3: Bank risk-taking is positively related to foreign directors on boards with more independent directors and boards with more family-related directors.

3.4. Methodology

A multivariate regression of panel data controlling for firm and year fixed effects is employed as the baseline regression to test the relationship between foreign directors on the board and bank risk-taking. The fixed effect model[41] is chosen over OLS and random-effect regressions as it can control for time-invariant unobserved omitted variables that may influence the bank's outcome. Standard errors are adjusted to account for potential heteroscedasticity and autocorrelation of the error term.

The baseline regression (Hypothesis 1) is specified as:

$$lnZ - score_{i,t} = \alpha_0 + \beta_1 foreign\_ratio_{i,t} + \beta_2 women\_ratio_{i,t} + \beta_3 independent\_ratio_{i,t} + \beta_4 Familyrelated\_ratio_{i,t} + \beta_5 board\_size_{i,t} + \beta_6 CI_{i,t} + \beta_7 merger_{i,t} + \beta_8 bank\_size_{i,t} + \beta_9 listed_{i,t} + \beta_{10} Big4_{i,t} + \varepsilon_{i,t}$$

(3-1)

To test the second hypothesis, the interaction *Foreign_ratio* × *Structural change* estimates the influence of foreign directors on boards on bank risk-taking following the structural change. *Structural change* dummy is constructed to capture the effect of the structural change, which equals one if the observation year is 2011 onwards, and zero otherwise. Hence, the coefficient of structural change is expected to be positive with the Z-score and equity-to-capital ratio, and negative with the loan-to-asset ratio.

[41] We have conducted the Hausman test to choose between random-effect and fixed-effect models, with the result pointing to the use of a fixed effect model.

The model for Hypothesis 2 is specified as:

$$lnZ - score_{i,t} = \propto_0 + \propto_1 (foreign\_raio)_{i,t}\ X\ (Structural\ change)_{i,t} + \propto_2 (foreign\_ratio)_{i,t} + \propto_3 (Structural\ change)_{i,t} + control\_variables_{i,t} + \in_{i,t}$$

(3-2)

To test the third hypothesis, the interaction *Foreign_ratio* × *Independent_ratio* is constructed to estimate the influence of foreign directors on boards with more independent directors on bank risk-taking. Likewise the interaction *Foreign_ratio* × *Family related_ratio* is contructed to estimate the influence of foreign directors on boards with more family related directors. Hence, the models for Hypothesis 3 are specified as:

$$lnZ - score_{i,t} = \propto_0 + \propto_1 (foreign\_raio)_{i,t}\ X\ (Independent\_ratio)_{i,t} + \propto_2 (foreign\_ratio)_{i,t} + \propto_3 (Independent\_ratio)_{i,t} + control\_variables_{i,t} + \in_{i,t}$$

(3-3) and

$$lnZ - score_{i,t} = \propto_0 + \propto_1 (foreign\_raio)_{i,t}\ X\ (Family\ related\_ratio)_{i,t} + \propto_2 (foreign\_ratio)_{i,t} + \propto_3 (Family\ related\_ratio)_{i,t} + control\_variables_{i,t} + \in_{i,t}$$

(3-4)

We also need to consider endogeneity problems in financial studies (Adams & Ferreira 2009; Antonakis, Bendahan, Jacquart, & Lalive, 2010; Kai & Prabhala, 2007; Roberts & Whited, 2013; Wintoki, Linck, & Netter, 2012). For example, Harris and Raviv (2006) find evidence that board size and firm performance are both driven by exogenous factors, such as the firm's information environment, profit potential, and the opportunity cost of outside directors. Pathan and Skully (2010) provide evidence that board structure in the banking sector is endogenously determined. Kai and Prabhala (2007) acknowledged that investment/managerial choices made by firms are not random but are intentional decisions by the board or managers of the institution to self-select into their preferred decisions. Likewise, the decisions to invest in the Vietnamese domestic banks by foreign entities tend not to be random, but based on unobserved and observed private information. In other words, foreign entities self-select themselves to invest in a certain Vietnamese bank. Therefore, the relationship between the foreign director ratio and Z-score, if any, could be driven by the unobserved and observed factors. That is, apart from observable firm characteristics (i.e. size, cost-to-income ratio, profitability, etc.), foreign entities are also likely to base their investment decision (i.e. becoming a strategic partner of a certain Vietnamese bank) on

unobserved private information, which affects both the presence of foreign directors in the bank and the bank's outcome (i.e. bank risk-taking).

Hence, in this paper the Heckman two-stage selection model proposed by Heckman (1979) and propensity score matching method developed by Rosenbaum and Rubin (1983) are employed as robustness checks.

3.5. Data description

The data is hand-collected from annual reports containing accounting and corporate governance data. The data is an unbalanced panel from 32 commercial banks, covering the period 2006 to 2016, totalling 304 observations. All selected banks are joint-stock commercial banks operating under the same regulatory environment. Likewise, all financial statements were prepared based on the Vietnamese Accounting Standard (VAS). The final sample represents 92.8% of total assets of the Vietnamese commercial banks as of 2012.

3.5.1. Measure of bank risk

Literature on the relationship between corporate governance and bank risk has shown a wide variety of measures of bank risk, using both accounting-based data and market-based data. A common market-based measure of risk is the volatility of the return of equity or stocks, such as the standard deviation of the daily bank stock returns in a year (Lepetit, Nys, Rous, & Tarazi, 2008; Pathan, 2009; Sila, Gonzalez, & Hagendorff, 2016). The standard deviation of residuals obtained from the market-model regression is also commonly used as a proxy for idiosyncratic risk (Akbar et al., 2017; Beltratti & Stulz, 2012; Lepetit et al., 2008; Pathan, 2009; Sila et al., 2016). Lepetit et al. (2008) devise the market data based Z-score (MDZ-score) to measure the distance from default, with the MDZ-score equaling $\frac{\overline{R}+1}{\partial}$; where $\overline{A}$ and ∂ are, respectively, the mean and standard deviation of the weekly return for a given year.

In terms of accounting measures of bank risk, the most widely employed indicator in the literature is the conventional Z-score as an inverse proxy of insolvency risk (Akbar et al., 2017; Laeven & Levine, 2009; Lambert, Noth, & Schüwer, 2017; Lepetit et al., 2008; Safiullah & Shamsuddin, 2018). The Z-score measures the number of standard deviations below its mean that the ROA of a bank would have to fall below to consume its equity (Safiullah & Shamsuddin, 2018); hence, the greater the Z-score, the more stable the bank.

The Z-score is calculated as:

$$Z - score_{i,t} = \frac{ROA_{i,t} + ETA_{i,t}}{\partial_{ROA_i}} \quad (3\text{-}3)$$

where ROA is the return on assets, the ETA ratio is the equity-to-asset ratio, and ∂_{ROA} is the standard deviation of the ROA of bank *i*. An advantage of the Z-score is that it does not require a strong assumption about the distribution of the ROA (Strobel, 2011). Additionally, it uses accounting data that is available for both listed and unlisted banks, which is especially appealing to researchers conducting research in less developed financial markets. Chiaramonte, Croci, and Poli (2015) find that the Z-score is as good as the CAMELS rating system in identifying distress events, with the advantage of being less data demanding. Prior studies have modified the conventional Z-score, which results in a number of methods to construct the Z-score, such as the industry-adjusted Z score, and the rolling Z-score with a three-year, four-year, or five-year window (Akbar et al., 2017; Delis, Tran, & Tsionas, 2012; Laeven & Levine, 2009; Lambert et al., 2017; C. Lee & Hsieh, 2014). In a regression analysis, the logarithm of conventional Z-scores is commonly used to control for non-linear effects and outliers (Beck & Laeven, 2006), as well as to ensure the assumption of normal distribution of banks' returns (Laeven & Levine, 2009).

To sum up, the Z-score is the optimal choice to measure bank risk in the Vietnamese context, with it being as effective a measure of risk as the CAMELS rating system (Chiaramonte et al., 2015). However, given a limitation in the number of observations (304 observations), coupled with unbalanced data in Vietnam, the traditional method of computation provides results for a longer time period compared with the rolling window Z-score, which would require dropping initial observations. In addition, we only use the accounting data rather than the market data to measure bank risk in Vietnam, for two main reasons. First, market data are only available to larger listed banks;[42] thus, they cannot be representative of the Vietnamese banking system, which consists of both listed and unlisted banks. Second, as stated by Chiaramonte et al. (2015), market data are severely distorted in illiquid and opaque markets, such as financial markets in many developing countries including Vietnam. There are other indicators which can be used as proxies of risk, such as the loan-to-deposit ratio (LTD) as a measure for liquidity risk, and loan loss reserves to gross loans (Abedifar, Molyneux, & Tarazi, 2013; Safiullah & Shamsuddin, 2018). Following Hesse and Cihak

[42] Only 11 out of 34 commercial banks are listed on the stock market at the end of 2016.

(2007), to calculate Z-score, we use the standard deviation estimates of the return on assets, calculated over the full period, and combine these with current values of the capital-asset ratio and return on assets. We also use the ratio of LTD as a proxy for liquidity risk, and the equity-to-asset ratio (ETA), which evaluates the ability of a bank to absorb potential losses for robustness checks, following Abedifar et al. (2013), Safiullah and Shamsuddin (2018), and Zhu and Yang (2016). NPLs are not used for robustness tests, because there are no reliable data on bad debts.[43]

3.5.2. Constructions of explanatory variables

Our key explanatory variable is the ratio of foreign directors to total board members. To control for firm-level bias, other governance variables and bank-specific characteristics are controlled for. The chosen variables are based on prior studies (Adams & Mehran, 2012; Berger, Kick, & Schaeck, 2014; Dong et al., 2017; Owen & Temesvary, 2018; Palvia, Vähämaa, & Vähämaa, 2015; Safiullah & Shamsuddin, 2018). Variables to control for bank-specific characteristics include bank size, previous M&A activities, previous initial public offering activities, and the cost-to-income ratio. In addition, it is required by Vietnamese law that all banks' annual financial statements are audited by external auditors. This is to provide assurance of the quality of the information reported in banks' financial statements, which could limit the firm's ability to manipulate accounting information, hence mitigating agency conflicts (Fan & Wong, 2005). Nevertheless, it is at banks' discretion to choose the external auditors. Fan and Wong (2005) find evidence that Big 5 auditors[44] are employed to alleviate the agency problems in firms in emerging markets, while firms are motived to improve their corporate governance if they choose to hire reputable external auditors (Claessens & Yurtoglu, 2013). Therefore, a dummy variable representing whether a bank is audited by the Big 4 auditors[45] is included to account for the possible mechanism that mitigates the agency conflicts.

In terms of governance variables, board gender diversity, board independence, related directorship, and board size are included.

[43] In 2011, the government issued circular No. 09/2014/TT-NHNN, which has a clause regulating that banks are permitted to consider and restructure time limits for debt payment and keep intact groups of debt as the group has already been classified before the restructuring time limit for debt payment. This regulation expired in April 2015.
[44] The Big 5 auditing companies are Deloitte, PwC, Ernst & Young, KPMG, and Arthur Anderson. Arthur Anderson was dropped out of this list after the Enron scandal occurred at the end of 2001.
[45] The Big 4 auditing companies are Deloitte, PwC, Ernst & Young, and KPMG.

Table 3.1: Variable definitions

This table reports the definitions of the variables used in this essay.

Symbol	Description
Risk measures	
Z-score	$Z - score_{i,t} = \frac{ROA_{i,t}+ETA_{i,t}}{\partial_{ROA_i}}$. $\partial_{ROA_i}$is the standard deviation of ROA. A higher Z-score implies a lower probability of insolvency. *lnZ-score* is the natural logarithm of Z-score.
LTD	Loan-to-deposit ratio, as a measure for liquidity risk, is calculated as total loans to total deposits.
ETA	Equity-to-asset ratio, measuring the ability of a bank to absorb losses due to a negative shock, is calculated as total equity to total assets.[46]
Explaining variables	
Board composition variables	
Board size (*Board_size*)	Log of number of directors on board.
Women_ratio	Ratio of female directors on board.
Foreign_ratio	Ratio of foreign directors on board.
Family related_ratio	Ratio of family related directors on board. Family related directors are those who have a close relationship with each other, such as family members.
Independent _ratio	Ratio of independent directors on board.
Bank characteristic variables	
Bank size (*bank_size*)	Log of total assets at the end of the year. Bank size is measured in million VND.
CI	Cost-to-income ratio, calculated as operating expenses to operating income.
Listed dummy (*listed*)	Dummy variable equals 1 if the bank is listed, 0 otherwise.
Merger dummy (*merger*)	Dummy variable equals 1 if the bank has merged with another bank in that year and the following years, 0 otherwise.
Ownership	Dummy variable equals 1 if the bank is state-owned, 0 otherwise.
Audited by big 4 (*Big4*)	Dummy variable equals 1 if the bank is audited by the big four auditing companies (Ernst & Young, KPMG, Deloitte, PricewaterhouseCoopers) in that year, 0 otherwise.
Structural change	Dummy variable equals 1 if the observation year is 2011, 2012, 2013, 2014, 2015, or 2016, equals 0 otherwise. This dummy variable represents the period when the economy experiences drastic legal reform and political changes.

[46] Vietnam had not fully implemented Basel II by 2018; hence, data on risk-weighted-assets is unavailable.

Board gender diversity is measured by the ratio of female directors on the board. Board independence is measured by the ratio of independent directors on the board. Related directorship is measured by the ratio of family related directors on the board. Board size is measured as a logarithm of the number of board members.

Prior studies in economics and finance provide differing views regarding females and risk-taking. There is evidence that female directors could mitigate bank risk-taking. For example, studies in psychology suggest that men have inherently greater risk-taking attributes, such as intellectual risk-taking and physical skills, than women (Byrnes, Miller, & Schafer, 1999). Female directors are also documented as being more diligent and allocating more effort to monitoring than male directors (Adams & Ferreira 2009). Fehr-Duda, De Gennaro, and Schubert (2006) also suggest that women are less risky in investment decisions. On the other hand, Adams and Funk (2012) find that female directors are slightly more risk-taking than male directors. They argue that once women have adapted to a male-dominant culture, the risk-averse nature of women vanishes (Adams & Funk, 2012). Lara, Osma, Mora, and Scapin (2017), find that males and females do not differ substantially when performing in highly specialised positions. Regarding the relation between the gender composition of a board and a financial firm's risk-taking, prior studies also provide mixed results. For instance, Berger et al. (2014) investigate a sample consisting of 826 German banks over the period 1994-2010, and find that in the three years following an increase in female ratios in the boardroom, portfolio risk increases marginally but significantly, which is explained as female executives possessing less experience than their male counterparts. Sila et al. (2016), instead, find no significant relationship between women directors in the boardroom and bank risk. Palvia et al. (2015) and Dong et al. (2017), in contrast, find evidence that female chairs reduce bank risk. Palvia et al. (2015) report a negative relationship between female CEOs and chairs, and bank default risk during the financial crisis, and that smaller female-led banks were less likely to default during a crisis. Dong et al. (2017), on the other hand, find a significant negative relationship between board gender diversity and non-performing loans.

An independent director is defined by Vietnamese law as a director who has no pecuniary relationship with the bank or performs any other function other than being a director of the bank.[47] The level of board independence reflects the board ability to monitor and perform independent oversight of management actions (Switzer & Wang, 2013). Independent

[47] According to Article 50 on the 2010 Law on Credit Institution.

directors are expected to act in the interests of the shareholders (Kim, Kitsabunnarat-Chatjuthamard, & Nofsinger, 2007). One line of argument to support this hypothesis is that independent directors have to protect their reputation as independent in the market, and are thus more proactive in monitoring management in the shareholders' interests (Dong et al., 2017). Nevertheless, empirical studies investigating the effect of independent directors on bank outcomes are mixed (Adams & Mehran, 2012; Dong et al., 2017; Pathan & Faff, 2013). Some studies find insignificant or negative relationships between board independence and performance. The arguments for these findings are based on a lack of in-depth knowledge of the bank because independent directors are not working at the bank (Adams & Mehran, 2012), are too busy to play an active role in board decision-making because they are usually working in other positions as well, are hired just to conform to regulations, or because of a limited market for high performing independent directors (Pathan & Faff, 2013). Therefore, they are not effective in improving firm performance. Nevertheless, with respect to board independence and risk taking relationships, studies also find a negative relationship (Pathan, 2009; Switzer & Wang, 2013). Pathan (2009) explains that even though independent directors are motivated to increase shareholders' value, they are independent from shareholders and more regulatory compliant, hence, they reduce risk-taking.

Family related directors, who have a close relationship with each other, such as family members, are used as a proxy for block ownership. Block-owners have greater incentive in monitoring managers, hence block ownership mitigates agency costs (Grove, Patelli, Victoravich, & Xu, 2011). To capture the effect of block ownership, ideally, cash flow rights or voting rights should be used. However, there is no requirement under Vietnamese law for unlisted banks to publish shareholding information, meaning that there is not enough data available for the analysis. Therefore, the ratio of family related directors on board is used as a proxy of block ownership. As family related directors have long-term interests in banks, they are expected to increase firm performance.

Prior studies on board size and firm performance suggest that in financial firms, bigger board size is associated with higher firm performance because in such complex firms larger boards are necessary to advise and monitor managers regarding various aspects of the banking business (Adams & Mehran, 2012; John et al., 2016). However, big boards also suffer from slow decision making, coordination problems, and director free-rider problems (Jensen, 1993; Switzer & Wang, 2013). Jensen (1993, p. 865) argues that when boards are big, "they are less likely to function effectively and are easier for the CEO to control" as a consequence

of free-riding problems among directors and the increased time required for decision-making. This trade-off in the banking industries leads to another line of argument that small boards are better at influencing managers (Pathan, 2009). Given the incentives in taking on high risk by shareholders in the presence of deposit insurance, Pathan (2009) proposes that small boards are likely to be associated with higher bank risk-taking. He argues that small boards are better at monitoring and influencing bank managers in maximising shareholder wealth. Therefore, banks with small boards are expected to be associated with higher risk-taking. Several studies also confirm this hypothesis by finding the negative relationship between board size and bank risk-taking, as reported in the literature review by John et al. (2016).

Variables representing the management in banks such as CEO duality and payment incentives are not included because; first, in all Vietnamese banks, there is no case of CEO duality (i.e. a director holds both the board chair and the management chair), and second, the data on payment incentives and payment packages are unavailable.

3.6. Descriptive statistics and correlation matrix

Descriptive statistics for the dependent, independent, and control variables used in the empirical analysis are presented in Table 3.2. The average Z-score, an inverse proxy of insolvency risk of Vietnamese bank, is 21.57. The average number of directors is around seven and there is around one woman on the board of each bank. The average foreign director on boards is less than one (0.07), as only fifteen banks out of thirty-two banks in the sample have direct investment from foreign financial entities (so called strategic foreign investors). Banks with foreign strategic investors have one or two, or even three foreign directors on the board to represent the strategic foreign investors. Similarly, there is less than one independent director on each bank board as, before 2010, there was no regulation requiring there to be independent directors. Only when the new law on financial institutions was enforced in 2010, did the requirement of each bank having at least one independent director on their board come into effect. However, since there was a transition period between the old and new laws, many banks appointed independent directors only after 2012. In terms of bank specific financial characteristics,[48] the mean of the CI ratio is 0.59. The mean value of LTD is 0.89, which is smaller than 1, whereas the ETA ratio has the mean of 0.11. Both the

[48] There is one outlier in the sample, which is Tienphong Bank in year 2011, with a cost-to-income ratio of -1,646%. This is due to the negative income of 78.55 billion VND in 2011 as a result of weak governance and aggressive credit expansion in the past. Therefore, we drop this outlier.

mean values of the LTD ratio and the ETA ratio are at levels which might be regarded as safe.

Table 3.2: Descriptive statistics

This table reports the summary statistics for the full sample. The sample consists of an unbalanced panel of 304 observations (firm-years) from 32 commercial Vietnamese banks in the 2006-2016 period. Board and bank characteristics are manually obtained from the commercial banks' financial and annual statements. The dependent variables are Z-score, loan-to-deposit ratio, and loan-to-asset ratio. All variables are defined in Table 3.1.

Variable	No. of obs	Mean	SD	Min	Max
Bank specific characteristics					
Z-score	304	21.57	16.20	4.26	172.53
Cost-to-income ratio	304	0.59	0.19	0.16	0.99
Merger dummy	304	0.04	0.19	0.00	1.00
Listed dummy	304	0.22	0.41	0.00	1.00
Bank size	304	7.75	0.59	5.92	9.00
Return-to-asset ratio (ROA)	304	0.012	0.008	0.0002	0.051
Loan-to-deposit ratio	304	0.89	0.28	0.24	2.52
Equity-to-asset ratio	304	0.11	0.07	0.01	0.46
Corporate governance variables					
Number of directors on board	304	7.17	1.89	4	13
Women_ratio	304	0.17	0.15	0.00	0.67
Foreign_ratio	304	0.07	0.11	0.00	0.43
Independent_ratio	304	0.08	0.09	0.00	0.50
Family related_ratio	304	0.07	0.16	0.00	0.75

Table 3.3 reports the evolution of board structure and financial characteristics of Vietnamese banks in the 2006-2016 period. There is an increasing trend in the number of directors, associated with increasing bank size. There is a noticeable increasing trend in the independent director ratio, reflecting the compliance of Vietnamese banks with regulation as well as Vietnamese banks' awareness of best practices in corporate governance (i.e. more independent directors on a board is desirable). The ratio of foreign directors and the ratio of female directors show a small increase; however, it has fluctuated over the years.[49] The Z-score is quite stable in the 2006-2012 period. However, it deteriorated quickly after 2013 due to the drop of ETA ratio and ROA ratio as banks had to focus on resolving bad debts and as the consequence of the economic downturn. The LTD ratio of Vietnamese banks is decreasing over time. The CI ratio becomes especially high after 2011, reflecting the fact that banks had to focus on resolving bad debts after the 2008-2009 financial crisis.

[49]There is only one foreign director (out of 3 foreign directors) in An Binh Bank (ABB) in 2016 that is female.

Table 3.3: Evolution of board structure and financial characteristics during the period 2006-2016

This table displays the change in bank financial and board characteristics over the period between 2006-2016. The results are based on the sample of 32 Vietnamese banks (304 firm-year observations).

Variable	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Bank specific characteristics											
Z-score	25.36	22.89	26.31	24.63	22.29	22.36	25.84	17.99	15.97	16.56	15.71
LTD	0.95	1.11	0.95	0.95	0.94	0.93	0.83	0.78	0.76	0.8	0.84
Bank size	7.19	7.38	7.4	7.54	7.73	7.82	7.84	7.96	8.03	8.09	8.15
CI	0.46	0.39	0.56	0.48	0.47	0.54	0.68	0.73	0.73	0.76	0.74
ROA	0.018	0.018	0.014	0.015	0.015	0.015	0.01	0.007	0.007	0.006	0.007
ETA	0.14	0.12	0.15	0.12	0.11	0.1	0.12	0.1	0.09	0.09	0.08
Listed dummy	0.00	0.08	0.10	0.13	0.22	0.23	0.26	0.28	0.35	0.35	0.38
Merger dummy	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.07	0.08	0.08	0.13
Corporate governance variables											
Board size	6.37	6.77	6.93	6.97	7.03	7.19	7.19	7.62	7.5	7.65	7.46
Women_ratio	0.16	0.17	0.17	0.16	0.17	0.16	0.16	0.16	0.15	0.17	0.18
Foreign_ratio[50]	0.03	0.04	0.06	0.06	0.07	0.07	0.08	0.09	0.08	0.07	0.09
Independent_ ratio	0	0	0.01	0.03	0.04	0.07	0.1	0.14	0.15	0.15	0.16
Family related _ratio	0.09	0.08	0.08	0.07	0.07	0.07	0.07	0.06	0.07	0.06	0.07

Table 3.4 reports the pair-wise correlations among variables. Multicollinearity, indicated by high correlations, would invalidate the regression's coefficient estimates and their significance becomes sensitive to adding or removing explanatory variables (Brooks, 2019). Since ETA and the log of total assets have a high correlation (-0.73), in the regression, we exclude the ETA ratio. In addition, to check for the regression's sensitivity, selected explanatory variables are omitted in the baseline regression.

[50] There is only one foreign director (out of 3 foreign directors) in An Binh Bank (ABB) in 2016 that is coincidently is female. So female directors and foreign directors are almost mutually exclusive.

Table 3.4: Pairs-wise correlation matrix

The table shows the Pearson pairs-wise correlation matrix with the correlation coefficients in the first row and the p-value in the second row. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively . See Table 3.1 for variable definitions.

Variales	Zscore	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Log(number of directors) (1)	-0.15***												
	0.01												
Independent_ratio (2)	-0.16***	-0.11***											
	0.01	0.07											
Foreign_ratio (3)	-0.14**	0.39***	0.05										
	0.02	0.00	0.41										
women_ratio (4)	0.06	-0.02	-0.01	-0.14**									
	0.31	0.75	0.92	0.02									
Family related_ratio (4)	-0.06	-0.09	-0.10**	0.20***	0.20***								
	0.31	0.12	0.07	0.00	0.00								
LTD (6)	0.04	-0.05	-0.24***	-0.10*	-0.03	-0.04							
	0.47	0.38	0.00	0.09	0.62	0.54							
ETA (7)	0.43***	-0.20***	-0.03	-0.16**	-0.10*	0.06	0.27***						
	0.00	0.00	0.55	0.01	0.08	0.30	0.00						
Merger dummy (8)	-0.12**	-0.06	0.17***	-0.08	-0.04	-0.06	-0.07	-0.14**					
	0.03	0.26	0.00	0.18	0.50	0.29	0.23	0.01					
Listed dummy (9)	-0.12**	0.31***	0.03	0.18***	0.13**	-0.03	-0.07	-0.23***	0.15**				
	0.03	0.00	0.65	0.00	0.02	0.61	0.25	0.00	0.01				
CI (10)	-0.21***	-0.04	0.43***	0.03	0.06	0.03	-0.23***	-0.23***	0.22***	0.02			
	0.00	0.48	0.00	0.61	0.32	0.57	0.00	0.00	0.00	0.71			
Ownership (11)	-0.05	0.15***	-0.17***	-0.06	0.17***	-0.18***	0.11*	-0.32***	-0.08	0.22***	0.04		
	0.39	0.01	0.00	0.28	0.00	0.00	0.06	0.00	0.17	0.00	0.51		
Bank size (12)	-0.30***	**0.39*** **	0.12**	0.20***	0.06	-0.18***	-0.27***	**-0.73*** **	0.19***	**0.46*** **	0.28***	**0.60*** **	
	0.00	0.00	0.04	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Audited by big 4 (13)	0.06	0.14**	0.19***	0.21***	-0.01	-0.12**	-0.19***	-0.22***	0.10*	0.12**	-0.03	-0.03	0.28***
	0.32	0.02	0.00	0.00	0.86	0.04	0.00	0.00	0.09	0.03	0.64	0.57	0.00

3.7. Empirical results

3.7.1. The relationship between foreign directors on boards and bank solvency risk

In this section, we report the estimation of the relationship between foreign directors on a board and bank Z-score (Equation 3-1). Since bank size and the ownership dummy (i.e. whether or not the bank is state-owned) have quite a high correlation (0.6), we only include bank size in the regression. The effect of bank ownership type is also discussed in section 3.11. To check the regression's robustness and sensitivity to specification error, in models from (1) to (3) of Table 3.5 selected variables are omitted from the complete model (i.e. model (5)). Model 4 is to check if the use of the number of directors in the denominator to calculate woman ratio, foreign ratio, family related ratio and independent ratio have any effect on the models estimated (as woman ratio, foreign ratio, family related ratio and independent ratio are all have board size in the denominator). To do it, we use an instrument to measure board size by regressing ln(Board size) = alpha + beta * ln(Bank size) + error. Then the errors from this regression are stored and used as a measure of board size, that is not correlated with bank size. Model (4) reports the result with Residual is the instrument of board size captured from the above process.

As shown in Table 3.5 (p.53), none of the corporate governance measures has a significant relationship with the Z-score, except for board size. Board size, measured as the logarithm of number of directors, is associated with higher Z-scores in models (2) (4) and (5), suggesting that bigger boards control risk better. There is an insignificant relationship between foreign director ratio and bank Z-score. This might be explained in that, even though foreign directors on Vietnamese bank boards are believed to have experience and skills in risk management, they are not motivated to reduce the level of risk-taking in the Vietnamese domestic bank. The Vietnamese banking sector is still underdeveloped and the majority of income is from lending activities. As of 2015, interest income represents 70% to 80% of total income for Vietnamese banks (Tran, Ong, & Weldon, 2015). Therefore, it is likely that foreign entities are motivated to increase risk-taking in Vietnamese banks so that they can enjoy the short-term returns from increasing lending.

The role of female directors in bank insolvency risk is not significant in any specifications, which is understandable in the Vietnamese context. The participation of women in higher powered positions is still much lower than that of men (Truong, 2008). In addition, Vietnam is an Asian country where the society strongly prefers sons over daughters, due to cultural,

economic, and social reasons (Pham, Hall, Hill, & Rao, 2008). This cultural norm can partly explain why women have little influence on board decision-making, leading to the non-significant result. In addition, it might be that boards appoint female directors, not based on their skills and knowledge, but rather so that it will be easier for male directors to create an "old boy network" and to manipulate the decision-making made by female directors. This result is consistent with the finding of Adams and Ferreira (2009), who find insignificant results in a GMM estimation, and Sila et al. (2016), who find insignificant results in both fixed effect and GMM estimations.

In terms of board independence, there are also no significant coefficients between the independent director ratio and Z-score. The explanation for this finding is that independent directors usually lack in-depth knowledge of the bank because they are not working at the bank. They are usually too busy because, besides independent directorships, they hold positions in different firms. In addition, it was only after 2012, when the regulation that banks have to have at least one independent director on board took effect, that banks appointed independent directors. However, the number of independent directors on boards, on average, is just one director for each bank and, in many cases, it is thought that independent directors are hired just to conform to regulations.

Regarding the effects of bank specific characteristics on risk-taking, the results show a significant relationship, as expected, between the cost-to-income ratio, bank size, and bank risk. The cost-to-income ratio has a significant negative relationship with bank risk suggesting that, the higher the operating cost relative to operating profit, the lower the bank's solvency. Similarly, bank size has a negative and significant relationship with the level of bank solvency, showing that the larger the bank, the riskier it is. The dummy variable representing whether a bank is audited by the big four auditing companies is only significant in model (3), suggesting that there is no difference in the quality of accounting statements between banks audited by the big four and their counterparts. The effect of the merger dummy is significant and negative in model (3), suggesting that mergers are associated with a decrease in the Z-score. However, the signs of merger dummy flip in models (1) and (2) and (4) when we include bank size in the regression, suggest that there is a multicollinearity problem between bank size and the merger dummy.

Table 3. 5: The effect of board composition on current bank solvency risk

This table exhibits the relation between the natural logarithm of the Z-score and the ratio of foreign directors on the board. The sample consists of an unbalanced panel of directors and financial data from 304 bank-year observations in the 2006-2016 period. All specifications include firm and year fixed effects. Standard errors are adjusted for potential heteroscedasticity and correlations of the error term following Driscoll and Kraay (1998). Values of the t-statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable (LnZ-score)	(1)	(2)	(3)	(4)	(5)
Foreign_ratio	**-0.05**	**-0.159**	**-0.079**	**-0.112**	**-0.151**
	(-0.16)	(-0.52)	(-0.17)	(-0.42)	(-0.63)
Board size		0.161*	0.147		0.168*
		-1.71	-0.91		-1.88
Residual of board size				0.159*	
				(1.69)	
Independent_ratio			-0.128	-0.222	-0.103
			(-0.26)	(-0.90)	(-0.41)
Women_ratio			-0.196	-0.184	-0.229
			(-0.76)	(-0.96)	(-1.18)
Family related_ratio			-0.269	-0.332	-0.326
			(-0.74)	(-1.41)	(-1.31)
CI	-0.862***	-0.784***	-0.552**	-0.705***	-0.745***
	(-4.79)	(-4.41)	(-2.18)	(-3.85)	(-4.24)
Listed dummy	0.0092	0.0072	0.0101	0.0315	-0.00652
	-0.09	-0.08	-0.09	(0.36)	(-0.07)
Bank size	-1.582***	-1.584***		-1.210***	-1.589***
	(-10.81)	(-11.48)		(-8.61)	(-11.48)
Merger dummy	0.224**	0.195**	-0.223**	0.0973	0.198**
	-2.25	-2.29	(-2.46)	(1.19)	-2.3
Audited by big 4	-0.0303	-0.0422	-0.267***	-0.0410	-0.0495
	(-0.54)	(-0.73)	(-3.17)	(-0.51)	(-0.66)
constant	14.64***	14.34***	3.267***	12.00***	14.41***
	-14.26	-14.12	-9.3	(12.23)	-14.16
Year dummies	Included	Included	Included	Included	Included
R_squared	0.097	0.094	0.086	0.113	0.097
No. of observations	304	304	304	304	304

It is expected that there are differences in governance between listed and unlisted banks, as listed banks are subject to more regulations than unlisted banks. Thus, we also test the interaction term between the listed dummy and the foreign director ratio. However, the interaction term is not significant, indicating that there are no differences in the impact of foreign directors on boards on bank risk between listed and unlisted banks.[51] This might reflect that the undeveloped financial markets have no effects on enforcing listed banks to be more conservative in taking risks.

[51] Results are available upon request.

3.7.2. The relationship between foreign directors on boards and alternative measures of bank risk

In this section we report two other types of bank risks, measured by the loan-to-deposit ratio and equity-to-asset ratio, in their relation with foreign directors on board. All models are estimated using the firm and year fixed effects with adjusted standard errors.

As can be seen in Table 3.6, the coefficients of the foreign director ratio are all insignificant, implying that there is no significant relationship between the foreign director ratio and the alternative measures of bank risk.

Table 3. 6: The effect of board composition on different measures of risk

This table presents the results of regressions testing the relation between foreign directors on boards and measures of bank risk-taking, which are the equity-to-asset ratio (ETA) and loan-to-deposit ratio (LTD). The full definitions of the variables are in Table 3.1. t-statistics in parentheses. Values of the t-statistics are in brackets. Superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Both models control for firm fixed effects, with adjusted standard errors following Driscoll and Kraay (1998).

Dependent variable	ETA (1)	LTD (2)
Foreign_ratio	**-0.0649**	**0.0857**
	(-1.67)	(0.49)
Independent_ratio	-0.0163	-0.736
	(-0.38)	(-1.60)
Women_ratio	-0.0268	0.275**
	(-1.07)	(2.11)
Family related_ratio	-0.0577	0.143
	(-1.53)	(0.89)
Board size	0.0306**	0.0141
	(2.28)	(0.15)
CI	-0.0640**	-0.170
	(-2.70)	(-1.66)
Listed dummy	-0.0018	0.199***
	(-0.15)	(3.06)
Bank size	-0.259***	-0.263
	(-7.90)	(-1.47)
Merger dummy	0.0654***	0.0931
	(3.95)	(0.91)
Audited by big 4	-0.0125	-0.115*
	(-1.18)	(-1.74)
constant	1.973***	2.890**
	(8.13)	(2.41)
Year dummies	Included	Included
R_squared	0.538	0.099
No. of observations	304	304

3.8. The effect of changes in regulatory and economic environment

3.8.1. The effect of change in economic conditions on the relation between foreign directors and risk-taking

In this section, we test whether the structural change influences the foreign directors' strategy, which in turn affects bank risk-taking. We include only bank specific characteristics as control variables in Equation (3-2). The merger dummy is excluded owing to the multicollinearity problem between bank size and the merger dummy. Other governance variables are omitted as they contribute very little to the predictability of the model, given the relatively small number of observations (304) in the sample. The results are reported in Table 3.7.

As shown in Table 3.7, the coefficients of the structural change dummy have expected signs and are significant in models (1) and (2), suggesting that the structural change decreases insolvency risk, increases the ETA ratio, as expected. This implies that the Vietnamese domestic banks reduced the level of risk-taking after 2011. In addition, banks with foreign directors are associated with lower LTD before 2011. In contrast, despite the structural change resulting in lower risk-taking in the Vietnamese domestic banks, the higher the ratio of foreign directors on board was, the higher the LTD ratio and lower Z-score and ETA a bank experienced after 2011. The results are consistent with the second hypothesis.

Regarding the economic significance, the results show that a one standard deviation increase in the ratio of foreign directors after year 2011 implies a decrease in Z-score (in logarithmic) by approximately 3.22 percentage points of mean Z-score (in logarithmic) [0.095* 1.043/ln (21.57) = 0.0322]; and a decrease in ETA by approximately 9.85 percentage points of mean ETA [0.095* 0.114/0.11 = 0.0985]; and an increase in LTD by approximately 7.55 percentage points of mean LTD [0.095* 0.707/0.89 = 0.0755]. This result can be explained in that, after 2011, due to a drastic change in policy and economic environment, foreign directors wanted to increase shareholders' short-term returns because they were afraid of uncertainty in future, including frequent changes in legal regulations, the corruption fighting and the arrest of senior bankers, and the wave of mergers between banks; hence they encouraged bank managers to increase risk-taking by increasing lending.

Table 3. 7: The relation between foreign directors and risk-taking after 2011

This table presents the results of the change in risk-taking in banks associated with the presence of foreign directors on boards before and after 2011. The *Structural change*, starting from 2011, is the dummy variable, which equals 1 if the year is from 2011 onwards, and 0 otherwise. Superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. All models control for firm fixed effects, with adjusted standard errors following Driscoll and Kraay (1998). 2006-2010 year dummies are included in all models[52]. *t*-statistics are in parentheses. The definitions of the variables are in Table 3.1.

Dependent variable	LnZ-score	ETA	LTD
	(1)	(2)	(3)
Foreign_ratio	0.689	0.0335	**-0.399****
	(1.68)	(0.59)	**(-2.33)**
Foreign_ratio x Structural change[53]	**-1.043****	**-0.114****	**0.707*****
	(-2.56)	**(-2.32)**	**(3.45)**
Structural change	**0.362*****	**0.048*****	-0.063
	(7.27)	**(5.84)**	(-1.69)
CI	-0.496***	-0.0208	-0.275***
	(-3.12)	(-0.99)	(-2.79)
Listed dummy	0.0484	0.00956	0.201***
	(0.49)	(0.59)	(3.14)
Bank size	-1.415***	-0.211***	-0.205
	(-9.05)	(-6.61)	(-1.33)
Audited by big 4	-0.0748	-0.0129	-0.113
	(-1.42)	(-1.19)	(-1.58)
constant	14.17***	1.760***	2.734**
	(12.03)	(7.17)	(2.35)
Year dummies 2006-2010	Included	Included	Included
R_squared	0.097	0.538	0.124
No. of observations	304	304	304

3.8.2. Addressing selection bias due to unobservable heterogeneity

In our analyses in the previous sections, the selection bias concerns are partly addressed using firm fixed effects, which control for unobserved time-invariant heterogeneity among banks. In this section, we further mitigate such concerns by employing the two-stage Heckman model and propensity score matching estimator on the models in section 3.8.1.

The propensity score matching determines the probability that an individual would have received the treatment, based on a set of covariates. Different from the two-stage Heckman

[52] The results are still the same if we exclude the 2006-2010 year dummies of the models.

[53] We have conducted the F test to test the difference between the coefficient of the foreign_ratio and the foreign_ratio x structural change. The result shows that the coefficient of the foreign_ratio x structural change is significantly smaller than the coefficient of the foreign_ratio at 1% level of significant (p-value = 0.0074).

model, the propensity score matching model assumes that unobserved private information is irrelevant to the outcome (i.e. bank risk-taking). Observations of banks with foreign directors are considered as the treatment group, while observations of banks without foreign directors are considered as the control group. The bank-year observations from the treatment group are matched with observations from the control group using the propensity score matching technique. The chosen covariates should simultaneously influence the participation decision and the outcome variable (Caliendo & Kopeinig, 2008). Hence, the covariates used to match the two groups are bank-specific characteristics, which are the listed dummy, bank size, cost-to-income ratio, and audited by Big 4 dummy. The purpose of the propensity score matching is to create a sample that contains individuals from the treatment and control groups that are similar in the relevant pretreatment characteristics.

Table 3. 8: Covariates difference before and after propensity score matching

This table reports the difference of the covariates between the group of banks having foreign directors on board (treatment group) and banks without foreign directors on board (control group) on the covariates before and after propensity score matching using the t-test. Superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definitions of the variables are in Table 3.1. The sample consists of 304 observations.

Before matching

Variables	Treatment	Control	Difference	t-statistic
	N=98	N=206	(control – treatment)	
listed dummy	0.33	0.17	-0.16***	-3.24
Bank size	7.92	7.67	-0.25***	-3.56
Cost-to-income ratio	0.594	0.592	-0.002	-0.065
Audited by Big 4	0.93	0.74	-0.19***	-3.96

After matching

Variables	Treatment	Control	Difference	t-statistic
	N = 98	N=98	(control – treatment)	
listed dummy	0.327	0.296	-0.031	-0.46
Bank size	7.919	7.919	0.0003	0.0048
Cost-to-income ratio	0.594	0.595	0.0006	0.024
Audited by Big 4	0.928	0.928	0.00	0.00

Table 3.8 reports the difference of the covariates between the treatment and control group on the covariates before and after propensity score matching using the t-test. The propensity score matching approach shows no statistical difference between the treatment and control groups in all the covariates (Table 3.8).

Table 3. 9: Endogeneity test of foreign directors on boards and bank risk-taking: Propensity score matching (PSM) approach

This table presents the results of the regression analyses of the relationship between foreign directors on boards and different measures of bank risk-taking on the matched sample (196 observations), using the propensity score matching method on the covariates reported in Table 3.6. The full definitions of the variables are in Table 3.1. t-statistics are in parentheses. Superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. All models control for firm fixed effects, with adjusted standard errors following Driscoll and Kraay (1998). 2006-2010 year dummies are included in all models.

Dependent variable	LnZ-score	ETA	LTD
	(1)	(2)	(3)
Foreign_ratio	**1.381****	**0.130****	-0.365
	(2.61)	**(2.25)**	(-1.56)
Foreign_ratio x Structural change	**-1.232***	**-0.128***	**0.616****
	(-2.00)	**(-1.91)**	**(2.14)**
Structural change	**0.350*****	**0.0352*****	-0.0506
	(3.91)	**(3.34)**	(-1.15)
CI	-0.416*	-0.0143	-0.399***
	(-1.99)	(-0.57)	(-4.53)
Bank size	-1.255***	-0.126***	-0.202
	(-6.02)	(-4.71)	(-1.56)
Listed dummy	0.0227	-0.00697	0.145*
	(0.14)	(-0.28)	(1.85)
Audited by big 4	-0.161	-0.0163	0.317***
	(-1.54)	(-1.53)	(6.26)
Constant	13.00***	1.093***	2.409**
	(7.85)	(5.17)	(2.37)
Year dummies 2006-2010	Included	Included	Included
R_squared	0.016	0.338	0.039
No. of observations	196	196	196

Table 3.9 shows the results of the PSM model. The effects of the structural change are as expected, implying that after 2011, Vietnamese banks are associated with a lower level of risk-taking. The coefficients of the interaction terms between the foreign director ratio and the structural change are also significant and have expected signs, which confirms that after 2011, banks with foreign directors increase risk-taking in banks, even after controlling for the difference in selected firm characteristics between the control and treatment groups.

The two-stage Heckman model, on the other hand, is based on the assumption that the unobservable private information affects both the managerial decision to invest in a Vietnamese domestic bank and the bank's risk-taking. In the first stage a probit model of the foreign dummy (i.e. foreign dummy equals 1 if the bank has foreign directors on board in that year, 0 otherwise) is regressed on the cost-to-income ratio, bank size, audited by Big 4,

listed dummy to generate the inverse Mills ratio. The inverse Mills ratio captures the private information that drives the foreign entity to invest in the domestic banks. In the second stage, the inverse Mills ratio is included in the original regressions to correct for the self-selection bias. The ex-ante expectation of the Mills ratio term should be zero, which means there is no unobservable information that drives the given decision.

Table 3. 10: Endogeneity test of foreign directors on boards and bank risk-taking: Two-stage Heckman approach

This table presents the results of the relationship between foreign directors on boards and different measures of bank risk-taking using the Two-stage Heckman approach on the full sample. The full definitions of the variables are in Table 3.1. t-statistics in parentheses. Superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. All models control for firm fixed effects, with adjusted standard errors following Driscoll and Kraay (1998). 2006-2010 year dummies are included in all models.

Dependent variable	LnZ-score	ETA	LTD
	(1)	(2)	(3)
Foreign_ratio	0.687	0.0323	**-0.401****
	(1.69)	(0.58)	**(-2.43)**
Foreign_ratio x Structural change	**-1.074****	**-0.133****	**0.673*****
	(-2.60)	**(-2.58)**	**(3.31)**
Structural change	**0.356*****	**0.0448*****	**-0.0693***
	(7.29)	**(5.42)**	**(-1.89)**
CI	-0.417**	0.0285	-0.186
	(-2.25)	(1.11)	(-1.30)
Bank size	-1.588***	-0.318***	-0.398
	(-8.31)	(-11.31)	(-1.46)
Listed dummy	-0.161	-0.120***	-0.0335
	(-1.06)	(-4.60)	(-0.14)
Audited by big 4	-0.458	-0.251***	-0.541
	(-1.59)	(-5.20)	(-1.26)
Mills ratio	-3.460	-2.149***	-3.872
	(-1.50)	(-5.93)	(-1.02)
Constant	17.92***	4.088***	6.929
	(6.56)	(10.73)	(1.52)
Year dummies 2006-2010	Included	Included	Included
R_squared	0.101	0.57	0.124
No. of observations	304	304	304

Table 3.10 reports the results of the two-stage Heckman model. In three proxies of bank risk-taking, there is a robust relationship between the foreign director ratio and risk-taking after

2011, suggesting that foreign directors increase bank risk-taking after 2011, even after taking into account the selection bias due to private information. The Mills ratio in models (2) is significant, showing that there is selection bias in the model.

3.8.3. Robustness check: Privately owned banks sub-sample analysis[54]

Even though the agency conflicts due to the separation of ownership and control exist in both state-owned and privately-owned banks, the relationship between the board and bank risk is likely to differ across private and state sectors. This is because, apart from the agency relationships (i.e. owner vs management; minority shareholders vs majority shareholders), there is an additional agency relationship in state-owned firms; that is, the controlling shareholders themselves are agents of the true controlling owners, which is the state. It is believed that state ownership increases agency conflicts, due to the different incentives between the bureaucrats and the state agencies (Zou & Adams, 2008). Ding, Zhang, and Zhang (2007) argue that when the controlling shareholders gain control, they might act in their own interests, at the expense of minority shareholders as well as the state. In the Vietnamese context, transparency in state-owned banks is weaker than in private-owned banks since Vietnam has traditions of favouring state-owned enterprises. In addition, the Vietnamese banking sector is driven by state-owned banks. Hence, in this section we investigate whether the impact we find of foreign directors on risk-taking is driven by state-owned banks. As the ownership dummy is dropped owing to multicollinearity with the firm fixed effects, we use the sub-sample analysis to rerun the baseline regressions with a sample of private banks only. It is impossible to rerun the analysis of the sub-sample using only state-owned banks, as the sample size is too small, with only 45 observations**.**

Table 3.11 shows that the results are consistent with those reported in the regression in section 3.8.1 (i.e. Table 3.7). The results indicate that after 2011, foreign directors in private banks are associated with lower Z-scores and ETA, and higher LTD, indicating that the results obtained from the regressions in section 3.8.1 are not driven by state-owned banks.

[54] State ownership or state-owned bank refers to banks which have more than 50% of shares owned by the state; meanwhile, private ownership refers to banks which have more than 50% of shares owned by the private sector.

Table 3. 11: Privately owned banks subsample analysis

This table presents the results of regressions in section 3.8.1 on a sample of privately-owned banks only. The *Structural change*, which started from 2011 is the dummy variable, which equals 1 if the year is from 2011 onwards, and 0 otherwise. The full definitions of the variables are in Table 3.1. t-statistics are in parentheses. Superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. All models control for firm fixed effects, with Driscoll and Kraay (1998) robust standard errors.

Dependent variable	LnZ-score	ETA	LTD
	(1)	(2)	(3)
Foreign_ratio	0.525	0.00561	**-0.405***
	(1.26)	(0.10)	**(-1.97)**
Foreign_ratio x Structural change[55]	**-1.233*** **	**-0.157*** **	**0.837*** **
	(-2.84)	**(-3.24)**	**(3.55)**
Structural change	**0.350*** **	**0.051*** **	**-0.089***
	(5.69)	**(5.47)**	**(-1.99)**
CI	-0.393**	-0.0120	-0.276**
	(-2.52)	(-0.57)	(-2.51)
Bank size	-1.436***	-0.227***	-0.148
	(-8.47)	(-6.97)	(-0.91)
Listed dummy	0.0387	0.00191	0.241***
	(0.30)	(0.09)	(3.35)
Audited by big 4	-0.0805	-0.0130	-0.106
	(-1.52)	(-1.25)	(-1.47)
Constant	14.09***	1.859***	2.253*
	(11.19)	(7.51)	(1.87)
Year dummies 2006-2010	Included	Included	Included
R_squared	0.177	0.538	0.175
No. of observations	261	261	261

3.9. The channels through which foreign directors influence bank risk-taking

Board independence has been recognised as an internal mechanism that reduces the conflicts between shareholders and managers. However, independent directors may not have deep knowledge of the banking businesses, given that the market for executives in Vietnam is limited. Likewise, even though family related directors have long-term interests in banks, boards with more family-related directors can suffer from the "group think" problem. In both cases, foreign directors may find it easier to influence the decision-making of the boards. In our baseline regressions in Table 3.5, both the independent director ratio and family related

[55] We have conducted the F test to test the difference between the coefficient of the foreign_ratio and the foreign_ratio x structural change for the sub-sample. The result shows that the coefficient of the foreign_ratio x structural change is significantly smaller than the coefficient of the foreign_ratio at %% level of significant (p-value = 0.0107).

ratio have no significant effect on bank risk. However, board independence and board with more family related directors could act as the channel through which foreign directors influence the bank risk-taking. Thus, in this section, we address whether there is any difference in the effect of foreign directors on risk-taking with respect to board independence and board with more family related directors. We include only bank specific characteristics as control variables in Equations (3-3) and (3-4). The merger dummy is excluded owing to the multicollinearity problem between bank size and the merger dummy. Other governance variables are omitted as they contribute very little to the predictability of the model, given the relatively small number of observations (304) in the sample.

Table 3. 12: The channel via which foreign directors increase risk-taking: Board independence

This table presents the results of the regressions identifying the channels through which foreign directors increase risk-taking. Superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. All models control for firm fixed effects, with Driscoll and Kraay (1998) robust standard errors. t-statistics are in parentheses. The definitions of variables are in Table 3.1.

Dependent variable	LnZ-score	ETA	LTD
	(1)	(2)	(3)
Foreign_ratio	**0.581***	0.0469	**-0.357***
	(1.74)	(0.99)	**(-2.00)**
Foreign_ratio x independent_ratio	**-5.840*****	**-0.883*****	**4.001*****
	(-2.92)	**(-3.19)**	**(3.03)**
Independent_ratio	0.261	0.0434	-0.992**
	(0.95)	(0.84)	(-2.13)
CI	-0.774***	-0.0647**	-0.162*
	(-4.50)	(-2.56)	(-1.78)
Listed dummy	0.00706	0.00176	0.203***
	(0.08)	(0.13)	(3.45)
Bank size	-1.584***	-0.249***	-0.202
	(-10.86)	(-7.42)	(-1.35)
Audited by big 4	-0.0424	-0.00764	-0.0772
	(-0.69)	(-0.66)	(-1.37)
Constant	14.61***	1.943***	2.525**
	(14.40)	(7.85)	(2.39)
Year dummies	Included	Included	Included
R_squared	0.092	0.535	0.142
No. of observations	304	304	304

Table 3.12 reports the effects of the interaction term between board independence and the foreign director ratio on different measures of risk-taking. The regressions all control for firm and year fixed effects with adjusted standard errors. As can be seen from Table 3.12, foreign directors on boards with more independent directors are associated with higher risk-

taking (i.e. lower Z-score, lower ETA, higher LTD ratio) compared to foreign directors on boards with less independent directors. The results suggest that foreign directors increase risk-taking on boards that better represent shareholders' rights.

In the following, we examine whether there is any difference in the effect of foreign directors on risk-taking with respect to boards with family connected directors.

Table 3. 13: The channel via which foreign directors increase risk-taking: Boards with family connected directors

This table presents the results of the regressions identifying the channels through which foreign directors increase risk-taking. Superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. All models control for firm fixed effects, with Driscoll and Kraay (1998) robust standard errors. t-statistics are in parentheses. The definitions of variables are in Table 3.1.

Dependent variable	LnZ-score	ETA	LTD
	(1)	(2)	(3)
Foreign_ratio	0.253	-0.00197	0.00795
	(1.20)	(-0.06)	(0.05)
Foreign_ratio x Family related_ratio	**-3.628*** **	**-0.552*** **	**0.812**
	(-3.05)	**(-3.18)**	**(0.79)**
Family related_ratio	0.0306	0.000923	0.137
	(0.29)	(0.04)	(0.81)
CI	-0.780***	-0.0653**	-0.166*
	(-3.95)	(-2.37)	(-1.80)
Listed dummy	-0.0179	-0.00227	0.221***
	(-0.18)	(-0.16)	(3.42)
Bank size	-1.518***	-0.239***	-0.253
	(-10.90)	(-7.00)	(-1.34)
Audited by big 4	-0.0310	-0.00614	-0.109
	(-0.55)	(-0.50)	(-1.47)
Constant	14.15***	1.874***	2.882**
	(14.53)	(7.44)	(2.15)
Year dummies	Included	Included	Included
R_squared	0.11	0.54	0.096
No. of observations	304	304	304

Table 3.13 shows that foreign directors on a board with family related directors are associated with a lower Z-score and lower ETA ratio compared to their counterparts, as expected. However, there is no relationship between foreign directors on a board with family related directors and LTD.

3.10. Conclusion

In this study bank board characteristics are explored by investigating the effect of foreign directors on bank risk-taking under the Vietnamese institutional setting. Foreign directors could improve board effectiveness in monitoring and advising managers thanks to the cognitive conflicts (i.e. different viewpoints) in the board decision-making process. In contrast, foreign directors are motivated to increase risk-taking to maximise shareholders' wealth. This study contributes to the literature in two important ways. First, it expands the limited existing literature on the role of institutional investors on bank risk-taking. Second, it provides the institutional background of a developing country – Vietnam - and illustrates how regulation changes could possibly impact the effectiveness of internal corporate governance mechanisms.

The main findings are as follows. We find evidence that foreign directors increase bank risk only after 2011, when there is uncertainty in the economy. The finding employs various identification strategies such as the fixed effects specifications, the 2-stage Heckman and PSM, which address the endogeneity problem. The study also takes into account the year heterogeneity by including the year dummies in all specifications. The findings provide evidence that, if external governance mechanisms are weak, board characteristics play an important role in determining the effectiveness of the board. We also find evidence that foreign directors could influence board decision-making in boards with more independent directors and boards with more family connected directors. As independent directors usually hold more than one position in several organisations, they are too busy to closely monitor management. In contrast, boards with more family related directors are more likely to suffer from the "group think" problem than more diversified boards. In both cases, it would be easier for foreign directors to influence the decision-making of the board.

The study, however, faces some difficulties that limit its scope. First, the period of investigation is not long, hence we can only use the static Z-score, and not the rolling window Z-score, as the measure of bank risk. It would be desirable to conduct this research at a future date, because by then we can compare the rolling window Z-score with the static Z-score to see whether or not the changing-over-time nature of the Z-score, embedded in the rolling window Z-score, affects the results. Second, it could add more value to the literature by digging deeper into the process of board decision-making, such as in terms of how board members interact with each other. Is there enough trust among them? Or do they devote

enough time and effort in the decision-making process, and so on. Last, but not least, it could be more insightful to compare and contrast the effect of board characteristics in Vietnamese banks with banks in other countries with similar banking development, for example, the Philippines, Indonesia, Malaysia, and China. This would provide evidence for the roles of corporate governance mechanisms (such as regulations and the degree of protection of minority investors) in different institutional settings, and how they could affect local banks' risk. These limitations await future studies to address them.

Chapter 4. The effect of board gender diversity on Vietnamese bank efficiency: A comparison between one-stage stochastic frontier analysis and two-stage distributional free analysis approaches

4.1. Introduction

Given the important role of the board of directors in corporate governance, its effect on firm performance has long been a topic of interest for academics and practitioners. After all, the board of directors is elected by shareholders to maximise shareholders' value. The board could maximise shareholders' wealth by mitigating agency conflicts between shareholders and managers, and by providing linkage to the external environments that are beneficial to the firm businesses. In particular, from the agency theory perspective, the board monitors and advises the management, hence ensuring that managers are working for the shareholders' benefit. From the resource dependency theory proposed by Pfeffer and Salancik (2003), the board provides linkage to the external environment that the firm requires for its development. Hillman, Withers, and Collins (2009) conclude from the resource dependency theory that it is not just the board that matters for firms as a decision-making group, but the type of directors on the board is also important. Among different aspects of board compostion, board gender diversity seems to receive increasing attention from policy makers and practitioners all over the world. This is because European countries are increasingly advocating quotas on female directorship to promote gender equality. Consequently, there is an increasing body of empirical research on the difference between men and women in leadership positions. Adams and Funk (2012) conduct a large survey of directors and show that male and female directors differ systemically in their core values and risk attitudes. Adams and Ferreira (2009) find that female directors provide better monitoring; therefore, they argue that female directors could act as an additional independent director and help improve the monitoring function of the board. However, any improvement in the monitoring function of the board would not necessarily be translated into an improvement in firm value. Some studies indeed find no relationship between board gender diversity and bank performance (Carter et al., 2010; Pathan & Faff, 2013). Practitioners argue that, if female directors do not add value to firms, the promotion of women in leadership will just be tokenism (Carter et al., 2010).

Given the increasing attention paid to the role of women in leadership all over the world, in this chapter, the role of female directors is investigated in relation to Vietnamese bank

efficiency. The topic is chosen under the context that Vietnam is reforming its corporate governance code to be in line with best practices around the world. Its newest law on corporate governance of listed firms[56] also requires firms to consider gender in appointing leadership positions. The study contributes to the existing literature in several ways. First, a number of studies exploring the relation between board gender diversity and performance use firm profitability measures such as ROA, ROE, and Tobin's Q as proxies for firm performance. Nevertheless, to the best of our knowledge, there is no board gender diversity-firm performance study employing bank efficiency using the stochastic frontier analysis (SFA) method as a measure of performance. Efficiency is believed to better represent firm performance than accounting ratios (Halkos & Salamouris, 2004; Hardwick, Adams, & Zou, 2011). Second, in terms of methodology, unlike many previous studies employing two-stage stochastic frontier analysis (SFA), this study employs the one-stage SFA, which is believed to be superior to the two-stage SFA (Wang & Schmidt, 2002). The results from the two-stage SFA are also reported as a robustness check. Third, the study contributes to the literature on the role of female directors in bank efficiency from a developing country perspective, which has very limited examination in the existing literature. In addition, only a few studies exploring the role of female directors are theory-based (Terjesen, Sealy, & Singh, 2009). This study links the female directors-firm performance relationship to two most influential theories that help in understanding the board, which are agency theory and resource dependency theory.

The rest of the chapter is organised as follows: Section 4.2 develops hypotheses based on prior research on measures of firm performance and the board gender diversity-performance relationship; Section 4.3 describes the methodology and data and the descriptive statistics; Section 4.4 reports the main hypothesis testing; Sections 4.5 and 4.6 provide some additional robustness tests; and the conclusion in Section 4.7 offers some suggestions for future research.

4.2. Evidence on the roles of female directorship on bank performance

4.2.1. Measures of performance

Substantial research effort has been put into measuring the performance of commercial banks. There are two approaches to evaluating bank performance; using accounting ratios to

[56] Decree No. 71/2017/ND-CP (Article 13) on guidelines on corporate governance of public companies.

measure profitability, or employing non-parametric and parametric frontier analyses to measure efficiency. In essence, profitability and efficiency are different concepts. Profitability measures the extent to which a business generates profit from factors of production (Stavárek & Polouček, 2004). Meanwhile, efficiency measures how efficient the transformation process is in transforming inputs into outputs.

Accounting ratios to measure bank profitability widely used in the literature include, but are not limited to, ROA, ROE, and Tobin's Q. Athanasoglou, Brissimis, and Delis (2008) use ROA to represent the ability of a firm's management to gain profits from assets and ROE to measure the return to shareholders on their equity. Between ROE and ROA, ROA is preferred as the key measure of bank profitability, since it takes into account the risks associated with high leverage[57] or differences in bank capital structure, while ROE does not (Athanasoglou et al., 2008). Other profitability ratios that are widely used to measure performance include Tobin's Q (Khanna & Palepu, 2000; Wernerfelt & Montgomery, 1988), the deviation of ROA from the sample mean at time *t* (Chronopoulos, Liu, McMillan, & Wilson, 2015), and market share[58] (Buzzell et al., 1975). Even though empirical findings confirm that ROE and ROA are important indicators to forecast a financial crisis, ROE and ROA may be subject to manipulation by management,[59] or off-balance sheet activities (Athanasoglou et al., 2008; Trujillo‐Ponce, 2013). Financial accounting ratios also often fail to represent economic value-maximising behaviour of firms (Kohers, Huang, & Kohers, 2000).

Frontier analysis, on the other hand, is a sophisticated technique, which is widely used to "benchmark" how efficient decision-making units (DMUs) are in transforming inputs into outputs. The analysis is used to measure and compare the relative efficiency of each DMU with that of the frontier DMUs. The frontier consists of the best practice DMUs, where no other DMU "has as much or more of every output (given inputs) or as little or less of every input (given outputs)" (Berger & Humphrey, 1997, p. 177). The DMUs that do not lie on the frontier are regarded as relatively inefficient. The measure of inefficiency of a specific DMU is its distance from the frontier, which will be associated with an inefficiency score between

[57] ROE equals ROA times the leverage ratio i.e. total assets-to-equity ratio. Thus, banks with high leverage will generally report higher ROE but lower ROA.
[58] Buzzell, Gale, and Sultan (1975) find a strong relationship between market share and return on investment.
[59] For example, banks will increase the leverage ratio, which leads to the increase in risk, to report higher a ROE ratio. Off-balance sheet activities incur the same risk as loans, but are not calculated as assets, thus they can distort the ROA ratio.

0 and 1, with higher scores indicating a less efficient DMU, relative to other DMUs in the sample. Frontier analysis is a more powerful measurement of performance than accounting ratios because: (i) It allows individuals to pick up the "best practice" banks within the industry without the need to have experience or knowledge of the industry; and (ii) the analysis enables objective determination of the area of best practice within a complicated service operation (Berger & Humphrey, 1997). Compared to traditional accounting profitability ratios, efficiency seems to be superior in terms of measuring performance since none of the profitability ratios on their own provide an adequate indication of bank efficiency (Halkos & Salamouris, 2004), and efficiency tends to be a more reliable measure of each firm's performance (Hardwick et al., 2011).

There are, to date, hundreds of published articles employing the frontier technique to measure bank performance (Berger & Humphrey, 1997; Fethi & Pasiouras, 2010). The frontier analysis approaches widely employed in the literature are either non-parametric or parametric. The two approaches differ as to whether or not the shape of the frontier is imposed. The parametric frontier analysis requires assuming a functional form of the frontier, whereas, the non-parametric frontier technique creates the frontier by linearly connecting the best practice DMUs in the sample.

Among the non-parametric frontier approaches, data envelopment analysis (DEA) is the most[60] commonly employed in empirical studies (Fethi & Pasiouras, 2010). One of the advantages of DEA is that it is not necessary to make any assumptions about the distribution of inefficiencies (Berger & Humphrey, 1997). DEA also does not require any particular functional form for the data in determining the most efficient banks, and works relatively well with small samples (Berger, Hunter, & Timme, 1993). However, some of the disadvantages of DEA include assumptions that data be free of measurement error, and its sensitivity to outliers (Fethi & Pasiouras, 2010). In addition, the parameters are not estimated using statistical methods, but calculated using a linear programming technique, which precludes hypothesis testing (Murillo‐Zamorano, 2004). Luckily, the work by Simar and Wilson (2007) has provided means for inference about the efficiency level based on DEA estimators by proposing two bootstrap methods.

[60] Free disposal hull (FDH) is commonly used as well. However, FDH is just a special case of the DEA model where the frontier does not include points connecting the frontier line of the DEA model.

Parametric frontier approaches, on the other hand, apply econometric methodology to specify a functional form for the frontier (Berger & Humphrey, 1997). The functional forms include the Cobb-Douglas production function, trans-log, or a Flourier-flexible functional form. Unlike non-parametric approaches, the parametric approaches allow for inefficiency to be detangled from random error, which accounts for luck and measurement error. However, this technique requires choosing a functional form of production function. It is suggested that the more flexible the functional form, the better (Berger & Humphrey, 1997). Thus, the Fourier flexible functional form is better than the trans-log form and the trans-log form is preferable to the Cobb-Douglas functional form. Nevertheless, Berger and Mester (1997) find that, empirically, there is no difference between the choice of the Fourier flexible or the trans-log functional form. As the Fourier flexible functional form requires more coefficients to be estimated, and because of the degree of freedom issue, the trans-log model is chosen for this study.

There are two main approaches to estimating time-varying inefficiency[61], which are the distribution-free approach, and the stochastic frontier approach. The distribution-free approach has an advantage that it imposes no distributional assumption on the inefficiency terms. Examples of this approach are the CS90 model proposed by Cornwell et al. (1990) and the LS93 model proposed by Lee and Schmidt (1993). Both the CS90 and LS93 models are fixed effects model, however, the CS90 model cannot separate inefficiency from technological change (Kumbhakar, Wang, & Horncastle, 2015). The LS93 model, in contrast, specifies that the inefficiency term is a function of parameters representing firm fixed effects and year fixed effects; therefore, it is not suitable for our relatively small sample size. The stochastic frontier approach (SFA), on the other hand, has a strong assumption of the distribution of the inefficiency term and random error, such that the inefficiency term follows an asymmetric distribution, which stems from the logic that inefficiency cannot be negative, while the error term follows a symmetrical distribution. Examples of the SFA approach are the BC95 proposed by Battese and Coelli (1995) and models proposed by Greene (2005). In order to estimate the effects of environmental variables[62] on (in)efficiency levels, the common methodology employed in the literature is SFA, using either one-stage

[61] There are models developed to measure time-invariant efficiency. However, given the nature of the rapid development of technology in the banking field, we assume that the efficiency of Vietnamese banks is time-variant.

[62] Environmental variables, as defined by Berger and Mester (1997), are exogenous variables, or partially exogenous, and are not traditional inputs or outputs of the frontiers, but may have an impact on the inefficiency.

or two-stage estimation. The two-stage estimation consists of two separate steps. In the first step, the stochastic frontier model is estimated[63] and the (in)efficiency levels are generated based on the assumption of the distribution of the inefficiency, ignoring the environmental variables that may affect the inefficiency level. In the second step, the efficiency levels are regressed on the environmental variables. Hence, one can measure the efficiency level using the distribution-free or stochastic frontier approaches, then regress the efficiency obtained on environmental variables. Unfortunately, the two-stage approach has been shown by Wang and Schmidt (2002) and Schmidt (2011) as providing a biased frontier, as well as a downward bias of the effect of environmental variables on efficiency, since the model at the first step is mis-specified. Wang and Schmidt (2002) argue that there are not only inputs that solely affect efficiency, but there are also firm characteristic variables that cause the output to deviate from the frontier. Thus, they advocate the one-stage approach, which addresses this problem. The one-stage estimation procedure treats the inputs, outputs, input prices, and environmental variables as "given" or "fixed" and specifies the distribution for efficiency levels conditional on those variables. The BC95 and Greene (2005) models both apply the one-stage approach.

4.2.2. Relationship between board gender diversity and bank efficiency

The percentage of women over total board members is employed as a proxy for gender diversity, following many existing studies (Adams & Mehran, 2012; García-Meca et al., 2015; Pathan & Faff, 2013; Sila et al., 2016). Owen and Temesvary (2018) use the Blau index,[64] which has the maximum value of 50 at gender equality on board, following Blau (1977), as one might argue that 50% of board members being women is better than, say, 70% of members on boards being women. Nevertheless, as the Blau index calculated has very high correlation (0.94) with the ratio of women on board, we only use the percentage of women over total board members as a proxy for gender diversity.

There are two main theories that link board gender diversity with firm performance, which are agency theory and resource dependency theory.

[63] The frontier can be estimated using various techniques such as OLS, fixed effects, models proposed by BC92, the CS90 model, or the LS93 model. The appropriate technique depends on the nature of the data.

[64] The Blau index is measured as: $B = \left[1 - \sum_{g=1}^{G} P_g^2\right] \times 100$, with P being the fraction of women and men on bank boards, and g indexing gender.

Agency theory

Terjesen et al. (2009) argue that based on the Human capital theory, individuals' cumulative stocks of education, skills, and experience enhance cognitive conflicts that benefit his/her organisations. This argument is consistent with Forbes and Milliken (1999), who recognise that "cognitive conflict", defined as "task-oriented differences in judgment among group members", among others, enhances board effectiveness. The cognitive conflict, in other words, can be defined as diversification of views (which also promotes a greater independence of views). Muller‐Kahle and Lewellyn (2011) provide a summary of the literature explaining why cognitive conflict is important for board effectiveness, as a decision-making group. First, cognitive conflict helps to avoid the deterioration of decision quality as the consequence of groupthink. Second, diversity within the board improves decision-making quality due to board members' range of experience from different educational and industrial backgrounds, hence bringing different information into board discussions. Third, cognitive conflicts force board members to devote more time and effort to finding solutions and mitigating conflict, hence improving decision-making. In this aspect, female directors might bring different values to the discussion process by promoting heterogeneity of ideas on the board. In this regard, board gender diversity could mitigate agency conflicts by improving the effectiveness of the board decision-making.

Nevertheless, there are arguments that board diversity could lower cohesion and integration between groups, and create more conflicts among board members; more diverse opinions would make decision-making more time-consuming, and less efficient (Carter et al., 2010; Maznevski, 1994). Maznevski (1994) further emphasises that the conflicts among people with diverse cultural values, gender, or nationality are difficult for parties to understand, and are usually left unresolved. Hence, it can be concluded that the performance of the board would very likely affect the decision-making processes of the board, however, it is unclear as to the direction of influence of board gender diversity on efficiency.

Resource dependency theory

Pfeffer and Salancik (2003) argue that directors are elected by shareholders because they possess access to external resources that the organisation requires for its development, hence enabling firms to minimise dependency on external resources. They theorise that the board of directors provide linkages to four aspects: (i) Information about other firms' activities in the forms of advice and counsel; (ii) channels for communicating with the external

contingencies that the firm depends upon; (iii) commitments of support from important environmental resources; and (iv) legitimacy resulting from having a prestigious person present on the firm's board. Hillman et al. (2009) even suggest that resource dependency theory provides a more successful tool for understanding boards. Through these four channels, board members help the firm to be less dependent on the external environment and reduce uncertainty for the firm. Additionally, the theory predicts that board members who have more access to environmental resources and cope better with organisational uncertainties would impose more control over the firm's functioning. Therefore the question is: Do female directors have access to different environmental resources that are beneficial to the firm?

Regarding the literature on the role of female directors on firm outcomes, first, it is worthwhile noting that a large body of research on female directors is predominantly conducted in Western countries (Terjesen et al., 2009). Prior studies regarding women in leadership suggest that gender differences may not apply to highly specialised positions (Lara et al., 2017). Adams and Funk (2012) argue that once women have adapted to a male-dominant culture, then women and men in leadership positions are not different. Similarly, Derks, Van Laar, and Ellemers (2016) propose that women leaders usually distance themselves from junior women to present themselves to be more masculine and ambitious to be able to fit in male-dominated organizations. However, those studies are all conducted in developed countries, where there is a long tradition of promoting gender equality. In contrast, a literature review on the role of female directors by Terjesen et al. (2009) also shows that there is still gender discrimination and/or gender difference at work. For instance, several studies in Western countries suggest that women have less work experience and education investment than men of the same age group (Tharenou, Latimer, & Conroy, 1994). Davidson and Burke (2000) imply that the "glass ceiling" still existed in the UK prior to 1998, where women leadership was concentrated in the lower levels of management. Singh, Terjesen, and Vinnicombe (2008) document from FTSE 100 Directorship from the FAME and Hemscott databases in the 2001-2006 period that newly appointed female directors, even though they are more likely to hold an MBA degree than their male counterparts, are less likely to have experience as chair of a board, or a CEO and chief operating officer (COO). Prior studies on the role of female directors on bank performance also provide mixed results, ranging from a positive effect, to no causal effect at all. Moreover, recent studies that we are

aware of all use accounting ratios as proxies for bank performance. The following is a review of some recent studies on the role of female directors on boards.

Owen and Temesvary (2018) use a sample consisting of 90 US bank holding companies over the 1999-2015 period to investigate the impact of female directors on bank performance. ROA, the revenue-to-expense ratio, stock price growth, and ROA minus the risk-free rate divided by the standard deviation of ROA are used as proxies for bank performance. Employing a fixed year and firm effects model, they find a U-shaped relationship between board gender diversity and measures of performance. The results are also robust in the instrumental variables regressions that control for a potential endogeneity problem.

García-Meca et al. (2015) conducted a cross-country study on the effect of gender diversity on bank performance using a dataset from nine developed countries (six developed European countries plus Canada, the US, and the UK) during the 2004-2010 period. Employing the generalised method of moments, they find a positive relationship between gender diversity and bank performance. The result is robust in those cases using both ROA and Tobin's Q as dependent variables. Their explanation of the finding is that qualified female directors have unique characteristics that bring about additional value in banks.

Pathan and Faff (2013) study the effects of board structure (board size, independence and gender diversity) in large US bank holding companies on performance in the 1997-2011 period. Various accounting and market profitability indicators such as ROE, ROE net interest margin, and the Tobin's Q ratio are employed as proxies for bank performance. Employing the generalised method of moments, they find a positive effect of gender diversity on boards on bank performance in the US only for the pre-Sarbanes-Oxley Act period (1997-2002), but no evidence of gender diversity affecting bank performance in the post-financial crisis period.

Carter et al. (2010) obtain accounting and governance data from the S&P 500 index and the Investor Responsibility Research Center database and study the effect of board ethnic and gender diversity on bank performance. Employing the three stage least squared regression analysis (3SLS) to control for the endogeneity problem in the relationship between board composition and firm performance, they find some evidence of the positive association between the female director ratio and ROA in the fixed effects regressions. However, the relationship disappears in the 3SLS analysis. They conclude that there is no evidence of a causal relationship between board gender diversity and firm performance.

Adams and Ferreira (2009) use a sample consisting of data from 1,939 firms in the 1996-2003 period, collected from international databases such as S&P 500 and S&P Midcaps to investigate the relationship between gender diversity on boards and firm performance. Using ROA and Tobin's Q as proxies for performance, they find that the coefficient of the female director ratio with respect to firm performance is positive in the OLS regressions, but negative in the fixed effects and instrumental regressions. They conclude that, after controlling for omitted variable bias and reverse causality by using the instrumental variables technique, gender diversity on boards lead to a decrease in performance in firms with strong governance. Their explanation is that gender diverse boards appear to be tougher monitors. Therefore, in firms with strong governance, tougher boards could lead to over-monitoring, which negatively affects firm performance.

Given the mixed results regarding the effect of board gender diversity on bank performance in Western countries and the specific characteristics of Vietnam, we argue that, in the context of Vietnam, board gender diversity has a negative effect on bank efficiency. This is because female directors in Vietnamese banks might face strong "old boy networks", which reduce the probability that female directors influence the group decision. Women are also likely to experience smaller networks compared to their male counterparts owing to social barriers such as cultural norms, and their family responsibilities. Hence, compared to men, women might have less access to external resources that firms require. In addition, Terjesen et al. (2009) argue that women are less likely to be as experienced as business experts as men. Thus, we have the following hypothesis:

H1: Board gender diversity has a negative significant effect on bank efficiency.

4.3. Methodology and data

4.3.1. Sample and observations

The data is from 34 commercial banks, covering the period from 2006 to 2016, totalling 297 observations. The sample is an unbalanced panel, since: (1) Some banks were established later than the others, for example Baoviet Bank, Lienvietpost bank, and Tien Phong Bank were established in 2008; and (2) the majority of banks in Vietnam are not listed, for which inclusion of notes in financial reports are not compulsory. As a result, some data which are only available on financial reports' notes, such as the number of employees and labour expenses, were not publicly available for some years. The value of labour expenses and the

number of employees are among crucial data for measuring bank efficiency. However, since the missing values account for less than 10% of the sample, and the variables are missing at random, the observations having missing values for labour expenses were deleted. The final sample represents 93.9% of the total assets of the Vietnamese commercial banks as of 2012.

4.3.2. Methodology

In order to test whether or not female directors affect bank efficiency, we adopt a one-stage SFA method, the BC95 model. Efficiency in cost function (i.e. cost efficiency) is measured as a proxy for bank efficiency. Cost efficiency is regarded as a better indicator of management than technical efficiency (in production functions), because it takes into account input prices, or the cost minimising behaviours by firms, while technical efficiency purely reflects technical relationships. In contrast, it is widely considered that profit efficiency is superior to cost efficiency as an indicator for bank management, as profit efficiency takes into account both cost and revenue performance (Berger et al., 2009).

To test for the existence of a cost/alternative profit frontier,[65] following Schmidt and Lin (1984), skewness tests of the residuals in cost and profit functions using OLS are conducted. The results show that the direction of skewness of the residual term in the cost function is positive, which is consistent with the existence of a cost frontier (Schmidt & Lin, 1984). As for the alternative profit function, our data also shows a positive skewness of the estimated residual. Olson, Schmidt, and Waldman (1980) call the phenomenon of a positive skewness of the residual in the production/profit function as a type I failure. This implies either some firms are super-efficient instead of inefficient, or all firms in the industry are efficient, or the technique of frontier analysis is inappropriate (Carree, 2002; Green & Mayes, 1991). Indeed, we attempt to estimate the alternative profit efficiency for the Vietnamese banks. The result shows that all Vietnamese banks are very efficient, with an average score of 0.98 in the CS90 specification and 0.995 in the BC95 specification during the 2006-2016 period, suggesting almost no inefficiency in these banks. Given the fact that Vietnamese banks are far from fully efficient, the results suggest the inappropriateness of the technique. Therefore, this study is limited to an investigation of cost efficiency.

[65] As the data to measure output prices is not available, profit efficiency cannot be estimated in the Vietnamese context. Instead, alternative profit efficiency is used, which does not require output prices. The alternative profit function maximises profit given input quantities, input prices, and output quantities. Profit here is defined as the accounting net profit before tax.

Input-Output specifications for measuring cost efficiency

There are several approaches to the choice of inputs and outputs with respect to financial institutions that are widely employed in the literature, including the intermediation approach, production approach, value-added approach, and revenue approach (Berger & Humphrey, 1992; Drake, Hall, & Simper, 2009; Sealey & Lindley, 1977). The difference among these approaches lies in how inputs, outputs, input prices, and output prices are identified.[66] For instance, in the production approach, banks are considered as firms that use labour and capital as factors of production to produce loans and deposit accounts (Matthews & Thompson, 2005). Thus, only labour and physical capital (and their associated costs) should be included as inputs. In contrast, under the intermediation approach, based on work by Sealey and Lindley (1977), banks are regarded as intermediaries connecting savers and investors. With this approach, interest costs and deposits should also be counted as inputs, as the deposit is the main "raw material" to be transformed in the intermediation process to create outputs (Berger & Humphrey, 1997). The value-added approach, proposed by Berger and Humphrey (1992), on the other hand, distinguishes inputs and outputs according to their "value-added" characteristics. Accordingly, the categories that "use external sources of operating cost allocations, are employed as the important outputs" (Berger & Humphrey, 1992, p. 250). Thus, under this approach, deposits and loans are important outputs. There is also a longstanding disagreement in the literature as to whether deposits should be categorised as inputs or outputs, as deposits have both input and output characteristics (Berger & Humphrey, 1997). To solve this duality, because interest expenses are "associated with the role of deposits as providing the input of loanable funds" (Berger & Humphrey, 1997, p. 251), Berger and Humphrey (1997) suggest that one can count interest expenses as an input and the rate paid as an input price, while including the quantities of deposits as an output.

This study employs the intermediation approach, as widely adopted in literature.[67] According to Sealey and Lindley (1977), outputs are physically measured as the dollar value of the various types of earning assets. In contrast, inputs comprise implicit resource costs, the cost incurred in providing services to depositors, such as capital, labour, and material

[66] Details of the choices of inputs and outputs in those approaches are reported in Chapter 5.
[67] As discussed, one could take into account the input and output characteristics of deposits by using deposits as both inputs and outputs. However, our data does not support the accommodation of an additional output (i.e. deposits) owing to the degree of freedom issue.

costs, and explicit interest payments to the depositors. Accordingly, we specify three outputs and three inputs as shown in Table 4.1.

Table 4.1: Descriptive analysis of variables used to estimate cost frontier

This table reports the summary statistics for the full sample. The sample consists of an unbalanced panel of 297 observations (firm-years) from 32 commercial Vietnamese banks in the 2006-2016 period. Data are manually obtained from the commercial banks' financial and annual statements. Total cost and output quantities are measured in billion VND. Input prices are measured as ratios. The dependent variable is Total costs. Data are deflated using the GDP deflator with 2010 as the base year.

Variable	Definition	Obs	Mean	Std. Dev.	Min	Max
Dependent variables						
Total cost (TC)	Total operating expenses + interest expenses	297	6,974,947	9,137,183	63,900	55,247,024
Variable input prices						
Price of labour (w1)	labour expenses/total assets	297	124.69	38.97	50.71	268.11
Price of capital (w2)	(Total operating expenses - labour expenses)/total fixed assets	297	1.04	2.37	0.11	39.39
Price of funds (w3)	interest expenses/total deposits	297	0.10	0.05	0.02	0.39
Fixed output quantities						
Total fixed assets (z)		297	1,142,276	1,364,356	12,480	7,200,998
Variable output quantities						
net loans (y1)	loans to customer - provisions	297	60,715,174	92,452,676	327,767	484,099,776
Other earning assets (y2)	Total assets - y_1 - z - interbank lending	297	26,973,246	29,161,104	75,007	143,214,896

The outputs and inputs are measured in billion VND and are adjusted by the GDP deflator, with 2010 as the base year. Table 4.1 shows the descriptive statistics of inputs, outputs, and input prices used for estimating cost efficiencies. Table 4.2 shows the movement over the years of inputs, outputs, and input prices, which indicates the rapid and steady expansion of output quantities (i.e. y1, y2, and z1). The price of funds is extremely high in 2008 and 2011,

reflecting the difficulty in the business environment when the deposit rates were at 12.7% and 14%, respectively. Besides, in 2008, banks also experienced difficulty in lending owing to the uncertainty in the economy due to the global financial crisis. Likewise, in 2011, banks were making losses in stock and gold markets, which led to the high price of capital.

Table 4.2: Inputs, input prices, and output evolution over time – mean for 2006, 2008, 2011, 2014, and 2016

This table displays the change in bank financial characteristics over the period between 2006-2016. The results are based on the sample of 32 Vietnamese banks (297 firm-year observations). Total cost, output and input quantities are measured in billion VND. Input prices are measured as ratios. Data are deflated using the GDP deflator with 2010 as the base year.

Year	2006	2008	2011	2014	2016
Dependent variables					
Total cost	4,051,292	5,673,609	9,641,053	7,074,045	9,372,616
Variable input prices					
Price of funds (w3)	0.079	**0.144**	**0.179**	0.066	0.054
Price of capital (w2)	0.768	0.651	**2.162**	1.035	1.196
Price of labour (w1)	96.02	110.24	130.61	129.55	141.70
Output quantities					
Net loans (y1)	38,929,744	**37,065,649**	51,865,053	71,626,961	113,900,000
Other earning assets (y2)	15,398,856	17,291,853	24,855,105	33,833,793	67,232,588
Total fixed assets (z)	650,618	719,988	1,002,557	1,486,774	1,903,335

It might be important to control for the difference in the output quality among banks. Berger and Mester (1997) argue that some banks could trade-off between risk and return, and as a result, riskier banks might be more efficient. Alternatively, a bank which is good at operations might also be good at risk management. As a result, riskier banks might be less efficient. Mester (1996), in a study of the efficiency of the US banks, uses the average volume of non-performing loans as an input to account for the quality of bank outputs and bank risk. Other researchers use loan loss provisions as an indicator of the extent of problem loans when the data for non-performing loans is not available (Drake & Hall, 2003).[68] In this study, following Berger and Mester (1997), we capture the difference in risk among banks using the standard deviation of ROE as a direct measure of bank risk. The non-performing

[68] There is quite a body of other literature on the treatment of non-preforming loans and loan loss expense as bad outputs. See, for example, Seiford & Zhu (2002).

loan ratio is not used as a proxy for the level of risk, as the data on non-performing loans in Vietnam is both not fully available and unreliable. The standard deviation of ROE is regarded as one of the environmental variables that influence the inefficiency component.

One-stage SFA vs two-stage SFA

As mentioned in the previous section, the one-stage SFA is considered to be superior to the two-stage SFA, therefore in order to test whether or not female directors improve bank efficiency, we adopt one-stage SFA employing the model proposed by Battese and Coelli (1995) (BC95 model). The BC95 model employs a random effect regression. The models developed by Greene (2005) are also one-stage SFA models, and employ a fixed effect regression, however, those models require a large number of observations. Hence, we can not use the fixed effect regression on one-stage SFA models given the limited sample size (297 observations). Nevertheless, to rule out the effect of time-invariant unobservables, we therefore, also use two-stage estimation procedures, with the model proposed by Cornwell et al. (1990) (CS1990 model) used to estimate efficiency, as a robustness check. In addition, to the best of our knowledge, studies on the role of female directors and foreign directors on boards employing SFA analysis have all employed two-stage SFA. The reason for this might be that researchers could adopt a standard regression in the second steps.

The BC95 is a random-effects time-varying inefficiency effects model. The cost model has the following form:

$$y_{it} = \alpha + x'_{it}\beta + \varepsilon_{it}, \quad i = 1, \dots N, t = 2, \dots T_i; \quad (4\text{-}1)$$

$$\varepsilon_{it} = v_{it} + u_{it} \quad (4\text{-}2)$$

$$v_{it} \sim N(0, \sigma_v^2) \quad (4\text{-}3)$$

$$u_{it} \sim N^+(m_{it}, \sigma_u^2) \quad (4\text{-}4)$$

$$m_{it} = \tau_{it}\delta \quad (4\text{-}5)$$

where y_{it} is the total cost of the i-th firm in the t-th time period;

x_{it} is a $kx1$ vector of input/outputs quantities and input prices of the i-th firm in the t-th time period; β is unknown parameters;

v_{it} are random variables, which are assumed to be independently and identically distributed with normal distribution, and independent of the u_{it};

u_{it} are non-negative random variables assumed to be independently distributed with the $N^{+}(m_{it}, \sigma_u^2)$ truncated distribution, and u_{it} are assumed to account for inefficiency of the firm; and

τ_{it} is a $px1$ vector of environmental variables, which may influence the efficiency of a firm.

The BC95 model has some characteristics: (i) The inefficiency component is time-varying and is a function of environmental variables that may influence the efficiency of a bank; (ii) the cost inefficiency is estimated given not only inputs, outputs, and input prices but also environmental variables, using the maximum likelihood estimator; and (iii) the inefficiency is assumed to have a truncated distribution.

To address the drawback of SFA regarding the requirement to choose a specific functional form of production function, the more flexible the assumed functional form the better.[69] The cost function is, therefore, specified as the translog functional form, in the following form:

$$\ln(C / w_1 z_1) = \delta_0 + \sum_j \delta_j \ln(y_j / z_1) + \frac{1}{2}\sum_j \sum_k \delta_{jk} \ln(y_j / z_1)_{it} \ln(y_k / z_1)_{it} + \sum_m \beta_m \ln(w_m / w_1)_{it}$$
$$+ \frac{1}{2}\sum_m \sum_n \delta_{mn} \ln(w_m / w_1)_{it} \ln(w_n / w_1)_{it} + \delta_h \ln(z / z_1) + \frac{1}{2}\delta_g \ln(z / z_1)\ln(z / z_1) +$$
$$+ \sum_j \sum_m \theta_{jm} \ln(y_j / z_1)_{it} \ln(w_m / w_1)_{it} + \sum_j \lambda_j \ln(y_j / z_1)_{it} \ln(z / z_1)_{it} + \sum_m \lambda_m \ln(w_m / z_1)_{it} \ln(z / z_1)_{it}$$
$$+ \gamma_t t + \frac{1}{2}\gamma_{tt} t^2 + \sum_j \gamma_j \ln(y_j / z_1)_{it} t + \sum_m \gamma_m \ln(w_m / z_1)_{it} t + \ln(z / z_1)_{it} t + u_{it} + v_{it}$$

(4-6)

The model of cost inefficiency is specified as:

$$u_{it} = \alpha_0 + \alpha_1 women\_ratio_{it} + \alpha_2 foreign\_ratio_{it} + \alpha_3 listed_{it} + \alpha_4 ownership_{it} + \alpha_5 SD(ROE)_i + t + w_{it} \quad (4\text{-}7)$$

where *i*, *t* index the bank and year, respectively; j = 1, 2 index the three output variables; $\delta_{jk} = \delta_{kj}$; m = 2, 3 index the two input variables; and $\delta_{mn} = \delta_{nm}$.

[69] For instance, if we take the first order partial derivative of total cost with respects to x_1, the log function would give more flexibility than the Cobb-Douglas production function in terms of how the total cost changes when x_1 changes by 1 unit. In the Cobb-Douglas function, when $\ln x_1$ increases by 1 unit, then lnTC would change by the coefficient of $\ln x_1$, given other variables being held unchanged. Meanwhile, in the trans-log function, lnTC would change by the coefficient of lnx1 plus the coefficients of other interactive variables with lnx1 (i.e. $\ln x_1 * \ln y_1$, $\ln x_1 * \ln y_2$ and so on) in the model.

Of which:

Women_ratio refers to the ratio of female directors on the board;

Foreign_ratio refers to the ratio of foreign directors on the board;

ownership is the dummy variable, equal to 1 if the bank is a private bank and 0 otherwise;

listed is the dummy variable, equal to 1 if banks are listed on stock markets and 0 otherwise;

$S.D(ROE)$ refers to the standard deviation of the return-to-equity ratio, and is a proxy for the level of bank risk;

t is the time trend;

ε_{it} is the random variable, $\varepsilon_{it} = v_{it} + u_{it}$; and

$u_{it} + v_{it}$ in the cost model is included to reflect how much cost is wasted to produce the same outputs in a typical bank compared to the best-practice banks.

To ensure price homogeneity (Berger and Mester (1997), the inputs are normalised by w_1, which is the price of labour and equals labour expenses divided by total assets. Further, all outputs are normalised by equity capital (z_1) to reduce heteroscedasticity (i.e scale biases). C represents the bank's total costs, and is also normalised by ($w_1 * z_1$). *t* and t^2 are included to capture technological change over time. $\ln u$ represents the inefficiency component, which is detangled from the cost function residual by assuming a truncated distribution for *u*. $\ln v$ is an error term, capturing measurement errors and luck. *v* is detangled from the inefficiency stochastic function residual using a normal distribution assumption.

4.3.3. The choice of explanatory variables of the inefficiency model

In terms of the inefficiency model, Berger and Mester (1997) suggest some explanatory variables could affect efficiency, such as bank size, corporate governance, ownership type, and other bank characteristics. As the loan-to-asset ratio and bank size have a high correlation with inputs, they are not included in the inefficiency model. Our variable of interest is female directors on boards, in its relationship with bank efficiency. As discussed in section 4.2.2 of the hypothesis development, female directors are expected to have no impact on Vietnamese banks' efficiency.

In addition, the ratio of foreign directors on the board is included to control for the effect of foreign directors on efficiency. Foreign directors are representatives from foreign financial strategic partners (see section 3.2) which invest from 15% to 20% of the total shares of a Vietnamese domestic bank. Agency theory, resource dependency theory, and human capital theory all predict that foreign directors could be beneficial to firms. From the agency theory perspective, the presence of foreign directors on boards could mitigate agency conflicts by monitoring managers to work for the shareholders' interests. Under the resource dependency theory, foreign directors could advise and counsel the management. They also bring access to a different set of information between the firm and environmental contingencies. Under the human capital theory, given their different educational backgrounds, skills, knowledge, social networks and cultures, foreign directors bring cognitive conflicts to the board. Accordingly, there is a rich body of literature investigating the relationship between majority foreign ownership (i.e. foreign ownership accounting for more than 50% of the total shares) and bank profitability (Berger, Clarke, Cull, Klapper, & Udell, 2005; Bonin, Hasan, & Wachtel, 2005; Boubakri, Cosset, Fischer, & Guedhami, 2005), and efficiency (Berger, 2007; Bonin et al., 2005). In contrast, there are limited studies investigating the relationship between minority foreign ownership and bank efficiency (Berger et al., 2009; Jiang et al., 2013; Lin, Doan, & Doong, 2016; Nguyen, Nghiem, Roca, & Sharma, 2016; Sun et al., 2013); however, the results are quite mixed. The studies in the Chinese context provide a consistent result that the strategy of attracting foreign investors has improved bank efficiency in the long-run, while the study by Nguyen et al. (2016) in the Vietnamese context finds that after being partially acquired by foreign entities, the Vietnamese domestic banks experience lower cost efficiency than before the partial acquisition. It is worth noting that in all the above studies the effect of minority foreign ownership is investigated by employing two-stage SFA, and a dummy variable to represent minority foreign ownership. In this study, the ratio of foreign directors on a board is employed instead of the dummy variable, and one-stage SFA is used for the baseline regression. We believe the foreign director ratio will be the better indicator of the impact of minority foreign ownership than the dummy variable applied in previous studies. To the best of our knowledge, so far no studies have been conducted in the Vietnamese and Chinese context on the effect of minority foreign ownership on bank efficiency using the proportion of foreign directors on a board as a proxy for minority foreign ownership, employing the one-stage SFA technique.

After the above considerations, the inefficiency is estimated to change linearly according to the female director ratio, foreign director ratio, ownership types (state-owned or privately-owned), listed dummy, the standard deviation of ROE and the time trend.

4.3.4. Addressing sample selection bias

It is possible that the female directors are not randomly employed by banks. For example, corporate culture reflects beliefs and behaviours of participants in the organisation accumulated over a long period, which may vary from organisation to organisation, and can influence both the appointment of directors and the firm performance. For example, due to social prejudice, the appointment of female directors might be based, in part, on their gender and not their competence. Indeed, Croson and Gneezy (2009) find that gender differences on a board are not predetermined, but driven by social aspects. Antonakis et al. (2010) argue that in male-oriented environments, the sample of male leaders are upward biased and only the performance of very competent women will be observed due to the selection bias. These considerations show that there are unobserved heterogenetic factors (i.e. discrimination towards women) in leadership in certain firms. This implies that the data is subject to sample selection bias. There are several methods to address a potential selectivity bias. Following Sipilainen and Oude Lansink (2005), we incorporate the inverse Mills ratio estimated in the first stage of the two-stage Heckman analysis, into the function estimating the cost frontier. The inverse Mills ratio is used to capture the unobservable self-selection in the selection model. In addition, we also estimate the cost function on a matched sample using the propensity score matching technique. Details of how the inverse Mills ratio and the matched sample are obtained are reported in the following section. It is noteworthy that recently Kumbhakar, Tsionas, and Sipiläinen (2009) and Greene (2010) have developed different approaches to capture the selection bias. Kumbhakar et al. (2009) specify that the unobservables in the selection model are correlated with the inefficiency term. In contrast, Greene (2010) specifies the unobservables in the selection model as correlated with the noise in the stochastic frontier model. Nevertheless, it is still a challenge to address the unobservables concern empirically. Therefore, we control for the potential selection bias following Sipilainen and Oude Lansink (2005) by estimating the inverse Mills ratio and incorporating the inverse Mills ratio into the cost frontier model. The inverse Mills ratio is applied to capture the private information that drives a female director to choose to be a director of a certain bank.

4.4. Empirical results of the main hypothesis

The regression results are reported in Table 4.4. From model (1) to (4) we report the results with a focus on the effect of female directors on bank inefficiency, from different settings. In model (1), the female director ratio together with the foreign director ratio and firm specific variables are included. As the foreign director ratio has a significant correlation with both the female director ratio and the listed dummy, we exclude the foreign director ratio in model (2) to rule out possible multicollinearity problem. Model (3) and model (4) are used to address the endogeneity problem inherent in the data. Lastly, in model (5) the standard deviation of ROE, a proxy for bank risk-taking, is omitted to determine whether or not the risk-taking level is important in explaining the inefficiency level.

Table 4.3: Covariates difference before and after propensity score matching

This table reports the difference of the covariates between the group of banks having female directors on the board (treatment group) and banks without female directors on the board (control group) on the covariates before and after propensity score matching using the t-test. Superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definitions of variables are in Table 3.1. The sample consists of 297 observations.

Before matching				
Variables	Control	Treatment	Difference	t-statistic
	N=94	N=203	(treatment-control)	
Listed dummy	0.14	0.25	0.11**	2.13
SD(ROE)	0.063	0.075	0.012**	1.80
Foreign_ratio	0.094	0.059	-0.35***	-2.64
Ownership	0.085	0.163	0.077**	1.80
After matching				
Variables	Control	Treatment	Difference	t-statistic
	N = 93	N=93	(treatment-control)	
Listed dummy	0.14	0.15	0.011	0.21
SD(ROE)	0.063	0.065	0.002	0.29
Foreign_ratio	0.090	0.093	0.003	-0.16
Ownership	0.086	0.118	0.032	0.72

There is a possible endogeneity problem; that is, the relationship between the female director ratio and bank inefficiency is due to unobservable factors. For instance, it is possible that female directors are not randomly chosen by the board, but depend on the board strategy, leadership style and so on, and those unobserved factors might also affect firm performance. Therefore, we adopt the two-stage Heckman analysis (model 3) and propensity score matching (model 4) to address the endogeneity problem. In terms of the two-stage Heckman analysis, in the first stage probit model, the female dummy (i.e. female dummy equals 1 if the bank has female directors on the board and 0 otherwise) is regressed on foreign director

ratio, standard deviation of ROE, ownership dummy, and the listed dummy to capture the inverse Mills ratio. In the second stage, the inverse Mills ratio is included in the original regressions to correct for the self-selection bias. In terms of the propensity score matching, we match the observations of banks with female directors on the board with those without female directors on the board. As banks with female directors account for nearly 70% of the sample size, we create a dummy variable which equals 1 if the bank has no female directors on boards and 0 otherwise. The matching criteria are ownership dummy, listed dummy, foreign director ratio, and the standard deviation of ROE. After matching, all the matching criteria become insignificant (as shown in Table 4.3). Finally, we have a matching sample consisting of 186 observations. The regressions are then replicated on the matched sample.

The regression results for the cost stochastic frontiers are reported in the first section of Table 4.4. The significant coefficient for the positive squared terms of loans to customer lny_1 and other earning assets lny_2, suggest that more loans increase total cost. Similarly, the estimated coefficients of the squared term of other earning assets lny_2 (such as investments in gold, securities, and long-term enterprise bonds) show that investments on other earning assets increase costs to the bank.

Table 4.4: Estimation results of cost frontier using BC95 model

This table exhibits the relation between the cost inefficiency component and the ratio of female directors on the board. The first section of the table shows the estimates of the cost translog Frontier. The second section shows the relation between environmental variables and the inefficiency component, with the focus on the female director ratio. The third section reports the models' parameters. Models (3) and (4) are estimated to address possible selection bias from an assumption that female directors choose one particular bank over the others because they benefit from the choice. The sample consists of unbalanced panel of directors and financial data from 297 bank-year observations in the 2006-2016 period. Values of the t-statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable (lnTC)	(1)	(2)	Two-stage Heckman (3)	PSM (4)	(5)
Cost translog Frontier					
lnw2	-0.115	-0.108	-0.164	-0.0259	-0.117
	(-0.27)	(-0.25)	(-0.38)	(-0.04)	(-0.27)
lnw3	0.208	0.189	0.244	-0.0547	0.206
	(0.56)	(0.51)	(0.63)	(-0.11)	(0.55)
lny1	0.374	0.375	0.354	-0.115	0.382
	(0.89)	(0.90)	(0.79)	(-0.19)	(0.91)
lny2	0.202	0.205	0.198	0.270	0.206
	(0.61)	(0.62)	(0.58)	(0.57)	(0.62)
lnz2	-0.374	-0.363	-0.402	-0.469	-0.369
	(-0.69)	(-0.67)	(-0.75)	(-0.69)	(-0.67)
lnw2xlnw2	-0.00350	0.000159	-0.00576	-0.0200	-0.00333

	(-0.05)	(0.00)	(-0.08)	(-0.23)	(-0.05)
lnw3xlnw3	0.0768	0.0803	0.0826	-0.0681	0.0765
	(1.50)	(1.59)	(1.56)	(-0.86)	(1.49)
lny1xlny1	0.206***	0.201***	0.203***	0.219**	0.192***
	(3.09)	(3.03)	(2.98)	(2.40)	(3.00)
lny2xlny2	0.145***	0.147***	0.129***	0.0942**	0.140***
	(3.49)	(3.53)	(2.95)	(2.01)	(3.41)
lnz2xlnz2	0.00624	0.0134	-0.0107	-0.144	0.00617
	(0.06)	(0.13)	(-0.10)	(-1.09)	(0.06)
t	0.159**	0.157*	0.154**	0.00303	0.150*
	(1.97)	(1.93)	(1.97)	(0.04)	(1.88)
t x t	-0.0159***	-0.0162***	-0.0135**	-0.0086***	-0.016***
	(-3.25)	(-3.37)	(-2.21)	(-2.78)	(-3.22)
Mills			-0.308		
			(-1.59)		
constant	-3.600**	-3.637**	-3.434*	-3.251	-3.582**
	(-2.00)	(-2.02)	(-1.89)	(-1.19)	(-1.98)
Environmental variables of the inefficiency component					
Women_ratio	**0.217***	**0.200****	**0.239***	**0.978****	**0.218***
	(1.94)	**(1.99)**	**(1.82)**	**(2.27)**	**(1.93)**
Foreign_ratio	0.0655		0.256	0.344	0.053
	(0.45)		(1.24)	(1.06)	(0.36)
SD (ROE)	-0.211	-0.192	-0.369	1.179	
	(-0.67)	(-0.62)	(-1.11)	(1.42)	
Listed dummy	-0.0929*	-0.0881*	-0.140*	-0.217	-0.096*
	(-1.85)	(-1.86)	(-1.90)	(-1.45)	(-1.91)
Ownership	-0.113	-0.108	-0.146	-0.421*	-0.107
	(-1.25)	(-1.28)	(-1.10)	(-1.84)	(-1.20)
t	-0.097***	-0.098***	-0.085***	-0.077**	-0.095***
	(-3.62)	(-3.70)	(-2.74)	(-2.45)	(-3.60)
Constant	0.681***	0.700***	0.620**	0.142	0.655***
	(3.71)	(4.02)	(2.57)	(0.92)	(3.64)
Model's parameters					
σ_u	0.129***	0.129***	0.129***	0.169***	0.129***
σ_v	0.064***	0.063***	0.061***	0.061***	0.064***
lambda $=(\sigma_u/\sigma_v)$	2.02***	2.03***	2.12***	2.76***	2.02***
gamma $=(\sigma_u^2/(\sigma_v^2+\sigma_u^2))$	**0.80**	**0.81**	**0.82**	**0.88**	**0.80**
Log likelihood	241.49	241.38	243.16	152.29	240.03
No. of obs	297	297	297	186	297

The estimated coefficients in the inefficiency component, which are reported in the second section of Table 4.4, are as expected. The estimated coefficients relating to the women ratio

are of particular interest to this study.[70] The positive sign of the female director ratio coefficient in models (1) and (2) suggest that the female directors on boards are associated with higher inefficiency (i.e. less efficient).[71] After addressing a potential endogeneity bias, the relationship is still robust (models 3 and 4). This result can be explained in that female directors are less likely to have business expertise than their male counterparts (Terjesen et al., 2009) and have less access to environmental resources that are beneficial to the bank's performance compared to the male directors.[72] Thus, the greater the representation of women on the board, the higher the ratio of female directors, the lower the bank efficiency.

The effect of the foreign director ratio on the inefficiency term is not statistically significant in all models. One possible explanation is that, according to the strategic partnership agreements, the foreign strategic partners are required to send experts to the local banks to train the local staff. The partner is also required to help the local bank in developing banking products and services, and raising financial, administration and risk management capabilities. These services increase operating costs to the local firms and, therefore, do not lead to any increase in efficiency. Nevertheless, this finding is inconsistent with the recent findings by Nguyen et al. (2016), that the cost efficiency of the Vietnamese banks post-partial foreign acquisition is lower than prior-partial acquisition. However, their study employed the two-stage SFA. In the following section, we also check for the robustness of the results estimated using the BC95 model, by employing the two-stage distribution-free approach (CS90). Interestingly, in the two-stage CS90 model, we also find the negative association between foreign director ratio and bank efficiency, consistent with Nguyen et al. (2016).

Bank risk-taking levels might be an important factor to explained bank performance, as banks could increase short-term returns by increasing the level of risk-taking (Berger & Mester, 1997). However, as shown in Table 4.4 the coefficients of the standard deviation of

[70] We tried to interact the female director ratio with the structural change dummy mentioned in Chapter 4 to see if female directors changed their behaviors after 2011. However, the interation term shows a non significant result. Hence we do not report it here but will provide it upon request.

[71] The term "more inefficient", instead of "less efficient" is used, because we are testing the relationship of the inefficiency component and environmental variables.

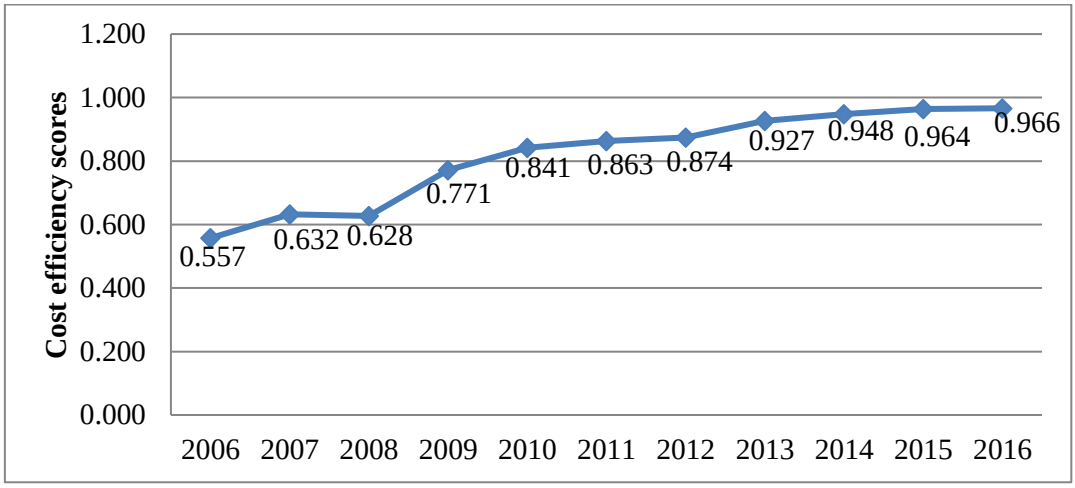
[72] It is a challenge to derive the economic significance of female directors on bank efficiency in this case because the method we used is non-linear regression. The relationship between the inefficiency scores and women ratio is estimated using the parametric stochastic frontier analysis. Therefore, we cannot apply the conventional calculation of the economic significance applied for linear regressions. We also have not seen papers applied stochastic frontier analysis reported the economic significance of environment variables on inefficiency scores.

ROE are insignificant in all specifications. In addition, in model (5), the standard deviation of ROE is excluded; however, the predictability of the inefficiency term (the gamma) does not change, showing that the standard deviation of (ROE) is not an explanatory factor for the inefficiency in banks.

The negative and significant coefficients of the listed dummy in all models indicate that listed banks are less inefficient (i.e. more efficient) than unlisted banks. In contrast, the negative coefficients of the ownership dummy are all insignificant, suggesting that there is no difference in efficiency between state-owned and private banks.

The variance parameter gamma in model (1), which is calculated directly from the estimated parameter lambda, suggests about 80% of the variance is due to inefficiency, and the remaining variance is explained by random variation. The lambdas in all models significantly differ from 0, implying that there exists one-sided errors representing the inefficiency effects (Coelli, Rao, O'Donnell, & Battese, 2005; Schmidt & Lin, 1984).

Figure 4. 1: Mean of efficiency change over time (Model BC95)



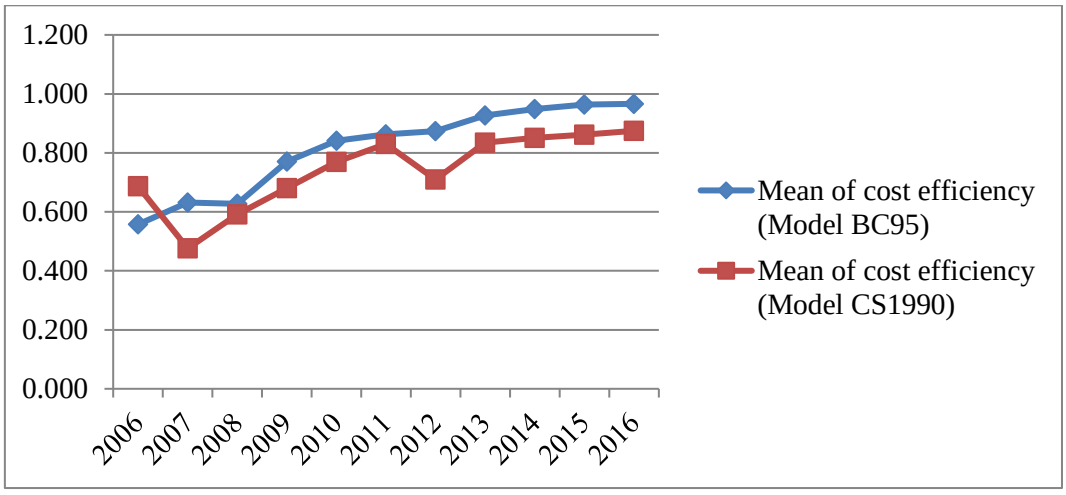
In general, the Vietnamese banks are quite efficient with average efficiency in the investigated period at around 84%. In terms of the movement over the ten years, Figure 4.1 shows that, overall, Vietnamese banks experience an improvement in cost efficiency levels over time. There were two disruptions during the investigated period, in 2008 and in 2011-2012, with a slowdown in the improvement rate. The first disruption reflects the immediate negative shock of the global financial crisis in 2008 and the second one reflects the lagged effect of the global financial crisis and European debt crisis on the Vietnam economy. Since 2013 onwards, cost efficiency presents a consistent improvement.

4.5. The two-stage distributional free approach

In this section, the efficiency is measured using the CS90 frontier model in the first stage. In the second stage, the estimated efficiency is regressed on the environmental variables, using the OLS and truncated models. The results obtained will be compared with the results of the one-stage BC95 model. The CS90 model is chosen because, first, it best fits our data. As the sample size is quite small, the data does not support the use of the LS93 model and the models proposed by Greene (2005), which require a relatively large sample size. Second, the CS90 is a distributional free model; hence, it relaxes a restriction of having to impose a functional form on the cost frontier as in the case of the SFA models. Third, it is a fixed effect model in which the inefficiency term is confounded in the firm fixed effects.[73] Thus, the model can capture the time-invariant omitted firm factors.

The comparison is reported in Figure 4.2 and Table 4.5. Figure 4.2 shows the evolution over time of the efficiency levels estimated by the BC95 and CS90 models. As can be seen from Figure 4.2, there are differences between the efficiency scores estimated by the CS90 model and the ones estimated by the BC95 model.

Figure 4. 2: Efficiency change over time: BC95 model vs CS90 model



The results for the relationship of the inefficiency with the explanatory variables in the second stage of the CS90 model are reported in Table 4.5. The regressions employ OLS and truncated[74] models with robust standard errors. The Tobit is not employed as the efficiency

[73] The CS90 model is a fixed effect model. Firm-specific effects are captured in the intercepts of the frontier function, as in the conventional fixed effect model for panel data. The inefficiency is confounded in the intercept: $\alpha_{it} = \alpha_{0i} + \alpha_{1i}t + \alpha_{2i}t^2$, of which the parameters α_{0i}, α_{1i}, α_{2i} are the firm-specific effect, t is the time trend variable to allow for time-varying efficiency, and α_{it} is the intercept of the frontier function.

[74] The efficiency is truncated at 1.

is not coming from a censoring process (McDonald, 2009). Year dummies are included in all specifications. Firm dummies are not included as the CS90 model is a fixed effect model, which already captures the firm effects in the estimated efficiency scores. Models (1) and (3) are the OLS and truncated regressions, respectively. Models (2) and (5) are the OLS and truncated regressions on the matched sample using propensity score matching in section 4.4. The Heckman Mills ratio estimated in section 4.4 is incorporated in the regressions in models (3) and (6) to capture the selection bias.

Table 4.5: Regression results of the CS90 model

This table exhibits the relation between the cost efficiency (equals one minus inefficiencies) and the ratio of female directors on the board, employing OLS and Truncated regressions. Year dummies are included in all models. Models (2), (3) and (5), (6) address possible selection bias from the assumption that female directors choose one particular bank over others because they benefit from the choice. The sample consists of an unbalanced panel of directors and financial data from 297 bank-year observations in the 2006-2016 period. Values of the t-statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent variable (Efficiency scores)	OLS regressions			Truncated regressions		
	OLS	PSM	Two-stage Heckman	Truncated	PSM	Two-stage Heckman
	(1)	(2)	(3)	(4)	(5)	(6)
Women_ratio	**-0.116*** **	**-0.176*** **	**-0.117*** **	**-0.147*** **	**-0.207*** **	**-0.149*** **
	(-2.62)	**(-2.95)**	**(-2.64)**	**(-3.42)**	**(-3.95)**	**(-3.47)**
Foreign_ratio	-0.110*	-0.125**	-0.333	-0.152**	-0.162***	-0.461
	(-1.91)	(-2.04)	(-1.14)	(-2.56)	(-2.69)	(-1.56)
Listed dummy	0.0213	0.0493***	0.0646	0.0280*	0.058***	0.0876
	(1.63)	(2.71)	(1.17)	(1.86)	(2.76)	(1.55)
Ownership	0.00825	0.0260	0.0230	0.00792	0.0273	0.0279
	(0.50)	(0.91)	(0.95)	(0.46)	(0.94)	(1.11)
SD (ROE)	-0.0624	-0.706*	0.257	0.0621	-0.558	0.497
	(-0.46)	(-1.89)	(0.62)	(0.47)	(-1.54)	(1.25)
Mills			0.551			0.759
			(0.79)			(1.08)
Constant	0.711***	0.776***	0.462	0.691***	0.750***	0.349
	(22.92)	(17.34)	(1.46)	(27.17)	(19.68)	(1.10)
Year dummies	Included	Included	Included	Included	Included	Included
R_squared	0.561	0.591	0.562			
Sigma				0.0957***	0.0902***	0.0955***
				(20.73)	(14.11)	(20.72)
Number of obs	296	186	296	285	180	285

As can be seen in Table 4.5, the effect of female directors on bank efficiency is consistent with that found from applying the BC95 model. In all specifications, the relationship between the ratio of female directors on the board and bank efficiency in the CS90

specification is quite stable in terms of the coefficient and statistical significance. After controlling for difference between the banks with and without female directors in some bank specific characteristics (model 5) and the selection bias (model 6), the relationship is still robust. This result contradicts the result found by Nguyen, Locke, and Reddy (2015), which suggests that female directors improve a firm's Tobin's Q. However, their study examines listed non-financial firms in Vietnam. One possible explanation for the different result in banks is that banks are doubtlessly difficult to control, and agency problems are more serious because of their increasing size, complexity and leverage (Ahrens et al., 2011). Given that female directors often have less business experience than male directors, the complexity in the banking businesses inhibits female directors from adding value to banks.

The effect of the foreign director ratio in the CS90 model indicates that banks with more foreign directors on board are associated with lower efficiency, which is inconsistent with the result obtained in the one-stage SFA model (i.e. BC95). However, this negative association is consistent with Nguyen et al. (2016), also employing the two-stage procedure. Their explanation for the finding is because the involvement of minority foreign ownership in a Vietnamese domestic bank encourages the bank to detect past non-performing assets and write them off using gross profits and correct fraudulent accounting numbers. However, the inconsistent result obtained from the one-stage SFA and two-stage SFA suggests that the effect of foreign directors on bank efficiency is not robust, as it is subject to the methodology employed. Thus, it is inconclusive whether foreign directors result in a decrease in Vietnamese bank efficiency.

4.6. Additional robustness tests

Since the five state-owned banks are very large compared to other types of bank in the market,[75] the empirical results are possibly driven by the state-owned banks. To investigate this, we rerun the sub-sample efficiency analysis including only privately-owned banks (exclusive of state-owned banks). We cannot rerun the analysis of the sub-sample using state-owned banks only, since the sample size is too small, with only 45 observations. The result[76] is consistent with those reported in the main regression section, that female directors are associated with higher inefficiency.

[75] Market shares (deposit and lending) and total assets of the 5 state-owned banks account for nearly 50% of the whole banking market.
[76] The result will be provided upon request.

In addition, it is believed that governance in listed banks is different from that in unlisted banks, as listed banks are subject to more reporting regulation and are under monitoring from the stock market. Similarly, state-owned banks might have different governance than private banks, owing to the difference in ownership between the two types of banks. Hence, to test the effect of female directors on different governance styles, we also include the interaction term between the female director ratio and the listed dummy, and between the female director ratio and the ownership dummy to the regressions. In both the CS90 and BC95 models, we do not find a significance in the coefficients of the interactive terms. These suggest that there is no difference between female directors in listed and unlisted banks, in state-owned and privately-owned banks.

4.7. Conclusions

In this study, we investigate the effect of board gender diversity on the efficiency levels of Vietnamese banks in the 2006-2016 period. The one-stage BC95 SFA method on inefficiency stochastic frontier cost is employed. The results are compared with the ones obtained from the CS90 model for robustness checking. The study expands the very limited existing literature on the role of female directors on bank efficiency, as a measure of performance. In addition, to the best of our knowledge, this is the first study investigating the role of female directors in the banking sector in Vietnam.

The main findings are as follows. The statistically significant lambdas support the use of the inefficiency stochastic frontier. The one-stage SFA regression shows that banks in Vietnam are quite efficient, with the overall efficiency level around 84%. The larger proportion of women on a board appears to lower the efficiency of the bank. The result is robust in both the BC95 and CS90 models. The study also finds evidence that banks with a higher proportion of foreign directors on the board are associated with lower efficiency than their counterparts in the CS90 model. Among the control variables, this shows that there is no significant association between bank efficiency and bank risk measured by the standard deviation of ROE.

The study, however, faces some difficulties that limit its scope. First, even though the efficiency measure is a better indicator of performance than a single accounting ratio such as ROA or ROE, the methodologies applied to calculate efficiency are not perfect. The CS90 method is criticised as creating bias in the estimated efficiency frontier, while the framework for addressing endogeneity in the BC95 model is still developing. However, keeping in mind

that the true relationship should not be sensitive to the methodology used, it is quite robust that the higher female director ratio is associated with the lower efficiency. Second, the sample is quite small (around 300 observations), which limits us from trying to include deposits as an output to accommodate their output characteristics. Third, our data does not accommodate the profit function, while the literature suggests that profit efficiency is superior to cost efficiency as an indicator for bank management. However, it should be noted that the limited sample size does not prevent us from drawing reliable results, as this sample size has covered 32 out of around 37 commercial banks in Vietnam. Furthermore, there are banking studies that have such a small sample size, for instance Berger et al. (2009), Dong et al. (2017), Dong, Hamilton, and Tippett (2014), and Nguyen et al. (2015). Fourth, it should be noted that the relationship found in the empirical part does not reflect "causality", rather it reflects the "association" between female directors and bank efficiency. The reason for this is that the framework for addressing endogeneity in the one-stage SFA is still developing. For example, researchers are still proposing different ways to address the selection bias, whether to include the inverse Mills ratio in the frontier like Sipilainen and Oude Lansink (2005), or in the inefficiency term like Kumbhakar et al. (2009), or in the noise of the stochastic frontier model like Greene (2010). It is not yet finalised as to which method produces the best estimates.

The limitations lead to some suggestions for future research. It would be desirable to conduct this research in the future, when the sample is bigger, to try different approaches and angles. It is also worth conducting a cross-country study as well, using a pool data from countries with a similar background, like China, and a different background, like the US. This would provide evidence on the roles of exogenous variables (such as regulation and corporate mechanisms) on enabling female directors to affect local banks' efficiency. The larger sample size could also enable the application of different one-stage methodologies for robustness checks, such as the ones proposed by Greene (2005) with firm fixed effects and firm random effects.

Chapter 5. The effect of mergers on Vietnamese bank efficiency: A two-step DEA window analysis approach

5.1. Introduction

Mergers and acquisitions (M&As) are common economic phenomena through which a firm acquires another firm's assets. A great deal of attention has been devoted to investigating the economic impacts of M&As in the banking sectors in developed countries such as the US and European countries (DeYoung, Evanoff, & Molyneux, 2009). This is because the banking sector is the backbone supporting economic growth in any economy. M&As, on the other hand, attract public attention, because M&As could lead to higher market power, allowing banks to set a higher price, which in turn could have a negative impact on social welfare (Ferraz & Hamaguchi, 2002). It is also important for policymakers to understand the impact of M&As so that they can design policies to navigate the financial markets. From a governance perspective, buying a firm is perhaps among the most important strategic decisions that a board might face. The board concerns will centre on whether a potential M&A could create value for the existing shareholders, either in the long-term or the short-term. A bad deal may potentially result in the takeover company becoming a target themselves if the acquirer after an M&A does not perform well. In contrast, there are chances that M&As lead to an increase in value to existing shareholders, as M&As usually involve a restructuring of firm dependency (Pfeffer & Salancik, 2003). Cameron, Kim, and Whetten (1987) argue that distressed firms are firms that experience a substantial, absolute decline in the firms' resource base over a period of time. M&As will usually lead to a replacement of a part/whole of the board and management team of the merged firm and a transfer of board members from the merging entity to the combined one. Hence, from the resource dependency theory perspective, the change in board composition might lead to a more efficient use of resources, as a result of greater access to additional environmental resources through the newly appointed directors. Therefore, this would also likely lead to an increase in efficiency for the combined bank.

The majority of studies on the effects of M&As in the banking sectors are conducted in developed countries such as in the US and Europe in the 1980s-1990s (DeYoung et al., 2009). Studies of M&As in developed countries focus on the profit-driven motive behind a M&A, whether to gain long-term profit by improving operating efficiency, increase market power, or earn short-term abnormal M&A induced returns in the stock markets. Pfeffer and

Salancik (2003), in contrast, argue that firms engage in M&As to achieve environmental stability, rather than for reasons of profitability or efficiency. Firms could achieve environmental independence through M&As, with the purpose of: (i) Reducing competition by absorbing competitive firms; (ii) diversifying operations; or (iii) managing interdependence with sources of inputs or purchases of outputs by absorbing them (Pfeffer & Salancik, 2003). Nevertheless, Hillman et al. (2009) argue that managing interdependency is not the sole predictor of M&As, but other factors such as internal considerations and the industry environment could determine M&A waves. Dymski (2002) argues that both macrostructural circumstances (e.g. regulatory regimes, or macroeconomic conditions[77]) and banks' strategic motives are important attributes leading to the various M&A waves in world history. Owing to these differences among motives for M&As, the efficiency-driven pattern or the motives to reduce environmental dependency applied in developed countries might not reflect the situation in developing countries. The mixed results on the impact of M&As in different institutional settings confirm this argument.

In this study, the effect of M&As on bank performance in Vietnam, a developing country, is explored. We test whether there is efficiency improvement after some recent M&A events, as predicted under the US setting. It is worthwhile to conduct the study because the motives for M&As in Vietnam are different from those witnessed in both developed and developing countries in the past. In the US, the M&A waves, which happened in the 1980s-1990s, were associated with the expansion in businesses of outstanding individual banks, which took over failed or near failed banks to increase their market share (Ferraz & Hamaguchi, 2002). South-East Asian countries, on the other hand, experienced the M&A waves after the 1997 financial crisis. The main types of M&As were cross-border, through which the government encouraged foreign investors from developed countries to purchase assets of local distressed banks. As a result, acquirers from developed countries found M&As to be opportunities to increase their presence in the high-growth local markets. Unlike the case of the US, the recent wave of M&As in Vietnam comes from the strategy initiated by the government to restructure the banking sector. Unlike in South-East Asian countries, the Vietnamese government is more conservative in opening the banking system to foreigners.[78] Therefore,

[77] Such as the business environment of banking firms, the pace of economic growth, and the size and maturity level of the domestic market.

[78] Foreign entities can hold up to 20% of a local bank's assets. Even though the government, in principle, encourages foreign banks to buy up 100% of the assets of a weak bank, the limitation in the regulatory framework prevents this happening in reality.

M&As in Vietnam are between domestic banks. In fact, the M&As in the Vietnamese banking sectors are not purely driven by market forces, but also by government enforcement.

The study employs two-stage Data Envelopment Analysis (DEA) window analyses to scrutinise the impact of M&As on the Vietnamese bank technical efficiencies. In the first stage, DEA window analysis is used to estimate the technical efficiency of Vietnamese banks. In the second stage, the efficiency is regressed on a merger dummy and other control variables using OLS, truncated and bootstrap methods as robustness checks. DEA, together with stochastic frontier analysis (SFA), are among frontier analysis methods that are widely employed in assessing bank efficiency (Berger & Humphrey, 1997; Fethi & Pasiouras, 2010). SFA, first introduced by Aigner, Lovell, and Schmidt (1977), is a parametric approach, while DEA, proposed by Charnes, Cooper, and Rhodes (1978), is a non-parametric technique. Both approaches are based on measuring the distance from the production functions' frontier to measure inefficiency. There is no consensus on whether DEA or SFA is better because both have merits and demerits; rather, the choice of method depends on the purpose of the empirical work. DEA is an appropriate approach for this study because we have a small sample and want to detect performance trends for specific banks over time (Asmild, Paradi, Aggarwall, & Schaffnit, 2004). In addition, we also incorporate DEA into the window analysis technique, which groups data on banks in three years into a three year "window" and treats them as if they represent different firms. This method mitigates the effect of outliers because the ultimate efficiency scores are the mean of three years' efficiencies. Likewise, it also partly incorporates the effect of technological changes over time. DEA window analysis is, therefore, regarded as the sensitivity method and facilitates the use of the bootstrap technique. Details of the methodology are elaborated in the Methodology section.

The rest of the paper is organised as follows: Section 5.2 discusses the M&As in Vietnam; Section 5.3 provides the hypothesis development based on prior research on the impact of M&As on bank efficiency; Section 5.4 describes the methodology and data; Section 5.5 reports the efficiency scores and the hypothesis testing; and Section 5.6 provides the conclusion and suggestions for future research.

5.2. The Vietnamese banking sector and M&As

The Vietnam government had been conducting expansionary monetary policy in the 2002-2007 period (with an average of a nearly 30% YoY growth rate). The abundance of money

in the economy, for a long time, led to high inflation and a bubble in the real estate market. The inflation rate rose markedly, from 8.3% in 2007 to 23.12% in 2008. At the same time, the global financial crisis caused a sharp slowdown in Vietnamese exports, due to a decrease in demand for Vietnamese goods from major importing countries. As a result, macroeconomic conditions in Vietnam deteriorated quickly with increasing dollarisation, a frozen real estate market, a sharp decline of the stock market, and a rapid increase in non-performing loans (NPLs). In the 2008-2011 period, while the M2 growth rate was, on average, 26.56%, NLPs were estimated to grow at 51% YoY. [79]

Hence, the government issued Decision 254/QD-TTg dated March 01, 2012 (Decision 254) on approving the Scheme on "Restructuring the credit institution system in the 2011-2015 period" to restructure the banking system. According to Decision 254, the aims of the restructuring programme were: Improving the operational efficiency and safety of local banks; enhancing market discipline in banking activities; and diversifying the structure of types, ownership, and sizes in the banking system to be more consistent with international standards. To achieve these goals, the State Bank of Vietnam focuses on three tools: first, resolving bad debts in the system; second, encouraging (in some cases, forcing) bank mergers and acquisitions; and third, encouraging foreign banks to cooperate with domestic banks to help improve governance and risk management of the local banks. The State bank also allocated credit growth limits to each bank based on their previous performance in order to curb credit growth.

M&As in Vietnam have been occurring, particularly since 2012, with two M&As in 2012, two in 2013, and three in 2015. However, unlike what had happened in the US with profit-induced M&As or some other Southeast Asian countries with cross-border M&As, the M&As in Vietnam were among the efforts by the government to clean up the fragmented financial markets and prevent the possible collapse of the banking system as a consequence of letting weak banks fail. Therefore, bank M&As in Vietnam more or less have the involvement of the government. The government encourages weak banks to find a healthier

[79] Information released on the website of the State Bank of Vietnam at: https://www.sbv.gov.vn/webcenter/portal/vi/menu/sm/chitiet/inbaiviet?dDocName=CNTHWEBAP01162517937&_afrLoop=37136531686551577#%40%3F_afrLoop%3D37136531686551577%26centerWidth%3D100%2525%26dDocName%3DCNTHWEBAP01162517937%26leftWidth%3D0%2525%26pageTemplate%3D%252Foracle%252Fwebcenter%252Fsiteresources%252FscopedMD%252Fs8bba98ff_4cbb_40b8_beee_296c916a23ed%252FsiteTemplate%252Fgsreb7f299f_0d88_4514_a092_22e830e01a86%252FTemplate.jspx%26rightWidth%3D0%2525%26showFooter%3Dfalse%26showHeader%3Dfalse%26_adf.ctrl-state%3D5q43yetl0_17.

bank to merge with. Otherwise, the government intervenes in the operations of the weak banks.[80] As a result, four M&As out of seven M&As were mergers between relatively heathy banks and a weak bank (see Table 5.5 for more detail). In addition, private banks which sharing the same major shareholders were encouraged to merge. For example, Maritime Bank (MB) acquired Mekong Development Bank (MDB) because MB was one of MDB's big shareholders (owning a 10% shareholding as of 2015). Saigon Thuong Tin Bank (Saccombank) acquired Southern Bank for the same reason. Saigon Bank was merged with First Bank (Ficombank) and Trust Bank because the three of them are owned by the same group of investors. On the other hand, the government has influenced state-owned enterprises/banks to merge with weak banks. For instance, Saigon-Hanoi Bank agreed to acquire Hanoi Building Bank (Habubank), as two big shareholders in Saigon-Hanoi bank were state-owned enterprises. The Vietnam Bank for Investment and Development (BIDV) was merged with Housing Bank of Mekong Delta (MHB) because they were both state-owned banks. In return, the government created favourable conditions for the combined entities to conduct business. For instance, the State Bank of Vietnam allocates higher credit growth limits for those involved in restructuring weak banks.

To sum up, it is reasonable to assume that the acquisition of weak banks was not led by profit-maximising motives. Therefore, we would not expect an improvement in efficiency after M&As. However, we would expect an increase in lending and deposit quantities after M&As, because banks in Vietnam usually look to broaden their customer base and increase market share, given the strong competition and reliance on traditional services (i.e. lending) to generate income by Vietnamese domestic banks.

5.3. Research on value creation following banking M&As and hypothesis development

There are two strands of literature investigating the benefits of M&As. One strand uses financial ratios of performance (such as return on equity, return on assets) or productive efficiency (i.e. using a frontier analysis approach) to measure possible merger-induced improvements. The other strand uses 'event-study' methodology to measure how the bond or stock markets react to a M&A announcement (DeYoung et al., 2009). Nevertheless,

[80] In 2012, the SBV released a list of banks that were considered as weak banks according to their criteria. However, the criteria were not published to the public. These weak banks were: First Bank, TinNghia Bank, Saigon Bank, Hanoi Building Bank, Tien Phong Bank, Vietnam Construction Bank (was purchased with 0 VND by the SBV), Quoc Dan Bank, Western Bank, Ocean Bank (was purchased with 0 VND by the SBV) và GPBank (was purchased with 0 VND by the SBV). Later, Sourthern Bank and Dong A Bank were categorized as weak banks by the SBV in 2014 and 2017 respectively.

financial ratios are usually considered to be a misleading indicator of performance because: first, they may be subject to manipulation by management,[81] or off-balance sheet activities (Athanasoglou et al., 2008; Trujillo‐Ponce, 2013); and second, they do not control for product mix, or input prices, or they fail to represent economic value-maximising behaviours by firms (Berger et al., 1993; Kohers et al., 2000). The event-study type methodology, on the other hand, can track whether there is an abnormal return (i.e. a rapid adjustment of the stock prices associated with the merger) following a M&A announcement (Asimakopoulos & Athanasoglou, 2013). In particular, these studies investigate whether the announcement of a bank merger creates value to the shareholders of the targeted bank and/or the combined entity (Altunbaş & Marqués, 2008). The assumption underlying this methodology is that the stock market follows the "market efficiency hypothesis", meaning the stock market prices will react immediately and fully to incorporate all available information (Malkiel & Fama, 1970). However, there are some criticisms of using this method. First, it is not easy to disentangle the value creation as the result of improved efficiency or larger market power (DeYoung et al., 2009). Second, the assumption of perfect price adjustment following, or around, a M&A event, conflicts with the challenges of the integration process in the combined entity (Bernad, Fuentelsaz, & Gómez, 2010). In addition, market-based data can be distorted if the financial market is illiquid and opaque (Chiaramonte et al., 2015) and the data is limited to listed firms only. These limitations make the use of this approach for Vietnam difficult.

In this study, we use frontier analysis to measure the bank efficiencies. This methodology has some advantages. First, none of the profitability ratios on their own provide an adequate indication of bank efficiency (Halkos & Salamouris, 2004), whereas frontier analysis does. Second, efficiency is likely to be a more reliable measure of firms' performance that accounting based measures (Hardwick et al., 2011). Third, it is possible to disentangle the effect of scale efficiency from technical efficiency. Bernad et al. (2010) argue that the complexities of the integration process in terms of strategic and organisational harmonisation in the combined entity require a long-run period for the benefits of the M&A to be realised. Therefore, regardless of the methods used, the performance effects of M&As should be evaluated over the long-term. Indeed, Knapp, Gart, and Chaudhry (2006), using ROA and

[81] For example, banks will increase the leverage ratio, which leads to the increase in risk, to report a higher ROE ratio. Off-balance sheet activities incur the same risk as loans, but are not calculated as assets, thus they can distort the ROA ratio.

ROE as indicators of bank profitability, find that there is a substantial profit gain up to five years post-merger before they revert to the mean profitability of the industry. Fortunately, efficiency indicators can capture the realisation of cost reduction in the longer term.

Conventional wisdom on potential gains from banking M&As is that M&As may allow banks to maximise value by achieving improvement in X-efficiency, (i.e. the ability of management to control costs and generate revenues), scale and scope efficiency, or increase in market power (i.e. allowing banks to set prices that are less favourable to customers to raise profits) (Avkiran, 1999; Berger, Demsetz, & Strahan, 1999; Berger & Humphrey, 1997; Berger et al., 1993; DeYoung, 1997; DeYoung et al., 2009; Houston, James, & Ryngaert, 2001). Researchers also agree on two ex-ante conditions for banks to benefit from merging with another bank, which are: (i) The acquiring bank is more efficient than the acquired bank; and (ii) both banks are located in the same local market (Berger et al., 1999; Berger & Humphrey, 1997). Mergers have the potential to reduce costs thanks to scale and scope (product mix) economies.[82] Nevertheless, the literature shows that the inefficiencies from scale and scope economies usually account for only a small proportion of cost (Berger et al., 1993). In contrast, the transfer of management practices from X-efficient[83] banks to X-inefficient target banks seems to be associated with larger cost savings and revenue enhancement (Berger & Humphrey, 1994; DeYoung, 1997; Houston et al., 2001).

In line with the results of M&As and bank efficiency studies, the existing literature in banking M&As and efficiency can be divided into two periods, pre-2000 and post-2000. The pre-2000 literature on earlier frontier analysis, mainly from US studies, provides evidence that M&As result in no or modest improvement on cost efficiency (Berger et al., 1999; Berger & Humphrey, 1994; Berger et al., 1993; DeYoung, 1997). In addition, only small banks appear to have potential scale economies, while large banks might be subject to scale diseconomies (Berger & Humphrey, 1997). Therefore, it is argued that the small improvement of cost efficiency from these mergers is offset by the scale diseconomies created by merging banks (Berger & Humphrey, 1997). The same finding is found in

[82] The cost savings from scale economies may be achieved through eliminating redundant managerial positions, closing overlapping bank branches, etc.; meanwhile, the scope economy may come from the cross-selling of banking services, i.e. providing services to former customers of the acquired bank (Asimakopoulos & Athanasoglou, 2013; Houston et al., 2001).

[83] In essence, X-efficiency and scale and scope economies are different. A bank is considered as cost X-efficient when it can produce a given bundle of outputs with minimum cost for the input prices it faces, while scale and scope economies are measured in terms of a least-cost scale and mix of the product bundle, when assuming that the bank is cost/revenue X-efficient (Berger & Humphrey, 1994).

Australia in the 1986-1995 period; that is, mergers did not bring about operating efficiency[84] gains (Avkiran, 1999). Nevertheless, the pre-2000 studies find improvement in profit efficiency. For example, Fixler and Zieschang (1993) employ Tornqvist productivity indices, which take account of both cost effects through their input index and revenue effects through their output index as a measurement of efficiency. They find evidence that merging banks tend to be more productive than average and are able to maintain their productivity advantage in subsequent years after the merger (Fixler & Zieschang, 1993). Akhavein, Berger, and Humphrey (1997) investigate profit efficiency in bank megamergers and find a 16% average increase in profit efficiency rank relative to other large banks. The different findings with respect to cost efficiency and profit efficiency are believed to be due to the net benefits from M&As mostly being found in revenue enhancements, rather than cost improvements (Akhavein et al., 1997; Avkiran, 1999; Berger et al., 1993; Fixler & Zieschang, 1993).

The post-2000 period provides more evidence of productive efficiency gains from mergers, however, the evidence is mixed and these studies are mainly conducted in developed country contexts. DeYoung et al. (2009) provide a literature review of post-2000 studies on the effects of M&As on bank performance and conclude that there is evidence of (cost) efficiency improvement in European bank mergers. More recent studies include Rezitis (2008), Bernad et al. (2010), and Halkos and Tzeremes (2013). Rezitis (2008) employs a one-stage stochastic frontier analysis to test the effect of acquisition activity on the efficiency of Greek banks in the 1993-2004 period. The result indicates that the technical efficiency of merged banks deteriorates in the post-merger period, while there is no technological improvement or economies of scale in the period after merging compared to the period before merging. Bernad et al. (2010) investigate the effect of M&As on the productivity of savings banks in the 1987-2004 period in Spain. Based on the Cobb-Douglas production function, in which labour and capital constitute the two main inputs, and total production (sum of loans, securities, and shares) is the single output, the effect of mergers on banks' output are estimated. They find that half the saving banks experience an improvement in productivity after a merger or acquisition. Halkos and Tzeremes (2013) take a different approach to analysing the economy of scope benefits from mergers. Instead of evaluating bank scope efficiency before and after a real merger, they examine whether scope economies

[84] Avkiran (1999) defines the operating efficiency as the ratio of non-interest expense to operating income, also known as the cost to income ratio.

might exist in 45 potential M&As from 18 Greek banks during the 2007-2011 period. They find that in the short-run (i.e. 2011) there are substantial operating efficiency gains thanks to the (virtual) mergers between two cost-efficient Greek banks. However, the majority of newly merged banks fail to generate efficiency gains during the whole sample period.

To sum up, the literature on the effect of M&As on bank efficiency consists of studies in developed countries such as the US and European countries. Studies in the US suggest that there is evidence of revenue efficiency gains following a M&A. However, American banks benefit from very little to not at all from cost efficiency improvement, because the minor benefits are usually offset by scale diseconomies. Studies in Europe, in contrast, provide mixed results on efficiency gains by merging banks in the post-merger period.

In terms of efficiency and M&A studies in the Vietnamese context, to the best of our knowledge, there are no studies so far, partly because the M&A is still a new economic phenomenon, which has happened only since 2012. There are some studies of Vietnamese bank efficiencies using both DEA and SFA techniques, such as Nguyen, Roca, and Sharma (2014), Vu and Turnell (2010), and Ngo and Tripe (2017).

Hence, based on the literature review and the context of the Vietnamese banking system in the investigated period, we propose the following hypothesis:

H1: Bank merger has a negative impact on the merging bank's efficiency. In other words, the acquiring bank experiences lower efficiency after a M&A.

5.4. Methodology and data

In order to test whether or not banks improve efficiency after acquiring another bank, we adopt the two-stage DEA window analysis method. The first stage involves measuring technical efficiency using the DEA window analysis technique. The second stage is to test the relationship between technical efficiency and merger events employing the bootstrap method. OLS and truncated methods are reported, as well as the bootstrap method for robustness checks.

Following Coelli et al. (2005), the input-oriented technical efficiency of any bank under variable returns to scale is generated by solving the following linear programming problem:

$$min_{\theta,\lambda}\theta, \qquad (5\text{-}1)$$

$$\text{s.t} \quad -y_i + Y\lambda \geq 0, \qquad (5\text{-}2)$$

$$\theta x_i - X\lambda \geq 0, \qquad (5\text{-}3)$$

$$N1'\lambda \leq 1 \qquad (5\text{-}4)$$

$$\lambda \geq 0 \qquad (5\text{-}5)$$

where equation (5-4) is designed to ensure the frontier is convex to account for the variable returns to scale; θ is the technical efficiency and θ and λ are calculated by linear programming; and x_i is the cost-minimising vector of input quantities for the i-th bank, given the output levels y_i. The efficiency of a unit is measured as a weighted sum of its inputs divided by a weighted sum of its outputs

The mean scale efficiency is at around 0.9[85] in this study, implying that there are some banks operating under scale inefficiency. Therefore, it justifies our choice of using variable returns to scale DEA for our data.

5.4.1. Input-Output specifications for measuring technical efficiency

There are several approaches to the choice of inputs and outputs with respect to financial institutions that are widely employed in the literature, including the intermediation approach, production approach, value-added approach, and revenue approach (Berger & Humphrey, 1992; Drake et al., 2009; Sealey & Lindley, 1977). In the production approach, banks are considered as firms that use labour and capital as factors of production, to produce loans and deposit accounts (Matthews & Thompson, 2005). Thus, only labour and physical capital (and their associated costs) should be included as inputs. In comparison, under the intermediation approach, based on work by Sealey and Lindley (1977), banks are regarded as intermediaries connecting savers and investors. With this approach, interest cost and deposit should be counted as an input, as the deposit is the main "raw material" to be transformed in the intermediation process to create outputs (Berger & Humphrey, 1997). Both the production and intermediation approaches regard loans and other earning assets as outputs, and physical capital and labour as inputs. The two approaches are different in the way they treat deposits. The production approach does not account for interest costs, and sometimes regards a deposit as an output, while the intermediation approach considers deposits as an important input. The value-added approach, proposed by Berger and

[85] The score of full scale efficiency equals 1.

Humphrey (1992), on the other hand, distinguishes inputs and outputs according to their "value-added" characteristics. Accordingly, the categories that use external sources of operating cost allocations, are employed as outputs (Berger & Humphrey, 1992, p. 250). Thus, under this approach, deposits and loans are important outputs. Conversely, Drake et al. (2009) develop the revenue approach, which considers income (i.e interest income, and non-interest income) as outputs. In contrast, Hancock (1985) argues that it is possible to apply a model of production with monetary goods, besides the conventional physical resources of labour, capital, and materials. Accordingly, both the value-added and revenue approaches use interest and non-interest expenses as inputs. On the other hand, there is also a longstanding disagreement in the literature on whether deposits should be categorised as inputs or outputs, as deposits have both input and output characteristics (Berger & Humphrey, 1997). To solve this duality concern, as interest expenses are associated with "the role of deposits as providing the input of loanable funds" (Berger & Humphrey, 1997, p. 251), Berger and Humphrey (1997) suggest that one can count interest expenses as an input and the rate paid as an input price, while including the quantities of deposits as an output.

This study employs the value-added and revenue approaches, and treats deposits as both inputs and outputs. The revenue approach, which considers income as outputs, is normally preferable than the value-added approach as it takes into account the management process. However, in the Vietnamese context, the value-added approach, which considers deposit and loans as important outputs, is also relevant as the majority of income in Vietnamese banks comes from traditional business activities (i.e. lending). In addition, in SFA and DEA framework, results could vary depending on the chosen inputs and outputs. Therefore, the 2 methods are applied to cross-examined the results to access whether the findings are artifacts of the approach used.

In contrast, the reasons to specify a deposit as an output are that, first, in a typical bank, deposits could account for more than half of capital and labour expenses (Berger & Humphrey, 1992; Lozano-Vivas, Pastor, & Pastor, 2002). Second, the Vietnamese banking sector is very concentrated, with five state-owned banks accounting for one half of the deposit and lending markets, and the remaining banks (including 28 commercial banks, three joint venture banks, and five foreign-owned banks in 2015) account for the remainder of the market. Thus, the private domestic commercial banks have to compete strongly against each other and against foreign banks to attract deposits. As a result, competition forces banks to

devote more resources to attract customers. Accordingly, we specify three outputs, and three inputs in Table 5.1.

Table 5. 1: Inputs, outputs definition

This table reports the definitions of inputs and outputs measures.

Definition	Measurement
Outputs for the value – added approach	
Net customer loans (Y1)	= Total customer loans - provisions
Total deposits (Y2)	
Other earning assets (Y3)	= Total assets - y1- interbank lending - fixed assets
Outputs for the revenue approach	
Interest income (Y4)	
Other incomes (Y5)	= non-interest income + net income from other operating activities.
Inputs	
labor expenses (X1)	
non-interest expenses (X2)	= operating expenses – labour expenses – interest expenses
interest expenses (X3)	

It might be important to control for differences in the output quality among banks. Mester (1996), in a study of the efficiency of the US banks, which employed a stochastic frontier approach, uses the average volume of non-performing loans as an input to account for the quality of bank outputs and bank risk. Other researchers use loan loss provisions as an indicator of the extent of problem loans when the data for non-performing loans is not available (Drake & Hall, 2003). According to Berger and Mester (1997), whether it is appropriate to include loan losses or problem loans in banks' cost and profit functions depends on whether they are exogenous (i.e. caused by negative external shocks like an economic downturn) or endogenous (i.e. caused by "bad management"). If the problem loans are exogenous and, if we fail to control for them, "then measured cost efficiency may be artificially low because of the expenses of dealing with these loans (e.g., extra monitoring, negotiating workout arrangements, etc.)" (Berger & Mester, 1997, p. 194). Following Berger and Mester (1997), Drake et al. (2009) assume that the loan losses were due to "bad luck" and, therefore, included the loan loss provisions in the banks' cost as an input. On the contrary, we use the stock of loan loss provisions as a proxy because we consider high loan loss provisions in Vietnamese banks to be a result of "bad management", consistent with the "bad management" hypothesis of Berger and DeYoung (1997). The reason we use loan

loss provisions instead of non-performing loans to measure the loan quality is that the data on non-performing loans in the Vietnamese banks is unreliable. We also use the models proposed in Berger and DeYoung (1997) to confirm that the high loan loss provisions are due to "bad management" rather than "bad luck", which is reported in Appendix 4. Detailed definitions of inputs and outputs are provided in Table 5.1.[86]

Table 5.2: Inputs, outputs evolution over time – mean and standard deviations for 2008, 2011, 2013, 2016; standard deviations in brackets

This table displays the evolution over time of key variables affecting bank efficiency for the full sample used in this study. The sample consists of a balanced panel of 225 observations (firm-years) from 25 commercial Vietnamese banks in the 2008-2016 period. Data are measured in billion VND. Bank characteristics are manually obtained from the commercial banks' financial statements. All variables are defined in Table 5.1. Data are deflated using the GDP deflator with 2010 as the base year.

Year	2008	2011	2013	2016
Net customer loans	30,485	71,327	93,958	173,000
	(47,724)	(97,073)	(125,900)	(224,400)
Total deposits	37,579	74,905	113,200	201,700
	(56,260)	(89,561)	(124,400)	(239,500)
Other earning assets	17,302	40,972	49,030	114,600
	(25,887)	(34,170)	(41,872)	(211,200)
Interest income	5,669	15,586	12,892	17,052
	(7,545)	(16,563)	(14,105)	(18,959)
Other earning incomes	654	1,150	1,629	2,443
	(976)	(1,559)	(2,168)	(3,455)
Interest expenses	3,864	10,545	8,642	10,193
	(4,904)	(11,219)	(8,987)	(11,442)
Non-interest expenses	423	1,097	1,459	2,031
	(564)	(1,161)	(1,377)	(1,991)
Labour expenses	459	1,138	1,278	2,134
	(803)	(1,501)	(1,527)	(2,430)

[86] There is quite a body of literature on the treatment of non-perfoming loans and loan loss expense as bad outputs. See, for example, Seiford & Zhu (2002).

Table 5.3: Descriptive statistics of variables used to estimate DEA technical efficiencies over the 9-year period. Units of measurement: billion VND

This table displays summary statistics for the sub-categories of the sample. The sample consists of a balanced panel of 225 observations (firm-years) from 25 commercial Vietnamese banks in the 2008-2016 period. Data are measured in billion VND. Bank characteristics are manually obtained from the commercial banks' financial statements. All variables are defined in Table 5.1. Data are deflated using the GDP deflator with 2010 as the base year.

	Observations			Mean	SD.	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
Variables	**All banks**	**State-owned banks**	**Private banks**	**All banks**				**State-owned banks**				**Private banks**			
Outputs for the value – added approach															
Y1	225	27	198	89.60	137	0.33	850	386.00	194.00	129.00	850.00	49.20	50.90	0.33	262.00
Y2	225	27	198	104.00	143.00	0.74	864	400.00	198.00	145.00	864.00	64.30	68.30	0.74	351.00
Y3	225	27	198	49.2	83.40	0.42	1,070	130.00	59.70	60.70	263.00	38.20	80.20	0.42	1,070
Outputs for the revenue approach															
Y4	225	27	198	12.00	14.10	0.24	74.90	42.60	15.50	18.20	74.90	7.80	6.99	0.24	30.50
Y5	225	27	198	1.45	2.18	-0.86	12.80	6.19	2.73	1.97	12.80	0.80	0.95	-0.86	6.02
Inputs															
X1	225	27	198	1.21	1.63	0.02	8.84	4.71	1.91	0.92	8.84	0.73	0.79	0.02	4.08
X2	225	27	198	1.20	1.37	0.03	7.26	3.92	1.74	1.03	7.26	0.83	0.76	0.03	3.80
X3	225	27	198	7.65	8.76	0.09	46.60	25.50	10.30	6.63	46.60	5.21	4.86	0.09	24.30

Notes: Y1: Net customer loans; Y2: Total deposits; Y3: Other earning assets; Y4: Interest income; Y5: Other incomes; X1: Labour expenses; X2: Non-interest expense; X3: interest expense.

The outputs and inputs are measured in billion VND and are adjusted by the GDP deflator, with 2010 as the base year. Tables 5.2 and 5.3 represent the descriptive statistics of inputs and outputs used for estimating technical efficiencies. Table 5.2 shows the movement over the years of inputs and outputs, which indicates the rapid and steady expansion of output quantities (i.e. Y1, Y2, Y3). Accordingly, the income and expenses also increase over time. Additionally, Table 5.2 shows that Vietnamese banks are still primarily reliant on net interest income. The banks, however, expand other earning assets (including stock trading and gold trading on the asset side of the balance sheet) more quickly than the traditional services (i.e. lending). From 2008-2016, while lending quantities increase five times, other earning assets go up seven times. This suggests that Vietnamese banks are trying to be less dependent on lending activities as their main source of income. It can be seen from Table 5.3 that state-owned banks dominate the banking system in terms of loans and deposits.

5.4.2. Methodology

5.4.2.1. DEA window analysis

DEA window analysis was first introduced by Charnes, Clarke, Cooper, and Golany (1985), grouping data on firms in several periods into a "window" and treating them as if they represent different firms (Yue, 1992). In particular, the "window" of size s at time t, is defined as a reference production set consisting of observations made from the point $s = t$ up to $s = t + s$ only (Tulkens & Eeckaut, 1995). As all DMUs within a given window are measured against each other, there is an implicit assumption that there is no technological change within the period covered by each of the windows (Asmild et al., 2004). Tulkens and Eeckaut (1995) generalise window analysis, as a special case of a sequential reference production set. A sequential reference production set at each point in time t is constructed using the observations made from the point in time $s = 1$ up until $s = t$. This can be carried out by assuming that "what was feasible in the past remains feasible for ever" (Tulkens & Eeckaut, 1995, p. 480). However, there are some conditions influencing production possibility, such as regulation, competitive situation, economic conditions and so forth., which were possible in the past, but might not be possible today (Asmild et al., 2004), especially when the period examined is long. Therefore, the window analysis, with a properly narrow window width, seems to be a proper choice to capture the change in environmental variables. Furthermore, a narrow window width also seems to fit well into the assumption that there is no technological progress or regress within each of the windows.

Therefore, in this study, we chose a three-year window, which is also adopted in many papers (Nguyen et al., 2014; Yue, 1992), forming seven windows (Table 5.4).

Table 5.4: Seven three-year window table

This table represents the 3-year windows and the periods they cover. The data cover a 9-year span from 2008 to 2016, forming 7 windows.

Window 1	2008	2009	2010						
Window 2		2009	2010	2011					
Window 3			2010	2011	2012				
Window 4				2011	2012	2013			
Window 5					2012	2013	2014		
Window 6						2013	2014	2015	
Window 7							2014	2015	2016

Window analysis is chosen with DEA in this study because it has some advantages. First, it can be used to study trends of the efficiency evaluations across, as well as within, windows (Charnes et al., 1985). Efficiency at a point in time can be calculated by averaging efficiency levels of the same bank across windows. In this sense, the mean efficiency of a bank has partly captured the change in technology over time, because the bank appears in several windows with different frontiers. Second, the DEA window analysis artificially creates more 'degrees of freedom' into the analysis (Charnes et al., 1985), as each bank appears in several windows. As a result, we get larger data sets for analysis than we would if we used single year frontiers. A further consequence of using window analysis rather than single year frontiers is that we establish some basis for assessing trends in relative efficiency through time.

5.4.2.2. Accounting for the effect of merger events

A major disadvantage of the DEA approach is that the parameters are not estimated using statistical methods, but calculated using mathematical programming techniques, which precludes hypothesis testing (Murillo - Zamorano, 2004). Kneip, Simar, and Wilson (2003) introduced bootstrap procedures that derive the asymptotic distribution of DEA efficiency estimators under variable returns to scale (VRS), which allows one to perform consistent inferences regarding the efficiency in multiple inputs-outputs. However, the Kneip et al.

(2003) approach does not account for environmental variables that are considered as factors constraining firms' choices of inputs and outputs. Coelli et al. (2005) state that not considering the difference in environmental factors - the factors that are not considered as traditional inputs, but which could influence the efficiency of a firm - might lead to misleading results. Relevant factors include ownership type, firm age, or various management factors; for example, managers' characteristics, M&A events, or whether a bank goes public. Coelli et al. (2005) suggest several ways to accommodate "environmental" factors. In this study, we use the two-stage method account for those environmental factors and the single bootstrap proposed by Simar and Wilson (2007) as a robustness check. The two methods' main advantage over other methods in that it is not an a priori requirement to make assumptions regarding the direction of the influence of the environmental variables (Coelli et al., 2005). In addition, unlike the case of SFA where the two-step methodology leads to a biased frontier, in the case of DEA, it is perfectly legitimate to estimate the frontier ignoring environmental variables (Schmidt, 2011).

The two-stage approach is very popular in the literature (Simar & Wilson, 2011). Basically, the approach involves two stages: The first stage is to estimate DEA efficiency scores using only the traditional inputs and outputs; and the second stage involves regressing the scores on the covariates identified as environmental variables using OLS or Tobit models (Coelli et al., 2005). Nevertheless, Simar and Wilson (2007) criticise the two-stage approach as exposing a serious problem that invalidates the method. The problem is that the DEA efficiency estimates are serially correlated because the DMUs lying on the estimated frontier will cause the change in efficiency estimate of other DMUs. Therefore, the inference drawn from in the second stage regression results applied to finite numbers of observations are invalid due to the serial correlation of the estimated residuals (Simar & Wilson, 2007). As the correlation problem disappears in infinite samples, Simar and Wilson (2007) develop two bootstrap procedures, namely the single and the double bootstrap procedures, that could increase the finite sample to a very large number and, therefore, solve the problem of correlation of the estimated residuals. In this study, we use the single bootstrap to find the true relationship between the environmental variables and the bank efficiencies. The method is described in Appendix 5.

Hence, the true relationship between efficiency ∂ and environmental variables is given by:

$$\partial_i = \beta_1 merger + \beta_2 foreign\_ownership + \beta_3 listed + \beta_4 bank\_size + \beta_5 ltd + \omega_j, j = 1, \ldots, \quad (5\text{-}6)$$

However, it is worthwhile noting that while the two-stage approach could be used for panel data, the bootstrap method is meant for use with cross-sectional data (Badunenko & Tauchmann, 2018). Therefore, in order to use the bootstrap method, we pool the data over time, implying that the technology has not changed over the study period. This is feasible because: (i) The technology has not changed much, as empirically seen in the following section (Table 5.7) using the DEA-Malmquist approach; (ii) technological change has been partially captured in the technical efficiency estimated by the window analysis; and (iii) the data has been adjusted using the GDP deflator.

5.4.3. Data

The data is a balanced panel that is hand-collected from annual financial statements containing accounting and ownership data of Vietnamese commercial banks. Using unbalanced data can introduce unnecessary noise, which may influence the shape and position of the frontier in the DEA window analysis (Coelli et al., 2005); so, we only include banks with no missing data. Furthermore, as we are using a balanced panel, we are only looking at acquiring banks, not the acquired ones. In the end, we have balanced panel data for 25 commercial banks, covering the period 2008 to 2016, totalling 225 observations. There are three state-owned banks and 22 private banks in the sample. All selected banks are joint-stock commercial banks operating under the same regulatory environment. Likewise, all of the financial statements were reported based on the Vietnamese Accounting Standard (VAS). Among the 25 banks, six banks merged with other banks in the period investigated (Table 5.5). Details of the banks in the sample are provided in Appendix 6. The final sample represents 78.2% of the total assets of the Vietnamese commercial banks as of 2016.

As it is required that the units under assessment using DEA need to be homogeneous (Dyson et al., 2001), we include only domestic commercial banks in the sample. Foreign banks and joint-venture banks are excluded from the sample due to the lack of data, as well as their constraints in approaching local customers.

Table 5.5: Merger events

This table reports the merger events of the sample banks during the 2008-2016 period.

No	Year of M&As	Banks participating in the M&A	Banks after the M&A	Weak banks
1	2012	Saigon Bank; First Bank; Tin Nghia Bank	Saigon Bank	First Bank; Tin Nghia Bank
2	2012	Saigon-Hanoi Bank; Hanoi Building Bank	Saigon-Hanoi Bank	Hanoi Building Bank
3	2013	Western Bank; Vietnam Petrolimex finanical company	PVcomBank	Western Bank *(Note: no available data regarding labor expenses after the merger)*
4	2013	Dai A Bank; Ho Chi Minh City Development Bank; Societe Generale Vietfinance (a finance company)	Ho Chi Minh City Development Bank	
5	2015	Maritime Bank; Mekong Delta Bank	Maritime Bank	
6	2015	The Vietnam Bank for Investment and Development; Housing Bank of Mekong Delta	The Vietnam Bank for Investment and Development	
7	2015	Saigon Thuong Tin Bank; Sourthern Bank	Saigon Thuong Tin Bank	Southern Bank

5.5. Empirical results

5.5.1. The trend of technical efficiency over time

Table 5.6 shows the descriptive statistics for the technical efficiency levels employing the two approaches, the value-added approach and the revenue approach, for the different ownership types. The overall mean technical efficiencies of the Vietnam banks employing the two approaches, are relatively high and consistent, at 81.4% and 82.7%, respectively. The technical efficiency level of 81.4% in the value-added approach implies that, on average, banks waste over 18% of their resources relative to the best-practice bank in the sample in generating the same amount of output quantities, given the same economic conditions. On the contrary, the 82.7% technical efficiency level in the revenue approach shows that a typical bank, on average, uses 17.3% higher costs than the best-practice bank in generating the same revenue.

Table 5.6: Technical efficiency over the 2008-2016 period using DEA window analysis

This table displays the change of technical efficiency over time in three categories; state-owned banks, privately-owned banks, and all banks. The Mann-Whitney U test compares the difference in median efficiency between state-owned banks and privately-owned banks. The sample consists of 25 banks over the 2008-2016 period, totalling 225 observations.

	Value-added approach			Revenue approach		
Year	State-owned banks	Privately owned banks	All banks	State-owned banks	Privately owned banks	All banks
2008	0.827	0.758	0.766	0.909	0.840	0.848
2009	0.995	0.849	0.866	1.000	0.787	0.813
2010	0.945	0.809	0.825	0.892	0.739	0.758
2011	0.763	0.683	0.693	0.929	0.734	0.757
2012	0.911	0.646	0.678	0.968	0.680	0.715
2013	0.901	0.817	0.827	0.943	0.791	0.809
2014	0.950	0.878	0.887	0.998	0.891	0.904
2015	1.000	0.883	0.897	0.995	0.916	0.926
2016	1.000	0.870	0.886	1.000	0.905	0.917
Mean efficiency	0.921	0.799	**0.814**	0.959	0.809	**0.827**
Mann-Whitney U-test hypothesis: Ho: There is no difference between the efficiencies of SOBs and POBs						
Z ratio	-4.096			-5.367		
P value	0.000			0.000		
Decision	Reject Ho at the 1% level of significance			Reject Ho at the 1% level of significance		

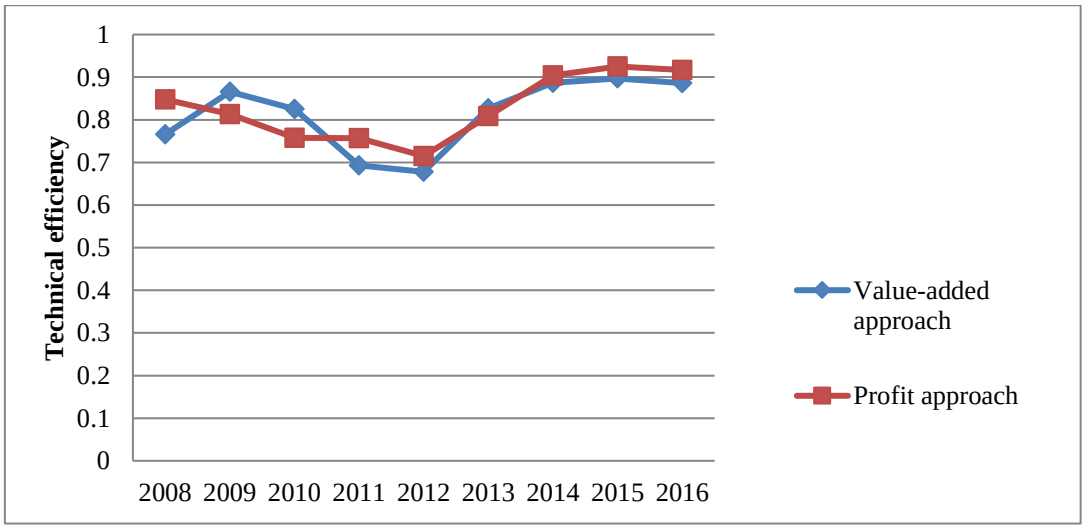
The mean efficiency of state-owned banks is, on average, higher than that of the privately-owned banks, at 0.921 and 0.959, respectively, compared to 0.799 and 0.809, respectively using the two approaches. To confirm this observation, we employ the non-parametric Mann-Whitney U test. The results show that the differences of the median efficiencies between the two groups are significant at the 0.1% level, which is consistent with the studies of efficiency of Vietnamese banks and Chinese banks (Berger et al., 2009; Nguyen et al., 2014). This finding is interesting because the analysis shows that state-owned banks are experiencing decreasing returns to scale[87] during the period. Some possible explanations for

[87] This result will be provided upon request.

the relatively greater efficiency of the state-owned banks compared to the private banks are that, first, state-owned banks are regarded as safer than private banks; therefore, they can set lower interest rates than private banks, meaning that state-owned banks have relative cost advantages. This is confirmed by the fact that the cost of funds (i.e. the ratio of interest expense over total deposits) is, on average, lower in state-owned banks than in privately-owned banks (0.071 vs 0.102, and the difference is significant at the 1% level in t-testing). Second, state-owned banks are large banks and established much earlier than private banks; therefore, they have many branches and customers all over the country. Therefore, they have large numbers of deposit accounts as well as a large loans' volume. Third, the government might create more favourable business conditions for state-owned banks than for private banks.

In terms of the movement over the nine years, Figure 5.1 shows that, overall, Vietnamese banks have experienced a minor improvement in technical efficiency levels since 2012.

Figure 5. 1: Efficiency trends of Vietnamese banks over time



There were two disruptions during the investigated period, in 2008 and during the 2011-2012 period. The first disruption reflects the immediate negative shock of the global financial crisis in 2008, and the second (the 2011-2012 period) reflects the lagged effect of the global financial crisis and the European debt crisis on the Vietnamese economy. In the 2011-2012 period, the Vietnamese economy experienced a hard time with a high inflation rate at 18.83% in 2011, a frozen real market, and the shutdown of many firms as a consequence of the lower demand on Vietnamese products from overseas markets. As a result, there was a credit crunch in the 2011-2012 period, with the YoY credit growth at

10.9% and 8.9% in 2011 and 2012, respectively, compared to the average growth rate of 30.66% in the 2008-2010 period, coupling with high NPLs at 8.6% in 2012. These factors led to the drop in efficiency of the Vietnamese banks in the 2011-2012 period.

In addition, there is a lag between the changes in technical efficiency in generating outputs' quantities and technical efficiency in generating revenue in 2008. In particular, the increase in the cost in 2008 led to the drop in revenue in 2009. From 2009 onwards, the technical efficiencies in the two approaches show similar movement patterns. These movements are also consistent with the findings of Nguyen et al. (2014) for the 1995-2011 period.

5.5.2. Technological change over the study period

In order to determine whether there has been technological progress over the 2008-2016 period, we employ the output-based DEA Malmquist Productivity Index approach. Technological change is an economic concept capturing technological progress[88] over time. Fare, Grosskopf, and Lovell (1994) specified a technological change (*tech_change*) between year *t* and *t*+1 as equation (5-7):

$$Tech\_change = \left[\left(\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})} \right) X \left(\frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)} \right) \right]^{1/2} \quad (5\text{-}7)$$

where:

$D_0^t(x^t, y^t)$ is defined as the reciprocal of the maximum proportional expansion of the output vector y^t given the input vector x^t;

$D_0^t(x^{t+1}, y^{t+1})$ is the distance function measuring the maximal proportional change in outputs required to make (x^{t+1}, y^{t+1}) feasible given the technology at *t*;

$Tech\_change$ > 1 if there is development in technology;

$Tech\_change$ = 1 if there is no technology progress; and

$Tech\_change$ < 1 indicates there is technical regress.

[88] The improvement in technology can come from the innovation of methods in using existing inputs, or through the improvement of input quality.

The results are reported in Table 5.7.

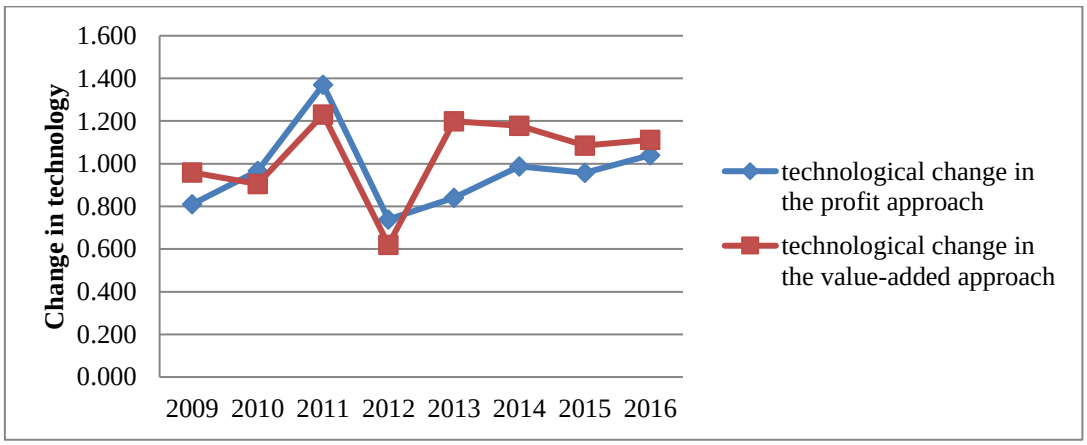
Table 5.7: Malmquist index summary of annual means

This table reports the decomposition of total factor productivity into technical efficiency change, technological change, and scale efficiency change in the 2009-2016 period.

Year	2009	2010	2011	2012	2013	2014	2015	2016	Mean
Malmquist Index for the revenue approach									
Technological change	0.810	0.967	1.370	0.739	0.840	0.988	0.958	1.040	**0.949**
Technical efficiency change	1.169	1.061	0.700	1.197	1.176	1.014	0.993	0.977	1.023
Scale efficiency change	1.051	1.030	0.882	1.069	1.064	1.014	0.986	0.985	1.009
Total factor productivity change	0.947	1.026	0.959	0.885	0.988	1.001	0.951	1.016	0.971
Malmquist Index for the value – added approach									
Technological change	0.959	0.905	1.231	0.620	1.199	1.178	1.085	1.112	**1.015**
Technical efficiency change	1.386	0.984	0.658	1.380	1.104	0.984	0.997	0.985	1.035
Scale efficiency change	1.091	0.988	0.853	1.129	1.042	0.999	1.005	1.035	1.015
Total factor productivity change	1.329	0.890	0.810	0.855	1.324	1.160	1.082	1.095	1.051

As demonstrated in Table 5.7, there is a minor technological change over the nine-year period, at -5.1% and 1.5% respectively. In terms of technical efficiency change, the changes confirm what we have found in the main hypothesis test, meaning there was a decrease in technical efficiency in 2011-2012. Regarding the change of technical efficiency over time in the two approaches, we can see they share the same trend, except for 2008, as shown in Figure 5.2, with a drop in technical efficiency in 2012.

Figure 5. 2: Technological efficiency trends over 2008-2016 period



5.5.3. The impact of M&As

First, we employ the Mann-Whitney U test, and the results reported in Table 5.8 show that the differences of the median efficiencies between banks after M&As and banks without M&As are significant at the 5% level in the value-added approach, and at the 10% level in the revenue approach. The higher mean efficiency of banks after M&As, compared to banks without M&As, in both approaches reflect the upward trend of efficiency over time, not the relationship between M&As and efficiency.

Table 5.8: Mann-Whitney U-test of the difference in the mean efficiency of banks with and without M&As

This table compares the difference in median efficiency between banks with M&As and banks without using the Mann-Whitney U test. The sample consists of 6 banks involved in M&As and 19 banks that were not involved in M&As in the 2008-2016 period. The total number of observations are 225.

Revenue approach		**Value-added approach**	
Banks after M&As	Banks without M&As	Banks after M&As	Banks without M&As
Mean efficiency		Mean efficiency	
0.899	0.822	0.887	0.809
Mann-Whitney U-test hypothesis:			
Ho: There is no difference between the median of efficiencies of banks with M&As and banks without M&As.		**Ho:** There is no difference between the median of efficiencies of banks with M&As and banks without M&As.	
Z ratio	-1.945	-2.016	
P value	0.052	0.044	
Decision: Reject Ho at the 10% level of significance.		**Decision:** Reject Ho at the 5% level of significance.	

To further investigate the change of efficiency in banks with and without undertaking an M&A over time, we conducted a simple comparison. That is, first, we calculated the change in average efficiency levels between the period three years before and three years after an M&A for banks that undertook M&As. This change could then be compared with the change in average efficiency of the group of banks that did not undertake any M&As, for the exact same years. Among six M&As occurring in the investigated period, we excluded the three M&As undertaken in 2015 due to the lack of sufficient time after the M&As. Thus, we calculate the average efficiency of the three banks that undertook M&As in 2012, and 2013 only. The peer group consists of banks which were not involved in any M&As in the period, excluding state-owned banks.

Table 5. 9: Comparison of the change of average efficiency

This table compares the difference in the improvement of mean efficiency 3 years before and 3 years after an merger event between banks involved in M&As and banks that were not. The sample consists of 3 banks involved in M&As in the 2012-2013 period and 16 privately owned banks that were not involved in M&As in the 2008-2016 period. Total observations are 171. ***, ** denote statistical significance at the 1% and 5% level, respectively.

	Revenue approach		**Value-added approach**	
Period	Banks undertook M&As (3 banks)	Banks without undertaking M&As	Banks undertook M&As (3 banks)	Banks without undertaking M&As
2008-2010	0.827	0.797	0.846	0.825
2014-2016	0.929	0.904	0.887	0.879
Difference	**0.102**	**0.107*** **	**0.041**	**0.054** **

Table 5.9 reports the difference in the average efficiency between the two periods. As can be seen from Table 5.9, the improvement in average efficiency of the banks taking on M&As was not significant, and lower than that of the banks which did not undertake any M&As (0.102 vs 0.109 and 0.041 vs 0.061). The pattern is the same with both approaches. The result confirms our prediction that M&As decrease the efficiency of the combined bank. This might be explained by the costs incurred to the combined bank associated with resolving bad debts, which were transferred from the weak bank. Owing to the nature of Vietnamese M&As, where the merging banks were not efficient, it is reasonable to not observe an increase in efficiency after the M&A. The finding confirms the consensus among researchers that, for banks to benefit more from M&As, the acquiring bank needs to be more efficient than the acquired bank.

To further confirm the findings, we empirically tested the impact of M&As on the Vietnamese bank technical efficiencies, employing truncated regression. Following Berger and Mester (1997), we identify five environmental variables that might influence the efficiency scores; hence, the second stage regression is given by:

$$\partial_{i,t} = \beta_0 + \beta_1 merger_{i,t} + \beta_2 foreign\_ownership_{i,t} + \beta_3 listed_{i,t} + \beta_4 ownership_{i,t} + \beta_5 ltd_{i,t} + \omega_{i,t} \qquad (5\text{-}8)$$

We also use the results from the single bootstrap as a robustness check. As the bootstrap technique proposed by Simar and Wilson (2007) applies for cross-sectional data, we pool the data in the study period. Therefore, the regression model is:

$$\partial_i = \beta_0 + \beta_1 merger + \beta_2 foreign\_ownership + \beta_3 listed + \beta_4 ownership + \beta_5 ltd + \omega_j, \quad with\ j = 1, \dots, n \qquad (5\text{-}9)$$

where:

∂ represents the efficiency scores, estimated in the window analysis in the previous section; and

Merger is a dummy variable, equal to 1 if the bank merges with another bank in that year or any previous years, and 0 otherwise.

Other controlling variables are:

foreign _ ownership is a dummy variable, equal to 1 if domestic banks have minority ownership (less than 20% of total equity according to Vietnamese law) owned by a foreign entity in that year and the following and 0 otherwise;

ownership is the dummy variable, equal to 1 if banks are a state-owned bank and 0 otherwise;

Listed is a dummy variable, equal to 1 if banks are listed on stock markets and 0 otherwise;

Loan-to-deposit ratio (ltd) is a proxy to measure banks' risk-taking; and

w_{it} is the random variable.

According to McDonald (2009), the tobit regression is considered inappropriate in the second stage of the DEA method, as efficiency is not generated by a censoring process. The author advocates the use of OLS regression. Due to this, the results employing the OLS, truncated and bootstrap techniques are reported in Table 5.10. The truncated and bootstrap regressions exclude observations where the technical efficiency equals one (full efficiency) as, even though the full efficiency is technically possible, it happens with zero probability (Badunenko & Tauchmann, 2018). In addition, the year and firm dummies[89] are included in

[89] According to Greene (2004), truncated regression models using fixed effects underestimate the standard errors, therefore inflating t-statistic values. Hence, as the t-values are not very much above 1.65 (the 10% level), we should be cautious in interpreting the association between listed dummy and ownership dummy, and the efficiency levels. As the results are still robust in the bootstrap analysis, we maintain the conclusions regarding the association between listed dummy, ownership dummy and the technical efficiency.

all specifications, as we want to control for unobserved time-invariant heterogeneity among banks and years. Standard errors are clustered at bank level in the OLS and truncated models. Nevertheless, we refer to the bootstrap technique using 2,000 replicates for DEA developed by Simar and Wilson (2007) as the baseline regression, given this small sample size. As can be seen from Table 5.10, the results from the truncated and bootstrap methods are almost the same (except for some minor differences in the p-value).

Table 5.10: The effect of merger on technical efficiency

This table exhibits the relation between the efficiencies, measured by the value-added approach and the revenue approach, and the merger dummy. The sample consists of balanced panel financial data from 225 bank-year observations in the 2006-2016 period. All specifications include year and firm fixed effects. Standard errors are adjusted for potential heteroskedasticity and correlations of the error term following Driscoll and Kraay (1998). The value of the t-statistics are in brackets. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Value-added approach			Revenue approach		
Variables	OLS	Truncated	Bootstrap	OLS	Truncated	Bootstrap
Merger dummy	-0.0221	-0.0762	-0.0762	-0.0127	-0.0150	-0.0150
	(-0.54)	(-1.60)	(-1.62)	(-0.34)	(-0.28)	(-0.29)
Foreign_ownership	-0.0312	-0.0169	-0.0169	-0.0336	-0.00199	-0.00199
	(-1.24)	(-0.58)	(-0.58)	(-1.22)	(-0.06)	(-0.06)
Listed dummy	0.0291	0.0887**	0.0887**	0.0300	0.120**	0.120**
	(0.79)	(2.07)	(2.13)	(0.71)	(2.38)	(2.42)
Ownership	0.0653	0.137**	0.137**	0.145***	0.195**	0.195**
	(0.86)	(2.15)	(2.22)	(2.65)	(2.40)	(2.52)
Loan-to-deposit ratio	0.0633	0.0941	0.0941	0.0813*	0.131*	0.131*
	(1.39)	(1.41)	(1.43)	(1.81)	(1.65)	(1.71)
Constant	0.662***	0.455***	0.455***	0.714***	0.550***	0.550***
	(7.42)	(6.25)	(6.25)	(9.96)	(6.57)	(6.69)
Year and firms dummies	Included	Included	Included	Included	Included	Included
Sigma		0.0935***	0.0935***		0.101***	0.101***
R_squared	0.6447			0.6162		
Ward chi_square		252.23	278.07		187.18	205.38
No. of observations	225	183	183	225	186	186

The coefficients of the merger dummy in all specifications are insignificant, which is unsurprising for such a small sample of M&A. The listed dummy has a significantly positive relationship with efficiency, which is consistent with a recent study in Vietnamese bank efficiency by Nguyen et al. (2016). The difference in performance between listed and

unlisted banks might be explained by the difference in governance between listed banks and unlisted banks. Different from unlisted banks, listed banks are operating under the Securities Law 2006 and the Code of Corporate Governance of listed companies[90] (Code) as a subordinate legal document under the Securities Law. The principles of the Code aim to ensure: (i) An effective managerial structure; (ii) the rights of shareholders; (iii) fair and impartial treatment between shareholders; (iii) effective management by the board of management and control board; (v) prevention of conflicts of interest and related party transactions; and (vi) information disclosure and transparency. Hence, internal governance in listed banks is likely to differ from unlisted banks. One example is that the remuneration of board members in listed firms is subject to approval by a general meeting of the shareholders; thus, it is less likely that board members in listed banks may tunnel money out of the banks. Subject to these regulations, listed banks are, therefore, likely to have better and more transparent management than unlisted banks. As a result, listed banks are expected to perform better as the transparency helps to mitigate the agency conflicts.

The coefficient for foreign ownership has a negative sign, although not significant. The finding is not consistent with studies conducted in the Chinese banking sector. Both Berger et al. (2009) and Sun et al. (2013) find that minority foreign ownership improves Chinese banks' efficiency. The different findings could be attributable to the different development in institutional infrastructure for good corporate governance mechanisms in place between the two countries. In addition, those studies use cost and profit efficiencies, which take into account the price of inputs and outputs, as measures of efficiency; while this study uses technical efficiency, which does not take prices into account. In addition, the insignificant coefficients might be explained given the Vietnamese context. In Vietnam, foreign investors are restricted to holding no more than 20% of the total shares of any domestic bank. In such cases, foreign investors usually assign a delegate to sit on the local bank's board or management to represent their rights (so-called "minority foreign ownership"). In return, foreign directors are committed to assisting the local bank in modern technology transfer, developing banking products and services, and raising financial, administration and risk management capabilities. Therefore, in the short run, those banks incur relatively more costs

[90] Decision No. 12/2007/QD-BTC of March 13, 2007, promulgating regulations on corporate governance applicable to companies listed on the stock exchange or a securities trading centre. The Vietnamese Government issued a new code on corporate governance in 2017 (Decree 71/2017/ND-CP).

relating to upgrading technology, training local staff, and upgrading risk management systems, etc., than other banks.

The loan-to-deposit ratio is a proxy for the level of risk-taking in banks. The positive relationship between the loan-to-deposit ratio and technical efficiency is significant in the value-added approach, suggesting that Vietnamese banks increase revenue by increasing lending to customers. In terms of ownership, the finding is consistent with what we have found using the Mann-Whitney U test in the previous section, that state-owned banks are more efficient than private banks. This finding is also consistent with previous studies in Vietnam (Nguyen et al., 2016; Nguyen et al., 2014; Vu & Turnell, 2010).

5.6. Conclusion

The study explores the effect of M&As on technical efficiency in the Vietnamese banks. The study utilises DEA window analysis to estimate technical efficiency and various regressions (OLS, truncated and bootstrap) to explore the relationship between M&As and the estimated technical efficiency. The findings are as follows. The technical efficiency in the Vietnamese banking sectors in the 2008-2016 period is quite high, with an average of 0.82. The results are similar in both the value-added approach and the revenue approach, implying that, given the outputs, Vietnamese banks on average could save 18% of their costs to achieve full efficiency. This finding is similar to that of Vu and Turnell (2010). In addition, state-owned banks experience higher efficiency than private banks, which is consistent with Nguyen et al. (2014). Mergers in the Vietnamese context do not cause an increase in efficiency, but show evidence (i.e. the difference comparison) that they might lead to a decrease in efficiency. This is because the mergers do not come from the outstanding banks taking over weak banks, but are induced by the restructuring programme proposed by the government. However, the finding is only significant in the value-added approach, not in the revenue-approach. This result should not be surprising given the limited number of observations in this study.

This study does, however, contribute to the literature in two important ways. First, it expands the limited existing literature on the impact of M&As from a developing country perspective. It also provides the background of the M&As in Vietnam with its distinctive characteristics, and illustrates how institutional factors could influence the expected result. Second, it informs the government about the effects of M&As. Perhaps the government should promote mergers between more efficient banks and weak banks, because it creates the channel for

operational improvement, instead of letting banks merge just because they have the same big owners. On the other hand, letting foreign entities become involved in the banking restructuring process by acquiring weak banks would be a good idea, because they have superior management skills and long-term incentives to improve the weak bank's efficiency, which in turn would benefit the local market.

The study, however, faces a difficulty that limits its scope. The sample period of the investigation is not long, and the number of mergers is limited. The limited number of M&A events prevents us from rendering a meaningful result from a statistical viewpoint. Vietnam is in its second phase of restructuring the banking sectors, and is now promoting mergers between healthier banks. Therefore, this creates an opportunity for a similar study in the future, with more observations, to compare and contrast the effect of M&As with respect to different motives by banks.

Chapter 6. Conclusions, implications and limitations and summary of the thesis

This chapter provides a summary of the empirical findings, reported from Chapter 3 to Chapter 5, regarding the impacts of foreign and female directors on Vietnamese bank risk-taking and efficiency, and the impact of M&As on bank efficiency. Relevant conclusions and implications for policy formulation are noted in section 6.1. Section 6.2 discusses limitations of the thesis and recommendations for potential future study. Section 6.3 provides a brief summary of the thesis.

6.1. Conclusions and implications

6.1.1. A summary of key research findings and policy implications

In this thesis, three research questions concerning corporate governance mechanisms in the Vietnamese banks are investigated. The first study aims to examine whether foreign directors affect bank risk-taking. The second study focuses on exploring the effect of female directors on bank efficiency. We also control for the effect of female directors in relation to bank risk-taking in the first study, and foreign directors on bank efficiency in the second study. In the last study, domestic M&As are investigated in terms of their relation to bank technical efficiency. The three hypothesis questions are explored with the insights of agency and resource dependency theories that link directors on boards with firm outcomes. The agency theory predicts that, by resolving agency conflicts between shareholders and management, shareholders' benefits will be protected. Shareholders elect the board of directors to represent their rights and give the board the authority to hire, fire, and compensate the management team. Therefore, the board plays an important internal corporate governance mechanism to ensure managers work towards maximising shareholders' wealth. In addition, as the board is a decision-making group, where each individual director may have different characteristics and different human capital resources that contribute to the decision-making process, board composition does matter in mitigating the agency conflicts and, hence, affects firm outcomes. The resource dependency theory, in constrast, argues that firms are open organisations that are dependent on external resources for their development. Directors provide the linkage between the firm and the environmental resources that the firm requires. Directors that have more access to external resources will have more power in the firm. From the two theories, we argue that whether a director can influence firm outcomes depends on: (i) Whether the director contributes to the board in a way that mitigates agency conflicts;

and (ii) whether the director brings about access to external resources that the firm requires for its development.

The findings are as follows. First, there is robust evidence that foreign directors on boards increase the level of bank risk-taking. In addition, there is evidence that banks with foreign directors take more risks than banks without foreign directors in the 2012-2016 period, which is the period of economic and political uncertainty in Vietnam. The findings are robust employing different techniques to address potential selection bias such as firm fixed effects, Heckman two-stage analysis, and Propensity score matching. The explanation for these findings is largely based on agency theory, with foreign directors playing a governance role that mitigates agency conflicts. In particular, we argue that: (i) Foreign directors are motivated to increase risk-taking to maximise shareholders' wealth; (ii) foreign directors represent from 15% to 20% of foreign ownership in the domestic bank, thus they have incentive and power to monitor managers to work for shareholders' benefits; (iii) foreign directors have higher risk appetite than domestic directors because they have experience working in more sophisiticated financial markets in developed countries; and (iv) after year 2011, there are uncertainties in the Vietnamese economic and political environment, and foreign directors are motivated to increase risk-taking to reap short-term profits.

We find the effect of foreign directors on bank efficiency is subject to the methods employed. Using the one-stage BC95 model, we find no evidence that foreign directors have an effect on bank cost efficiency. Interestingly, following a two-stage frontier analysis that is widely adopted in literature that examines the determinants of firm efficiency, our result is consistent with a recent finding on the Vietnamese banking sector by Nguyen et al (2016), that the presence of foreign directors on boards is associated with lower bank efficiency. Nevertheless, Wang and Schmidt (2002), using Monte Carlo simulations, conclude that two-stage frontier analysis provides a biased frontier and severe downward biased coefficients between efficiency and its determinants. Therefore, they strongly recommend the use of the one-stage frontier analysis.

The robust finding that foreign directors increase bank risk-taking has posed a question regarding the initial purpose of the foreign strategic partnership programme. The Vietnamese government proposed this programme with an aim of improving the performance and risk management practices of Vietnamese banks by encouraging investments from foreign institutional financial investors due to their superior experience in management and finance.

Nevertheless, we find no evidence that foreign investors bring about performance improvement in the Vietnamese local banks. In contrast, foreign directors even increase risk-taking in the domestic banks when the economic conditions become unfavourable. As the programme does not work as intended, perhaps the government should eliminate the restriction of the maximum foreign ownership in the Vietnamese domestic banks to let the "invisible hand" operate, especially under the context that 100% foreign-owned banks are allowed to be established in Vietnam since 2008.

In terms of board gender diversity, we do not find a robust effect of female directors on bank risk-taking. Even though we find evidence that female directors are associated with a higher loan-to-deposit ratio in the firm fixed effects setting, the relationship is not robust with other measures of bank risk. Interestingly, there is evidence that female directors are associated with lower cost efficiency. The result is robust when employing both one-stage and two-stage SFA frameworks, and after accounting for a potential selection bias by employing Heckman two-stage analysis and Propensity score matching. We argue that, owing to social norms, boards with more female directors have less access to external resources that the firm requires, such as networks, and business opportunities, compared to the boards with more male directors. Therefore, the presence of female directors on boards does not translate to an improvement in bank efficiency. In addition, literature also shows that women are not as experienced in conducting business as men. Therefore, the boards with more female directors are associated with lower efficiency.

The finding on the role of board gender diversity on the Vietnamese banks' efficiency implies an important policy recommendation. Many developed countries are promoting gender equality in leadership by enacting boardroom gender quotas, as gender disparity still exists in leadership (see Adams and Funk (2012)). However, as firms are entities that maximise shareholders' value, it is important that women add value to firms, otherwise the role of gender in leadership positions will only be tokenism, which brings benefits to none. We additionally provide an additional piece of evidence to the existing literature on the role of female directors on boards, that female directors do not necessarily add value to firms. Thus, this law of promoting gender in leadership roles should be viewed with careful consideration.

In terms of the effect of M&As on Vietnamese bank technical efficiency, we investigate this effect from the view that M&As lead to a major change in the merged firm and are usually

involved in the restructuring of corporate governance in the merged firm. Therefore, it is expected that M&As would lead to a possible improvement in the efficiency of the combined entity. A two-stage DEA rolling window approach is employed to test the relationship. In the first stage, DEA window analysis is used to estimate the technical efficiency of the Vietnamese banks. In the second stage, the efficiency is regressed on the merger dummy and other control variables using OLS, truncated, and bootstrap methods as robustness checks. Given a relatively small market for M&As, and a limited number of M&A events so far, we do not find a robust relationship between M&As and bank efficiency. However, we find evidence that banks involved with M&As experience lower efficiency improvement than banks not involved in M&As. The reason for this could be that M&As decisions by the boards in Vietnamese domestic banks are not profit-driven; rather, there is government intervention in this decision-making process. Therefore, it is understandable that M&As do not lead to an improved efficiency of the combined entity as expected.

The Vietnamese government initiated M&As among Vietnamese domestic banks with an aim to clean up the fragmented financial market, deal with non-performing loans, and increase the competitive capacity of domestic banks. However, from shareholders' viewpoints, an effective M&A should add value to shareholders. Prior studies suggest that, for banks to benefit from M&As, the acquiring bank needs to be more efficient than the acquired bank. Thus, the Vietnamese government should take into consideration this condition and design policies accordingly.

In terms of control variables, we also find a consistent positive association between the listed dummy and bank efficiency, which is consistent with Nguyen et al. (2016). This finding implies an important policy implication that the government should boost the process of equalisation of state-owned banks, which is currently still very slow.

6.1.2. The contributions of the thesis

The thesis contributes to the literature on corporate governance of banks in at least two ways. First, the thesis provides evidence as to whether corporate governance mechanisms in developing countries work differently in relation to risk-taking and performance compared to in developed countries. Vietnam is characterised by low development of financial markets, and the institutional framework for supporting good corporate governance is largely absent. Meanwhile, developed countries have good institutional frameworks for good corporate governance practices. For example, developed countries have well-developed

legal systems to protect investors, especially minority investors; it is easier to bring a reputed case to court; and accounting rules are more transparent and developed. The institutional framework creates an institutional environment that mitigates agency conflicts in firms. There are also other market forces that provide incentives to the board to adopt good governance practices. For example, the high development of financial markets rewards firms with good governance practices through a lower cost of accessing capital. Mature markets for labour create incentives for directors and managers to do their intended jobs, otherwise they will be replaced. As the quality of corporate governance practices varies between countries with difference legal framework and financial development (Doidge et al., 2007), it is likely that what is found in developed countries is not applicable in Vietnam. Indeed, the main findings in this thesis do not support what is commonly found in the developed countries context. For example, there is evidence that female directors increase bank performance in developed countries in the 2004-2010 period (García-Meca et al., 2015), however, female directors in Vietnamese banks are associated with lower bank performance in the 2006-2016 period.

Second, there is a large body of research on corporate governance and bank performance and risk-taking documented in the developed countries context. However, studies of corporate governance in developing countries are still limited. Studies regarding corporate governance and firm outcomes in the Vietnamese context are especially very limited, especially articles that are published in international ranked journals. We have only identified one study by Nguyen et al. (2015) investing the relationship between female directors and bank performance in Vietnamese listed non-financial firms; one study by Nguyen et al. (2016) exploring the relationship between minority foreign ownership resulting from the foreign strategic partnership programme and bank efficiency; and no studies regarding M&As in the financial sector. Hence, this is the first study using a hand-collected dataset of Vietnamese banks' accounting data and board composition data in the 2006-2016 period, to empirically examine whether board composition and M&As in the Vietnamese banking sector have an impact on banks' outcomes. The studies also employed rigorous tools, where applicable, to address the concern of endogeneity problems in financial studies.

6.2. Limitations of the thesis and recommendations for future research

Despite the above mentioned contributions, this thesis has some limitations. First, in terms of the data used in this thesis, like many studies in corporate governance, the sample selection process for the studies depends on the availability of data. The data is hand-collected from Vietnamese commercial banks' annual reports and financial statements. Therefore, the dataset is subject to some potential bias and shortcomings. First, the sample consists of both listed and unlisted banks. It is not required by law that unlisted banks publish financial notes along with their financial statements. Therefore, in the analysis of efficiency in Chapters 4 and 5, there are some firm-year observations with missing data on input prices, which have been excluded from the sample. Therefore, it is likely that the firms remaining in the sample are more transparent and better performing ones. If this is the case, the research may suffer from selection bias which hinders generalisation of the studies. Second, while non-performing loans are regarded as a direct and important measure of the quality of the loan portfolio of banks (Messai & Jouini, 2013), there is no reliable and comprehensive dataset of non-performing loans in Vietnamese banks due to changes in regulations regarding loan classifications, especially after 2011. This is really unfortunate because non-performing loans convey useful information in terms of risk-taking behaviours by banks, and the loan quality and efficiency of banks. Third, the number of observations in this study is quite small compared to a conventional finance study, which also hinders generalisation. Nevertheless, it should be noted that the small sample size is not rare in banking studies; for example, studies by Berger et al. (2009) in the Chinese context, and by Nguyen et al. (2015) in the Vietnamese context used a sample of from 300 to 500 observations. Additionally, Wintoki et al. (2012) suggest that, as board structure is highly persistent, which can reduce the power of panel data estimation using 2-year intervals instead of annual intervals could mitigate this concern. However, due to the small sample size, we use yearly data instead. Luckily, the period investigated is relatively long (11 years), which could capture the change in corporate governance over time. Nevertheless, in the several years to come, it would be good to re-conduct studies of corporate governance in Vietnam because there would be more degrees of freedom in the regressions, which in turn will enhance the validity and generalisability of the studies.

In terms of methodology, to be more conservative, the findings are not representing a "causal relationship", but rather the "association" between independent variables and the dependent variable. Even though we have tried our best to address potential endogeneity problems,

there are still concerns regarding endogeneity. In Chapter 3, we used a PSM matched sample, however, the covariates chosen to match the treated and untreated samples are limited due to the availability of data. Therefore, we cannot rule out the possibility that the treatment and control samples are different on some other characteristics. In Chapter 4, owing to the procedure to address endogeneity in the one-stage SFA framework still being developed, we also cannot rule out all endogeneity problems. Techniques to address endogeneity are not employed in the study reported in Chapter 5 owing to limited observations of M&A events. Future studies should, therefore, focus on finding a good instrument for the variable of interest to address the endogeneity problem.

In terms of the scope of the studies, first of all, because the data is hand-collected and limited, the studies are limited to investigating some observable board characteristics only, as proxies for how the board implements its decision-making processes. Nevertheless, these proxies are not even a close representation of how board members interact with each other and how a decision is made. Therefore, a survey approach might be an alternative method to understand how a certain director contributes to decision-making. In addition, the thesis does not take into account the interaction between board directors and managers. Managers are the ones who execute strategies proposed by the board. Therefore, the interaction between managers and the board would very likely affect firm outcomes. Hence, for future studies, it is suggested that survey studies exploring how the board operates as a decision-making group would provide much more insight as to how effective the board decision-making is. In addition, studies investigating the board in relation to managers, would potentially offer a channel by which directors affect firm outcomes. It would otherwise be better to include top managers' characteristics as control variables in modeling for the board-firm outcomes relationship.

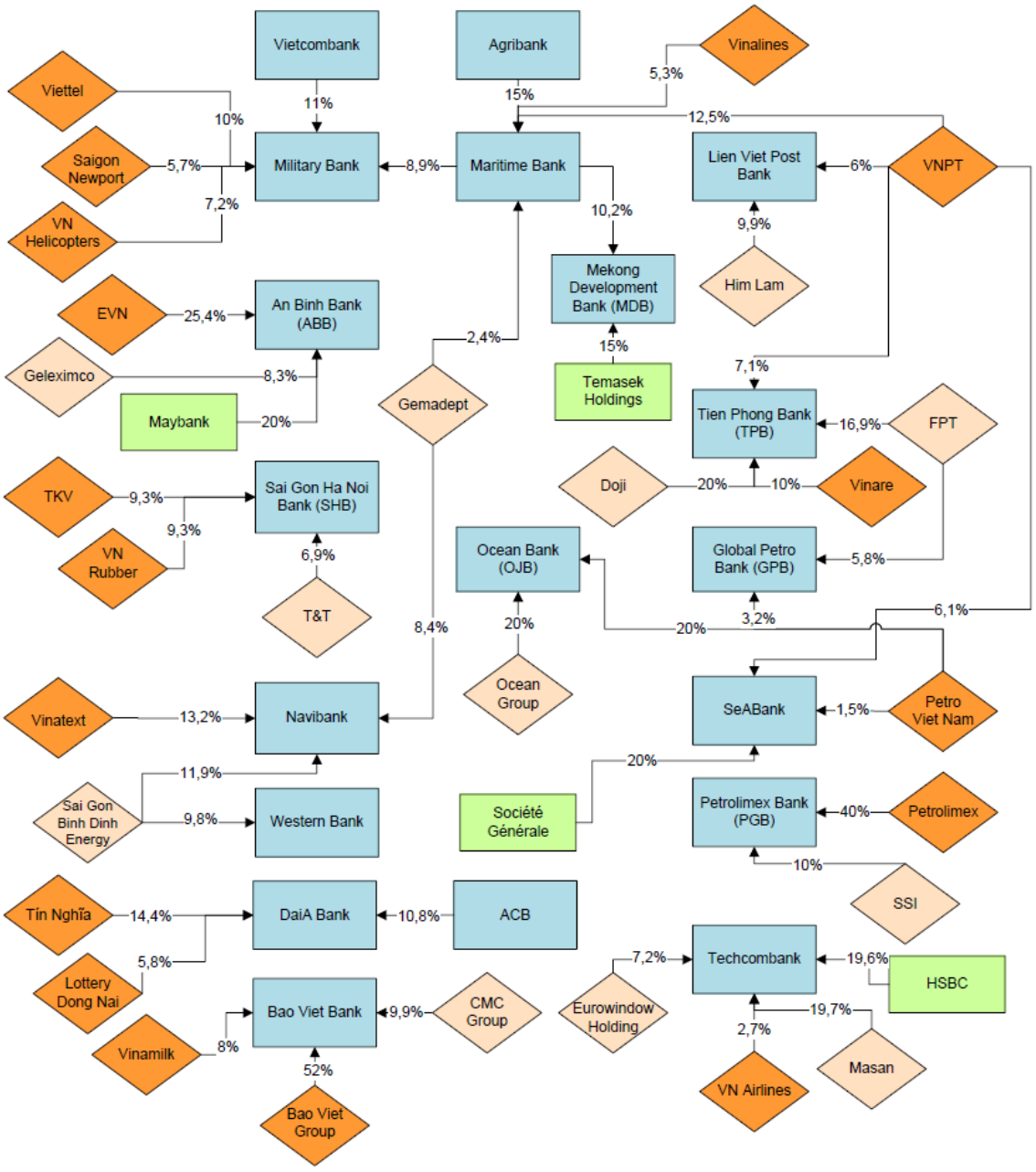
6.3. Summary

In this thesis, the effect of selective corporate governance mechanisms, which are the role of foreign directors on boards, the role of female directors on boards, and the impact of M&As, in relation to bank efficiency and risk-taking, are explored in the Vietnamese context. The relationships are examined under the insights of agency theory and resource dependency theory. The thesis contributes to the literature on the corporate governance of banks by providing pieces of evidence as to how corporate governance mechanisms in a country with weak institutional infrastructure for good corporate governance practices would work

differently, as compared to the situation in developed countries. Indeed, we find evidence that foreign directors are associated with higher risk-taking in Vietnamese banks after 2011 and banks with female directors on boards are likely to experience lower efficiency than their counterparts. We also find evidence that banks after M&As tend to have lower efficiency improvement compared to banks that do not engage in M&As during the investigated period. Various robustness checks are also employed in the empirical examinations where applicable. The findings imply an important policy implication that the government should undertake careful consideration in designing policies by adopting so-called “best practices” on corporate governance, as they might not work as intended in the Vietnamese context. The thesis also highlights its limitations and areas for improvement and future study.

Appendixes

Appendix1: Cross-ownership among State-owned enterprises (SOEs), corporations, international and commercial banks



(Source: Cross ownership of financial institutions and corporations in Vietnam – an assessment and recommendations, p.60, Fulbright Economics Teaching Program)

Appendix2: New regulation issued since 2010

Law 47/2010/QH12 dated 16, June 2010 (replacing the 1997 law on credit institutions) regulated the establishment, organisation, operation, special control, reorganisation and dissolution of credit institutions, foreign bank branches and representative offices of foreign credit institutions and other foreign institutions engaged in banking operations (the 2010 law). Notably, the new law added more regulations on corporate governance of credit institutions than the 1997 law (60 articles compared to 6 articles). The new law has provisions regarding stake limitation, organisation, structures of credit institutions, functions and tasks of administration/supervision/operation departments, roles of internal control departments, roles of external auditing, and requirements of managers, directors, relating parties, and so on.

Law 17/2017/QH14 dated 20, November 2017 amending and supplementing a number of articles of the Law 47/2010/QH12. The new law came into effect in January 15 2018. The new law concentrates on: (1) Dealing with credit institutions which are under special control by the SBV, including the merger and consolidation of the weak banks, the dissolution plan, and the bankruptcy plan among other aspects; and (2) other amendments aimed at improving the governance and operation of a credit institution.

Circular 02/2013/TT-NHNN dated 21 January 2013 regulated the classification of assets, the establishment and levels of risk provisions, and the use of provisions for dealing with risks in the operation of credit institutions and foreign bank branches. The classification of debt, and the use of provisions to deal with risks in this circular are based on Basel II standards.

Decree 53/2013/ND-CP dated 18 May 2013 set up the Vietnam Asset Management Corporation (VAMC). The establishment of VAMC aims to act as a tool for commercial banks to clear bad debts from their balance sheets. VAMC is a non-profit organisation, unlike DATC. Commercial banks will sell NPLs to VAMC, concurrently having to set aside 20% of the value of the bad debts as provisions each year for five years. This means that the bad debts were just transferred from the banks' balance sheets to VAMC's balance sheet. How to resolve the transferred assets is still a difficult question as infrastructure for selling bad debts are yet to be established, especially as selling land to foreigners is prohibited in Vietnam.

Circular 04/2010/TT-NHNN dated 11 February 2010 regulated merger, consolidation and acquisition of credit institutions (Circular 04). Circular 04 provides a legal framework for mergers, consolidations, and acquisitions for all types of credit institutions, including foreign banks, provided that the credit institutions submit a clear plan of actions to SBV for approval. Since 2011, there were eleven successful transitions. In particular, there was one consolidation in 2011, one merger in 2012, one consolidation and one merger in 2013, and four mergers and three state purchases in 2015. The M&As have reduced the number of banks by nine.

Circular 10/2011/TT-NHNN dated 22 April 2011 stipulated the criteria for selecting strategic shareholders for the equitised state-owned commercial banks, and Decree 01/2014/ND-CP dated 03 January 2014 on the purchase by foreign investors of shareholdings in Vietnamese credit institutions (Decree 01) replaced of Decree 69/2007/ND-CP dated 20 April 2007. The two regulations set out to encourage foreign investors to participate in domestic banks' businesses (both SOBs and private banks) to assist the banks in "modern technology transfer, developing banking products and services, raising financial, administration and management capacity". The shareholding limit for a strategic investor is 20%, and for all foreign investors and their related parties it is 30%. Foreign investors seem to have become more reluctant to invest in domestic banks, especially when Vietnamese banks are focusing their resources into resolving bad debts. Additionally, the shareholding caps prevent foreign investors from having enough power over managing the banks' businesses.

Appendix3: List of banks introducing foreign strategic investment

No	Banks	Code	Foreign Strategic Investors	Start date	Investment ratio (as % of total equity)	Notes
1	Commercial Bank for Foreign Trade of Vietnam	VCB	Mizuho Corporate Bank Ltd (Japan)	Sep-11	15%	
2	Vietnam Bank for Industry and Trade	CTG	The Bank of Tokyo UFJ, Ltd (Japan)	Dec-12	19.73%	IFC: 8.02%; others: 1.78%
			IFC (International)	Jan-11	10%	
3	Hanoi Building Bank	HBB	Deutsche Bank (Germany)	Oct-07	10%	Weak bank, HBB was merged to Sai Gon-Hanoi Bank in 2012. Deutsche Bank became a foreign investor at SHB with 3.42% ownership.
4	Saigon Thuong Tin Bank	STB	ANZ (Australia)	Mar-05	9.6%	ANZ divested in 01/2012. Eximbank took over the ANZ's shareholdings (9.6%). ANZ opened subsidiary in 2008.
5	Vietnam Export Import Bank	EIB	Sumitomo Mitsubishi (Japan)	Nov-07	15%	Vietcombank: 8.19%
6	Asia Commercial Bank	ACB	Standard Chartered Bank (UK)	Jul-05	15%	Dragon Financial Holdings: 6.81%; Connaught Investors Ltd: 7.26%. Standard Chartered divested from ACB in 2018.

No	Banks	Code	Foreign Strategic Investors	Start date	Investment ratio (as % of total equity)	Notes
7	Vietnam Prosperity Bank	VPB	Overseas Chinese Banking Corporation (Singapore)	Mar-06	15%	OCBC owned 10% in 3/2006; increased its ownership to 15% in 8/2008, and sold in 11/2013 to the banks' domestic investors
8	Vietnam Technological and Commercial Bank	TCB	HSBC (UK)	Dec-05	19.41%	Masan Corporation: 15%; HSBC established a subsidiary in 2008. HSBC divested from Techcombank in 2017.
9	Vietnam International Bank	VIB	Commonwealth Bank (Australia)	Sep-10	20%	
10	South-East Asia Bank	SEAB	Societe Generale (France)	Aug-08	20%	Other strategic investors: PetroVietnam, mobifone. Societe Generale divested in March 2019.
11	An Binh Bank	ABB	May Bank (Malaysia)	Mar-08	20%	May Bank increased its ownership from 15% in 2008 to 20% in 2009; IFC became a large shareholder with 10% ownership
12	Southern Bank	PNB	United Chinese Bank UOB (Singapore)	May-07	20%	Tram family: Tram Be: 8.36%, Tram Ngan: 4.42%, Tram Kieu: 7.36%, Tram Ngan: 4.79%, Tram Hoa: 2.10%. PNB was merged to Saccombank in 10/2015; UOB became small investor with 4.24%.

No	Banks	Code	Foreign Strategic Investors	Starting date	Investment ratio (as % of total equity)	Notes
13	Orient Commercial Bank	OCB	BNP Paribas (France)	Dec-07	21.06%	Vietcombank: 3.52%; Ben Thanh joint stock company: 8.53%. BNP Paribas divested in 2018.
14	Saigon Commercial Bank	SCB	Macquarie capital (Australia)	Nov-11	14%	Weak bank, merged with First Bank, Tin Nghia Bank in 2012.
15	MeKong Development Bank	MDB	Fullerton Financial Holdings Pte. Ltd.	Dec-10	20%	Maritime bank: 9.36%; Phuc Kien investment company: 10%. MDB was merged into Maritime bank in 2015. FFH divested in 2015, right before MDB merged into Maritime Bank.

Appendix4: Testing the "bad management" hypothesis vs the "bad luck" hypothesis, following Berger and DeYoung (1997)

According to the "bad management" hypothesis, low measured efficiency is the result of poor management practices by senior managers, including managing day to day operations and the loan portfolio. Poor monitoring practices, as a result, lead to a high number of non-performing loans. Thus, under the bad management hypothesis, the low efficiency is expected to occur before non-performing loans. As a result, we would expect the significant negative relationship between the lag values of efficiency and non-performing loans. In contrast, the "bad luck" hypothesis states that external events (e.g. global financial crisis, the European debt crisis) have a negative spill-over effect on the economic conditions, hence, leading to an increase in non-performing loans. As a result, banks begin to spend extra operating costs dealing with these problem loans. As most of the costs, for example, the costs associated with loan workout and default, are incurred after the increase in the problem loans, we would expect a significant negative relationship between lag values of non-performing loans and efficiency. In the Vietnamese bank context, the ratio of loan loss provisions to total loans is used as a proxy for the extent of non-performing loans. Accordingly, we have two fixed effect regressions as below. As the data is deflated, the year effect is excluded from the regressions.

The bad management model:

$$LLP_{i,t} = LLP_{i,t-1} + Effiency_{i,t-1} + CAR_{i,t} + LTD_{i,t} + \varepsilon_{i,t} \ (I)$$

The bad luck model:

$$Effiency_{i,t} = Effiency_{i,t-1} + LLP_{i,t-1} + CAR_{i,t} + LTD_{i,t} + \varepsilon_{i,t} \ (II)$$

where:

LLP is the loan loss provision-to-customer loan ratio; and

Efficiency is the efficiency scores estimated by DEA window analysis.

Two controlling variables are:

CAR is the total equity-to-total asset ratio; and

LTD is the loan-to-deposit ratio.

The results are reported in Table 1 below:

Table 1: Bad management hypothesis vs bad luck hypothesis

Variables	Model I		Model II	
	LLP (1)	LLP (2)	Efficiency_1 (Value-added approach) (3)	Efficiency_2 (Revenue approach) (4)
Lag 1 of LLP	0.495***	0.489***	1.791	3.777*
	(9.58)	(9.48)	(1.04)	(2.30)
Lag 1 of efficiency_2	-0.00533*			0.458***
	(-2.47)			(6.67)
Lag 1 of efficiency_1		-0.00561**	0.358***	
		(-2.67)	(5.12)	
CAR	0.0136	0.0127	-0.385	-0.345
	(1.51)	(1.41)	(-1.29)	(-1.21)
LTD	-0.00159	-0.00125	-0.0930	-0.0511
	(-0.79)	(-0.62)	(-1.37)	(-0.79)
Constant	0.0111***	0.0111***	0.627***	0.480***
	(4.29)	(4.45)	(7.53)	(5.85)
N	200	200	200	200

t-statistics in parentheses *p<0.05; ** p<0.01; ***p<0.001

As can be seen from Table 1, the results of columns (1) and (2) suggest that the loan loss provisions have a significant negative relationship with the first lag of the efficiency, indicating that low efficiency leads to a higher loan loss provision-to-customer loan ratio. The relationship is robust in both methods estimating efficiency (i.e. the value-added approach and the revenue approach). These results support the bad management hypothesis (Model I). The results of Model II, on the other hand, do not support the bad luck hypothesis. The positive coefficients in columns (3) and (4) suggest that the higher the loan loss provision-to-customer loan ratio, the higher the efficiency, which is contradictory to what the bad luck hypothesis predicts.

Appendix5: Bootstrap method proposed by Simar and Wilson (2007)

Simar and Wilson (2007) propose the two bootstrap procedures,[91] namely single bootstrap and double bootstrap, to overcome the serial correlation problem which occurs among efficiency scores; thus, yields are consistent with the inference of the second stage regression (i.e. the relationship between the environmental variables and efficiencies). The double bootstrap is preferable, but both can be used for robustness checks (Simar & Wilson, 2007). Following Simar and Wilson (2007) and Badunenko and Tauchmann (2018), the single bootstrap employed to estimate technical efficiency can be generalised as:

- The production function has the below form (Equation (A-1):

$$\boldsymbol{F} = \{(\boldsymbol{x}, \boldsymbol{y}) \in \boldsymbol{R}_{+}^{\boldsymbol{N}} \times \boldsymbol{R}_{+}^{\boldsymbol{M}} : x\ can\ produce\ y\} \quad \text{(A-1)}$$

As the population F is unobserved, the output oriented technical (in)efficiency of DMU *i*, we cannot obtain the true value of efficiency ∂; instead, $\hat{\partial}$ is estimated using DEA on the sample f, which is the sub of F.

- We also assume the true relationship between efficiency ∂ and environmental variables is given by:

$$\partial_i = Z_j\beta + \omega_j, j = 1, \ldots, \quad \text{(A-2)}$$

where Z_j is a row vector of firm-specific variables that are expected to influence the efficiency. As we can obtain only $\hat{\partial}$, instead of ∂, $\hat{\partial}$ is used in a truncated regression (left truncated at 1) of $\hat{\partial}_t$ on Z_j to obtain coefficient estimates of β (called $\hat{\beta}$) and the estimated standard deviation of the error term ω (called $\hat{\sigma}_\omega$).

- Loop over the following steps in order B times, in order to obtain a set of B bootstrap estimates $(\widehat{\beta^b}, \widehat{\sigma_\omega^b})$, with b = 1,….,B:

- For each DMU i = 1, . . . , M, draw an artificial error $\hat{\sigma}_{\omega i}$ from the truncated N(0, $\hat{\sigma}_\omega{}^2$) distribution with left-truncation at $1 - Z_j\beta$;
- Calculate artificial efficiency scores $\hat{\partial}_i$ as $Z_j\hat{\beta} + \hat{\sigma}_{\omega i}$ for each DMU i = 1, . . . , M;
- Run a truncated regression (left-truncation at 1) of $\hat{\partial}_i$ on Z_j to obtain maximum likelihood, bootstrap estimates $\widehat{\beta^b}$ and $\widehat{\sigma_\omega^b}$; and

- Lastly, calculate confidence intervals and standard errors for $\hat{\beta}$ and $\hat{\sigma}_\omega$ from the bootstrap distribution of $\widehat{\beta^b}$ and $\widehat{\sigma_\omega^b}$.

[91] In essence, the bootstrap technique is used to increase the sample size by resembling a dataset with replacement.

Appendix6: Vietnamese banks included in the sample for the M&A study

No.	Banks
1	Eximbank
2	Nam A Bank
3	An Binh Bank
4	BIDV
5	Quan Doi Bank
6	Lien Viet Bank
7	Saigon Commercial Bank (SGB)
8	Vietinbank (CTG)
9	Vietnam Thinhvuong Bank (VPB)
10	Vietcombank (VCB)
11	A Chau Bank (ACB)
12	Techcombank
13	Nam Viet Bank (NVB)
14	TienPhong Bank (Tpbank)
15	Saigon Bank (SCB)
16	Hdbank (phat trien nha HCM)
17	Vietcapital Bank (Ban Viet)
18	Vietnam International Bank (VIB)
19	SEA Bank (NH Dong Nam A)
20	SHB (sai gon - hanoi)
21	Saccombank (STB)
22	Maritime Bank (MSB)
23	Oricombank
24	Kien Long Bank
25	Petrolimex Bank (PGbank)

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