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Three essays on efficiency, motivations for foreign entry, and competition and risk in South East Asian Banking

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Three Essays on Efficiency, Motivations for Foreign Entry, and Competition and Risk in South East Asian Banking

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Summary

Essay 1

This paper explores the efficiency of banks and its determinants in the South East Asian region using the DEA technique and Tobit regression. Efficiency was found to decline significantly between 1998 and 2004, suggesting that the effects of deregulation were slow to materialise. Being consistent with comparative studies in emerging markets, foreign banks appear to be more efficient than their domestic counterparts but, conflicting with the general expectation; state-owned banks are less inefficient than private players. Banks with higher levels of government ownership are more technically efficient while those with greater private stakes obtained lower levels of technical (and cost) efficiency. Among country-level factors, national banking sector development is found to have a strong and positive link with bank efficiency. The results are robust to different modelling specifications.

Essay 2

This paper examines the motivations for foreign bank entry into South East Asian countries in the aftermath of the 1997 financial crisis. The results show that manufacturing FDI and bilateral trade exert a weak impact on the decision of entry by foreign banks, providing little evidence for the argument that banks follow their home customers abroad as suggested by one strand of the literature. In contrast, local profit opportunities appear to be the prominent factor attracting foreign bank penetration in South East Asia during the period 1998 to 2004. The results are robust to different modelling techniques.

Essay 3

This paper investigates the effects of competition on risk-taking behaviour at the bank level in South East Asia. The Panzar and Rosse (1987) H-statistic is used as a measure of banking competition for a study of commercial banks from a sample of four countries in South East Asia (Indonesia, Malaysia, Philippines and Vietnam) and we show that it is not necessary for policy makers to increase bank systemic risk in return for a more competitive banking system. In contrast, the results reveal that competition helps to decrease instability. Our results are robust to alternative risk indicators, different H-statistic modelling and specifications.

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List of Abbreviations

ADB	Asian Development Bank
AE	Allocative Efficiency
AMC	Assets Management Corporation
ASEAN	Association of Southeast Asian Nations
BIBF	Bangkok International Banking Facility
BIS	Bank for International Settlements
CD	Certificate of Deposit
CE	Cost Efficiency
CIA	Central Intelligence Agency
CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
DMU	Decision Making Unit
FDI	Foreign Direct Investment
FRA	Financial Sector Restructuring Authority
FSMP	Financial Sector Master Plan
GCC	Gulf Co-Operation Council
GDP	Gross Domestic Product
GLS	Generalized Least Squares
GMM	Generalized Method of Moments
GNP	Gross National Product
IFC	International Finance Corporation
IMF	International Monetary Fund
LLP	Loan-Loss Provision
LLR	Loan-Loss Reserve
NPL	Non-Performing Loan
OCC	Office of the Comptroller of the Currency
OECD	Organisation for Economic Co-Operation and Development
OLS	Ordinary Least Squares
ROA	Return on Assets
ROE	Return on Equity

S-C-P	Structure-Conduct-Performance
SEA	South East Asia
SFA	Stochastic Frontier Approach
TDRI	Thailand Development Research Institute
TE	Technical Efficiency
UAE	United Arab Emirates
VRS	Variable Returns to Scale
WBG	World Bank Guide
WTO	World Trade Organization

Chapter 1

General Introduction

In order to foster economic growth, the financial sector has to be efficient and stable[1]. Liberalization of financial systems that took place in many countries in the early 1990s mainly aimed to promote efficiency through stimulating competition. However, the recurrence of financial crises once again reminded policy makers of the costly outcomes of deregulation as well as emphasizing the importance of a prudential regulatory framework to lessen systemic fragility. While the efficiency improvements thanks to liberalization and competition are not guaranteed and given that undesired consequences of market failures may appear, more empirical analysis on the subject of liberalization and banking sector efficiency is important from a policy perspective.

In an attempt to contribute to the release of prudential supervision and regulation, this thesis presents three studies that examine five South East Asian banking system: Indonesia, Malaysia, Philippines, Thailand and Vietnam. The period of study is from 1998 to 2004. There are two reasons why this period is selected. The main reason is that although most countries in the sample started to liberalize their financial systems in the early 1990s, in the period prior up to 1998, policy makers mainly focused on deregulation while they paid less attention to the supervisory framework. Having being awakened by the crisis, the authorities turned to improve regulation and supervision (Table 1.1). Therefore, analysis of the post-1997 period aims to capture changes in regulation. A second reason why we look at this period relates to data limitations on the respective banking systems in 1997 because of the Asian crisis.

Table 1.1. *Deregulation in South East Asian banking, pre- and post-1998 period*

Pre-1998 - Deregulation focus	Post-1998 - Regulation and supervision focus
• Abandon fixed exchange rates • Liberalize capital account • Remove interest rate ceilings • Reduce banking entry barriers, but to some degree (foreign bank entry, branching) • Relax activity restrictions (real estate lending, derivatives, foreign currency transactions)	• Enhance capital adequacy ratios (applying stress tests, adopting BIS rules) in Indonesia • Redefine and tighten NPL and LLP rules; moving towards international accounting standards in Thailand and Vietnam • Develop deposit insurance schemes in Indonesia and Vietnam • Encourage bank consolidation to build a resilient financial system

Note: Bank for International Settlements (2001, p. 85); Bank Indonesia, Annual Report (2000, p. 114 and 2001, p. 149); Bank of Thailand, Annual Report, (1998 and 1999); State Bank of Vietnam, Annual Report, (2002); Surveys by Bekaert and Harvey (2004); The Economist (2004, p. 87)

[1] A well-established literature has examined the causality between finance and economic growth and a substantial number of studies have suggested that financial development leads economic growth. For theoretical reviews, see, for example, Fry (1997); Hermes (1994); King and Levine (1993); Levine (1997) and Levine (2004), for empirical evidences, see, for example, Arestis, Demetriades and Luintel (2001); Beck and Levine (2004); Fase and Abma (2003); Levine, Loayza and Beck (2000); Levine and Zervos (1996); and Rousseau and Wachtel (2000). For evidence on the leading role of growth, see, Ang and McKibbin (2007), on bidirectional relationship between growth and finance, see, for example, Al-Yousif (2002)

1.1. The Financial Crisis in Asia

The Asian crisis commenced in mid-1997, about a decade after financial liberalization was implemented, and affected local currencies, financial sectors, and asset prices of several countries in the East Asian region. Among countries included in our study, Indonesia and Thailand were the two most affected countries, Malaysia and Philippines were less affected and Vietnam was relatively unaffected. Over the three years prior to 1997, on average, Asia attracted approximately half of the total private capital inflows into developing economies (IMF, 1998). However, when the US raised interest rates to control for inflation in the mid-1990s, which made the US become a more attractive enviroment for investors compared to the South East Asian region, foreign capital outflows started. This increased the value of US dollar, to which local currencies were pegged and, subsequently, decreased the value of exports from Asian countries, deteriorating the current account deficits further.

In the area of finance, the collapse of property values (that had grown rapidly due to the substantial foreign direct investment inflows) severely impacted on the banking sector where real estate lending had substantially developed without adequate risk management. As the asset price bubble bust (partially because of capital outflows), non-performing loans over total loans in commercial banks reached over 48% in Indonesia and 45% in Thailand by December 1998 (World Bank, 2005b, p. 59). The crisis was reputed as being the most serious economic slump since the Second World War (McNeill and Bockman, 1998). This impelled the largest financial rescue packages in history of over USD112 billion from the IMF, provided to Indonesia, Thailand and South Korea (Lane, Ghosh, Hamann, Phillips, Schulze-Ghattas, & Tsikata, 1999). Costs to resolve the financial sector crises accounted for over 50% and 40% of GDP in Indonesia and Thailand, respectively (Haggarth, Reis, & Saporta, 2002).

While there is a general consensus as to the occurrence and consequences of the crisis, economists have offered two conflicting (but not mutually exclusive) views on the causes of the crisis. On the one hand, some (Corsetti, Pesenti, & Roubini, 1999; Krugman, 1998) suggest that the Asian crisis was due to policy distortions originating from excessive government intervention and (explicit or implicit) guarantees against loss, particularly in financial markets, which posed a serious moral hazard problem and resulted in overinvestment in risky projects. On the other hand, others (Radelet & Sachs 1998; Marshall, 1998) see this turmoil is more related to weaknesses of domestic corporate

governance in (mis-)allocating credit (particuarly to speculative real estate) and in responding to sudden shocks as a consequence of investors' panic[2].

1.2. The Three Essays in Brief

The process of further financial liberalization in South East Asia post the above-mentioned crisis makes this region become an interesting 'laboratory' to study the effects of deregulation. As mentioned, this thesis contains three related essays on various aspects of financial liberalization. Specifically, the first essay aims to investigate the effects of deregulation on the efficiency of banking institutions; the second analyses the motivations for foreign bank entry and the third examines the relationship between market competition and risk-taking behaviour of commercial banks in South East Asian banking.

Even though many developing countries have liberalized their financial systems, whether financial deregulation can enhance efficiency in the banking sector is still open to empirical debate. Some researchers provide evidence supporting the view that liberalization increases bank efficiency (Gilbert & Wilson, 1998; Hasan & Marton, 2003; Isik & Hanssan, 2003; Sturm & Williams, 2004; Ziam, 1995). Others, in contrast, find evidence against this relationship (Denizer, Dinc, & Tarimcilar, 2000; Grabowski, Rangan, & Rezvanian, 1994; Grifell-Tajie & Lovell, 1996; Williams & Intarachote, 2003). Still, efficiency changes are sometimes shown to depend on size (Altunbas, Gardener, Molyneux, & Moore, 2001; Elyasiani & Mehdian, 1995) and ownership structure (Bhattacharyya, Lovell, & Sahay, 1997) of banking firms. In addition, different techniques have been employed in efficiency studies and also there is no consensus as to the definition of bank inputs and outputs which complicate comparison of the evidence even further. Studies of bank efficiency up to the late 1990s had mainly been conducted on advanced economies (Molyneux, Altunbas, & Gardener, 1996; Berger & Humphrey, 1997). In our view, the lack of empirical evidence on less developed nations provides a justification for further study on bank efficiency, especially as this may yield useful policy

[2] For discussions of the causes and consequences of the crisis, see, for example, Jomo (1998); Krugman (1998); Nixson and Walters (1999); Radelet and Sachs (1998); Stiglitz (1998); Wade (1998); Woo, Sachs, and Schwab (2000). For discussions of individual countries, see, Robison and Rosser (1998) (Indonesia); Jomo (1998) (Malaysia); Lim (1998) (Philippines); Lauridsen (1998) (Thailand); Chang (1998) (South Korea). For evidence on costs of restructuring financial systems, see, Hoggarth, Reis, and Saporta (2002). For a detailed chronology of the first six months of the crisis, see, ADB (1998, p. 21). For some facts and figures concerning the financial rescue packages from the IMF, see, Lane et al. (1999).

implications. Thus, the first essay examines the determinants of efficiency in South East Asian banking in the aftermath of the financial crisis.

In particular, the first essay applies data envelopment analysis (DEA) to a sample of banks in five South East Asian countries to estimate the levels of X-efficiency. The results reveal that foreign banks are more efficient than domestic institutions. This is consistent with most comparative performance analysis in developing countries using both accounting ratios (Barajas, Steiner, & Salazar, 1999; Claessens, Demirgüc-Kunt, & Huizinga, 2001; Denizer, 2000) and frontier approaches (Bonin, Hasan, & Wachtel, 2005; Hasan & Marton, 2003; Havrylchyk, 2005; Kraft, Hofler, & Payne, 2002; Weil, 2003; Williams & Intarachote, 2003). Within domestic banking sectors, interestingly, state-owned banks are found to be less inefficient than privately-owned banks, conflicting with the general view of mis-management associated with state ownership. In the second stage, Tobit regression technique is employed to investigate the determinants of efficiency. The results suggest that, at a country level, average credits to the private sector by the banking system significantly increase efficiency of banks. At the bank level, those institutions with more equity capital appear to be more efficient. In addition, there is some evidence that large institutions are less cost and allocatively efficient than small institutions even though the former is more technically efficient. Banks that are efficient in allocating internal resources tend to be more profitable. Overall, following the second reforms, it appears that efficiency in the South East Asian banking sector experiences a downward trend from 1998 to 2004, suggesting that efficiency gains are not soon realised after liberalization. These results are robust to different model specifications.

As another cornerstone of financial liberalization, the opening of domestic markets to foreign firms has also been widely adopted by developing countries around the globe. Studies of the effects of foreign bank entry on local banking market generally find that foreign bank participation pushes domestic partners to reduce overhead costs and diversify banking services (Claessens et al., 2001; Denizer, 2000; Peria & Mody, 2004). Meanwhile, some studies have shown that foreign banks only 'cherry pick' certain market segments where they have advantages (Bhattacharya, 1993). If this is true, the cost improvements by domestic banks, as a result of foreign bank presence, should just occur in segments where foreign competitors are involved. Other 'ignored' market niches would not benefit from the existence of foreign banks in the local banking market. Policy makers are then concerned about the favoured effects of foreign entry: are these effects widespread or focused on some (and which) segments? For this reason, the knowledge of

the underlying motivations for banks to expand overseas is clearly relevant for regulators. Therefore, the second essay aims to analyse the motivations for foreign bank entry in South East Asia.

Theories suggest two reasons for banks to expand globally (1) banks follow their home clients overseas and (2) banks enter foreign countries to exploit local business opportunities. While the evidence on the first hypothesis is relatively well established, empirical studies on the second motive for expansion are sparse and typically focus on developed countries. In this second essay, locally based foreign banks are defined to have at least 10% of share owned by overseas banks. The presence of foreign banks in domestic markets is alternatively measured by the percentage of foreign bank share and foreign bank assets to total banking assets. We examine the aforementioned motivations for foreign expansion using a single model and applying four different techniques. The results indicate that there is little evidence to support the customer-following hypothesis, measured by one-way FDI and bilateral trade between home and host countries. On the other hand, local business opportunities, measured by the bank's profits and the host banking system's cost efficiency, appear to be the significant factors that attract foreign banks to enter South East Asian market over the period 1998 to 2004.

Apart from the benefits that are believed to accrue to the domestic banking system, foreign banks have also been claimed to force domestic banks to take-on more risk (Barajas et al., 1999, p. 35; Claessens et al., 2001, p. 909; Gardener, Molyneux, Moore, & Winters, 2000, p. 235; Kim & Lee, 2004, p. 26; Unite & Sullivan, 2003; p. 2343) by intensifying market competition. The argument is that, upon facing competition from foreign partners, domestic banks may shift their loan portfolio to less creditworthy borrowers to retain market share and profits. This shifting may increase adverse selection problems and ultimately lead to increased systemic risk. Fostering competition is one of the major objectives of financial deregulation. Not only foreign bank entry relaxation but also activity diversification and other market-oriented policies serve the purpose of stimulating competition in banking. It is important for policy makers to understand if a positive relationship between competition and risk exists as this may influence bank licensing and entry.

Empirical studies on the relationship between competition and risk typically present ambiguous findings. Most of these studies are subject to criticism due to weak proxy measures for risk or competition (Boyd & De Nicolo, 2005). Furthermore, new empirical evidence on the relationship between competition (measured by indicators other

than structural indicators, such as entry barriers) and concentration now suggests that concentration may measure something else beyond market power (Beck, Demirgüc-Kunt, & Levine, 2006, p. 1599). This is because the presumed negative relationship between concentration and competition does not always hold as previously believed. This casts doubt on empirical studies that use concentration ratios to infer competition. In order to suggest implications to policy makers in the South East Asian region, the third essay attempts to explore the relationship between competition and bank risk-taking.

Following a non-structural approach, the Panzar-Rosse H-statistic is calculated to measure competitive pressure in the South East Asian commercial banking sector using various modelling techniques including dynamic panel estimates. Risk indicators, on the other hand, are alternatively proxied by loan-loss reserves, loan-loss provisions, ROA volatility and the Z index (at the bank level). The results show that it is not necessary for policy makers to increase bank systemic risk in return for a more competitive banking system. In contrast, competition helps to decrease instability. In other words, the trade-off between competition policy and financial stability does not appear to exist in South East Asian banking systems.

1.3. The Overall Structure of the Thesis

The structure of this thesis is as follows. Chapter 2 presents an overview of financial systems and some details on foreign bank presence in each country in the sample. This provides a background understanding of the banking context before moving onto the empirical modelling in the three specific essays.

Chapter 3 introduces the first essay. As mentioned, this essay aims to investigate the determinants of efficiency of banking institutions and how efficiency has changed after 1998. This is a period characterised by various reforms including relaxation on foreign bank ownership limits. The thesis then moves onto chapter 4 where the second essay is presented. In this chapter, the motivations for foreign bank expansion in South East Asia are analysed. Chapter 5 contains the final essay, which examines the relationship between competition and risk-taking in South East Asian banking. The overall conclusions for each of the three essays are presented in chapter 6.

Chapter 2

Overview of the Financial Sector in South East Asia

This chapter presents an overview of the structure of financial systems in the five South East Asian countries (Indonesia, Malaysia, Philippines, Thailand and Vietnam) that are studied in this thesis. In particular, we focus our analysis on the various financial reforms and foreign bank entry. The aim of this chapter is to provide the institutional backdrop to the latter empirical studies.

2.1. Indonesia

The structure of the Indonesian financial system is characterised by the dominance of the banking sector and the return of bank ownership to government hands, particularly after the restructuring programme that took place following the financial crisis of 1997/1998. The banking sector accounts for 90% of the total assets of the whole financial system (World Bank, 2003, p. 15). In turn, around 74% of the banking assets are controlled by 15 major banks of which 11 are recapitalized banks from public funds (Bank Indonesia, Financial Stability Review, April 2005, p. 9). Government ownership[1] in Indonesian banking, albeit declining following the divestment of government capital, is substantial and amounts to around 50% of the banking sector (Batunanggar, 2002, p. 16). There are three types of bank in Indonesia: commercial banks, regional development banks and rural banks[2].

2.1.1. *Financial Sector Reforms*

The initial reforms in Indonesian banking took place in 1988 when the sector was opened to new entrants, restrictions on foreign exchange transaction were reduced and access of local banks to international financial markets was facilitated (Zhuang, Edwards, & Capulong, 2001, p. 5). The relaxation of entry led to rapid growth in the number of commercial banks. About 73 commercial banks and 301 commercial bank branches were licensed to operate within two years (Batunanggar, 2002, p. 4), increasing the number of commercial banks in early 1990 to 125 banks. However, uniform prudential supervision principles were not introduced until 1991 and these principles (such as minimum capital adequacy requirements) had not been effectively implemented before 1998 because Indonesia had faced a major domestic banking crisis from 1992 to 1994 just three years

[1] Banks belonging to a specific ownership category (state, private and foreign) are defined according to the respective groups if their equity is at least 50% owned by the respective category. The definition applies throughout this thesis if not otherwise stated.

[2] In terms of scope of activities and geographical presence, regional development banks and rural banks are more limited than commercial banks. The two formers normally operate in local areas with narrower range of customers while commercial banks do businesses nationwide with broader customer base.

before the regional financial crisis in 1997/1998. Therefore, the banking system lacked an effective supervisory framework for nearly a decade after deregulation.

In order to rebuild the financial system after the 1997/1998 crisis, the authorities implemented a bank restructuring programme by establishing the Indonesian Bank Restructuring Authority. The aim of this authority was to enhance bank capital through recapitalization and to restructure failed bank's debts. The recapitalization programme was completed at the end of the 2000 and the government capital in those recapitalized banks was gradually divested when a secondary market in government recapitalization bonds commenced trading in 2001 (Bank Indonesia, Annual Report, 2001, p. 129). The debt restructuring programme, on the other hand, aimed at reducing banks non-performing loans. From a regulatory perspective, the Indonesian banking authorities introduce risk-based capital adequacy requirements into the local banking market and moved from compliance-based towards risk-based supervision. The main regulatory framework is to effectively adopt Basel I principles.

The banking policy of the Indonesian government just after the crisis typically focuses on two major tasks: the bank restructuring programme, as mentioned, and the sound banking construction programme (Bank Indonesia, Annual Report, various issues, 2000-2004). In 2005, besides the acceleration of building up a more resilient banking system and prudent supervision, a bank consolidation process was encouraged to further strengthen bank capital. In July, 2005 the central bank publicised criteria for anchor (key) banks that could acquire other banks[3]. Various business restrictions were also planned to link with bank capital as a further step towards a more stable banking sector.

After having experienced painful restructuring since 1998, the number of commercial banks in Indonesia had fallen to 131 by October 2006 (compared with 222 in 1997, Bank Indonesia, Financial Statistics, 2007).

[3] These criteria include, among others, minimum capital adequacy ratios of 12%, ROA 1.5%, loan growth 22%, loan to deposits ratio 50% and net NPL below 5%. The bank has to be a publicly listed bank or plan to list in the near future and is capable to take action as consolidators. Moreover, the central bank issued regulations to require banks to increase their capital to at least Rp.80 billion by the end of 2007 and by the end of 2010 the minimum level of capital must be Rp.100 billion. Those banks that do not satisfy the required capital level will be subject to merge or be acquired (World Bank, 2005a, p. 15). In the next 10 to 15 years, bank will be classified as Restricted Scope, Focused Banks, National Banks and International Banks depending on the size of their capital. Accordingly, restricted banks must have the lowest capital level up to Rp.100 billion and international banks the highest capital will require to have more than Rp.50 trillion of capital (Indonesian Banking Booklet, 2006, p. 27).

2.1.2. *Foreign Bank Access*

One year after liberalizing the financial sector in 1989, foreign banks were authorised to set up joint-ventures in Indonesia with foreign paid-in capital up to 85% (Chou, 2000, p. 57). The underlying rationale for the relaxation of foreign entry was the demand for foreign capital and the stimulation of competition in the domestic banking market. Three years later, in 1992, alongside the implementation of the Bank Act of 1992, foreign banks were permitted to acquire up to 49% of share in domestic private banks (Bekaert & Harvey, 2004).

In Indonesia, foreign banks' physical presence could be classified into three categories. Specifically, those operate as representative offices; branches and joint-ventures. Foreign bank branches operate under different regulations from their joint-venture and domestic counterparts. Previously, foreign bank branches were only allowed to open offices in 10 provincial cities. However, this geographical restriction was fully removed in 1999 (Goeltom, 2006, p. 244). In 2004, there were 11 foreign bank branches in Indonesia with total assets accounting for 8.8% of banking sector assets, if foreign joint-venture banks are included, the share of foreign banks in Indonesia amounts to 12.8%, increasing 5% compared to 1996 (Bank Indonesia, Financial Stability Review, June 2004, p. 80). In contrast to foreign bank branches, foreign joint-venture banks are locally incorporated. Most joint-venture banks are now operated more or less similarly to foreign bank subsidiaries since regulations have allowed foreign partners to acquire shares in domestic banks up to 99% since 1999 (Bank Indonesia Regulation No. 2/27/PBI/2000, 2000, p. 5). However, these foreign joint-venture banks have to retain 1% of share to domestic owners. In such cases, they are also required to maintain 50% of local staff in their management team (Feridhanusetyawan, Aswicahyono, Suhut, Anas, & Nurkemala, 2000, p. 10). Greenfield subsidiaries are not allowed in Indonesia (BIS, 2001, p. 87).

2.2. Malaysia

Unlike Indonesia and other countries in South East Asia, the Malaysian financial system is somewhat less dominated by the banking sector. The ratio of bank assets over total financial sector assets in 2005 amounted to 84%, compared to 65% in 1997 (Beck, Demirgüc-Kunt, & Levine, 2000, updated September 2006). Therefore, the sources of financing do not rely as heavily on bank intermediation. The difference in credit granted to the private sector as a share of total GDP between total financial institutions and banking institutions is about 36% on average over 1998 and 2005 period (Beck et al., 2000,

updated September 2006). On the deposit side, the similar figure is calculated of 28%. This compares to Indonesia and Vietnam where the difference between bank and total financial sector financing is approximately zero (Beck et al., 2000, updated September 2006). Moreover, in contrast to Indonesia where the government controls significant stakes in some large commercial banks, in Malaysia, more-than-fifty-percent government shareholding only exists in one commercial bank in addition to four specialised banking institutions. Combined assets of all these five government-owned banks just account for about 3% of total banking sector assets (Bankscope, 2004).

2.2.1. *Financial Sector Reforms*

Malaysia first liberalized interest rates and capital accounts in 1978 and introduced a base lending rate five years later in 1983 (Bekaert & Harvey, 2004). Due to inadequate supervision and a weak regulatory framework for deposit-taking cooperatives, Malaysia faced a domestic banking crisis between 1985 and 1988 that led to the failure of a number of deposit-taking institutions. These developments pushed the Malaysian central bank to implement more formal prudential supervision of deposit-taking firms, and regulation was then tightened. Further liberalization steps were taken in 1992 by the elimination of all controls over interest rates. Banking consolidation was encouraged by the central bank to stabilize the financial system. In 1994, a two-tier framework was introduced for commercial banks. Tier I banks were those that had paid-up capital of at least RM500 million and had to meet other undisclosed requirements. Banks in this category faced less activity restrictions and capital requirements than banks in Tier II, those that failed to meet the mentioned conditions. This process, however, was not a success because Tier II banks (with lower capital levels) rushed to raise new capital that led to credit and assets growth of over 20% in the period 1993 to 1997 (the two-tier framework was removed in 1999, Detragiache & Gupta, 2004).

Facing the 1997/1998 financial crisis, Malaysia was not severely affected by a banking crisis as other countries like Indonesia and Thailand. The consequences of the crises were not systemic, but concentrated on two banks: Bank Bumiputra and Sime Bank. Non-performing loans in these two banks accounted for over 20% those of the banking sector (Chua, 2003). However, Malaysia took similar approaches to Indonesia to resolve the banks' problems by establishing two agencies, Danaharta and Danamodal, to restructure non-performing loans and to inject capital to selected banks. As a result,

Malaysia post-crisis task, to a large extent, concentrated on encouraging local banks to merge.

After implementing the consolidation programme among domestic banking institutions, the number of domestic commercial banks declined from 17 in 2000 to 10 by 2005. There are 23 commercial banks of which 13 are foreign-owned, 10 merchant banks and 6 Islamic banks in Malaysia (Bank Negara Malaysia, Annual Report, 2005).

2.2.2. *Foreign Bank Access*

Malaysia is the only country in South East Asia which did not further liberalize foreign bank entry after the 1997/1998 crisis. In terms of number, the last license granted to a foreign bank to operate in Malaysia was in 1973[4] (Tschoegl, 2003). In terms of ownership, foreign banks were allowed to acquire up to 30% of the shares in domestic banks (Coppel & Davies, 2003). This limit was imposed in 1989 when the Banking and Financial Institution Act became effective and this limit has remained unchanged.

Historically, foreign banks held more than 90% of the asset share of the Malaysian banking system in 1959 with the number of foreign banks at one time reached 18, in another with only 8 domestically owned (Matthews & Ismail, 2006). In 1971, the banking authorities planned to reduce foreign ownership in the sector. For this reason, in terms of assets, foreign ownership declined to approximately 20% of total banking assets by the end of 1997 (Chua, 2003). Since 1990, the percentage of foreign bank ownership has remained relatively stable at this level (Bank Negara Malaysia, 2001; Chua, 2003).

As governed by the Banking and Financial Institution Act of 1989, foreign banks in Malaysia have to transform their organizational form into public company status which is locally incorporated. As required by law, the conversion of the legal entity to a locally incorporated form had to be carried out by the latest on the First of October 1994. For this reason after 1994 there have been no new foreign bank branches in Malaysia (in contrast to Indonesia and other South East Asian countries). All foreign banks are wholly-owned subsidiaries. Up to December 2005, there were 13 foreign bank subsidiaries in Malaysia and the domestic market is still closed to new foreign entrants.

[4] Only one exception is the Bank of China, which was licensed to reopen their branch in Malaysia in 2002

2.3. Philippines

Over the last 30 years, the banking sector in Philippines has emerged as a key element of the financial system. While banking institutions held about 64% of banking assets in 1970, this ratio increased to 71% in 1980, 83% in 2000 and 91% in 2005 (Beck et al., 2000, updated September 2006). Philippines has various types of banking firms: universal banks, commercial banks, thrift banks, rural banks and cooperative banks. In terms of the scope of their activities, universal banks provide a wider range of services including non-bank activities such as stock broking, insurance etc. (Herffernan, 2005, p. 19). In the Philippines, universal banks are allowed to operate as an investment house and are permitted to invest in allied and non-allied enterprises up to 50% of the bank net worth whereas this does not exceed 35% for commercial banks (Philippines General Banking Law of 2000, Chapter IV, article I and II).

Up to March 2006, the banking system in the Philippines contained 18 universal banks, 24 commercial banks, 85 thrift banks, and 746 rural banks and cooperative banks. Universal banks and commercial banks are the main players in the banking market with combined market share of over 89% of total banking sector assets in June 2006. Thrift banks account for 8.3% of the market while a very large number of rural banks and cooperative banks only account for 2.7% of market share (Bangko Sentral ng Pilipinas, Banking Statistics, updated November 2006).

2.3.1. *Financial Sector Reforms*

The initial efforts of financial system reforms in Philippines commenced in 1980. Interest rates controls were gradually liberalized in 1981. In addition, universal banking was introduced to reduce the financial system fragmentation and minimum capital requirements for banking institutions were raised. However, the Philippines faced a crisis soon after these initial efforts.

Prior to 1980, the central bank relaxed rules on lending to related parties. However, weak regulation in supervision and enforcement of these rules increased related lending much more than expected. This was particularly noticeable for politically motivated loans made by two government-owned banks: Philippines National Bank and Philippines Development Bank, of which the combined assets accounted for 50% of total banking sector assets. The domestic interest rate regime that encouraged debt-financed investments together with the rules relaxation weakened the financial system (Intal & Llanto, 1998). Shortcomings in regulation, a weak accounting framework and deficient bank

management led to various bank failures. In 1985, 1.6% of banking sector failed (Bekaert & Harvey, 2004).

After having been affected by this crisis in 1985, the central bank toughened and focused on prudential regulation in the late 1980s and early 1990s on four fronts. Firstly, new rules were introduced that limited single borrowers to 25% of bank capital and surplus. Secondly, restrictions on related lending were introduced. Loans made to banks were not allowed to exceed paid-in capital of the borrowing banks and outstanding deposits of the borrowing bank officers held in lending banks. In addition, inter-directorships were restricted between banks and non-banks and between two banks if the majority interests were controlled by one bank (in order to lessen insider abuse). Thirdly, banks had to increase their capital adequacy requirements. All different types of banks in Philippines have been required to increase their capital over time as a protection of the system against instability[5]. The fourth front relates to introducing a relevant accounting and reporting framework. Banks were required to be audited annually by an independent auditor and to report their loan portfolios in detail based on more disclosure rules regarding loan-loss reserves, doubtful loans and non-performing loans. This aimed to help the central bank to monitor and review the asset risk profile of banks and to receive early warnings of financial system vulnerabilities. These relatively early reforms in the regulatory framework make the Philippines distinct from many other South East Asian countries that lacked prudential regulation for a long period after their first attempts of liberalization and before their second round of reforms that commenced in 1998.

Also, thanks to these advanced supervisory efforts, Philippines was far less affected by the regional financial crisis of 1997. After the crises the country did not have to promptly set up a specialised agency to deal with bank non-performing loans and recapitalization like in Indonesia, Malaysia and Thailand. After 1998, however (and like other South East Asian countries), the central bank encouraged banks to consolidate in order to build a stronger banking system.

[5] The required capital levels of universal banks were doubled in 1990 compared to that of 1980, from P.500 million to P.1 billion. This requirement was further increased to P.4.5 billion by 1999. For commercial banks, the capital required in 1980 was P.100 million and gradually increased to P.500 million in 1990 and by 1998, commercial banks had to acquire the capital level of P.2 billion (Intal & Llanto, 1998)

2.3.2. *Foreign Bank Access*

Foreign bank participation and domestic bank branching restrictions have been in place since the central bank of the Philippines commenced its operations in 1949 and these stayed in place until the 1980s.

In the early 1990s, the local government started to remove these barriers to facilitate foreign investment and capital flows as a part of its financial reform objectives. In 1993, domestic bank branching barriers were fully removed and in 1994 the domestic banking market was opened to foreign access. In the same year, the regulators conducted two major actions. Firstly, restriction on foreign bank branching was lifted in early 1994. Secondly, the Foreign Bank Liberalization Act of 1994 was passed in May 1994 that allowed more foreign banks to enter. Entry into the domestic market could be executed through (1) acquiring up to 60% of the shares of an existing local bank or (2) a new banking subsidiary or (3) by setting up a foreign branch with full banking services[6] (Bekaert & Harvey, 2004; Reyes, 2001, p. 116). Therefore, foreign banks in the Philippines could be classified under three categories: representative offices, branches and subsidiaries. The Philippines is the only banking system in our study that allows greenfield entry as subsidiaries until 2004. In Malaysia, the domestic market has closed for de novo entry for over 30 years. In other countries, subsidiaries are originated from full acquisition of shares of a domestic bank.

The General Banking Law of 2000 was a further action to open the local banking market. The 60% ownership limit was relaxed for new entry and foreign banks are now allowed to acquire up to 100% of the voting stock of a domestic bank for a period of seven year since this regulation entered into effective (Milo, 2001). In June 2006, there were 14 foreign bank branches (three branches are licensed to operate as universal banks) and 4 foreign bank subsidiaries (operating as regular commercial banks) which account for 13.5% of total banking sector assets (Bangko Sentral ng Pilipinas, Banking Statistics, updated November 2006).

2.4. Thailand

The Thai financial structure, to a large extent, shares a common feature with that of Malaysia: non-bank financial institutions play a role, albeit minor, in the whole financial

[6] A foreign bank may only exercise only one mode of entry. Foreign bank expansion to Philippines through the third mode is limited to 10 and the share of majority foreign-owned banks shall not be allow to exceed 30% of total banking sector assets.

system. While in other countries so far discussed, banking firms account for over 90% of assets of the financial system, the ratio for Thailand is around 78% in 2005, increasing from 71% in 1997 (Beck et al., 2000, updated September 2006). The relatively larger role of non-bank financial institutions in Thailand compared to countries such as Indonesia, Philippines and Vietnam, has enriched the financing sources to industrial companies. Deposits mobilised by non-bank financial institutions increased from 4% in 1990 to 10% in 1998 and reached 15% of GDP in 2005. Credit granted to the private sector by non-banking firms increased from about 13% of GDP in 1989 to 44% by 1998 (Beck et al., 2000, updated September 2006). Being partially affected by the restructuring programme[7], private credit extended by non-bank institutions had declined since 1999 to just approximately 17% of GDP in 2005, but still well above that of, say, the Philippines where non-banks provide only 2% of the private sector credit. In the near future, non-bank financial institutions will no longer exist because of the implementation of the government Financial Sector Master Plan (established in February, 2002) that requires non-bank institutions to upgrade into either commercial or retail banks.

In October 2006, there were 44 financial institutions under the supervision of the central bank, the Bank of Thailand, a decline from 59 in 2003 following the consolidation programme (Bank of Thailand, Supervision Report, 2005, p. 29). Among these institutions, 34 are commercial banks, 17 registered in Thailand and another 17 are foreign bank branches; 6 are finance companies and 4 are (real estate) credit foncier companies (Bank of Thailand, Financial Institutions Statistics, 2006).

2.4.1. *Financial Sector Reforms*

At the onset of the first attempt to liberalize the financial sector in the late 1980s, competition among financial institutions was relatively restricted. Domestic banks, foreign banks and other financial institutions were separated by regulatory barriers (Williams & Intarachote, 2003, p. 3). When the financial liberalization programme was put into effect in 1989, policy makers aimed to achieve three objectives. Firstly, they aimed to foster competition among financial institutions in order to boost efficiency. Secondly, the reforms sought to broaden financial activities to support economic growth. Thirdly, the aim was to promote Bangkok as a major regional financial centre (Leightner & Lovell, 1998, p. 117). This was marked by the launch of the Bangkok International Banking

[7] Fifty six out of 58 finance companies in Thailand were closed down after the 1997/1998 crisis (Bank of Thailand, Supervision Report, 2000)

Facilities (BIBFs) in 1993 (banking institutions that obtained BIBFs licenses received various tax and regulatory incentives).

The financial liberalization process in Thailand could be divided into two periods. The first period was from 1988 and 1996. On the interest rate front, the authorities eliminated ceilings rate on commercial bank long-term time deposits in June 1989. Later on, ceilings on loan rates were removed in 1992. On the exchange rate and capital account front, foreign exchange controls on current account transactions were abolished in May 1990. In 1991, the restrictions on capital accounts, which were already fairly open and favourable for foreign investment in 1985 (Alba, Hernandez, & Klingebiel, 1999, p. 17), were further lifted (TDRI, 1999).

The process of liberalization and banking competition intensified in March 1993 (Bank of Thailand, Supervision Report, 1996/1997) when the Thai government established the BIBFs which benefited from several tax incentives and regulatory advantages. Among the most important incentives was 10% income tax instead of 30% (Alba et al., 1999, p. 18). The aim was to build Bangkok as an international financial centre and to attract foreign capital. BIBFs were required to mobilise funds from overseas and extend credits in foreign currency (Kawai & Takayasu, n.d., p. 93). In the same year, the scope of activities of commercial banks was also broadened to include insurance, underwriting, and distribution of debt securities. They were also authorised to act as supervisors, security registrars and selling agents for mutual funds (Alba et al., 1999, p. 19).

These liberalization efforts were interrupted by the 1997/1998 financial crisis. The collapse of property values severely impacted on the banking sector that had grown rapidly its real estate lending business. As the assets price bubble bust, it had a severe impact on Thai banks (Watanagase & Financial Institutions Policy Group, Bank of Thailand, 2006, p. 348). Non-performing loans over total loans in commercial banks reached 45% by December 1998 (World Bank, 2005b, p. 59).

In order to cope with the 1997 financial crisis, the government took several emergency measures. These measures characterise the second stage of financial liberalization beginning in 1998. Similar to Indonesia and Malaysia, special government agencies were set up in Thailand. The Financial Sector Restructuring Authority (FRA) and the Assets Management Corporation (AMC) were established to identify and resolve nonviable institutions and to protect viable institutions. The responsibility of the FRA was to review the rehabilitation plan of finance companies that ceased operations (by the order of the Thai Ministry of Finance) and to protect depositors and creditors of these

companies. Meanwhile, the sole purpose of the AMC was to act as the bidder of last resort for impaired assets of finance companies, which were auctioned by the FRA (Bank of Thailand, Supervision Report, 2000, p. 11). Financial Restructuring Advisory Committee funded by the Financial Institutions Development Fund was also established to inject government capital into banks. Another organization, the Corporate Debt Restructuring Advisory Committee (Bank of Thailand, Supervision Report, 2004, p. 23) was responsible for restructuring the debt of the corporate sector. Overall, the major restructuring programme has made considerable progress. This is best illustrated by the reduction of non-performing loans in the system to 8.3% by 2005 (Bank of Thailand, Supervision Report, 2005, p. 21).

In February 2002, the central bank set up a Financial Sector Master Plan Committee whose charge is to develop the Thailand financial sector over the next ten years (up to 2012). The 'visions' of the Master Plan are to reduce the differences in the level and quality of services between urban and rural areas; to develop an efficient, safe and competitive financial system; and to increase fairness and protection for consumers.

The Financial Sector Master Plan has been implemented since the beginning of 2004. One of the first steps taken by the government was to reduce the number of small financial institutions and then start the so-called "one presence" policy scheme to increase system efficiency through eliminating regulatory arbitrage and overlapping the business scopes of institutions (Watanagase & Financial Institutions Policy Group, Bank of Thailand, 2006, p. 359). The Master Plan envisages that financial institutions in Thailand will include only four types of banks: commercial banks, retail banks, foreign bank branches and foreign bank subsidiaries. Other qualified financial institutions (such as finance companies, credit foncier companies and stand-alone BIBFs) could be allowed to upgrade to commercial banks. Foreign banks that have branches and hybrid affiliates in Thailand have to merge into one. Domestic firms with more than one type of deposit taking institutions are also required to merge and maintain only one type. In line with the aforementioned developments, all BIBFs ceased operations in 2005 (Bank of Thailand, Supervision Report, 2005, p. 29). Regarding scope of activities, these four types of banks are allowed to provide similar services except retail banks, which are focused on retail customers and are not allowed to be involved in foreign exchange and derivatives businesses (Bank of Thailand, Supervision Report, 2003, p. 17).

2.4.2. *Foreign Bank Access*

At the beginning of 1988, when the first reforms were initiated, the number of domestic banks and foreign banks was more or less equal but the market shares were dramatically different due to restrictions on foreign bank activities. Fifteen domestic banks accounted for 95% of commercial bank assets while 14 foreign bank branches only held 5% market share. Foreign banks mainly faced three restrictions. Firstly, they were hampered with regard to deposit mobilization. Secondly, they had to pay 5% higher income tax than domestic banks and thirdly, they had to pay 16% withholding tax on dividend transfer (Alba et al., 1999; Easterly & Honohan, 1990). Under the BIBF launch in 1993, 19 new foreign banks were licensed to operate in Thailand (Alba et al., 1999, p. 32). Competition intensified, particularly in the lending market. Until 1997, the number of banks remained unchanged, 15 domestic commercial banks and 33 foreign banks (Bank of Thailand, Supervision Report, 1996/1997, p. 53).

Before the 1997 crisis, foreign banks were allowed to open only branches in Thailand (in Bangkok) while foreign acquisition of domestic banks was limited to 25% of stakes. As a result, there were no wholly-owned foreign bank subsidiaries in Thailand prior to 1997. Limitation on foreign bank activity in Thailand was also gradually eased. In late 1997, regulations were amended and foreign partners were permitted to wholly own shares in local financial institutions for a period up to 10 years. Therefore, in 2000, foreign bank subsidiaries entered the Thai market via acquisition[8].

As of October, 2006, there were three foreign bank subsidiaries which were formed from the acquisition of government divestments and 17 foreign full-service bank branches operating in Thailand (Bank of Thailand, Financial Institutions Statistics, 2006).

2.5. Vietnam

For a long time before the first round of banking reform commenced in the early 1990s, Vietnam had a mono-banking system. The central bank of Vietnam implemented the dual tasks of funds intermediation and supervision. Banking reforms in 1988 lead to

[8] According to FSMP (implemented at the start of 2004), foreign bank (de novo) subsidiaries and full-service foreign branches operating in Thailand are distinguished by three points: legal status, branch restriction and chartered capital. Subsidiaries are locally incorporated and allowed to open up to four branches in Thailand, one of them in Bangkok whereas foreign bank branches are allowed to open only one branch (Bank of Thailand, Financial Sector Master Plan, 2003). Subsidiaries are required to have registered capital of Bt.4 billion whereas in order to upgrade into branch, BIBFs are required to have registered capital of Bt.3 billion.

the creation of a two-tier banking system which separated central bank from commercial bank activity. Initially, four state-owned commercial banks were established and they were followed by various joint-stock commercial banks, foreign joint-venture banks and foreign bank branches.

The financial system in Vietnam is dominated by banks that account for over 95% of financial system assets (ADB, 2002). The banking sector itself was highly concentrated and characterised by an oligopolistic market structure. The four large state-owned commercial banks have controlled over 70% of total banking sector assets for over one and a half decades (World Bank, 2005d, p. 63). As of December 2004, credit extended by state-owned commercial banks accounted for 73% of the total lending market (Camen, 2006). The existence of partial government ownership in joint-stock commercial banks could increase this level to 80%. The non-bank sector, in contrast, is relatively underdeveloped.

The high degree of government ownership in the banking system has contributed to the fragmentation and weaknesses of the financial system. State-owned commercial banks mainly service state-owned enterprises while joint-stock banks are left to deal with the small private business and households sectors. About 45% of state-owned commercial banks credit is extended to state-owned enterprises, of which a substantial amount is non-performing (ADB, 2002). The extensive branch networks of the state-owned commercial banks and weak management have been the main reasons put forward as explanations of the inefficiency of these institutions.

2.5.1. *Financial Sector Reforms*

The Vietnamese government started its economic reform programme in 1986 to move the country from a centrally planned to market friendly economy. Following the so-called 'economic renovation' programme, the first round of banking reforms took place in 1988 marked by the creation of a two-tier banking system in 1989 and the allowance to all business organizations to take deposits from the public.

There were three noteworthy features of the economy at this stage. Firstly, the economy was performing poorly and was in a serious recession. The government printed money in order to cover budget deficits which resulted in triple-digit inflation. Secondly, the financial system was liberalized first as part of the comprehensive efforts to transform the economy although this was without parallel liberalization of the domestic real sector. In addition, there were no established bank supervision and regulation regimes in place

(such as capital adequacy and reserve requirements). Also, all business organizations were permitted to conduct bank-like traditional services: deposit taking. Thirdly, and probably most important, there was a loss of public confidence in the banking system. In this period, the number of credit operatives increased dramatically to 7,180 by the end of 1980s (the first was established in 1983). This was because of the growing demand for credit, particularly in rural areas since established state-owned commercial banks only served state-owned firms. In order to attract depositors, the deposit takers competed by raising interest rates up to 12% per month.

As a result of the raid expansion of the sector and their excessive lending (coupled with virtually no risk management), in 1990, over 7,000 credit operatives went bankrupt. The crisis seriously reduced public confidence in the local banking system. Therefore, local people shifted from depositing into cooperatives to reserving in US dollars. The real interest rate was negative in the 1989 and 1991 period. In 1990, the monthly inflation rate was 5.6% while the monthly lending rate varied between 1.8% to 3.0%; in 1991 it was slightly over 5.6% and between 1.8% to 6.0%, respectively.

Facing this crisis, in 1990, the government issued regulations to the central bank and financial institutions including commercial banks, credit cooperatives and finance companies. According to these new rules, state-owned commercial banks were to be made more commercially oriented and the entry by private banks and foreign banks was to be allowed. By 1995, the banking market in Vietnam comprised 52 domestic commercial banks, 4 foreign joint-venture banks and 18 foreign bank branches (State Bank of Vietnam, Annual Report, 2000).

The first round of reforms slowed down just prior to the Asian financial crises in 1997. In this stage, government ownership in the banking system hardly changed (Kovsted, Rand, Tarp, Nguyen, Nguyen, & Ta, 2002, p. 12) and little was done to enhance the legal framework for prudential supervision. However, when the crisis occurred, Vietnam was shielded to a major extent because the capital account was not yet liberalized[9] and the domestic currency was inconvertible (Kovsted & Nguyen, 2003, p. 15).

The second round of banking reforms commenced in 1998 with the approval of two banking laws and the establishment of the Bank Restructuring Committee in May 1998 whose aim was to develop a safe, sound and competitive banking system in Vietnam.

[9] Capital account was liberalised in 2001

The Committee's efforts are concentrated on improving the supervisory and regulatory framework, restructuring joint-stock banks and commercializing state-owned commercial banks.

In 2001, the central bank started to restructure and strengthen the joint-stock commercial bank sub-sector which was facing problems with mismanagement, high non-performing loans and low profits. Banks failing to comply with prudential ratios set by the central bank were forced to merge or had their licences withdrawn. Many of them were put under special supervision (Kovsted & Nguyen, 2003, p. 15). There were about 13 joint-stock banks closed and merged after this period. Also in 2001, the government approved a framework to restructure state-owned commercial banks. The initial attempt was to resolve the non-performing loans in state-owned commercial banks and to recapitalize state-owned commercial banks (ADB, 2002; Kovsted et al., 2002, p. 37). Policy loans were gradually transferred to the newly established bank for social policies[10]. Non-performing loans were transferred to Assets Management Companies to clean up state-owned commercial banks' financial statements after auditing by internationally recognised firms. State-owned commercial banks are also planned to be privatized via public share offerings (World Bank, 2005c, p. 53). All of these fundamental reforms are still at an early stage.

2.5.2. *Foreign Banks Access*

Foreign bank entry and activity restrictions have been partially eliminated since the early 1990s. In 1991, foreign banks are allowed to enter under three legal forms: representative offices, joint-venture and branches (but not subsidiaries). Also, foreign bank branches are not authorised to operate as full-service branches. Typically, they are not allowed to raise deposits in local currency from local citizens and firms (exceeding 50% of their registered capital, Vietnamese Law Database) and they implicitly face branching restrictions. Acquisition of domestic joint-stock commercial bank shares is allowed up to 10% in 1993 but there has not been much interest from foreign partners until recently[11].

[10] The Vietnam Bank for Social Policies commenced to operate in early 2003. Its main function is to take small-scale policy and directed lending programmes previously processed by state-owned commercial banks including the Vietnam Bank for the Poor (see, World Bank, 2004)

[11] There are three (joint-stock) banks with foreign shares in Vietnam by 2006. Asia Commercial Bank has 8.6% (Standard Chartered Bank, July, 2005). Saigon Thuong Tin Commercial Bank has 30% (ANZ: 10%; a British capital fund: 10% and IFC: 10%, August, 2005). Vietnam Commercial Bank for Private Enterprises has 10% (OCBC, early 2006) (Source: State Bank of Vietnam, World Bank, 2005d, p. 64)

In 1993, there were about eight foreign bank branches in Vietnam; most of them French banks. Other banks were established mainly in 1995 after US trade discrimination restrictions collapsed. The substantial entry of foreign bank branches increased the number of foreign banks. At the end of 1998, the banking system in Vietnam consisted of 4 state-owned commercial banks, accounting for 82% of total banking sector assets; 51 joint-stock banks (10% of total banking sector assets); 23 foreign bank branches and 4 joint-venture banks (collectively accounting for 8% of total banking sector assets). By 2006, there were about 30 foreign bank branches operating in Vietnam.

In May 2004, the State Bank of Vietnam announced that it would allow foreign participants to acquire up to 30% shares in domestic banks. In the Vietnamese context, the liberalization process accelerated in the latter half of 2003 in order to correspond with international treaties and commitments that the Government had made[12] and were pursuing.

In January 2007, Vietnam became the hundred fiftieth member of the WTO after 11 years of negotiation. The financial services sector has been turned into a new page of integration. Beginning April 2007, foreign banks will be allowed to open subsidiaries in Vietnam and joint-venture banks are allowed to acquire shares of domestic partners up to 100% provided that the parent banks have total assets over USD10 billion at the year end prior to the application. The 30% limit on stock purchase will be still in place but open to consideration by the local authorities. Limits on deposits in local currency mobilized from Vietnamese natural citizens will increase to 650% of paid-in capital of foreign bank branches and this limitation will be fully removed by January 2011 (World Bank, 2006b, p. 20).

In summary, the financial systems of the countries in South East Asia share the following common characteristics (Table 2.1). First, they all have dominant banking sectors. Banking institutions accounted for over 90% (Indonesia, Philippines and Vietnam) and over 70% (Malaysia and Thailand) of financial system assets. Typically, non-bank institutions and capital markets are relatively underdeveloped and most countries, except for Malaysia and Thailand, heavily depend on bank credit as a major source of funding for businesses. This reality raises concerns whether the banking system could continue to fuel

[12] When the Vietnam US Bilateral Trade Agreement entered into effect on December 2001, the US equity in joint-venture banks in Vietnam was allowed to be up to 49%. Nine years later the US equity in privatized banks is equivalent to that of Vietnamese investors and 100% US-owned subsidiaries are permitted to operate. In eight years, the US banks will be permitted to accept VND deposits from business customers, in 10 years from retail depositors.

investment and economic growth while credit demand is growing and regulation and supervision still remains relatively weak. Facing this fact, these countries have focused on developing capital markets after crises to create alternative sources to finance growth. In countries like Indonesia and Vietnam, banking assets are concentrated in various large state-owned commercial banks and both governments have started to reduce the level of state ownership by cleaning up their financial statements and putting these institutions up for sale.

The second characteristic shared by these countries relates to the timing of liberalization as well as approaches implemented to deal with the 1997/1998 crisis. In order to stimulate competition and improve banking sector efficiency, all these five countries deregulated their financial sectors. Most of them implemented various financial and banking reforms in the late 1980s, with Malaysia and the Philippines earlier. Soon after these initial efforts, these countries experienced various domestic banking crises before being hit by the 1997/1998 regional financial crisis. The main common cause of the domestic crises was due to excessive lending facilitated by inadequate regulatory and supervisory frameworks as well as general corporate mismanagement. To recover from the 1997/1998 regional crisis, these countries, from the most to the least affected, largely, adopted similar approaches to resolving their financial sector problems by focusing on loan restructuring and bank recapitalization programmes.

The third similarity is that immediately after 1997/1998 crisis, all countries carried out further reforms that focused on improving prudential supervision and regulation. International supervisory standards and risk management principles were introduced and gradually adopted. In addition, restrictions on foreign bank entry and activities were lifted, except in Malaysia, in order to stimulate competition. Furthermore, as another step to build a stronger financial sector, governments encouraged the restructuring of their banking sectors by encouraging consolidation. This had the effect of significantly reducing the number of financial institutions in these countries. The consolidation process was fostered to enhance bank capital adequacy but it generally appeared to lack market-driven incentives.

It can be seen that the five South East Asian banking markets under study in this thesis share common structural and regulatory features. This, we believe, provides a justification as to why it is sensitive to consider these banking systems for comparative study. The following papers examine banking sector efficiency, foreign bank presence and competition and risk issues in these five countries.

Table 2.1. *The South East Asian financial markets 1998-2004: similarities and differences*

Similarities	Differences	Facts and Figures
Banking sectors dominate the financial system	In Malaysia and Thailand, non-bank institutions play a certain role	Banks have 90% of financial sector assets in Indonesia, Philippines and Vietnam, and over 70% in Malaysia and Thailand
Financial reforms commenced in the late 1980s	Malaysia and Philippines sooner	Indonesia: 1983, Malaysia: 1978, Philippines: 1981, Thailand: 1989 and Vietnam: 1988
Facing a domestic banking crisis during 1980s due to weak regulatory framework	In Indonesia, crisis happens in the early 1990s	Indonesia: 1992-1994; Malaysia: 1985-1988; Philippines: 1981-1987; Thailand: 1983-1987; Vietnam: 1988-1990
Adopting similar approaches to deal with 1997/1998 crisis	Philippines and Vietnam are the least affected nations. Philippines have strengthened the local banking market before the crisis, while Vietnam financial system is integrated at a low level	Setting up special agencies to restructure NPLs and recapitalize banks. Indonesia: Indonesian Bank Restructuring Authority; Malaysia: Danaharta and Danamodal; Thailand: Financial Sector Restructuring Authority and Financial Restructuring Advisory Committee
Prudential supervision and regulation is the main focus after the crises	Slow progress in Vietnam	Enhance capital adequacy ratio (applying stress tests, adopt BIS rules) in Indonesia; Redefine and tighten NPL and LLP rules; Move towards international accounting standards in Thailand and Vietnam; Develop deposit insurance schemes in Indonesia and Vietnam
Foreign bank entry is further facilitated after 1998	Foreign bank entry regulation in Malaysia remains unchanged	Acquisition of shares in Indonesia: relaxed from 49% to 99% (1999), Philippines: from 60% to 100% (2000), Thailand: from 25% to 100% (1997), Vietnam: from 10% to 30% (2004)
Financial systems are restructured and consolidation is encouraged in order to construct sound banking systems, but lack of market-driven incentives	Thailand witnesses four cases of merge and acquisition between foreign and domestic banks with assets value of about USD10 billion	The number of banks decreases in Indonesia (1997: 222, 2004: 134); Malaysia (1997: 86, 2004: 41); Philippines (1997: 54 commercial banks, 2004: 42 commercial banks including universal banks); Vietnam (1998: 83, 2004: 73)

Note: Bank for International Settlements (2001); Bank Indonesia, Annual Report, various issues, 2000-2004, Financial Stability Review (2005), Regulation 2/27/2000 (2000), Financial Statistics; Bank Negara Malaysia, Annual Report, various issues, 2000-2005; Bank of Thailand, Annual Report, various issues, 1998-2000; Beck, Demirgüc-Kunt, and Levine (2000); Bekaert and Harvey (2004); Chou (2000); Chua (2003); Coppel and Davies (2003); Fulbright Economics Teaching Programme in Vietnam (2003); Montreevat (2000); State Bank of Vietnam, Annual Report, various issues, 2000-2003; Thai Bankers' Association; The Economist (2004, p. 87); Tschoegl (2003); Vietnamese Law Database

Chapter 3

Efficiency in the South East Asian Banking Sector

Abstract

This paper explores the efficiency of banks in five South East Asian countries (Indonesia, Malaysia, Philippines, Thailand and Vietnam). We use the non-parametric Data Envelopment Approach to estimate efficiency and then undertake Tobit regression to examine the determinants of these efficiencies. The results indicate that efficiency has significantly declined over the period 1998 to 2004 in the South East Asian banking sector, suggesting that the deregulation programme has not had a positive impact on efficiency. In line with the established literature on emerging banking markets, foreign banks appear to be more efficient than their domestic counterparts, however, we find that state-owned banks are more efficient than their private sector competitors. Banking firms with higher levels of government ownership are more technically efficient while those with higher private ownership are found to have lower technical and cost efficiency. Among country-level factors, national banking development shows a strong and positive link with efficiency of banks. The results are robust to different assumptions of inputs, outputs, technological changes and national banking convergence.

3.1. Introduction

The last two decades have witnessed many efforts to liberalise the financial sectors in South East Asian developing countries in order to stimulate competition and promote efficiency. However, the occurrence of regional financial crisis after earlier national banking turmoil[1] and the adverse effects caused to the economies by deregulation have reminded policy makers in these countries of the costly deregulatory consequences. These undesired effects also emphasize the need for an effective regulatory framework to build a sound and safe financial system.

It is an on-going debate as to the effects of financial liberalization on bank efficiency. Proponents of deregulation policies believe that liberalization programmes aimed at fostering competition, would help banks to improve their efficiency through, for example, better cost management, resource allocation and risk monitoring. Opponents to deregulation, in contrast, argue that competition stimulated by deregulation policy would lead banks to take-on excessive risk, particularly in the absence of prudential regulatory and supervisory framework. The aggressive risk-preference behaviour by banks may endanger the entire banking system[2].

Several empirical studies (Canhoto & Dermine, 2003; Casu & Molyneux, 2003; Gilbert & Wilson, 1998; Hasan & Marton, 2003; Isik & Hanssan, 2003; Sturm & Williams, 2004; Ziam, 1995) show that efficiency of banks is improved after the relevant financial systems have been deregulated. However, other researchers provide evidence that, following financial deregulation, bank efficiency has declined (Denizer, Dinc, & Tarimcilar, 2000; Grabowski, Rangan, & Rezvanian, 1994; Grifell-Tajie & Lovell, 1996; Williams & Intarachote, 2003) or deregulation has no significant impact on bank efficiency (Havrylchyk, 2005; Hao, Hunter, & Yang, 2001). Even more complicated, efficiency changes have been found to be dependent upon bank size (Elyasiani & Mehdian, 1995) and ownership structure (Bhattacharyya, Lovell, & Sahay, 1997).

This paper is an attempt to investigate bank efficiency in South East Asian economies following the 1997/98 financial crisis. As previously mentioned (Chapter 1, Table 1.1) in this thesis, after the crisis, countries in South East Asia conducted further

[1] The crisis in Asia commenced in mid-1997, about a decade after financial liberalization was implemented, and affected local currencies, financial sectors, and asset prices of several countries in the East Asian region. The crisis was reputed as the most serious economic slump since the Second World War (McNeill & Bockman, 1998). For further details about the regional crisis, please see Chapter 1 (Section 1.1), about domestic banking crisis in individual countries; please see Chapter 2 and Table 2.1.

[2] For arguments in favour of financial liberalization, see, for instance, Fry (1997), and against, see, for instance, Stiglitz (1994)

reforms aimed at strengthening regulatory frameworks and enhancing competition by removing foreign ownership limits (Chapter 4, Table 4.1), so analyzing bank efficiency features after this period could capture the effects of changes in supervision and regulation on financial institutions' efficiency. The present paper seeks to answer two questions. The first question is whether bank efficiency has improved following the financial reforms. The second question relates to what factors determine the efficiency of banks in South East Asia following the post-1998 period.

The paper is organised as follows. The following section, section 3.2, reviews the literature on the changes of banking efficiency following financial deregulation and factors that correlate with efficiency. Section 3.3 presents the methodological approach used to estimate efficiency scores in the first stage and the second-stage regression equation, which aims at examining factors that determine efficiency of banks. The data source and features of the sample studied are also presented in this section. Section 3.4 reports the results. This section first shows the descriptive statistics of the inputs, outputs and the efficiency levels of banks. Second, the outcomes from the second-stage regression are reported followed by the discussion. Finally, the conclusions, limitations and policy implications are summarized in section 3.5.

3.2. Deregulation, Bank X-efficiency and Its Determinants

3.2.1. *Background of Bank X-efficiency*

'X-efficiency' was a term coined by Leibenstein (1966) to refer to efficiency gains relating to unknown factors. Unlike scale and scope efficiencies, which are achieved by size and the joint production of services, respectively, X-inefficiency is attributed to managerial factors. More specifically, while scale and scope efficiency focus on the failure to operate at the optimal scale or at best combination of services to save cost, X-efficiency captures the failure to save cost at a given scale and/or a given level of product mix that a banking firm is operating[3].

X-efficiency appears to be more important than (Molyneux et al., 1996, p. 273) and exceeds (Gardener, Molyneux, & Moore, 1998) scale and scope efficiency, even for banks of similar scale and product mix (Bauer, Berger, & Humphrey, 1993). The notion of X-

[3] Another related concept is profit X-efficiency. In contrast to cost X-efficiency focusing on variable costs and holding outputs constant at a given level, profit X-efficiency takes into account output prices and considers revenues earned by varying both input and output quantities (Berger & Mester, 1997, p. 899). However, in this paper, we focus on cost X-efficiency partially due to unavailability of prices of outputs. For discussion of economies of scale, scope and X-efficiency, see, for example, Berger, Hunter and Timme (1993); Drake (2003); Goddard, Molyneux and Wilson (2001) and Molyneux, Altunbas and Gardener (1996)

efficiency has also been receiving growing attention from bank managers and policy makers. From a bank managers' perspective, X-efficiency is interesting because studies show that these can account for around 20% of sub-optimal cost performance while scale and scope economies are found to be much smaller (when found), typically around 5% (Berger, Hunter, & Timme, 1993; Berger & Humphrey, 1997; Altunbas, Gardener, Molyneux, & Moore, 2001)[4]. This means there is more room for banks to improve their cost performance by reducing X-efficiency rather than increasing size or diversifying products. From a policy makers' perspective, studies of X-efficiency can be helpful in assessing the effects of deregulation, structure of the banking market as well as merger and acquisition (points emphasised by Berger & Humphrey, 1997).

The estimation of X-efficiency is also attractive as such measures provide industry benchmarks using optimization techniques that can control for bank-specific and other factors. This compares with the use of traditional accounting measures that cannot control for these factors, such as business-mix (Sathye, 2003, p. 664). In addition, X-efficiency estimates provide another set of measures of bank cost performance that can be compared with accounting or market-based indicators to arrive at consistent estimates (Asmild, Paradi, Aggarwall, & Schaffnit, 2004, p. 68).

X-efficiency can be measured either through using non-parametric (DEA) or parametric (Stochastic Frontier SFA) frontier approaches which allow one to combine the major activities of a banking firm and to treat banks as different production units that select various inputs to produce a variety of outputs. The approach yields relative efficiency measures that allows bank managers to identify which areas of services they overuse inputs or/and underproduce outputs within their complex activities (Berger & Humphrey, 1997). These estimates can also be used, as noted above, by policy makers to gauge the impact of regulatory reform on bank efficiency and therefore banking system performance.

[4] One of the exceptions is Altunbas, Liu, Molyneux and Seth (2000), who found that diseconomies of scale is more prevalent than X-inefficiency, which ranges between 5% and 7% in the Japanese banking system over the period of 1993 and 1996. This is much lower than the level of 20% typically suggested by the evidence from US (Berger & Humphrey, 1997) and Europe (Molyneux et al., 1996; Altunbas et al., 2001a).

3.2.2. *Deregulation and X-efficiency*

Studies of X-efficiency of financial institutions following deregulation have found ambiguous results. One strand of the literature provides the evidence in favour of deregulatory policies. For example, Ziam (1995) examined bank efficiency after financial liberalization in Turkey using non-parametric approaches. The author computed and compared the efficiency scores of commercial banks operating in 1981 and those in 1990, 10 years after financial reforms. Ziam (1995) found that both technical and cost efficiency of commercial banks in 1990, on average, was higher than those for banks in 1981. The sampled banks are also found to improve economies of scale through achieving optimal scale of operations over the period. Isik and Hanssan (2003) also focused on Turkey and again used non-parametric techniques but, unlike Ziam (1995) who explored efficiency only at two points of time, 1981 and 1990; the aforementioned researchers investigated the efficiency in every year between 1981 and 1990. Overall, Isik and Hanssan (2003) also concluded that productivity and efficiency of Turkish commercial banks has improved over the period as illustrated by increased productivity (measured using the Malmquist Total Factor Productivity index).

In addition, Gilbert and Wilson (1998) used the Malmquist index to explore the impacts of financial deregulation and privatisation on the South Korean banking sector between 1984 and 1990. Gilbert and Wilson (1998) found that, following deregulation, banks in Korea improved largely their productivity thanks to their alteration of inputs and outputs mix. Hasan and Marton (2003), on the other hand, conducted their study on an eastern European country. They applied the stochastic frontier approach to study a sample of commercial banks in Hungary over the 1993 and 1998 period[5]. Hasan and Marton (2003) found that (both cost and profit) inefficiency in Hungarian banking has significantly declined over time, suggesting that privatization enhance cost and profit efficiency in the banking sector. Furthermore, Sturm and Williams (2004) applied both non-parametric and stochastic approaches to investigate the efficiency of banks in Australia during the post-deregulation period of 1988 and 2001. These researchers found that efficiency scores generated from non-parametric and parametric techniques are highly correlated and bank efficiency increased in the period after deregulation. In a study

[5] This sampling stage in Hungary is characterised by three features. First, in the early years, nonperforming loans were concentrated in state-owned banks. Second, the year 1995 is characterised by the ending of debt consolidation, banking recapitalization and the implementation of the restrictive monetary regulation in order to stabilize the economy. Third, the 1996 and 1998 period is marked by the completion of the privatization process with a well-developed regulatory and supervisory authority in place (Hasan & Marton, 2003, p. 2256)

comparing efficiency of new and old banks in Portugal, Canhoto and Dermine (2003) also suggest that banks experienced efficiency improvements, measured using a non-parametric approach, in the period following financial deregulation, 1990 and 1995.

Unlike all the above-mentioned studies focusing on deregulation in a specific country, Casu and Molyneux (2003) employed non-parametric techniques to study efficiency change in a group of five western European banking systems: France, Germany, Italy, Spain and the UK. In order to examine the effects of the process of EU legislative harmonization, the aforementioned authors use the period of 1993 and 1997 for their study. This period under study followed the European Unions Single Market Programme implemented in 1992. Casu and Molyneux (2003) found that bank efficiency in European countries improved, albeit by a small amount, following the implementation of the Single Market Programme.

Another strand of the empirical literature, however, suggests different or even conflicting results. Several of these studies show that, following financial deregulation, efficiency of financial institutions does not improve. Some researchers find that deregulation is associated with a declining tendency of bank efficiency while a few show that deregulation exerts little or no impact on efficiency of banking firms. For example, Grabowski et al. (1994) investigated bank efficiency in the US using non-parametric techniques. In order to capture the effects of deregulation, namely two regulatory Acts[6] in 1980 and 1982, Grabowski et al. (1994) selected the years 1979, 1983 and 1987 for their study. By comparing the efficiency scores between these years of 669 randomly selected banks the researchers found that, overall, efficiency of US banks declined after deregulation. Likewise, Humphrey and Pulley (1997) also found that, following deregulation, bank efficiency decreased in their study of 683 banks in the US over the period 1977 to 1988.

Denizer et al. (2000) applied non-parametric techniques to banks in Turkey but used a longer time span than Ziam (1995) and Isik and Hassan (2003) to investigate the (longer-term) effects of financial liberalization from 1970 to 1994. Denizer et al. (2000) expected that financial deregulation would force banks to be more efficient thanks to competition from new entrants in the market and relaxed regulation. However, contrary to

[6] These are the Depository Institutions Deregulation and Monetary Control Act in 1980 and the Garn-St. Germain Act in 1982, which removed barriers on banking firms and thrift institutions such as portfolio restrictions and interest rate ceilings. These Acts also widened the scope of activities conducted by thrift institutions by allowing them to be involved in commercial loans, checking accounts and trust operations, which traditionally limited to commercial banks (Grabowski et al., 1994, p. 40).

their hypotheses, following deregulation, banks in Turkey suffered from an observable decline in efficiency. Grifell-Tajie and Lovell (1996) studied the productivity of savings banks in Spain in the post-deregulation period of 1986 and 1991 using the Malmquist index. Grifell-Tajie and Lovell (1996) show that productivity of Spanish savings banks have declined as rapidly as over 5% per year, a rate of decline substantially higher than that found by previous studies. Using the parametric stochastic frontier approach, Williams and Intarachote (2003) examined profit efficiency of Thailand banks between 1993 and 1997 and they found that this increased at a decreasing trend over the period.

Also applying stochastic frontier techniques, but focusing their analyses on another eastern Asian country, South Korea, Hao et al. (2001) investigated the efficiency of 19 private banks between 1985 and 1995. This period includes the years 1991, 1993 and 1994 when the General Bank Act was amended to offer banks more autonomy in their management and operational activities. These authors provide evidence that deregulation exerts little or no significant impact on bank efficiency. Hacrylchyk (2005) investigated efficiency in the Polish banking sector over 1997 and 2001. The period studied is associated with various changes in the banking sector landscape. Restrictions on foreign banks were removed in 1998 with the new Banking Act and many large banks were privatised in 1999, following several initial deregulatory efforts since 1989. Hacrylchyk (2005) shows that efficiency of banks in Poland has not improved in their examined period, suggesting that the deregulatory policy did not generate favourable effects on bank efficiency, at least in the short run.

To complicate the evidence further, efficiency changes have been found to be dependent upon bank size (Elyasiani & Mehdian, 1995) and bank ownership structure (Bhattacharyya et al., 1997; Isik & Hanssan, 2003; Ziam, 1995). For example, Elyasiani and Mehdian (1995) compared the efficiency between small and large commercial banks before and after deregulation in the US. The aforementioned researchers selected a sample of banks that operated in both 1979 and 1986 and divided the sample into two sub-categories: small banks with total assets in 1986 less than USD50 millions and large banks with total assets constrained between USD50 million and USD10 billion. Employing a non-parametric approach, Elyasiani and Mehdian (1995) first assumed that these two bank categories operated under the same frontier and examined the efficiency of small and large banks at two points of time, 1979 and 1986. They found that small banks and large banks do not show consistent differences in efficiency performance (at the 1% significance level) in 1979 but in 1986, large banks exhibited significantly superior performance. The results

may imply that changes in efficiency of small and large banks follow different patterns during pre- and post-deregulation periods. Secondly, Elyasiani and Mehdian (1995) relaxed the assumption of a common frontier and estimated efficiency of these two sub-samples under separate frontiers. These estimates are justified on the grounds that small banks tend to operate in local markets with stronger local commitment focusing on retail and small business lending package, they also face limited access to financial markets. Small banks are also limited in hiring highly qualified management because they cannot allocate overhead costs to a wide array of outputs. Elyasiani and Mehdian (1995) investigated the changes in efficiency of small and large banks over time and showed that small banks are associated with a decline in efficiency between 1979 and 1986 while large banks demonstrate no significant change in efficiency between these two periods.

Bhattacharyya et al. (1997), on the other hand, show that efficiency changes are different for banks belonging to various ownership categories. These authors studied the efficiency of commercial banks in India after initial steps of deregulation, which took place in 1985. In this year, the central bank started to remove partially restrictions on bank activities, interest rates and exchange rates. Using an unbalanced dataset of about 70 commercial banks for the period 1986 to 1991, Bhattacharyya et al. (1997) categorized the sample into publicly-owned banks, privately-owned banks and foreign-owned banks. The results derived from non-parametric estimates indicate that publicly-owned banks are associated with a decline in efficiency, foreign-owned banks, in contrast, recorded an increase in efficiency while that of privately-owned banks is almost unchanged following financial deregulation. These outcomes are confirmed by the second-stage regressions in which efficiency are regressed again time and environmental factors. Overall, the efficiency of publicly-owned banks declined by 2.7% on average; the efficiency of foreign-owned banks, however, increased by approximately 6.8%; and that of privately-owned banks witnessed a negligible increase, by 0.07% on average. The results show that banks of various ownership categories responded to deregulation policies differently. Similarly, Ziam (1995) compared bank efficiency between the years 1981 and 1990 in Turkey and found that cost efficiency of private banks increased at a higher rate than that of state-owned banks following deregulation. Isik and Hasan (2003, p. 1470), again, show that ownership structure matter in determining bank efficiency improvement. Their efficiency study of banks in Turkey over 1981 and 1990 revealed that technical efficiency of private banks increased while that of state-owned banks decreased.

3.2.3. *Bank X-efficiency and Its Determinants*

From another perspective, there are several studies that examine the determinants or correlates[7] of efficiency of financial institutions by using the so-called 'two-step' approach (for example, Allen & Rai, 1996; Altunbas et al., 2000; Berger & Mester, 1997; Bhattacharyya et al., 1997; Casu & Molyneux, 2003; Chang, Hasan, & Hunter, 1998; Fries & Taci, 2005; Grigorian & Manole, 2002; Hao et al., 2001; Hasan & Marton, 2003; Havrylchyk, 2005; Mester, 1993). Efficiency measures are estimated in the first step and, in the second step, these efficiency scores are related to firm and environmental factors. The aim is to explore the main determinants of bank efficiency. The following section discusses the literature that analyses the determinants of bank efficiency.

3.2.3.1. *Bank size and efficiency.*

Hasan and Marton (2003) relate both profit and cost inefficiency calculated from a sample of banks in Hungary between 1993 and 1998 to various bank characteristics and find that bank asset size is inversely related to both profit and cost inefficiency. The results indicate that larger banks are relatively more efficient (Hasan & Marton, 2003, p. 2265). Nikiel and Opiela (2002), on the other hand, found that larger banks tend to be more cost efficient (but less profit efficient) in a sample of banks in Poland between 1997 and 2000. Unlike Hasan and Marton (2003) and Nikiel and Opiela (2002) who measure bank size by using the natural logarithm of bank assets, Grigorian and Manole (2002) use bank assets over total banking assets to proxy for bank size. In a cross-country study, Grigorian and Manole (2002) also suggest that larger banks are more efficient than small banks in 17 transition economies in the period 1995 to 1998.

In contrast, other studies, for example, Kaparakis, Miller and Noulas (1994) and Allen and Rai (1996), show that bigger banks tend to be less cost efficient. Kaparakis et al. (1994) investigated the efficiency of a large sample of commercial banks in the US in 1986 using the stochastic frontier technique. These authors show that banks' total assets are positively and significantly correlated with bank inefficiency. The results remain unchanged when dummy variables for bank size are replaced with banks' total assets. In addition, Allen and Rai (1996) investigated bank efficiency in 15 countries for the period

[7] Studies that use the two-stage regression approach implicitly assume that efficiency is determined by other factors. However, the causality could run in the opposite direction. For example, more efficient banks may compete better and become larger or make more profits rather than profits increasing bank efficiency. This can induce problems in interpretation of the results (Berger et al., 1993, p. 245; Berger & Mester, 1997, p. 911).

of 1988 and 1992 using the stochastic frontier approach. In the second stage, the efficiency outcomes from the stochastic cost frontier efficiency estimates are related to specific bank characteristics. The results show that, for a sample of large banks that operate in countries where they are restricted from involvement in real estate and insurance activities, asset size is significantly correlated with bank inefficiency.

Unlike the above-mentioned studies, Mester (1993) shows that bank size does not affect the level of cost efficiency. Mester (1993) applies the stochastic cost frontier technique to investigate the efficiency of mutual and stock S&Ls in the US in the year 1991. In the second stage, the author uses logistic regression to explore the correlates of bank efficiency and found no statistically significant relationship between bank size and cost inefficiency (Mester, 1993, p. 284). This evidence supports the findings from Cebenoyan, Cooperman, Register and Hudgins (1993) who also found an insignificant relationship between bank size and efficiency for a sample of stock and mutual S&Ls in the US in 1988. On another aspect, Berger and Mester (1997) show that banks of different size classes do not appear to vary much in cost efficiency but small banks are the most profit efficient group. These results imply that when banks become larger, they face more difficulties in generating profits even though they can control costs to the same degree (Berger & Mester, 1997, p. 936).

3.2.3.2. *Bank profit and efficiency.*

Turning to the correlates between bank profitability and efficiency, the empirical evidence, again, show inclusive results. Altunbas et al. (2000, p. 1620) found that cost inefficiency is negatively related to bank performance proxied by return on average assets in the Japanese banking sector over the period 1993 to 1996. The findings suggest that banks with higher rates of profits tend to be more cost efficient (even though efficiency is entered as a dependent variable in these estimates, the results could be interpreted as more efficient banks are more like to gain more profits because causality is an empirical question). Similarly, Allen and Rai (1996, p. 668) found that profitability, measured by (net) return on assets, is inversely related to bank (cost) inefficiency for a sample of large banks. This implies that for large banks, higher profits are associated with more cost efficiency. However, there is no such an evidence for the sample of small banks. Mester (1996) conducted simple correlations between inefficiency for a sample of 214 banks in the US over the 1991 and 1992 period with bank after-tax return on assets. The coefficient correlation between inefficiency and bank profits is negative and statistically significant.

Casu and Molyneux (2003) studied the efficiency of banks in Europe. Based on their results from second-stage Tobit regressions they found little evidence to suggest that bank profit measured by returns on average equity is correlated with bank efficiency levels.

3.2.3.3. *Bank capital and efficiency.*

Moving to the relationship between bank capital and X-efficiency, some studies show that banks with higher levels of capital are more efficient (Fries & Taci, 2005, p. 75; Grigorian & Manole, 2002, p. 18; Mester, 1993, p. 285). Others, in contrast, suggest that inefficient banks tend to hold higher levels of capital (Altunbas, Carbo, Gardener & Molyneux, 2007). The higher efficiency gained by well-capitalized banks could be explained as higher capital acts as an implicit insurance for depositors and subsequently promote deposits. Banks with greater deposits then may become more efficient because they have richer resources to offer loans and vice versa.

On the other hand, the bank capital and efficiency could be linked through the risk mechanism. According to regulatory hypothesis, regulators tend to encourage banks to augment their capital corresponding to the level of risk they are facing. Holding other things constant, regulators may allow a superior efficient bank with better management more room to take on risk, higher leverage, for instance. This means that banks that are more efficient have lower capital level. According to the moral hazard hypothesis, however, banks with lower capital level tend to be less efficient. This alternative hypothesis argues that banks have incentives to exploit existing flat deposit insurance schemes. The argument is highly relevant when banks have already been in a high position of leverage and risk, proposing that banks would take more risk as their capital decreases. The direction of causality may run from capital to risk and is affected by regulatory actions. Bank managers who are not efficient in screening and monitoring loans tend to produce lower efficiency performance while taking risk to cover lost returns needed to increase capital. In addition, in order to increase capital level and short-term profits, banks may opt to reduce funds devoted to monitoring credits. Holding other things constant, this would increase efficiency (and risk), suggesting a positive relationship between capital and efficiency (Altunbas et al., 2007, p. 53).

3.2.3.4. *Bank ownership and efficiency.*

Compared to other correlates, bank ownership structure, to some degree, provides a relatively clearer picture of its relationship with X-efficiency. There are many studies

that find fairly consistent results for developing country banking systems, the main result being that foreign banks are typically more efficient than their domestic counterparts (Bonin, Hasan, & Wachtel, 2005; Fries & Taci, 2005; Grigorian & Manole, 2002; Hasan & Marton, 2003; Havrylchyk, 2005; Jemric & Vujcic, 2002; Kraft, Hofler, & Payne, 2002; Maudos, Pastor, Perez, & Quesada, 2002; Nikiel & Opiela; 2002; Weil, 2003; Williams & Intarachote, 2003)[8].

However, considering the domestic banking sub-sector alone, efficiency comparison between privately-owned and government-owned banks does not provide unambiguous findings. Fries and Taci (2005, p. 77) suggest that, on average, the efficiency level of state-owned banks is significantly lower than that of domestic privately-owned banks in 15 transition economies in eastern Europe. In China, Fu and Heffernan (2005) found that joint-stock banks are more cost efficient than state-owned banks. The evidence supports the argument that privately-owned banks tend to perform better than government-owned banks because the latter is associated with mismanagement, poor credit screening and their activities are less driven by market factors.

In contrast, Denizer et al. (2000) found that in Turkey privately-owned banks do not exhibit greater efficiency than state-owned players, derived from DEA technique, over the period 1970 to 1994. This result conflicts with the authors' expectations, who posit that privately-owned banks would perform better due to their smaller assets size. The dynamic structure associated with small banks should help them to adapt more rapidly with market changes following financial liberalization (Denizer et al., 2000, p. 30). In addition, Kraft et al. (2002, p. 10) estimated bank efficiency in Croatia by using SFA and found that domestic privately-owned banks were less cost efficient than state-owned banks over the 1994 to 2000 period.

Different from the two above-mentioned studies, which employed one single technique and the pooled ownership sample to suggest differences in efficiency among various ownership structure, Altunbas, Evans and Molyneux (2001) employed a variety of approaches to estimate cost, profit and technical changes for banks of different ownership types in the German banking market. Recognizing that banks under different types of ownership may employ different production technology as suggested by Mester (1993),

[8] In advanced economies, however, domestically owned banks are found to be more efficient than their foreign-owned partners (Berger, DeYoung, Genay, & Udell, 2000; Chang et al., 1998; DeYoung & Nolle, 1996; Sathye, 2001; Sturm & Williams, 2004). The findings of these comparative efficiency studies that employ frontier approaches are also consistent with those that use conventional accounting ratios (Barajas, Steiner, & Salazar, 1999; Claessens, Demirguc-Kunt, & Huizinga, 2001; Denizer, 2000).

Altunbas et al. (2001b) first estimated efficiency for their banking sample using a separate cost specification for each category of ownership. The ownership classification comprises of private banks (including foreign banks, sole proprietorships and limited partnerships), government-owned banks (represented by savings banks), and mutual banks (represented by cooperative banks). For comparison purpose, the aforementioned authors additionally calculate efficiency using a common frontier for all types of ownership. They used both stochastic frontier and distribution-free approaches to apply to a German banking sample from 1989 to 1996. Altunbas et al. (2001) found that government-owned savings banks and mutual banks are slightly more cost and profit efficient than their private sector rivals. The results are compatible between separate and common frontier estimates of efficiency.

3.2.3.5. *Bank risk-taking and efficiency.*

Maudos et al. (2002) examined cost and profit efficiency and their correlates with other factors using bank data from 10 European countries between 1993 and 1996. These authors measured risk by two indicators: the standard deviation of return of assets (ROA) and the loan-to-asset ratio. The results show that ROA deviation is positively correlated with profit efficiency but has no significant relationship with bank cost efficiency. On the other hand, the loan-to-asset ratio is significantly and positively related to the level of bank efficiency. In short, bank risk-taking behaviour is found to be positively related with efficiency.

Altunbas et al. (2007) employed seemingly unrelated regression to analyse the link between capital, risk and efficiency across 15 European banking sectors. The sample includes all 10 countries studied by Maudos et al. (2002) but over a longer period-from 1992 to 2000. For the full sample of banks, Altunbas et al. (2007) found no evidence of a positive relationship between bank risk proxied by loan-loss reserves and (cost) inefficiency (derived using stochastic frontier techniques). However, they found an inverse relationship between risk and inefficiency for banks of different ownership types, namely, commercial, savings, and cooperative banks. Altunbas et al. (2007) also found an inverse relationship between inefficiency and risk for a sub-sample of the most efficient banks in their sample. This suggests that the negative connection between risk and cost inefficiency is preponderant or banks that are more efficient tend to take-on higher levels of risk. The results are consistent with those reported by Maudos et al. (2002).

However, it is noted that both Altunbas et al. (2007) and Maudos et al. (2002) reported the correlates between bank risk and efficiency for developed European

countries. Havrylchyk (2005) investigated efficiency in a single country in its transitional process, Poland. The author used non-parametric techniques to measure efficiency and found that loan-loss provisions and loan-to-asset ratio are both inversely related to cost efficiency. This implies that higher risk-taking banks are less efficient, conflicting with findings from both Altunbas et al. (2007) and Maudos et al. (2002). Concerning the volatility of ROA, Havrylchyk (2005) found that ROA volatility is positively and significantly correlated with cost efficiency. This again contrasts with the insignificant link reported by Maudos et al. (2002).

In sum, the literature so far provides an unclear pattern on the effects of deregulation on bank efficiency. The relationships between efficiency and factors such as bank size, profit, capital, risk and, to a lesser extent, ownership structure are mixed and matter to empirical investigation. The present paper, therefore, aims to examine efficiency improvements (if any) in South East Asian banking systems as well as its determinants after the period following the 1997/1998 crisis when further reforms took place[9].

3.2.4. *Measurement of X-efficiency*

Modern techniques (versus traditional accounting ratios) for measuring bank X-efficiency fall into two different categories: the non-parametric approach of which Data Envelopment Analysis (DEA) is relatively popular and the parametric approach of which the main technique is stochastic frontier analysis (SFA)[10]. Both of these approaches have certain strengths and weaknesses.

DEA is a linear programming technique, which helps its users to evaluate efficiency of firms by constructing the efficiency frontier directly from the actual data. Contrary to a typical econometric method characterized as a central tendency and accessing firms in comparison with an average performer, DEA is an extreme point technique, which

[9] In the macro-aspect, after 1998, countries in our sample focus on improving supervisory and regulatory framework including capital adequacy requirements, deposit insurance schemes and consolidation process (Chapter 1, Table 1.1). On the micro-aspect, limits on foreign bank ownership were further removed (Chapter 4, Table 4.1).

[10] Non-parametric approaches include Data Envelopment Analysis (DEA) (presumption of the possible substitution between observed input combinations) and the Free Disposal Hull (FDH) approach (where substitution is impossible). Parametric technique includes Stochastic Frontier Approach (SFA) (specification of the shape of efficiency is required), Thick Frontier Approach (TFA) (the ostensibly lowest average-cost performers are assumed to have above-average efficiency level and form a thick frontier) and the Distribution-Free Approach (DFA) (specific shape of the efficiency distribution does not have to be imposed). For detailed comparison of parametric and non-parametric approach, see, for example, Molyneux et al. (1996); Bauer, Berger, Ferrier and Humphrey (1998).

compares each firm with only the 'best' firms (Seiford & Thrall, 1990). These 'best' firms will form the frontier and envelop other firms within their boundary.

One of the advantages of this technique is that it does not require the specification of a production function relating to inputs and outputs. Second, the efficiency of firms is directly compared against their peers. Third, like the parametric approach, DEA can be used to estimate the efficiency of firms with multiple inputs and outputs, which can have different measurement units. Besides, DEA is appropriate to handle small samples (Canhoto & Dermine, 2003; Havrylchyk, 2005; Sathye, 2001). However, DEA is an extreme point technique, which assumes no random errors; all disturbances are attributed to inefficiency. Therefore, DEA may result in lower (and more dispersed) efficiency level estimates of firms compared to SFA (see, for example, Berger & Humphrey, 1997). In addition, DEA performs fairly well when it compares efficiency of firms relative to other firms, but it may converge slowly to 'absolute' efficiency (Anderson, 1996). In other words, DEA could reflect how well a firm is operating in comparison with other firms but does not compare the efficiency with the 'maximum theoretical' efficiency level. Furthermore, because DEA is a non-stochastic technique, statistical tests of hypotheses are problematic (Smith, 1997).

The SFA technique, on the other hand, facilitates statistical tests of hypotheses because it is an econometric approach. Another advantage of this approach is that it allows for random errors. Therefore, it is less likely to misidentify disturbances as inefficiency. The main disadvantage of this technique is that it requires the specification of a functional form. While non-parametric techniques construct the efficiency frontier directly from the observed data, the shape of stochastic efficiency frontier is imposed through the assumed functional form, which may be subject to specification error.

3.3. Methodology and Data

3.3.1. *Methodology*

The present paper applies a two-stage DEA approach following, for example, Casu and Molyneux (2003), Chang et al. (1998), Grigorian and Manole (2002), Havrylchyk (2005), Hao et al. (2001). In the first stage, the efficiency of banks in five South East Asian countries are estimated using variable returns to scale and input-oriented DEA techniques. In the second stage, the efficiency scores produced by DEA are regressed against a set of bank and country-specific characteristics to investigate which factors are correlated with efficiency as well as how efficiency has changed since 1998.

In order to measure the efficiency of banks in South East Asian countries, we adopt the DEA approach for the following reasons. First, as mentioned above, DEA does not require the pre-specification of production function and is a linear-based technique. Therefore, DEA is friendly to users since it requires less econometric specification than the SFA approach. Second, our sample is small. In order to form a production function for efficiency estimates, SFA normally requires relatively large data sets as a substantial number of parameters need to be estimated - typically small sample efficiency studies use DEA. As such, the DEA technique is more appropriate [11] (Havrylchyk, 2005; Canhoto & Dermine, 2003; Sathye, 2001).

Originally developed by Charnes, Cooper and Rhodes (1978) elaborated from the work by Farrell (1957); DEA is a mathematical programming technique, which is based on the concept of engineering efficiency. A firm could be said to be more technically efficient relative to another if it is possible to produce the same outputs with fewer inputs or same inputs but higher outputs. A single firm is said to be technically efficient if it could not increase any output or reduce any input without reducing other outputs or increasing inputs. This engineering concept is applied to the economic area and, subsequently, efficiency values obtained from DEA is called technical efficiency (Yue, 1992).

Using DEA the efficiency for a specific firm can be presented as follows:

$$\max_{u,v} h_0(u,v) = \frac{\sum_{r=1}^{s} u_r y_{rj_0}}{\sum_{i=1}^{m} v_i x_{ij_0}} \quad (3.1) \qquad s.t \frac{\sum_{r=1}^{s} u_r y_{rj_0}}{\sum_{i=1}^{m} v_i x_{ij_0}} \leq 1, j = 1,2,3,...,j_0,...,n$$

$$u_r \geq 0, r = 1,2,3,...,s$$

$$v_i \geq 0, i = 1,2,3,...,m$$

Where:

- x_{ij0} is the input i_{th} of the decision making unit (DMU/firm) j_{th}
- y_{rj0} is the output r_{th} of DMU/firm j_{th}
- u_r, v_i are the weights of outputs and inputs respectively

[11] Our small sample for yearly efficiency estimates satisfies the rule of thumb between the observations and the number of bank inputs and outputs suggested for DEA users. That is the number of observations should be at least three times larger than the total number of inputs and outputs (Boussofiane, Dyson, & Thanassoulis, 1991; Bowlin, 1999; Nunamaker, 1985). For a DEA bibliography, see, for example, Seiford (1996) and Tavares (2002). It is noted that DEA is sensitive to the number of firms because it compares efficiency of a decision making unit relative to those of others (in the dataset). As a result, the rank order of efficiency is not preserved if additional firms are introduced into the sample.

The formula (3.1), however, could not be solved to construct the frontier and obtain efficiency scores because it is a fractional linear program. The model (3.1) is associated with an infinite number of solutions since if (u, v) is optimal then (λu, λv) is also optimal for positive u and v. Therefore, (3.1) is transformed into a linear model as shown in (3.2):

$$\max_{u} z_0 = \sum_{r=1}^{s} u_r y_{rj_0} \quad (3.2)$$

$$s.t \sum_{r=1}^{s} u_r y_{rj_0} - \sum_{i=1}^{m} v_i x_{ij_0} \leq 0, j = 1,2,3,...,j_0,...,n$$

$$\sum_{i=1}^{m} v_i x_{ij_0} = 1$$

$$u_r \geq 0, r = 1,2,3,...,s$$

$$v_i \geq 0, i = 1,2,3,...,m$$

The efficiency of each DMU (or firm) in a sample can be obtained by solving problem (3.2). The solution to this linear model offers a measure of the efficiency of a specific DMU relative to the 'best' DMU as well as the weights producing the relevant level of efficiency. In order to obtain the efficiency scores of the whole sample, one has to solve problem (3.2) for every DMU.

Nevertheless, for a linear model, it is possible to construct a dual linear model, which uses the same data set, and the solution to either the original or the dual model generates the same outcomes about the problem being solved. The dual model is formulated by assigning a dual variable to each constraint in the original model and formulating a new linear programming on these variables.

The dual model for technical efficiency is displayed in (3.3):

$$\min_{\lambda} z_0 = \theta_0 \quad (3.3)$$

$$s.t \sum_{j=1}^{n} \lambda_j y_{rj} \geq y_{rj_0}, r = 1,2,...,s$$

$$\theta_0 x_{ij_0} \geq \sum_{j=1}^{n} \lambda_j x_{ij}, i = 1,2,...,m$$

$$\lambda_j \geq 0$$

The first and second constraints are required to make sure that the data are enveloped both from the above and below. The third constraint restricts all inputs and outputs to be non-negative. This model only allows constant returns to scale.

Extending the work by Charnes et al. (1978) shown above, Banker, Charnes and Cooper (1984) add another constraint to build the convex hull and to allow variable returns to scale. That is:

$$\sum_{j=1}^{n}\lambda_j = 1$$

Technical efficiency, as mentioned earlier, involves the capacity of firms to produce the same levels of outputs as those of other firms but with lower levels of inputs or to use the same quantity of inputs but generating higher outputs. Typically, technical efficiency does not capture the price factors of inputs. When the inputs price information is available, one can also compute cost efficiency and allocative efficiency besides technical efficiency. Cost efficiency reflects the capacity of firms to save costs. A firm is more cost efficient if it can use the same level of inputs to produce the same level of outputs as other firms but with lower costs. On the other hand, allocative efficiency reflects the capacity of firms to combine the usage of inputs (or the production of outputs) at minimum costs for a given level of outputs or inputs. Allocative efficiency in inputs selection reveals the ability of firms to opt for the mix of inputs that can be used to produce a fixed quantity of output at lowest cost.

The cost-minimisation efficiency requires the solution of the model shown in (3.4):

$$\min_{\lambda, x^*_{j_0}} w_j x^*_{j_0} \quad (3.4)$$

$$s.t \sum_{j=1}^{n}\lambda_j y_{rj} \geq y_{rj_0}, r = 1,2,...,s \qquad x^*_{j_0} \geq \sum_{j=1}^{n}\lambda_j x_{ij}, i = 1,2,...,m$$

$$\lambda_j \geq 0$$

$$\sum_{j=1}^{n}\lambda_j = 1$$

Where:

- w_j is the input prices vector for the decision making unit j_{th}
- x^*_{j0} is the cost-minimising vector of input quantities for the decision making unit j_{th}, given the input prices w_j and the output levels y_{j0}, and all other notation is as defined previously in (3.1)

The cost efficiency of the decision-making unit j_{th} is the ratio of minimum cost to observed cost as shown in (3.5):

$$CE = \frac{w_j x^*_{j_0}}{w_j x_{j_0}} \quad (3.5)$$

Allocative efficiency, reflecting input-mix, then, can be calculated as in (3.6):

$$AE = \frac{CE}{TE} (3.6)$$

Where:

- AE is allocative efficiency
- CE is cost efficiency obtained by solving model (3.5)
- TE is technical efficiency obtained by solving model (3.3)

3.3.1.1. *Input and output selection.*

One of the key elements of applying frontier technique to measure efficiency is to identify the relevant inputs and outputs of banking firms. There have been two main approaches to defining what banks produce: the intermediation and production approaches. The major difference between these two views is that the former treats deposits as inputs and measures bank outputs in terms of monetary value while the latter considers deposits as outputs and measures outputs in terms of number. Following, for example, Altunbas et al. (2001b), Casu, Girardone and Molyneux (2004), Esho (2001), Mester (1996) and Molyneux et al. (1996), this paper follows the intermediation approach to select bank inputs and outputs[12].

Kolari and Zardkoohi (1986) argue that processing costs vary among different accounts. Demand deposit accounts, for example, may be more costly to maintain than time deposit accounts because the former is more active. Therefore, monetary measure of bank inputs and outputs is more appropriate. Second, one large account may bring in more monetary units than a large number of smaller accounts. Third, banks are multi-service firms, measuring bank outputs in terms of monetary values allows the consistent measurement of outputs, for example, between deposits and securities investments, which could not be measured in terms of number of accounts. Fourth, banks may compete for market shares in monetary amounts rather than the number of accounts. If the objective of

[12] In addition to the two approaches mentioned above; researchers also employ value-added (for instance, Berger, Hanweck, & Humphrey, 1987) and user-cost (for instance, Hancock, 1991) approaches. Unlike the intermediation or production approaches, which consider liabilities as either inputs (intermediation) or outputs (production), the value-added could view both liabilities and assets of banks as outputs if the relevant categories have significant value added. Other items are treated as inputs or intermediate fundamentals. The user-cost, on the other hand, determines a financial product as an input or output depending on the net revenue generated by the respective (asset or liability) item. The value-added approach is more widely used than user-cost because the latter is subject to measurement error if the user costs change leading to the fact that an input in one period becomes an output in another. For further details, see, for example, Goddard et al. (2001) and Molyneux et al. (1996).

banks is to increase the number of accounts, they can divide one large into several smaller accounts to increase their outputs artificially (Kolari & Zardkoohi, 1986). On the other hand, deposits are associated with costs and only generate income when they have already transformed into assets (Molyneux, Thornton, & Lloyd-Williams, 1996). Depositors may withdraw the funds immediately and at any time.

Berger and Humphrey (1997, p. 197) stated that there is no perfect approach but the intermediation approach may be preferable to evaluate the entire financial institution while using deposits as an output (under the production approach) is more appropriate for comparing efficiency among branches within a bank. This is because of the fact that the intermediation approach includes interest expenses, which accounts from one-half to two-thirds of total costs as inputs but interest expenses (and operating costs) are excluded from inputs as viewed by production approach (Yue, 1992, p. 35). Furthermore, minimizing total costs, not only production costs, is needed to maximise profit (Casu & Molyneux, 2003)[13].

Accordingly, in order to calculate technical efficiency, three inputs are selected: fixed assets; deposits and personnel costs. Two outputs are net loans and other earning assets[14]. All of these inputs and outputs are expressed as a share of total bank assets. In order to compute cost efficiency, three relevant input prices are identified whereas the price of the first, second and third inputs are other operating costs over fixed assets, interest costs over deposits and personnel costs over loans plus deposits, respectively (Table 3.1).

The input-oriented approach[15] is used because after the 1997/1998 crisis, banks in South East Asia are expected to minimize costs rather than to maximize outputs. This is different from Laeven (1999) who uses the output-oriented approach because in his study period, 1992 and 1996, banks experienced high loan growth (see, among others, Shirai,

[13] For a comprehensive discussion of bank output measurements and consequences see, for example, Molyneux et al. (1996, p. 151)

[14] We also take into account of off-balance sheet items by selecting them as an output (to replace other earning assets) in robustness tests. Because data on off-balance sheet activities are less available (compared to non-interest income), we have used non-interest income to proxy for off-balance sheets operations

[15] Input-oriented models view inefficiency is associated with the overuse of inputs with fixed outputs. In contrast, output-oriented models hold inputs constant and inefficiency is considered as the underproduction of outputs. These two measures generate the same efficiency score under constant returns to scale (CRS) assumption but different when variable returns to scale (VRS) is assumed (Collie, Prasada Rao, O'Donnell, & Battese, 2005).

2001, p. 13). Meanwhile, banks are assumed to face variable returns to scale as argued by Avkiran (1999)[16].

Table 3.1. *Selection of bank inputs, relative prices and outputs*

Inputs		Price of inputs		Outputs	
Definition	Symbol	Definition	Symbol	Definition	Symbol
1. Fixed assets over total assets	X1	1. Price of X1: Other operating costs over fixed assets	P1	1. Net loans over total assets	Y1
2. Deposits over total assets	X2	2. Price of X2: Interest costs over deposits	P2	2. Other earning assets over total assets	Y2
3. Personnel costs over total assets	X3	3. Price of X3: Personnel costs over loans plus deposits	P3		

3.3.1.2. *Second-stage regression and variables.*

In the second stage, the efficiency scores are used as the dependent variables in a regression to examine the determinants of efficiency. The second-stage is estimated using Tobit regression because efficiency scores are constrained between zero and one (Lovell, 1993, p. 53). The Tobit regression approach is commonly used in the literature (Casu & Molyneux, 2003; Chang et al., 1998; Grigorian & Manole, 2002; Havrylchyk, 2005; Nikiel & Opiela, 2002). The equation is specified as follows:

$$\theta_{ijt} = \alpha + \beta_1.Size_{ijt} + \beta_2.Profit_{ijt} + \beta_3.Capital_{ijt} + \beta_4.Bank.private.credit_{jt} + \beta_5.Regulation_j + \beta_6.Economic.growth_{jt} + \beta_7.Inflation_{jt} + \beta_8.State.ownership_{jt} + \beta_9.Ownership_{ijt} + \beta_{10}.Year_t + \varepsilon_{ijt} \quad (3.7)$$

Where:

- The subscripts i, j and t denotes bank i in country j at time t
- θ_{ijt}: Efficiency scores (technical, cost and allocative)
- $Size_{ijt}$: assets of bank i over total banking assets
- $Profit_{ijt}$: pre-tax return on assets of bank i
- $Capital_{ijt}$: equity over assets of bank i
- $Bank.private.credit_{jt}$: private credit by deposit money banks over GDP
- $Regulation_j$: regulation restrictions of country j; this is a composite index = (Bank activity restrictions + Banking entry requirements + Capital regulatory requirements – Diversification – Independence of the supervisory authority – Private monitoring index). Bank activity restrictions reflect the ability of banks to

[16] Avkiran (1999) suggests that if the majority of banks exhibit different efficiency score under constant and variable returns to scale, it is safe to assume that banks face VRS. In our sample, the averaged lower efficiency scores generated under CRS condition has supported the usage of VRS

be involved in securities, insurance and real estate activities. The banking entry requirements reflect the types of legal submissions required to obtain a banking license. Capital regulatory index considers whether capital requirements capture certain risks prior to determining capital adequacy and whether initial capital is officially verified. Diversification index distinguishes whether there are explicit guidelines for asset diversification and whether banks are allowed to make loans abroad or not. Independence of the supervisory authority reflects the degree to which the supervisory authority is independent from the government and legally protected from the banking industry. Private monitoring index reflects the degree to which banks are monitored by the public. The relevant indexes are constructed and obtained from a survey in 2000, by Barth, Caprio and Levine (2006)[17]. Each individual index is typically the sum of the numerical answers to questions in a particular category. The full questions and quantification of the answers are presented in the Appendix A3.1.

- $Economic.growth_{jt}$: GDP per capita annual growth
- $Inflation_{jt}$: consumer price index annual growth
- $State.ownership_{jt}$: level of state ownership in the banking system
- $Ownership_{ijt}$: ownership dummy variable (state, foreign and private, state is dropped)
- $Year_t$: time dummy at year t
- α, β and ε are the constant, coefficients and error term, respectively

Variables capturing bank characteristics, including size, profitability and capital, we have noted show ambiguous correlates with bank efficiency. Some studies have found that bank size (Berger, 1993; Hasan & Marton, 2003), bank profitability (Altunbas et al., 2000) and capital (Fries & Taci 2005; Mester, 1993) are positively correlated with efficiency. However, other studies show the opposite, whereas larger banks (Allen & Rai, 1996; Kaparakis et al., 1994), more profitable banks (Allen & Rai, 1996) and well-capitalized banks (Altunbas et al., 2007; Hasan & Marton, 2003) are associated with lower levels of efficiency[18]. These conflicting results suggest that such relationship as are a matter for empirical investigation and hence our analysis of South East Asian banking.

[17] Direction to this dataset by Ross Levine is acknowledged

[18] Casu and Molyneux (2003) show that there is no significant link between bank profit and bank efficiency

Concerning ownership structure, we expect that foreign banks are more efficient than their domestic rivals in South East Asia because many comparative studies (Bonin et al., 2005; Hasan & Marton, 2003; Havrylchyk, 2005; Jemric & Vujcic, 2002; Kraft et al., 2002; Nikiel & Opiela, 2002; Weil, 2003; Williams & Intarachote, 2003) have found that in emerging banking markets, foreign banks tend to perform better than local partners. Within the domestic sub-sector, privately-owned banks are expected to outperform state-owned banks because the former may be more skilful in screening and monitoring credits, adapt more quickly to market changes and have better management. Therefore, the efficiency level of private banks is expected to be higher than state-owned counterparts.

To take account of national economic features, the first variable we use is credit by deposit money banks to the private sector as a share of GDP-this is simply a measure of domestic banking sector development. Even though credit extended to the private sector does not capture the capability of banking firms to overcome asymmetric information and to identify qualified investments (Beck & Levine, 2004, p. 428; Levine, Loayza, & Beck, 2000, p. 38), by excluding credit granted to governmental agencies and government-owned companies, it measures the mobilization and transformation of savings to private firms. Subsequently, private credit reflects the dynamic behaviour of the banking system, because

> According to (Barth et al., 2006), "banks or financial systems that issue more credit to private sector are more active in researching firm information, exerting corporate control, providing risk management services, mobilizing savings and facilitating transaction than financial systems that simply issue credit to the government or state owned enterprise" (p. 41).

In addition, past research has shown that banking sector development reflects long-run economic growth better than other broad money measures (Levine et al., 2000, p. 38).

As further restrictions on foreign bank ownership have been lifted in South East Asia since 1998 (Chapter 4, Table 4.1), we expect that banks are more likely to increase their lending to the private sector. This is because of competition from foreign banks, which we assume has encouraged local banks to shift their lending to the growing private sector so as to maintain market share. This should help to improve bank efficiency. In other words, bank efficiency is positively correlated with banking development. Likewise, GDP growth is also expected to be positively related with efficiency because better economic development is likely to be associated with more deposits and higher loan growth to finance the economy. On the other hand, regulatory restrictions are expected to hinder efficiency improvements because restricted financial systems are more likely to be less competitive (Casu & Girardone, 2006; Classens & Laeven, 2004; Demirgüc-Kunt,

Laeven, & Levine, 2004). Also, inflation (included following Grigorian & Manole, 2002) and the national level of state ownership are barriers to achieving higher levels of efficiency. This is because increased inflation rate could impede the ability of financial institutions to allocate their resources in effective ways (Boyd, Levine, & Smith, 2001) and the existence of high level of government ownership in financial systems tends to lower efficiency levels (Altunbas et al., 2001b; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1999).

3.3.2. *Data*

3.3.2.1. *Data and source.*

Our sample includes financial institutions in five countries in South East Asia: Indonesia, Malaysia, Philippines, Thailand and Vietnam. The period of study is from 1998 and 2004.

Financial firm-level data, except those for Vietnam, are extracted from the Bankscope database. For Vietnam-based institutions, the data are hand-collected from the State Bank of Vietnam and individual banks. Ownership structure is classified based on information from various sources including Bankscope, Thomson Financial, academic papers, ASEAN Bankers Association (regional updates) and other sources[19]. The country-level data come from the following sources. The bank credit extended to the private sector is from Beck, Demirgüc-Kunt and Levine (2000). The regulation index is from Barth et al. (2006). Other country-level variables are from the World Bank, World Development Indicators 2006. The data are retrieved from the website of the Economic and Social Data Service International, University of Manchester.

3.3.2.2. *Sample overview.*

Because non-commercial banks[20] account for a considerable proportion in our sample, particularly in Malaysia and Thailand, it is necessary to offer some identification to these institutions. They include bank holding companies, investment banks, Islamic

[19] Academic papers include Bekaert and Harvey (2004), Chou (2000), Chua (2003), Coppel and Davies (2003), Detragiache and Gupta (2004), Foceralli (2003), Megginson (2005), Montreevat (2000), Tschoegl (2001), Tschoegl (2003). Other sources are McMillan (2002), Montlake (2003), US Embassy in Jakarta (2005), World Bank (2000)

[20] The inclusion of various financial institutions in addition to commercial banks is justified on two grounds. First, even though each type of financial institutions has different business focus, they all compete with one another. Second, the selection of commercial banks alone significantly reduces the bank-year observations for yearly estimates, particularly for Thailand, being lower than the rule of thumb (Bowlin, 1998; Nunamaker, 1985) on the relationship between inputs, outputs and the number of observations suggested for using DEA techniques.

banks, mortgage banks, non-bank credit institutions, savings bank and specialised governmental credit institutions. The specific distribution of these institutions by country is displayed in Table 3.2.

Table 3.2. *Firm-year non-commercial bank financial institutions by country*

Types of institutions	Indonesia	Malaysia	Philippines	Thailand	Vietnam
1. Bank holding company	2	40	6	-	-
2. Investment bank	2	63	11	65	-
3. Islamic bank	5	-	-	-	-
4. Mortgage bank	-	-	4	-	-
5. Non-bank credit institutions	-	44	-	18	-
6. Savings bank	-	-	32	7	-
7. Specialised governmental credit institutions	-	26	7	14	7
Total	**9**	**173**	**60**	**104**	**7**

Note: Data from Bankscope. Bank holding companies are defined, under the US law, to be a firm that own at least 25% of the voting stock of a bank subsidiary in two or more banks. Investment banks can offer underwriting, advice on mergers and acquisitions, equity trading and global custody. Islamic banks offer banking services that comply with Islamic (Sharia) rules, of which the basic principle is the prohibition of interest. In order to be consistent with this rule, Islamic bankers need to develop alternative approaches to financing (see, Iqbal, & Molyneux 2005, p. 27). Mortgage banks are mainly involved in mortgage loans. Non-bank credit institutions such as finance companies (in Malaysia) and credit foncier (in Thailand) are restricted from taking deposits. Savings banks are those primarily financed by household deposits (Casu, Girardone, & Molyneux, 2005, p. 55). Specialised governmental credit institutions provide financial assistance to strategic sectors such as agriculture, small and medium businesses and industries served to national economic development (Bank Negara Malaysia, Annual Report, 2002, p. 194). Because non-bank institutions are significantly fewer in number, for simplicity, banks are used to refer to all financial institutions in this paper.

Table 3.3. *Firm-year financial institutions in South East Asia 1998-2004*

Country	Commercial banks				Other financial institutions				Min per year	Max per year	Grand-total	Commercial banks/Total banking sector assets
	F	P	S	Sub-total	F	P	S	Sub-total				
Indonesia	125	154	76	355	0	4	5	9	43	64	364	0.82
Malaysia	89	108	10	207	0	145	28	173	48	60	380	0.97
Philippines	33	145	14	192	4	49	7	60	30	42	252	0.84
Thailand	27	37	27	91	9	65	30	104	20	32	195	0.87
Vietnam	103	93	25	221	0	0	7	7	29	36	228	0.93
Total											1,419	

Note: F, P, S denote Foreign, Local Private and State-owned institutions, respectively. Institutions belong to a specific ownership category is classified as those that have at least 50% of shares held by the relative bodies. Data are mainly from Bankscope, Bank Indonesia, Bank Negara Malaysia, Bangko Sentral ng Pilipinas, Bank of Thailand and State Bank of Vietnam, ASEAN Bankers Association, and Thomson Financial. Other financial institutions include bank holding companies, investment banks, Islamic banks, mortgage banks, non-bank credit institutions, savings banks and specialized governmental credit institutions (Table 3.2).

In terms of the number of firm-year institutions, Table 3.3 shows that Malaysia has the highest firm-year number of banks in our sample with a total of 380 compared to the lowest number for Thailand, which is 195[21]. Regarding the numerical sample of banks, both Malaysia and Thailand are dominated by non-commercial banks. These institutions accounted for nearly half (in Malaysia, 173 out of 380) and over half (in Thailand, 104 out of 195) of total firm-year banks. These figures reflect the fact that the financial systems in these two countries are relatively less dependent on commercial banks than other South East Asian countries (as reviewed in Chapter 2, Sections 2.2 and 2.4). In contrast, commercial banks are the key players in Indonesia, Vietnam and, to a lesser extent, the Philippines. Non-commercial banks only account for 2.5% of total firm-year banks in Indonesia. The relevant figure in Vietnam is 3% but here the non-commercial banks in our sample are specialised-government institutions. Data on other non-bank financial institutions are unavailable for Vietnam.

Regarding government ownership, on average, Indonesia has the highest number of banks controlled by the government with 76 bank-year observations. This accounts for 21% the total number of bank-year observations of commercial banks in Indonesia in our sample. The second highest is Thailand with 27 bank-year observations and this account for nearly 30% of total sampled banks from Thailand in terms of number. This figure falls to just over 24% if we include 18 foreign banks branches of which data are not available. In contrast, Malaysia has the smallest number of commercial banks owned by the government, just 10 bank-year observations or less than 5% of the total number of bank-year observations in our Malaysian sample.

The minimum and maximum numbers of banks in a specific year shows that the fluctuation, in terms of number, is highest in Indonesia, reaching 21 institutions. Meanwhile, in other countries the differences are 12 institutions (Malaysia, Philippines and Thailand) and 7 institutions (Vietnam). The declining tendency of the number of banks observed, particularly in Indonesia, is consistent with the restructuring and consolidation process that took place in South East Asia over the period of study.

[21] We are unable to obtain data on about 18 foreign bank branches in Thailand in the sampled period

Table 3.4. *Market share in South East Asian banking 1998-2004*

		Total assets			Total loans			Total deposits		
		F	P	S	F	P	S	F	P	S
Indonesia	Mean	14.15	15.96	69.90	16.22	19.27	64.51	13.35	16.37	70.28
	Min	3.89	7.70	50.44	9.48	11.35	50.06	2.62	8.24	49.21
	Max	33.13	33.00	87.55	30.49	32.56	77.93	33.88	35.53	88.12
Malaysia	Mean	11.99	84.55	3.46	11.84	85.32	2.83	11.97	84.64	3.39
	Min	9.90	81.78	2.12	10.32	81.87	1.63	9.69	82.09	1.87
	Max	13.54	86.54	4.93	13.41	87.14	4.72	13.68	86.70	4.93
Philippines	Mean	2.48	76.73	20.79	2.16	77.51	20.33	2.40	79.37	18.23
	Min	1.04	73.92	19.30	0.95	73.00	18.06	1.00	76.59	16.93
	Max	4.34	78.66	22.32	3.00	79.56	24.14	4.23	80.79	19.92
Thailand	Mean	6.17	58.38	35.45	6.18	59.53	34.29	6.48	59.71	33.81
	Min	4.31	52.63	30.16	3.35	55.58	29.26	4.25	53.86	26.30
	Max	7.52	63.93	39.86	8.00	63.99	39.08	8.36	66.28	39.15
Vietnam	Mean	7.62	9.34	83.03	7.02	9.15	83.83	6.19	9.48	84.33
	Min	5.92	6.67	80.40	4.97	6.84	82.01	5.22	7.18	81.45
	Max	10.36	12.95	84.81	10.57	11.27	84.91	8.29	12.97	86.66
Min		2.48	9.34	3.46	2.16	9.15	2.83	2.40	9.48	3.39
Max		14.15	84.55	83.03	16.22	85.32	83.83	13.35	84.64	84.33

Note: Figures are in percentage, averaged over the 1998-2004 period. F, P, S denote Foreign, Local Private and State-owned banks, respectively. Banks belonging to a specific ownership category are classified as those that have at least 50% shares held by the relevant ownership group. Data are mainly from Bankscope, Bank Indonesia, Bank Negara Malaysia, Bangko Sentral ng Pilipinas, Bank of Thailand and State Bank of Vietnam, ASEAN Bankers Association, and Thomson Financial.

Moving onto market structure, Table 3.4 indicates that, in terms of assets, the level of foreign bank presence (in our sample) is highest in Indonesia with over 14% on average over 1998 to 2004. This level reaches the maximum in 2004, up to over 33%, reflecting the divestment of government capital in the Indonesian banking systems and the sale of domestic banks to foreign partners when restrictions on foreign bank entry were further removed. Foreign bank participation in Malaysian banking is, on the other hand, relatively stable at about 12%. While other countries further removed the barriers to foreign participation in local markets, Malaysia did no relax rules on foreign entry. In our sample, foreign banks in Thailand are underestimated because of missing data for 18 foreign banks branches. Foreign banks in the sample only include four domestic banks that were acquired by foreign banks. These banks account for over 6% of the sample on average, well below the data from the Bank of Thailand, which shows that foreign banks in Thailand accounted for 13% of banking sector assets as at December 2004 (Bank of Thailand, Financial Institutions Statistics, 2005).

Comparing privately-owned and state-owned banks, in Malaysia, private banks dominate the market with 85% assets market share while state-owned banks just account for around 3.5% of assets. In contrast, in Vietnam state-owned banks control over 80% of the market with only four banks and private banks share just over 9% of the market. Indonesian ranks second in terms of government-owned banks; the banking sector is dominated by 11 government-owned banks that control 70% of banking sector assets. In addition, the banking market in Vietnam is the most concentrated. In 1998, the four biggest (state-owned) banks controlled 82% of the banking sector. This compares to 55% in Indonesia, 40% in Philippines, 38% in Thailand and 34% in Malaysia.

3.4. Results and Discussion

3.4.1. *Descriptive Statistics of Inputs and Outputs*

There are three noteworthy points shown by the descriptive statistics of outputs, inputs and prices (Table 3.5). First, regarding outputs, privately-owned banks appear to offer more loans over assets than foreign-owned and state-owned banks (Y1) (in three out of five countries) while foreign banks have more other earning assets than state-owned and private-owned banks (Y2). In Malaysia and Philippines, net loans of local private banks account for 54% of bank assets whereas for state-owned and foreign-owned bank lending is around 49% of total assets. In Vietnam, loans of private banks are higher at 65% of assets. For foreign banks, in Malaysia and Philippines, over 40% of assets are other earning assets. This may reflect the more dynamic role of local private banks in lending and of foreign banks in developing fee-based activities.

Second, turning to the inputs, physical assets (X1) of foreign banks are lowest while their personnel costs over assets (X3) are the highest. This is consistent with the typically smaller scale of operations and higher salaries associated with the foreign banking sector. Privately-owned banks have more deposits (X2) over assets than other sectors. Deposits account for over 80%, in Indonesia and Malaysia, and 75%, in Philippines and Vietnam, of private banks' assets on average in the period of 1998 and 2004.

Third, regarding input prices, state-owned bank seem to pay highest rates for deposits (P2) while they incur the lowest personnel costs to process loans and deposits (P3). One may argue that state-owned banks should pay lower rates on deposits because state guarantees will make deposits in government banks safer (Mian, 2003, p. 5). However, we would argue that state-owned banks could pay higher rates to attract deposits

because their losses are compensated by the state[22]. Our descriptive results are consistent with empirical evidence presented by Drakos (2003) who found that state-owned banks tend to set significantly narrower margins than their private sector counterparts (in 11 European transition economies between 1993 and 1999).

Table 3.5. *Bank inputs and outputs in South East Asia 1998-2004*

		Outputs		Inputs			Price of inputs		
		Y1	**Y2**	**X1**	**X2**	**X3**	**P1**	**P2**	**P3**
Indonesia	F	0.546	0.377	0.006	0.666	0.011	5.623	0.103	0.009
	P	0.392	0.450	0.032	0.830	0.014	1.206	0.143	0.013
	S	0.412	0.448	0.022	0.775	0.015	3.116	0.231	0.013
Malaysia	F	0.495	0.462	0.007	0.776	0.008	2.663	0.042	0.006
	P	0.543	0.379	0.011	0.808	0.008	2.114	0.046	0.011
	S	0.486	0.362	0.049	0.788	0.006	0.862	0.047	0.005
Philippines	F	0.485	0.401	0.018	0.736	0.018	2.632	0.059	0.015
	P	0.540	0.325	0.034	0.770	0.015	1.153	0.059	0.012
	S	0.497	0.371	0.032	0.628	0.015	1.064	0.103	0.015
Thailand	F	0.546	0.303	0.047	0.786	0.018	1.101	0.045	0.032
	P	0.609	0.282	0.046	0.730	0.018	0.854	0.051	0.053
	S	0.670	0.248	0.027	0.674	0.008	0.433	0.074	0.006
Vietnam	F	0.550	0.387	0.008	0.592	0.008	3.510	0.055	0.015
	P	0.656	0.252	0.021	0.760	0.006	0.973	0.058	0.004
	S	0.653	0.283	0.010	0.753	0.004	1.157	0.065	0.003

Note: Figures are averaged over the 1998-2004 period. F, P, S denote Foreign, Local Private and State-owned banks, respectively. Banks belonging to a specific ownership category are classified as those that have at least 50% of shares held by the relative bodies. Y1 = net loans over total assets; Y2 = other earning assets over total assets; X1 = fixed assets over total assets; X2 = deposits over total assets; X3 = personnel costs over total assets; P1, the price of X1, = other operating costs over fixed assets; P2, the price of X2, = interest costs over deposits; P3, the price of X3, = personnel costs over loans plus deposits. Definition of inputs and outputs are displayed in Table 3.1. Data are mainly from Bankscope, Bank Indonesia, Bank Negara Malaysia, Bangko Sentral ng Pilipinas, Bank of Thailand and State Bank of Vietnam, ASEAN Bankers Association, and Thomson Financial.

[22] Therefore, the efficiency estimates of state-owned banks may be affected by the implicit government subsidy, particularly in Vietnam. In exploring their loan rates, we calculated interest income over loans of state-owned banks and compared this to other sectors. Our sample revealed that state-owned *commercial* banks charged lower loan rates than foreign and privately-owned banks. On average, borrowers of state-owned commercial banks pay 1.3% lower rates than those of foreign-owned banks and 1.9% lower rates than those of privately-owned banks. In Vietnam, in contrast, state-owned commercial banks charge 0.5% and 0.8% higher lending rates than foreign and private banking sectors. Arguably, by offering higher deposits rate and cheaper loans; state-owned commercial banks should have higher deposits and higher lending over assets. However, they attract fewer deposits and grant fewer loans over assets compared to privately-owned banks.

In short, private banks appear to attract more deposits and offer more loans than both foreign banks and state-owned banks. Foreign banks, on the other hand, tend to focus on non-interest earnings activities and incur highest personnel costs. In contrast, state-owned banks incur the lowest personnel costs and pay the highest rates for deposits.

3.4.2. *Descriptive Statistics of Efficiency Level*

Table 3.6. *DEA efficiency of banks in South East Asia 1998-2004*

	Indonesia		Malaysia		Philippines		Thailand		Vietnam	
Ownership	TE	CE	TE	CE	TE	CE	TE	CE	TE	CE
Foreign banks	74.0	56.9	88.1	78.4	77.9	65.4	62.4	45.1	85.3	72.3
Private banks	45.8	29.5	84.3	72.1	83.6	49.9	65.2	40.9	70.5	50.6
State banks	54.9	39.4	85.3	65.2	75.8	56.9	83.5	63.3	84.4	62.4
Mean	58.2	41.9	85.9	71.9	79.1	57.4	70.4	49.8	80.1	61.8

Note: Figures are in percentage, averaged over the 1998-2004 period. Banks belong to a specific ownership category is classified as those that have at least 50% of shares held by the relative bodies. TE denotes technical efficiency, CE denotes cost efficiency. These scores are computed using the DEA approach as outlined in section 3.3.1, equations (3.3), (3.5) and (3.6).

Table 3.6 indicates that, on average, inefficiency in South East Asia banking is lower than the level typically found in the literature at 20% (Berger & Humphrey, 1997; Goddard et al., 2001). To the extent that these efficiency scores are comparable across countries[23], the most inefficient banking sector is Indonesia with technical efficient level of 58% and cost efficient level of 42%. Malaysia is the least inefficient banking sector.

Within country, foreign banks are more efficient than private and state-owned banks. However, state banks appear to be more efficient than private banks. This seems to conflict with the conventional belief of mismanagement associated with state ownership (Megginson, 2005). As argued by Laeven (1999), state-owned banks may be more technically efficient than their private sector players because technical efficiency simply reflects how well banks transform inputs into outputs, it does not reflect the cost involved and the quality of outputs. Therefore, it does not mean state-owned banks perform better. Nevertheless, the description of efficiency scores also shows that state-owned banks are more cost efficient than private banks, except for those in Malaysia. This is far from our expectation.

[23] We assume that bank production technology is non-constant year by year; therefore, we estimate efficiency by constructing yearly frontiers for each country. This assumption does not allow us to compare efficiency scores across years and countries.

We try to explain this by looking at the price of inputs shown in Table 3.5. First, we view the price of fixed assets. State-owned banks are shown to have fewer other operating costs over fixed assets than private banks (P1) (in Malaysia, Philippines and Thailand). Second, they have lower personnel cost for processing loans and deposits (P3) (in Malaysia, Thailand and Vietnam).

It is likely that lower other operating costs and staff costs could offset the higher interest costs incurred by state-owned banks. It is predicted that the lower other operating costs of state-owned banks are generated by their limited marketing and sales activities. By setting higher deposits rates subsidized by the government, state-owned banks compete with other banks (using this competitive tool). Privately-owned banks, however, due to their limited freely-supported resources, have to spend more on marketing activities to attract and retain customers as well as to improve service quality. The lowest personnel costs over loans plus deposits associated with state-owned banks are in-line with the low salaries in the public sector in the countries under study. Both of these low cost components may lead to higher cost efficiency for state-owned banks.

Regarding the gap in efficiency among banks of different ownership, there is a substantial distance in efficiency between foreign and local banks, particularly in Indonesia and Vietnam. On average, in these countries, foreign banks are over 15% more efficient than state-owned banks which, in turn, are about 10% more efficient than private domestic banks both in terms of technical and cost efficiency[24]. The smallest difference in efficiency among banks is found in Malaysia. Foreign banks are just over 5% more efficient than local private banks. The gap in efficiency between state-owned and private banks in Malaysia is narrow. State-owned banks are just 1% more efficient than private sector banks. In contrast to the other four countries where state-owned banks are more cost efficient than private banks, the opposite is the case in Malaysia. It is noted that state-owned banks in Malaysia just account for 3.5% of assets; this may prevent state-owned banks from exercising market power by charging higher lending rates to gain efficiency like those in Vietnam.

[24] In Thailand, foreign banks appear to be less efficient than domestic banks. This exception is probably due to sample bias. First, as mentioned, the sample did not include 18 foreign bank branches in Thailand during our period of study. Second, foreign commercial banks in Thailand in our sample are those that were originally weak local banks that survived the crisis thanks to government capital injections. They become foreign-owned after the divestment of government ownership (namely, UOB Radanasin Bank PCL, Standard Chartered Bank (Thai) PCL, DBS Thai Danu Bank PCL and United Overseas Bank (Thai) PCL). All of these banks are at early stages of restructuring by foreign partners. Therefore, potential efficiency gains may not be realized yet.

3.4.3. *Correlates between Efficiency and the Independent Variables*

In order to gain some initial views of the relationship between bank efficiency and its independent variables, we first compare the absolute values of efficiency and each of the independent variable. Second, we run simple correlation estimates for comparison. The absolute values of each variable and the correlation coefficients are shown in Table 3.7.

Table 3.7. *Descriptive statistics of bank efficiency and the independent variables*

The absolute values of (dependent and independent) variables in separate countries								Correlation coefficients between efficiency and the independent variables	
	ID	MY	PH	TH	VN	Min.	Max.		
TE	58.2	85.9	79.1	70.4	80.1	58.2	85.9		
CE	41.9	71.9	57.4	49.8	61.8	41.9	71.9	TE	CE
Size	2.05	1.84	2.78	3.72	3.07	1.84	2.78	-0.01	-0.08
Profit	-2.87	1.02	0.71	-0.82	1.26	-2.87	1.26	0.15	0.11
Capital	7.80	12.32	17.87	14.52	16.37	7.80	17.87	0.24	0.15
Credit to private sector	25	97	36	90	33	25	97	0.24	0.31
Regulatory restriction	18	7	8	14	22	7	22	-0.30	-0.22
GDP per capita growth	0.20	1.29	1.50	2.01	5.29	0.20	5.29	0.08	0.00
Inflation	16.97	2.18	5.48	2.40	3.42	2.18	16.97	-0.26	-0.17
State ownership	69.90	3.46	20.79	35.45	83.03	3.46	83.03	-0.28	-0.25

Note: TE, CE, ID, MY, PH, TH and VN denote Technical Efficiency, Cost Efficiency, Indonesia, Malaysia, Philippines, Thailand and Vietnam, respectively. Figures are in percentage except the coefficients and regulation, which shows the restriction scores. Figures are calculated based on data from Bankscope, the State Bank of Vietnam, Barth et al. (2006) and the World Bank, World Development Indicators 2006. For detailed definition of variables, see section 3.3.1.2.

The description of bank-level and country-level variables shows that Indonesia and Malaysia can be considered as the two extremes. Most of the lowest and highest values lie in Indonesia and Malaysia while those of Philippines and Thailand are in-between. Vietnam is an exceptional case with highest level of state ownership, highly concentrated and restricted banking sector, and highest GDP per capita growth.

The technical and cost efficiency measures for Indonesian banks rank the lowest while those for Malaysia are the highest. Concerning national characteristics, lending to the private sector is lowest in Indonesia, just accounting for 25% of GDP while this ratio in Malaysia reaches 97%. Indonesia has experienced high inflation with the average annual consumer price index in the period of 1998 and 2004 reaching nearly 17% whereas Malaysia has experienced low inflation at just over 2%. Alongside Vietnam, Indonesia maintained a highly restricted banking sector with the regulation index of 18, ranking

second after Vietnam. Malaysian banking system, however, is more open with a regulation index of seven[25]. Regarding bank-level characteristics, banks in the Indonesian market maintain the lowest capital levels and perform worst in terms of pre-tax return on assets.

Overall, the above descriptive statistics seem to suggest that banks in countries where lending to the private sector is higher are more likely to be more efficient. In contrast, those operating in countries with higher rates of inflation and more restricted banking systems tend to be less efficient. In other words, private credit may increase bank efficiency while inflation and regulatory restrictions reduce bank efficiency. In addition, banks, which produce more profits, tend to be more efficient (more efficient banks are more likely to earn higher profits). Banks with lower levels of capital are less efficient (less efficient banks tend to hold lower level of capital). Inferences from the absolute figures appear to be consistent with simple correlations (shown in the same Table 3.7, the last two columns from left) where efficiency is negatively related to bank size, regulatory restrictions, inflation and the level of state ownership in the banking system. Meanwhile, it is positively linked to bank profit, bank capital, national level of credit to the private sector and GDP per capita growth.

3.4.4. *Correlates between Inputs, Outputs and Bank Variables*

An important issue concerning the two-step DEA approach is whether there is strong correlation among the inputs and outputs selected in the first stage and the bank explanatory variables in the second stage. If these variables are highly correlated, then the regression estimates may be biased (Collie et al., 2005). Therefore, we examine whether there is a significant correlation among these variables using Spearman rank correlation test as shown in Table 3.8.

The results (Table 3.8) show that there are no severe correlations among variables selected and the inputs and outputs in the first stage. There is one significant coefficient exceeding 0.5, between bank capital and deposits. Most of the coefficients have the expected signs. However, the negative sign between bank profit and loans is unexpected. This negative relationship may reflect the bank strategy to gain market share rather than earning profits by paying higher deposit rates and charging low loan rates. This leads to narrower interest margins and reduces return on assets.

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[25] As the regulation index is based on the survey for which most of the responses were received in 1998 to early 2000 (Barth et al., 2006), it may slightly lag behind the regulatory changes in respective countries. However, these indexes should be still reflective of differences in the individual country's banking sectors, at least in our sample period

Table 3.8. *Spearman rank correlation between inputs, outputs and bank variables*

		Bank-level variables		
		Size	Profit	Capital
Outputs	Y1	0.1178 (0.0000)	-0.1665 (0.0000)	-0.1515 (0.0000)
	Y2	-0.0606 (0.0224)	0.2053 (0.0000)	0.1291 (0.0000)
Inputs	X1	0.1013 (0.0001)	-0.1716 (0.0000)	0.0581 (0.0287)
	X2	0.2848 (0.0000)	-0.2649 (0.0000)	-0.5999 (0.0000)
	X3	-0.2850 (0.0000)	0.0098 (0.7123)	0.2645 (0.0000)
No. of observations		1,419	1,419	1,419

Note: The table shows the coefficients of correlation and p value in parentheses. Y1 = Loans over total assets; Y2 = Other earning assets over total assets; X1 = Fixed assets over total assets; X2 = Deposits over total assets; X3 = Personnel expenses over total assets. Size = Bank assets over total banking assets; Profit = Pre-tax ROA; Capital = Equity over total assets. For detailed definition of inputs, outputs and variables, see Table 3.1 and section 3.3.1.2. Bank size, profit and capital are as defined in Section 3.3.1.2. Figures are estimated using Spearman rank correlation test.

3.4.5. *Second-Stage Empirical Results*

3.4.5.1. *Ownership dummy technique.*

The results from the Tobit regression applied to equation (3.7), displayed in Table 3.9, show that bank size, measured by bank assets over total banking assets, are negatively correlated with cost and allocative efficiency at the 10% and 1% significance level, respectively. The coefficient between bank size and technical efficiency is positive, but insignificant. The results suggest that larger banks are less cost and allocatively efficient than small banks. This is contrary to results reported by, for example, Grigorian and Manole (2002) and Hasan and Marton (2003), but consistent with the findings of Allen and Rai (1996) and Kaparakis et al. (1994).

Bank profitability, similarly, also indicates a negative relationship with bank (technical) efficiency and the correlation is significant at the 10% level. In contrast, bank profitability is positively related to allocative efficiency at the 1% significant level.

The overall relationship between bank size and efficiency could be interpreted that bigger banks tend to be inferior in spreading costs leading to their lower levels of cost and allocative efficiency. Higher cost inefficiency may ultimately result in lower level of profits for large banks. This is supported by the study of Boyd and Runkle (1993, p. 48). For a sample of bank holding companies in the US over the period 1971 to 1990, the aforementioned authors found that large banks are less profitable in terms of asset returns than small banks.

Table 3.9. *Determinants of efficiency in South East Asia 1998-2004 – Ownership dummy*

	The dependent variables		
Independent variables	Technical efficiency	Cost efficiency	Allocative efficiency
Size	0.1977	-0.3366*	-0.5428***
	(0.1717)	(0.1827)	(0.1549)
Profit	-0.1434*	0.1053	0.2404***
	(0.0857)	(0.0910)	(0.0773)
Capital	0.4506***	0.2006***	-0.0135
	(0.0577)	(0.0579)	(0.0490)
Bank private credit	0.1108***	0.1850***	0.1143***
	(0.0404)	(0.0430)	(0.0365)
Regulation	-0.0207***	0.0008	0.0267***
	(0.0058)	(0.0062)	(0.0053)
Economic growth	0.0172***	0.0105***	0.0007
	(0.0036)	(0.0038)	(0.0033)
Inflation	-0.0009	-0.0018	-0.0001
	(0.0011)	(0.0012)	(0.0010)
Country-level of state ownership	0.0016	-0.0015	-0.0052***
	(0.0012)	(0.0013)	(0.0011)
Foreign ownership dummy	0.0537**	0.0780***	0.0614***
	(0.0245)	(0.0261)	(0.0222)
Private ownership dummy	-0.0881***	-0.1048***	-0.0637***
	(0.0216)	(0.0231)	(0.0196)
Year 1999	-0.1853***	-0.1251***	-0.0107
	(0.0378)	(0.0396)	(0.0337)
Year 2000	-0.2226***	-0.1978***	-0.0840**
	(0.0432)	(0.0451)	(0.0383)
Year 2001	-0.1310***	-0.1614***	-0.0991***
	(0.0366)	(0.0382)	(0.0324)
Year 2002	-0.2443***	-0.2332***	-0.1041***
	(0.0392)	(0.0410)	(0.0348)
Year 2003	-0.2898***	-0.2483***	-0.0875**
	(0.0417)	(0.0435)	(0.0370)
Year 2004	-0.2573***	-0.2391***	-0.1044***
	(0.0450)	(0.0471)	(0.0400)
Constant	1.0685***	0.7090***	0.6458***
	(0.0535)	(0.0562)	(0.0477)
No. of observations	1,419	1,419	1,419
Pseudo R^2	0.32	0.30	0.44

Note: Ownership structures are dummy variables for foreign, private and state-owned banks. We drop state ownership. The results are estimated using Tobit regression technique, applied to equation (3.7) in which technical, cost and allocative efficiency enter as the dependent variables. The standard errors are in parentheses. For detailed definition of variables and efficiency methodological estimates, see section 3.3.1. ***, **, * denote significant level at 0.01, 0.05 and 0.1, respectively.

The negative relationship between bank profit and technical efficiency could be interpreted as more technically efficient banks tend to have higher lending volume than other banks. In order to support loan growth, these banks are expected to charge lower rates and pay more personnel costs to process these loans. Subsequently, their profit would decline and they are less cost efficient despite being more technically efficient. The positive relationship between profit measured by return on assets and bank cost (insignificant) and allocative (significant) efficiency is commonly expected. Banks that are better at cost management tend to be more profitable. Our results partially support the findings of Altunbas et al. (2000) who showed that banks return on assets are inversely correlated with cost inefficiency.

The third bank-level factor is bank capital measured by equity over total assets. The results show that bank capital is positively correlated to both technical and cost efficiency at 1% level. The results are consistent with those found by, for example, Fries and Taci (2005) and Grigorian and Manole (2002). These authors investigated efficiency in emerging economies both in Asia and in (eastern) European regions and found that banks with higher capital level tend to be more cost efficient. However, our results conflict with findings from a study on western European countries, for instance, Altunbas et al. (2007). These researchers show that inefficient banks in developed European countries are more likely to hold higher levels of capital.

Turning to country-level characteristics, bank efficiency appears to be strongly and positively correlated with banking development measured by bank credit granted to the private sector. This is in-line with our expectations. Banks that channel more lending to the private sector are likely to be more dynamic in information seeking, credit screening and better management (Barth et al., 2006). Similarly, national economic growth proxied by GDP per capita growth is also positively and significantly correlated with bank efficiency, both technical and cost. The relationship shows that banks in countries with higher growth rate of per-capita GDP are more efficient. This is consistent with the findings by Grigorian and Manole (2002).

Country inflation measured by the consumer price index shows a negative relationship with both technical and cost efficiency but the coefficients are not significant. These negative coefficients may imply that banks operating in countries with lower levels of stability (higher rate of inflation) tend to be less efficient. Regarding the level of state ownership in the banking sector, the negative coefficients of cost (insignificant) and allocative efficiency (significant) and country-level state ownership suggest that in

countries where the banking sectors are majority controlled by the government banks tend to be less efficient.

Regulatory restrictions, in contrast, indicate an unclear relationship with bank efficiency. With technical efficiency, tightened regulation demonstrates a negative linkage; however, regulation shows a positive relationship with allocative efficiency. This is surprising. This controversial phenomenon is attributed to the likely conflicting impacts on different types of efficiency by various types of regulation (bank activity restrictions, entry requirements, capital regulatory requirement, diversification index, the independence of supervisory authority and private monitoring index) that constitute our regulation index. For instance, Grigorian and Manole (2002, p. 20) found that tighter capital adequacy requirements are associated with higher efficiency (measured using the DEA technique), conflicting with conventional expectations. Tighter entry requirements and restrictions on bank activities, on the other hand, are believed to lead to lower efficiency because they hinder competition (Classens & Laeven, 2004; Demirgüc-Kunt et al., 2004) which, in turn, reduce efficiency (Casu & Girardone, 2006; Hauner & Peiris, 2005).

Looking at the efficiency level by ownership structure, the regression outcomes support the descriptive analysis. Foreign banks are more efficient than state-owned banks, which, in turn, are more efficient than local privately-owned banks. The results, shown in Table 3.9, reveal that foreign banks on average are from 5% to 8% more efficient than domestic state-owned banks, which are from 6% to 10% more efficient than private banks. Foreign banks outperform domestic players in developing countries is a result confirmed in various other studies (Bonin et al., 2005; Grigorian & Manole, 2002; Hasan & Marton, 2003; Havrylchyk, 2005; Jemric & Vujcic, 2002; Kraft et al., 2002; Weil, 2003; Williams & Intarachote, 2003). However, the finding that state-owned banks perform better than private banks is somewhat unexpected. State-owned banks are normally associated with mismanagement and poor performance; however, there have been a few earlier studies that provide similar results to ours (Altunbas et al., 2001b; Denizer et al., 2000; Kraft et al., 2002).

Concerning the time dummy variables included to investigate the changes in bank efficiency, the results show that bank efficiency has been significantly decreased over the period of 1998 and 2004[26]. This is contrary to our expectations given the further removal

[26] This statistical inference is, in fact, inappropriate because efficiency is estimated by annual frontiers, leading the benchmark to change from one year to another. However, efficiency levels produced by country

of restrictions on foreign bank ownership (Chapter 4, Table 4.1) in the banking sector to foster competition and improve banking efficiency. However, bank efficiency has also been found to decline following deregulation in several other studies (Denizer et al., 2000, Grabowski et al., 1994; Grifell-Tajie & Lovell, 1996; Williams & Intarachote, 2003).

The significant decline in efficiency may not be solely attributed to deregulation and this decrease in efficiency needs to be explained with care. Elyasiani and Mehdian (1995) argue that changes in the banking environment dismantled by regulatory and supervisory reforms will affect both technological advance in banks and their efficiency performance. The impacts of the former are to push the efficiency frontier further away whereas those of the latter could reallocate efficient points of each bank relative to the frontier. There are two possible circumstances in which efficiency could decline while technological advances and operational improvements are made. First, if the effects from technological advance dominate and most banks cannot catch up with these changes, their efficiency could exhibit a decline because they are now compared against a frontier 'further-away' as a result of more advanced technology. Second, the effects of banking market changes may facilitate a number of banks to perform better (with the present technology). The 'super' performance of these banks will form the new frontier and lower the efficiency scores of the remaining banks whose operations are not improved. In other words, the efficient banks in a sample have shifted the frontier and leave the poor performing banks behind leading to an overall significant reduction in efficiency. This may contribute to the significant reduction of efficiency in South East Asian banking.

3.4.5.2. *Ownership percentage.*

Because of the fact that state-owned banks are found to be more efficient than local privately-owned banks, we modify slightly our regression model to further investigate whether efficiency increases with bank-level state ownership. Instead of using ownership dummy variables to compare efficiency among banks of different ownership categories, in the modified regressions, we use the percentage of share held by relative owners (foreign, private and state) to replace the dummy. Since there are three ownership categories, as mentioned, we run three separate regressions corresponding to the percentage of share held by foreign, private and government partners, respectively.

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frontier (across years) also reveal the similar results (please see Appendix A3.3a, A3.3b and A3.3c). This has encouraged the above suggestion.

Table 3.10. *Determinants of efficiency in South East Asia 1998-2004 – Foreign ownership level*

	The dependent variables		
Independent variables	Technical efficiency	Cost efficiency	Allocative efficiency
Size	0.5178***	0.0411	-0.2901**
	(0.1655)	(0.1758)	(0.1489)
Profit	-0.1783**	0.0796	0.2321***
	(0.0853)	(0.0907)	(0.0770)
Capital	0.4319***	0.1824***	-0.0225
	(0.0581)	(0.0583)	(0.0493)
Bank private credit	0.1420***	0.2209***	0.1326***
	(0.0406)	(0.0434)	(0.0368)
Regulation	-0.0202***	0.0021	0.0279***
	(0.0058)	(0.0062)	(0.0053)
Economic growth	0.0173***	0.0103***	0.0003
	(0.0036)	(0.0039)	(0.0033)
Inflation	-0.0009	-0.0018	-0.0001
	(0.0011)	(0.0012)	(0.0010)
Country-level of state ownership	0.0020	-0.0012	-0.0051***
	(0.0012)	(0.0013)	(0.0011)
Bank-level of foreign ownership	0.1422***	0.1667***	0.1043***
	(0.0183)	(0.0194)	(0.0164)
Year 1999	-0.1847***	-0.1204***	-0.0044
	(0.0380)	(0.04)	(0.0339)
Year 2000	-0.2213***	-0.1904***	-0.0742*
	(0.0434)	(0.0456)	(0.0387)
Year 2001	-0.1103***	-0.1339***	-0.0764**
	(0.0370)	(0.0388)	(0.0329)
Year 2002	-0.2291***	-0.2127***	-0.0831**
	(0.0396)	(0.0414)	(0.0351)
Year 2003	-0.2819***	-0.2371***	-0.0784**
	(0.0418)	(0.0439)	(0.0372)
Year 2004	-0.2552***	-0.2304***	-0.0932**
	(0.0452)	(0.0474)	(0.0402)
Constant	0.9502***	0.5647***	0.5564***
	(0.0492)	(0.0517)	(0.0438)
No. of observations	1,377	1,377	1,377
Pseudo R^2	0.31	0.28	0.41

Note: Ownership variable is the percentage of shares held by foreign partners. The results are estimated using Tobit regression technique, applied to equation (3.7) in which technical, cost and allocative efficiency enter as the dependent variables. The standard errors are in parentheses. For detailed definition of variables and efficiency methodological estimates, see section 3.3.1. ***, **, * denote significant level at 0.01, 0.05 and 0.1, respectively.

The results, reported in Tables 3.10, 3.11 and 3.12, are similar to those produced by regressions in which ownership dummy variables are used. Looking at the percentage of foreign ownership, as shown in Table 3.10, banks with higher levels of foreign

ownership are more technically, cost and allocatively efficient. The coefficients are statistically significant at the 1% level. This is as our expectation.

Table 3.11. *Determinants of efficiency in South East Asia 1998-2004 – Private ownership level*

	The dependent variables		
Independent variables	Technical efficiency	Cost efficiency	Allocative efficiency
Size	-0.3387	0.0378	0.6671
	(0.4343)	(0.4871)	(0.4941)
Profit	-0.2584	0.0986	0.4794***
	(0.1579)	(0.1739)	(0.1766)
Capital	0.1522	0.1019	-0.0401
	(0.1354)	(0.1434)	(0.1455)
Bank private credit	0.1739***	-0.0047	0.0441
	(0.0749)	(0.0819)	(0.0831)
Regulation	-0.0323***	-0.0082	0.0266**
	(0.0100)	(0.0113)	(0.0115)
Economic growth	0.0099	0.0088	0.0081
	(0.0076)	(0.0083)	(0.0085)
Inflation	-0.0028	-0.0018	0.0028
	(0.0017)	(0.0019)	(0.0020)
Country-level of state ownership	-0.0017	-0.0042*	-0.0069***
	(0.0019)	(0.0022)	(0.0022)
Bank-level of private ownership	-0.2182***	-0.1629***	-0.0097
	(0.0444)	(0.0489)	(0.0497)
Year 1999	-0.1637*	-0.1104	-0.0597
	(0.0875)	(0.0930)	(0.0942)
Year 2000	-0.1869*	-0.1866*	-0.1728
	(0.1047)	(0.1106)	(0.1121)
Year 2001	-0.1048	-0.0960	-0.0904
	(0.0850)	(0.0898)	(0.0910)
Year 2002	-0.2054**	-0.1579	-0.0758
	(0.0950)	(0.1004)	(0.1018)
Year 2003	-0.3272***	-0.2958***	-0.1789
	(0.1029)	(0.1096)	(0.1110)
Year 2004	-0.2973***	-0.2535**	-0.1592
	(0.1132)	(0.1212)	(0.1229)
Constant	1.5722***	1.0355***	0.7226***
	(0.1170)	(0.1240)	(0.1257)
No. of observations	249	249	249
Pseudo R^2	1.65	1.56	3.68

Note: Ownership variable is the percentage of shares held by private partners. The results are estimated using Tobit regression technique, applied to equation (3.7) in which technical, cost and allocative efficiency enter as the dependent variables. The standard errors are in parentheses. For detailed definitions of variables and efficiency methodological estimates, see section 3.3.1. ***, **, * denote significant level at 0.01, 0.05 and 0.1, respectively.

Table 3.12. *Determinants of efficiency in South East Asia 1998-2004 – State ownership level*

	The dependent variables		
Independent variables	Technical efficiency	Cost efficiency	Allocative efficiency
Size	0.3167	-0.4054	-0.7010***
	(0.2708)	(0.3078)	(0.2403)
Profit	-0.2110	-0.2108	0.0111
	(0.1996)	(0.2335)	(0.1827)
Capital	0.4500***	0.5425***	0.2852**
	(0.1312)	(0.1542)	(0.1206)
Bank private credit	0.2411**	0.1314	-0.0592
	(0.1096)	(0.1270)	(0.0995)
Regulation	-0.0057	0.0005	0.0222
	(0.0151)	(0.0174)	(0.0136)
Economic growth	0.0285***	0.0167	-0.0014
	(0.0096)	(0.0110)	(0.0087)
Inflation	0.0009	-0.0025	-0.0030
	(0.0034)	(0.0039)	(0.0031)
Country-level of state ownership	0.0005	0.0001	-0.0034
	(0.0032)	(0.0036)	(0.0028)
Bank-level of state ownership	0.1590***	0.0825	-0.0068
	(0.0602)	(0.0695)	(0.0544)
Year 1999	-0.2137**	-0.2034*	-0.0802
	(0.1045)	(0.1191)	(0.0941)
Year 2000	-0.3071***	-0.3658***	-0.2291**
	(0.1186)	(0.1347)	(0.1062)
Year 2001	-0.1880*	-0.3133***	-0.2311**
	(0.1066)	(0.1211)	(0.0953)
Year 2002	-0.3391***	-0.3667***	-0.1985**
	(0.1126)	(0.1279)	(0.1009)
Year 2003	-0.3552***	-0.3832***	-0.2080**
	(0.1176)	(0.1336)	(0.1054)
Year 2004	-0.3706***	-0.3343**	-0.1469
	(0.1222)	(0.1390)	(0.1097)
Constant	0.7349***	0.7054***	0.8456***
	(0.1591)	(0.1824)	(0.1431)
No. of observations	276	276	276
Pseudo R^2	0.19	0.14	0.21

Note: Ownership variable is the percentage of shares held by the state. The results are estimated using Tobit regression technique, applied to equation (3.7) in which technical, cost and allocative efficiency enter as the dependent variables. The standard errors are in parentheses. For detailed definitions of variables and efficiency methodological estimates, see section 3.3.1. ***, **, * denote significant level at 0.01, 0.05 and 0.1, respectively.

However, focusing on the level of private ownership and state ownership, Table 3.11 shows that bank-level private ownership is negatively and significantly correlated with bank technical and cost efficiency. This is surprising but consistent with the dummy technique above whereas privately-owned banks are less technical and cost efficiency than

their state-owned players. In contrast, bank-level state ownership is positively related to technical efficiency. Nevertheless, no significant correlation between the level of state ownership and bank cost as well as allocative efficiency is found (Table 3.12). In sum, the results suggest that foreign ownership increases bank technical, cost and allocative efficiency; state ownership increases bank technical efficiency only while private ownership reduces both technical and cost efficiency.

3.4.6. *Robustness Tests*

3.4.6.1. *Different specifications of inputs and outputs.*

Table 3.13. *Robustness test-Different specifications of inputs and outputs*

Model	**Inputs**	**Outputs**	**Price of inputs**
F1A (previously estimated)	1. Fixed assets over total assets (X1)	1. Net loans over total assets (Y1)	1. Price of X1: Other operating costs over fixed assets
	2. Deposits over total assets (X2)	2. Other earning assets over total assets (Y2)	2. Price of X2: Interest costs over deposits
	3. Personnel costs over total assets (X3)		3. Price of X3: Personnel costs over loans plus deposits
F1B	1. Total costs over total assets **(X1')**	1. Net loans over total assets (Y1)	Non-applicable
	2. Deposits over total assets (X2)	2. Other earning assets over total assets (Y2)	
	3. Personnel costs over total assets (X3)		
F1C	1. Fixed assets over total assets (X1)	1. Net loans over total assets (Y1)	Non-applicable
	2. Deposits over total assets (X2)	2. Non-interest income over total assets **(Y2')**	
	3. Personnel costs over total assets (X3)		
F1D	1. Total costs over total assets **(X1')**	1. Net loans over total assets (Y1)	Non-applicable
	2. Deposits over total assets	2. Non-interest income over total assets **(Y2')**	
	3. Personnel costs over total assets		

In order to check for robustness of the results, first, different combinations of inputs and outputs are specified (Table 3.13) in order to derive new efficiency estimates. The determinants of these are then investigated using the Tobit regression approach. One of these specifications (Model F1B) includes total costs (equal interest expenses plus other

operating expenses, following, for example, Casu, 2000; Yue, 1992) as an input. This input replaces physical assets[27]. Another one takes non-interest income as an output (to represent measure of off-balance activities) replacing other earning assets (Model F1C). In the last model (Model F1D), both these new input and output replace those in the model F1A, which has been previously estimated. The aforementioned alterations aim at capturing the increased fee-based activities of financial institutions. The results are reported in the Appendix A3.2.

3.4.6.2. *Different assumptions of technological changes and efficiency frontiers.*

Table 3.14. *Robustness test-Different assumptions of technology and (efficiency) frontiers*

Model	Assumptions	Frontier	Efficiency estimates
F1	Technology changes over time and there are significant differences in macro-banking conditions across countries	*Thirty five* frontiers for five countries	Based on yearly data for separate countries
F2	Technology changes over time but differences in national characteristics is negligible	*Seven* frontiers for five countries	Based on yearly data, but across countries
F3	Technology is constant over time and there are significant differences in macro-banking conditions across countries	*Five* frontiers for five countries in seven years	Based on country data across years
F4	Technology is constant over time and differences in national characteristics is negligible	*One* frontier for all five countries in seven years	Based on pooled sample, across years and countries

Second, efficiency estimates are computed under different assumptions of technological progress and national convergence in banking conditions (Table 3.14). Our previously reported estimates are based on the assumption that bank technology changes over the period 1998 and 2004 and national banking conditions are significantly different among South East Asian countries (Model F1). Three other models are associated with the elimination of either or both of these two assumptions (Model F2, F3 and F4) following, for example, Laeven, 1999; Casu and Molyneux, 2003. The full results, which are reported

[27] Technically, one can add more inputs or outputs to compute the efficiency. However, due to small yearly separate-country estimates, putting extra inputs or outputs may lead many institutions to appear on the efficiency frontier (Collie et al., 2005, p. 207). In our study, physical assets and other earning assets are replaced with the assumptions that these inputs and outputs are less important than others in the bank intermediation process.

in the Appendix A3.3a, A3.3b and A3.3c, show consistency with those reported in the previous sections[28].

Overall, the robustness tests confirm that, disregarding different assumptions of inputs, outputs, banking market convergence and technological changes from 1998 to 2004, larger banks in South East Asia exhibit *higher* levels of technical efficiency but *lower* levels of cost and allocative efficiency than small banks. In addition, profitable banks are less technically efficient and more cost and allocatively efficient. The evidence may imply that large banks do not benefit from cost savings thanks to their size as suggested by scale and scope literature. In contrast, size appears to be inversely related to X-efficiency. Furthermore, foreign bank ownership is associated with an increase in efficiency while private ownership reduces efficiency. State ownership, on the other hand, only increases technical efficiency. This may suggest that private banking sector need time to improve their efficiency and catch up with (technical) efficiency of the state sector, subsidized by the government and usually operates at large scale.

3.5. Conclusions

Our main conclusions are as follows. First, bank size is positively related to technical but negatively related to cost and allocative efficiency. Second, banks that are more profitable are likely to be less technically and more allocatively efficient, so it seems to suggest that small banks are more profitable than larger banks thanks to their superior capacity in allocating costs (Berger & Mester, 1997). Third, bank capital levels are found to be strongly and positively correlated with bank efficiency. To put this in another way, efficient banks in South East Asia tend to hold higher levels of equity capital.

Among the macro-environmental features, bank private credit and economic growth show significant links with bank efficiency. Banks in countries with higher levels of credit granted to the private sector and per-capita GDP growth seem to be more efficient. In contrast, there is some evidence that inflation and the level of state ownership in the financial system reduces bank cost and allocative efficiency.

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[28] The major exceptions concern the relationship between cost and allocative efficiency and inflation. For cost efficiency as the dependent variable (Appendix A3.3b), inflation shows inconsistently significant correlation with cost efficiency between model F2 (positive) and model F3 (negative). For allocative efficiency as the dependent variable (Appendix A3.3c), inflation also shows consistently significant: positive relationship with allocative efficiency in models F2 and F4, but negative in model F3. It is noted that models in which inflation indicates a significantly positive relationship with efficiency are associated with the assumption of *in*differences of national banking conditions across countries (Model F2 and F4). This may imply that the convergence of banking conditions among countries in the sample is low, which cause the assumption of indifferences become inappropriate.

Regarding ownership structure, being consistent with many comparative studies of efficiency in developing countries, foreign banks are found to be more efficient than their local competitors. Within the domestic sector, state-owned banks appear to be more efficient than privately-owned banks both in terms of technical and cost efficiency. However, results from regressions, where ownership levels are measured by the percentage of share rather than simple dummy variables, show that there is no significant evidence of the superior cost efficiency of state-owned banks although the evidence suggests that the higher level of government ownership is associated with higher level of technical efficiency. On the other hand, higher levels of foreign ownership increase bank technical, cost and allocative efficiency. Higher levels of private ownership, in contrast, reduce both bank technical and cost efficiency.

Overall, over the 1998 to 2004 period, the efficiency of banks in South East Asia declined. This suggests that the various financial reforms that took place in the region after the 1997/1998 crisis had no positive impact in increasing the cost performance of banks.

3.5.1. *Limitations*

We have applied DEA to investigate bank efficiency in South East Asia. We use a sample including various types of banks in order to obtain a respectable sample size for estimation purposes. However, the limitation is that these banks may focus on different core businesses, face different activity restrictions and subsequently may have different efficiency frontiers (even though they are competitors). This may bias our efficiency scores. Similarly, the sample includes very large institutions like bank holding companies that may be outliers and adversely influence the shape of the estimated frontiers. However, these adverse effects may be limited by the scaling of inputs and outputs with total assets, although some bias may remain. The existence of these large institutions looks like it pushes the frontier outwards lowering mean efficiency scores.

Second, when using basic DEA, we implicitly assume that the slack[29] is zero. Some methodological advances have been made such as Tone (2001). In future studies, these advances could be investigated for comparative purposes. In addition, standard DEA models do not capture multi-period optimisation nor risk-taking behaviour of firm's

[29] In the case of a single input and single output, this could be illustrated as the distance of inputs and/or outputs volumes among efficient DMUs which lie in (part) on the efficient frontier parallels with either the vertical or horizontal axis. The existence of slacks may be problematic because, technically, the (slacked) efficient DMU(s) could either reduce the inputs or increase the outputs (or both) to the levels of those are closer to the coordinate

managers (Collie et al., 2005, p. 207). This factor is important for banking firms because more loans may increase a bank's technical efficiency while loan quality is unknown. Some dynamic DEA models have been discussed by Färe and Grosskopf (1996).

Third, the two-stage approach used to examine factors that influence efficiency has two potential disadvantages. One of them is that if variables proxied for firm's inputs and outputs in the first DEA stage are highly correlated to those in the second stage, the results may then be biased (Collie et. al., 2005) (although this does not seem to be a problem in our estimates). Another issue is that, in the second stage, efficiency scores are assumed to dependent on various factors proxied by the independent variables. The causality, unfortunately, may run in both directions. This makes the interpretation of results problematic (Berger et al., 1993, p. 245; Berger & Mester, 1997, p. 911). New methods of incorporating environmental factor have been developed such as Fried, Schmidt and Yaisawarng (1999).

Noting these shortcomings, our study aims to fill a gap in the efficiency literature that spans both developed and developing countries. First, our cross-country sample is among a handful of studies that focuses on the East Asian region[30] and is the first, as far as we are aware, that includes data on banks in Vietnam. Second, we also include ownership features and its changes over the period of study. Studies in the literature typically examine static ownership structures (Bonin et al., 2005) or use ownership dummies (Grigorian & Manole, 2002; Matthews & Ismail, 2006; Sathye, 2001). The usage of dynamic ownership structure allows us to include the absolute value of percentage of share according to each mutually exclusive ownership category.

Future analysis could perhaps consider using stochastic approaches to estimate efficiency scores-although availability of data could be an issue. Efficiency measures derived from both parametric and non-parametric techniques could be compared for consistency purposes. Also these two techniques could be used to analyse productivity change in the respective banking systems.

3.5.2. *Policy Implications*

Since bank size is inversely related to bank cost efficiency (even though there is evidence that larger banks are more technically efficient), forced merger during financial restructuring should be carefully considered. Bank mergers will create larger banks and

[30] Karim (2001) and Williams and Nguyen (2005) use SFA while Laeven (1999) apply DEA

they may induce cost burdens rather than cost savings. This is, to some extent, in accord with the evidence found by Boyd and Runkle (1993) who find that bigger banks perform worse in terms of assets return than small banks. Secondly, efficient banks in South East Asia in the period of 1998 and 2004 appear to hold higher levels of capital; therefore, capital enhancement is necessary. Increasing capital adequacy does not only increase the buffer for banks to protect them from risks but also appears to increase their efficiency performance. Thirdly, increasing credit granted to the private sector shows a positive connection with bank efficiency, consequently, this should also be encouraged. On the other hand, governments need to be careful if they plan to privatize state-owned banks as they look more efficient than their private sector domestic counterparts. Perhaps future privatization should only be considered in the context of sales to foreigners, as foreign banks are typically found to be the most efficient operators in South East Asia. Finally, favourable effects (if any) associated with deregulatory policies on the efficiency of the financial sector may take a long time to be realized.

Chapter 4

Motivation for Foreign Bank Entry in South East Asia

Abstract

This paper examines the determinants of foreign bank entry into South East Asian countries in the aftermath of the 1997 financial crisis. The results show that manufacturing FDI and bilateral trade exert a weak impact on the decision of entry by foreign banks, providing little evidence for the argument that banks follow their home customers abroad as suggested by one strand of the literature. In contrast, local profit opportunities appear to be the prominent factors attracting foreign bank penetration in South East Asia during the period 1998 to 2004. The results are robust to different modelling techniques.

4.1. Introduction

The last two decades have witnessed a tremendous increase in financial services foreign direct investment to various developing economies stimulated by the liberalization of domestic banking markets. In South East Asia, the remarkable changes in foreign bank participation occurred after the 1997/1998 financial crisis, fostered by the further removal of foreign ownership limits after 1998. The penetration of foreign entrants even reshaped the local banking structure traditionally dominated by domestic players. The relaxation of entry barriers aimed at attracting more funds for the restructuring of weak domestic banks and also sought to improve banking system efficiency through heightened competition. Regulators have been concerned about the costs and benefits associated with this foreign bank penetration. The knowledge of the underlying motivations for foreign banks entering domestic markets is of interest to policy makers because the reasons for entry may determine the form of physical existence in the destination market which, in turn, can affect local banking sectors differently[1].

Theories suggest two main motivations for banks to expand internationally. The 'customer-following' view suggests banks follow their home clients abroad. In doing so, foreign banks take advantage of prior bank-customer relationships at home, which lubricates the transactions and facilitates cheaper prices of services (Goldberg & Saunders, 1981b). In addition, it helps banks to retain business relationships with parent corporations at home (Nigh, Cho, & Krishnan, 1986). The 'profit-exploiting' view, on the other hand, suggests that banks go abroad to exploit local business opportunities thanks to foreign bank's advantages in international operation.

Stemming from the second view, theory further assumes that the motivations for overseas expansion by foreign banks may depend on the level of economic development in host countries. Accordingly, foreign banks would be attracted by profit opportunities in host developing countries while they would enter host advanced nations to serve their home clients (Clarke, Cull, Peria, & Sanchez, 2003, p. 36). This is because in developing economies, banking techniques are underdeveloped, the overall banking system is less efficient and there is an increasing demand for financial services.

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[1] For example, if foreign banks enter to mainly serve their domestic multinational clients, one would expect them to primarily conduct wholesale services. In this case, they would prefer to establish foreign branches. Alternatively, if banks enter to mainly exploit the growing individual demands of highly populated nations and to sell their superior banking products and business management, one would expect these banks to serve the retail banking market segments. Subsequently, they would prefer to set up subsidiaries or acquire local banks if regulation is open for doing so. The presence of foreign bank branches tends to affect corporate market niches while that of subsidiaries is more likely to influence retail segments.

However, there is some evidence that following home clients abroad was a strategy pursued by foreign banks in the first wave of modern international banking in the 1960s[2], given the substantial expansion of manufacturing multinational corporations and trade flows in that period. The first wave of overseas expansion by banks, particularly the US institutions, paralleled with the expansion of their corporate customers to the same overseas destinations (Aliber, 1984). Nevertheless, the second wave, stimulated by deregulation in the 1980s, may be less related to customer-following incentives and more to profit-oriented motives, namely, banks move overseas where business opportunities are available. According to a survey conducted by the Bank for International Settlements in 2003 of 40 financial institutions with different types of operations in emerging countries, the expected profit margins appear to be the main motivation for why banks expand their services in emerging economies, other factors are of minor importance (BIS, 2004, p. 28).

The objective of the present paper is to investigate the motivations for foreign banks to enter South East Asian countries. By including both proxies for customer-following behaviour and local profit opportunities in our empirical estimates, we try to examine which of these two factors is more important in driving foreign bank presence in South East Asia over the period 1998 and 2004.

This paper is structured as follows. Section 4.2 outlines the modes of foreign bank expansion in South East Asia. The theoretical motivations as to why foreign banks expand overseas then follow. Section 4.3 presents the methodology and data used in the paper. The methodology ranges from the basic pooled OLS regression, 'between' regression, random-effects GLS to dynamic panel GMM estimates. Section 4.4 reports the results and discussion. In this section, the scale of foreign bank presence in South East Asia is presented first, then the comparative performance between domestic and foreign partners are analysed. Later, the results from different estimates of the determinants of foreign bank participation are shown and discussed. The final section, section 4.5, gives the conclusions, limitations and policy implications of the paper.

4.2. Major Modes and Motivations for Foreign Bank Entry

4.2.1. *Major Modes of Foreign Bank Entry*

4.2.1.1. *Merger and acquisition.*

[2] See, for example, Aliber (1984, p. 661) for the case of the U.S. and Gardener and Molyneux (1993, p. 128) for the case of Europe

One way for banks to enter a foreign market is to acquire the stakes or merge with locally incorporated banks. Acquisition of stakes allows foreign partners to gradually explore the local market without greenfield investments while getting to know different range of different banking services on offer. Even though setting up a representative office could be a cheapest way to enter a foreign market, representative offices, as discussed below, only allow for a limited range of activities and subsequently, they typically do not allow foreign partners to learn fully about the practical aspects of providing banking services in host nations. While merger is rare, acquisition of stakes is more popular and appears to be the preferable method of foreign banks penetrating the South East Asian market over the study period, 1998 to 2004. The acquisition of stakes by foreign firms in South East Asia has been facilitated by the banking sector recapitalization programme launched by governments after the 1997/1998 financial crisis, particularly in Indonesia and Thailand. In addition, the trend of foreign ownership has also been enhanced by the relaxation of foreign ownership limits previously imposed, for instance, from 49% to 99% in Indonesia (Table 4.1).

Although over the period 1990 to 2003, mergers and acquisitions in the financial service sectors of non-Japanese Asian countries accounted for a relatively small proportion (USD14 billion or 17% of the total values of cross-border merges and acquisitions in financial sector), compared to other regions such as Latin America and Central and Eastern Europe, Asia is the fastest growing region for merger and acquisition, accounting for some sizeable deals, especially in Thailand. In 2003, Asia became the region receiving largest financial sector foreign investment inflows (BIS, 2004, p. 5).

4.2.1.2. *Joint-ventures.*

Another mode of foreign entry relates to the establishment of joint-venture banks. In terms of risks, this type of entry involves higher levels of uncertainty than merger and acquisition because banks have to establish a new legal entity in a foreign country with local partner(s). The joint-venture form could be considered a hybrid of acquisition and de novo entry because it requires paid-in capital as well as certain degrees of direct investment. In some South East Asian countries, foreign partners are normally allowed by local government to contribute higher proportions of equity to a joint-venture bank than stakes acquired in a local bank (Table 4.1). In terms of scope of activities, joint-venture banks are not treated equally as wholly domestically-owned banks, at least in Vietnam. In Vietnam, foreign partners are originally allowed to pay up to 49% to a joint-venture bank

and face restrictions on scope of activities and branching. During 2007, foreign partners are expected to be allowed to acquire up to 100% of the stakes in joint-venture banks in Vietnam (World Bank, 2006b).

4.2.1.3. *Representative offices and agencies.*

As one of the modes of de novo entry, setting up a representative office is probably the simplest way to be present abroad. In general, this form of organization is relatively low cost but rep offices are not allowed to conduct any banking services (they are not allowed to make deposits or loans). They are normally opened as a precursor for further expansion. What representative offices do is to collect information, study the local market and transmit the obtained information and analysis to their head offices.

The second form of de novo entry is to set-up an agency. This kind of foreign bank operation can be considered as in-between a representative office and a foreign bank branch. Agencies, for example, in the US and elsewhere are permitted to offer loans. However, agencies are often restricted from taking deposits. Therefore they are likely to finance their lending with funds borrowed from money markets of the destination country or Eurocurrency markets (Park & Zwick, 1985, p. 51). This type of entry exists in the US but appear to be limited in South East Asian banking markets.

4.2.1.4. *Branches and subsidiaries.*

Taking into account of the costs, both representative offices and agencies to a large extent do not incur as much cost as foreign bank branches or subsidiaries. However, representative offices and agencies are restricted by their limited scope of activities. For this reason, banks when determining to go global may prefer to open branches or subsidiaries compared to other types of operational organization if local regulations allow. A foreign bank branch is an integral part of its parent bank in its home country, which operates as an extension of the head office and is allowed to accept deposits, grant loans and offer certain types of banking services. Typically, branches offer a narrower range of services than subsidiaries. As a consequence, foreign banks (in South East Asia at least) tend to set-up branches to focus on market niches such as serving wholesale or retail banking clients. A foreign bank subsidiary, on the other hand, is a separate entity from its parent bank. Subsidiaries are legally incorporated in the host nation and receive relatively equal treatment as wholly domestically-owned banks. Subsidiaries are allowed to conduct the most comprehensive types of banking services. Therefore, banks that seek to serve

both retail and corporate customers offering a wide range of service usually prefer to establish foreign subsidiaries where permitted.

Table 4.1. *Foreign ownership limits in South East Asian banking 1998-2004*

Forms	Indonesia	Malaysia	Philippines	Thailand	Vietnam
Acquisition	Since 1992 limited to 49% (51% for ASEAN banks), and increased to 99% in 1999	Since 1989 limited to 30%, expected to be increased to 49% after 2007	Since 1994, limited to 60%, increased to 100% in 2000, for new entry on a seven-year window basis	Prior to 1997, limited to 25%, since 1997 increased to 100%, and has to be reduced to 49% after 10 years	Since 1993, limited to 10%, increased to 30% in 2004
Joint-venture	Since 1989 limited to 85%, increased to 99% in 1999	N/a	N/a	N/a	Limited to 49% prior to 2004, expected to increase to 100% in 2007
Greenfield subsidiary	No	No	Yes	No	Expected to be allowed in 2007
Full-service branch	Yes	No	Yes	Yes	No
Domestic branching for branches and subsidiaries	Up to 10 cities prior to 1999, since 1999 fully open	N/a	Fully open since 1994	One for branch and four for subsidiaries after the implementation of the FSMP[3] in 2004	Implicitly restricted until 2006

Note: ASEAN Bankers Association, Regional Update (2003); Asian Development Bank (2002); Bank for International Settlements (2001); Bank Indonesia, Financial Stability Review (2005); Bank Indonesia, Regulation 2/27/2000 dated 15/12/2000; Bankscope; Bank of Thailand, Financial Sector Master Plan (2003); Bekaert and Harvey (2004); Chou (2000); Chua (2003); Coppel and Davies (2003); Goeltom (2006); Kim (2002); Montreevat (2000); Thai Bankers' Association; Tschoegl (2003); Unite and Sullivan (2003); Vietnamese Law Database; World Bank (2005d); World Bank (2006b). N/a: information is not available.

The decision to operate as a branch or subsidiary significantly depends on the business strategies of the parent bank (BIS, 2004, p. 9) and local regulations are also important in such decisions. Some countries allow foreign bank branches but restrict subsidiaries (Vietnam), others require all foreign banks to be locally incorporated (Malaysia). Others allow both branches and subsidiaries and allow them very similar scope of activities (Philippines). Branches may also be permitted to offer full-services; although differences across countries lie in branching restrictions, capital requirements or single obligator limits and so on. It is noted that most foreign bank subsidiaries in South

[3] FSMP stands for the Financial Sector Master Plan which was introduced in Thailand in 2002 and commenced to implement at the start of 2004 in order to develop an efficient, safe and competitive financial system in Thailand.

East Asia are formed through acquisition of local bank's equity apart from in Malaysia where foreign banks, since 1994, have been required to transform into subsidiaries and its banking market is still closed to new foreign entrants.

4.2.2. *Motivations for Foreign Bank Entry*

There have been two main views about the motivations for banks to establish their physical presence abroad. The 'customer-following' view suggests banks follow their home multinational customers to take advantage of and to retain the pre-existing bank-customer relationships. The 'profit-exploiting' view, on the other hand, suggests that banks are motivated by the business opportunities found abroad thanks to foreign banks' advantages in international operation.

4.2.2.1. *Banks follow their clients abroad.*

The customer-following view suggests banks move overseas to serve their customers abroad. Firstly, banks follow home customers to ensure the continuing relationship with parent corporations at home. Doing so may help to prevent foreign corporate affiliates from turning to new banks which could be those from the same home countries having offices in foreign host countries. If the new commercial relationship in the foreign country develops, it could endanger the existing relationship with previous banks in their home country (Nigh et al., 1986, p. 60). Secondly, thanks to the advantage in their pre-existing relationship with clients in home countries, banks have good knowledge of their customers' businesses, which helps to lower service charges and risk. Thirdly, on the side of clients, manufacturing firms may prefer to maintain credit relationships with a select group of financial firms in order to avoid costs resulting from providing corporate information to new banking partners (Lewis, 1991, p. 133). When production firms expand cross-border, banks follow to meet the borrowing demands of these customers overseas.

The expansion of non-financial service firms abroad has mainly involved direct investment in foreign countries, particularly during the 1960s, aimed at seeking cheap manufacturing locations. It is also facilitated by trade liberalization which encouraged trade exchanges and subsequently, required firms to set up foreign offices for commodity trading activities. Therefore, in empirical research that examines the motivations for foreign bank activity, the overseas expansion of corporate firms is normally measured by non-bank FDI and / or trading volume between home and host countries.

There have been many studies that try to investigate the customer-following motivation. Most of these studies focus on foreign bank activity in the US.

The first, and probably most extensive range of studies, investigate foreign bank presence in the US. For example, Goldberg and Saunders (1981a) examined the factors that impact on foreign bank entry in the US by using quarterly data from 1972 to 1979. The authors found that FDI into the US is a major determinant of the level of foreign bank assets in the US. Likewise, Hultman and McGee (1989) used later data from 1973 to 1986 and found similar results, namely that the growth of foreign bank agencies, branches and subsidiaries in the US is directly and positively related to inward non-financial service FDI. Unlike Hultman and McGee (1989), Grosse and Goldberg (1991) included both FDI and bilateral trade as major explanatory variables in seeking to analyse foreign banks by country of origin in the US. They found that both inward FDI (including portfolio investment) and two-way trade are positively and significantly correlated with foreign bank presence over 1980 to 1988. Also including a total trade variable (not by country of origin), Goldberg and Grosse (1994) analysed foreign banking activities in the US across states between 1972 and 1989 and found that FDI into each state significantly attracted foreign bank participation (as well as relaxed entry regulation and banking market size). Total trading volumes, however, show no significant relationship with foreign bank presence measured by either assets or the total number of offices.

In contrast to the aforementioned studies that focus on foreign bank presence in the US, a similar literature examines the reasons for US bank presence overseas (treating the US as the home nation). For example, Goldberg and Johnson (1990) investigate the presence of US banks operating in 22 foreign countries during the period 1972 to 1985. They found that exports (and imports) from (to) the US to (from) these host nations were significantly and positively related to the presence of US bank branches in these countries. Outward FDI also bears the same positive sign when relating to foreign branch presence where measured by assets but has an inverse relationship to foreign presence where measured by the number of branch offices. The authors argue that large banks may follow clients while small banks are less likely to have similar motivations. In addition, Sagari (1992) tried to explain the expansion of US banks to 21 host countries in a single year 1977. The author found that US bank FDI is positively determined by non-bank FDI and the regulations in the host countries.

Furthermore, Miller and Parkhe (1998) have examined the pattern of US foreign bank operations in 32 countries between 1987 and 1995. These authors found that outward

FDI from the US is positively and significantly related to the presence of US bank branches and subsidiaries overseas. However, when the sample is divided into developed and developing countries for further examination, the significance of FDI does not hold for the group of developing countries where foreign assets are used as a proxy for foreign bank presence. Notably, Miller and Parkhe (1998, p. 376) found that bilateral trade has a negative and significant relationship with the presence of US banks overseas. The normal positive (and significant) correlation is only found for developing nations and where foreign presence is measured by assets. On the other hand, Nigh et al. (1986) found that outward FDI and trade both are strongly and positively correlated with US bank branch presence in 30 foreign countries during 1976 and 1982. The results are unchanged when the sample is divided into less developed and developed countries as well as different geographical regions. This means that the operation of US corporate sector abroad appears to positively influence the presence of US foreign bank branches regardless of the host country's economic development.

In the European banking context, Fisher and Molyneux (1996) replicated the model developed by Grosse and Goldberg (1991) to examine the determinants of foreign bank activity in London between 1980 and 1989. The authors found that bilateral trade is strongly and positively significant in attracting the presence of foreign banks to London, measured by both the number of offices and employees. Interestingly, conflicting with evidence from most of the aforementioned US studies, Fisher and Molyneux (1996) found that FDI into the UK is not statistically significant in explaining foreign banking activity in London. In contrast, outward FDI from the UK to the home nations is significantly and positively related to foreign banking in London (measured by the number of employees).

Also investigating foreign banking activity in Europe, Buch (2000) found that FDI of German corporate firms and trade connections positively and significantly affected the expansion of German banks overseas during 1981 and 1998, providing evidence that German banks followed their clients abroad. Recently, Wezel (2004) conducted a similar study on the German banking market using a more recent sample from 1994 to 2001. This study showed that non-bank FDI has a strong influence on the flows of banking FDI abroad while trade linkages have a lesser impact.

A similar study was conducted for Italian bank expansion by Mutinelli and Piscitello (2001). Mutinelli and Piscitello (2001) examined the expansion of Italian banks to 46 host countries during the period 1989 and 1999 and found that non-bank FDI has a positive influence on the foreign location of Italian banks, supporting the argument that

banks follow their customers overseas to maintain pre-existing bank-client relationship. In contrast, Magri, Mori, and Rossi (2005) treated Italy as the host nation and examined factors that attracted foreign banks to enter Italy between 1983 and 1998. They found that non-bank FDI had no impact on foreign bank's decision to locate in the Italian market. This result is in accord with the finding by Fisher and Molyneux (1996). Bilateral trade, on the other hand, was positively and significantly related to the foreign bank presence in Italy.

For Japan, Yamori (1998) investigates factors that impact the location choice of Japanese multinational financial institutions measured by data from 1951 to 1994 on financial service FDI out of Japan. The author found that Japanese manufacturing FDI was an important factor influencing Japanese financial firms' overseas location.

All of the aforementioned studies consider foreign bank presence from either a single home or host country perspective. Another strand of the literature considers similar arguments from a multi-home and multi-host country view.

One of the first studies that examines the factors that motivated banks to go overseas on a multi-home and host country basis is Brealey and Kaplanis (1996). This cross-sectional study includes 37 home and 82 host nations for one single year, 1992. The bank sample considered includes the world's 1,000 largest banks by assets size. The results show that foreign bank presence measured by the number of offices (representative offices, branches and subsidiaries) is significantly and statistically related to FDI and trade among home and host nations. Another study by Cerutti, Dell'Ariccia, and Peria (2007) examines the international presence of the world's top 100 banks by assets size in 2002. Using a probit modelling approach, the authors examine factors that affect the selection of organizational forms of these banks in Latin America and Eastern Europe. They found that tax regimes and regulatory restrictions are among the most important factors influencing the choice of organizational forms. Moshirian and Van der Laan (1998) use quarterly data from 1985 to 1995 to analyse the level of foreign bank assets in the US, UK and Germany. They find that non-bank FDI is negatively and significantly related to foreign presence of banks incorporated in these home nations while host country's real national income appears to be one of the major determinants of foreign bank assets from these countries.

In conclusion, firstly, the literature outlined above mainly find that non-bank FDI is significantly and positively related to the expansion of banks abroad. Also, there is reasonable evidence that trade flows are important in explaining foreign bank presence.

4.2.2.2. *Alternative hypothesis of local profit opportunities.*

Unlike the client-following view, profit-exploiting view suggests that banks expand abroad to exploit business opportunities in local markets. Scattered evidence seems to suggest that there is motivation for bank to go abroad other than following their clients. Aliber (1984) has stated that observations of US bank expansion abroad during the late 1960s and the early 1970s revealed that this appears to parallel the expansion of US firms to the same nations. However, in the late 1970s and early 1980s, banks headquartered in many Western European nations and Japan expanded to the US and this did not appear to be reflected in FDI or trade flows. In addition, Fisher and Molyneux (1996, p. 274) also noted that while FDI into the UK was most substantial between 1986 and 1989, this was a period where "foreign bank presence in London was slowing". Besides, the growth of foreign banks offshore in centres such as the Bahamas and the Cayman Islands also provides the typical counter-examples of how local opportunities attract the foreign location choice of banks. Lewis and Davis (1987, p. 238) noted that negligible capital requirements and low entry barriers in addition to non-existence of taxes, attracted foreign banks to these (and other) offshore centres. International banks can raise funds without reserve requirements and minimise their overall taxes and levies. Furthermore, Seth, Nolle, and Mohanty (1998) compared the amount of funds received by non-financial corporations to the amount of loans granted by foreign banking institutions in the US and found that the lending volume granted by foreign banks in the US was higher than the amount of loans received by US-based foreign firms. This implied that customer-following reasons were perhaps not the main reason for banks to go overseas.

Empirical studies that try to examine the hypothesis of expanding overseas to exploit local profit opportunities are relatively limited. Goldberg and Saunders (1981b) is among the first to explicitly test the determinants of profitability and expected growth of local businesses on the growth of different organizational forms of foreign banks in the US. These authors used lagged interest margin and the rates of domestic investment to proxy for local profit opportunities. These variables were included alongside information on imports volumes into the US. Goldberg and Saunders (1981b) employed an expanded version of the quarterly dataset of Goldberg and Saunders (1981a) from 1972 to 1980. The foreign assets of each type of bank organizational form (agencies, branches and subsidiaries) as a share of total banking assets were used as proxies for foreign bank growth in the US. The results revealed that while interest margin, the level of domestic investment and imports were significantly related to the assets of agencies, only the level

of domestic investment was significantly related to both branches and subsidiaries. Goldberg and Saunders (1981b) argued that agencies may focus on short-run profit-maximizing objectives whereas branches and subsidiaries focus on more long-term strategies (future growth of local businesses). This evidence suggests that foreign banks are attracted by domestic business opportunities. Also including both proxies for client-following and local opportunities in one model in an attempt to investigate the role of location-related factors in motivating US banks to expand overseas, Nigh et al. (1986), in contrast, found that local market opportunities exert no significant impact on the decision of US banks to go abroad while the overseas presence of US firms is significant. However, these authors note the weak proxy they use to measure the local market opportunity - the amount of manufacturing production in the host country - they cite data issues for the choice of such a proxy.

Focarelli and Pozzolo (2005) use a probit model to study the decisive factors that explain branch or subsidiary establishment of 260 large banks across 29 OECD countries (using averaged data) over the period 1994 to 1997. Focarelli and Pozzolo (2005) employ several variables to measure local business opportunities. They include the rate of inflation, level of schooling, the size of the local credit market and the efficiency of domestic banks (the latter is proxied using three different indicators: cash flow, cost-income ratio and return on assets, all at country average levels). These authors note that they expect that low inflation, larger banking markets and higher level of schooling reflect faster rates of economic growth which, in turn, attract more foreign banks. Banking system efficiency, in contrast, is expected to be negatively related to foreign bank presence since low levels of domestic bank efficiency allows more room for foreign banks to exploit profits. Because more free cash flow (inefficient use of capital), higher cost-to-income ratios (high cost inefficiency) and greater return on assets (reflecting less competitive banking environments) are associated with a less efficient banking sector, these variables are expected to be positively related to foreign bank presence in host countries. Overall, Focarelli and Pozzolo (2005) show that both trade and profit opportunities are positively correlated to the establishment of branches or subsidiaries. However, profit opportunities exert greater explanatory power than client-following factors as measured by bilateral trade.

Similarly, Magri et al. (2005) analyse the factors that determine the level of foreign bank activity from 22 OECD countries in Italy between 1983 and 1998. These authors measure the local market opportunity by the difference in interest rate spreads (loan rate

minus short-term rate on government bonds). This variable is entered as an independent variable with FDI and trade. While FDI shows no significant relationship with foreign bank presence in Italy, both trade and profit opportunities indicate a positive and significant influence on foreign bank presence. However, the trade variable appears to be more robust than the profit opportunity variable (which loses its significance following the introduction of new banking legislation in 1993 that deregulated entry into the Italian banking system).

In short, two out of four papers, that have used closely-related proxies for local business opportunities, have found that the role of profit opportunities in explaining foreign bank presence is rather weak. Profit opportunities appear to be less important (Magri et al., 2005) than customer-following incentives or even unimportant (Nigh et al., 1986) in determining bank's overseas location. Another two papers suggest that business opportunities are more important than client-following motivations proxied by imports (Goldberg & Saunders, 1981b) and bilateral trade (Focarelli & Pozzolo, 2005). Notably, trade variable sometimes yields different results depending on whether an imports or exports measure is used (Fisher and Molyneux, 1996; Grosse & Goldberg, 1991). Overall, the support for the profit opportunity hypothesis appears somewhat limited compared to evidence on the customer-following hypothesis. Again, it should be noted that these studies predominantly focus on advanced economies. Drawing conclusions on the motivations for foreign bank entry into developing nations from the results of these studies is, therefore, difficult.

4.2.2.3. *Foreign bank entry and host country economic development.*

Stemming from the two most quoted reasons for banks to go overseas discussed above, theory further suggests that the reasons why banks may locate in developing countries could be different from those for developed nations. Specifically, banks may locate overseas in advanced countries to serve customers while they move to developing countries to exploit business opportunities.

The argument is that, in developing countries, local banking technique and services are underdeveloped and as such, foreign bank competitors, upon entering, have better technology, superior banking practices and services. This enables foreigners to earn market share. The competitive strength of foreign banks is further enhanced by higher banking efficiency which helps them to increase profits, given the growing demand in the host nations, particularly in retail banking business. These advantages that may accrue to

foreign banks may not exist in advanced countries where local competitors possess similarly advanced technology, services, and management skills and so on.

There is certain evidence that these arguments may be valid. One strand of the literature (that analyses accounting ratios) finds that in developing countries, foreign banks have higher levels of net interest income and profits than domestic banks while in developed nations, domestic banks are more profitable than foreign competitors (Barajas, Steiner, & Salazar, 1999; Claessens, Demirgüc-Kunt, & Huizinga, 2001; Denizer, 2000). Another strand of research uses modern frontier approaches to compare the efficiency of foreign and local banks. Studies on developing countries have found that foreign banks are more efficient than domestic banks (Bonin, Hasan, & Wachtel, 2005; Hasan & Marton, 2003; Havrylchyk, 2005; Kraft, Hofler, & Payne, 2002; Weil, 2003; Williams & Intarachote, 2003). Studies in developed nations, in contrast, typically find that foreign banks are less efficient than their domestic partners (Berger, DeYoung, Genay, & Udell, 2000; Chang, Hasan, & Hunter, 1998; DeYoung & Nolle, 1996; Sathye, 2001; Sturm & Williams, 2004). The results from the studies that use traditional accounting measurement of performance seem to be consistent with the findings of the efficiency studies that use frontier analysis such as data envelopment analysis and stochastic frontier approach.

When connecting the two branches of literature - one on foreign bank entry motives and the other on comparative performance analysis - one question arises: whether entry motivations depend on host country's economic development? As yet, there have been very few empirical studies that attempt to examine this question[4].

4.2.2.4. *Two motivations: complements or substitutes?*

It is important to note that in the two strands of the literature already discussed there are studies that do not explicitly stress the importance of profit opportunities (Brealey & Kaplanis, 1996) nor include variables to reflect host country business opportunities (Fisher & Molyneux, 1996; Grosse & Goldberg, 1991), one should view customer-following and profit-opportunity factors as complements rather than substitutes

[4] According to results reported by Focarelli and Pozzolo (2005), local profit factors seem to matter in attracting foreign banks to enter developed countries as well because 26 out of 29 countries in their sample are advanced OECD nations. Focarelli and Pozzolo (2005) found their profit variables are more important than customer-following factors proxied by trade. However, they did not include FDI as another proxy for customer-following hypothesis, so the effects of FDI are unknown. In addition, Miller and Parkhe (1998) found FDI is a determinant in motivating US banks to go overseas, but when their sample is subdivided into developing and developed countries, the significance of FDI for the developing country group disappear. Clearly, more studies are needed to work out whether local business opportunities are the dominant factors in attracting foreign banks to participate in developing countries.

for three main reasons. Firstly, as business entities, profit generation is the main objective of banks. Subsequently, where there are new opportunities to gain earnings, banks will enter markets as long as the local regulations allow. If banks are shown to follow customers abroad, the phenomenon could be interpreted as efforts of banks to earn additional profits based on their original investments in the home country (Sagari, 1992, p. 22). Exploiting profits from current home clients by following them to a foreign nation could be just a short-term focus of banks. Over the longer run, they may, in turn, exploit local business opportunities. Secondly, a handful of studies simultaneously examines both hypotheses and provides evidence that both FDI and/or trade and local profit opportunities play a statistically significant role explaining bank presence in foreign markets although these two factors may have an unequal role. Focarelli and Pozzolo (2005) indicates that profit opportunities offer greater explanatory power while Magri et al. (2005) suggests that customer-following reasons play a more prominent role. Thirdly, in empirical studies that found foreign bank presence is positively and significantly correlated with non-bank FDI, researchers most of the time enter foreign bank presence proxy as the dependent variable, implicitly assumed that customers lead and banks follow, the causality, however, is unclear. Levine (1996) argued that sometimes banks lead and their customers follow. As having mentioned earlier, Seth et al. (1998) addressed the issue of causality by comparing the amount of funds received by non-financial corporations to the amount of loans granted by foreign banking institutions in the US and found that the lending volume granted by foreign banks in the US is higher than the amount of loans received by US-based foreign firms. This may imply that banks could lead and their customers follow.

In conclusion, evidence from the bank performance analysis, both using accounting ratios and frontier approaches, reveal consistent results: in developed countries domestic banks perform better than their foreign counterparts while in developing nations foreign banks outperform local banks. This leads us to question whether the motivations for banks to operate in developed nations are different from those regarding entry into developing countries. In particular, it appear that foreign banks tend to follow their clients to advanced economies and focus more on local business opportunities in developing markets.

A large number of studies on the determinants of foreign banking activity, mainly focusing on advanced economies have found that the customer-following hypothesis empirically holds in most cases. In addition, while evidence supporting customer-following hypothesis are relatively well established, tests, that examine profit opportunity

motives tend to focus on industrialised nations, are fewer in number and tend to be inconclusive also.

Second, empirical tests that simultaneously examine both hypotheses are relatively limited. Researchers are aware that there may be factors that drive both financial service and non-financial service FDI (Buch, 2000). So, they include such variables as GDP (GNP) per capita and total GDP (GNP) to control for host country market size. However, these proxies are not sufficient to reflect local business opportunities. In addition, they produce ambiguous results[5]. Various studies, however, explicitly test for local commercial opportunities and use proxies that are closely related to profitability (Goldberg & Saunders, 1981b; Magri et al., 2005; Focarelli & Pozzolo, 2005) and these also yield mixed results.

We also note that the motives of customer-following and local profit-exploiting should be viewed as complementary rather than substitute in determining banking activity in foreign countries.

Bearing these factors in mind, the empirical tests that follow aim to investigate the motives for foreign bank entry into five South East Asian countries. Our focus is on both hypotheses and main interest is to analyse which motive is the main driver for bank entry into local South East Asian banking markets. Based on the above literature review and comparative analysis of performance between foreign and domestic banks, we expect local profit opportunities to play a more important role than customer-following factors in attracting foreign banks into South East Asian countries.

[5] Host country's GDP per capita is found to have both a negative (Focarelli & Pozzolo, 2005) and positive (Buch, 2000; Wezel, 2004) influence on the activity of foreign banks. Total GDP is found to exert no influence (Cerutti et al., 2007) and positive effects (Brealey & Kaplanis, 1996) on foreign bank presence. Likewise, GNP per capita is sometimes positively (Yamori, 1998) and negatively (Goldberg & Johnson, 1990) related to the operations of foreign banks in host countries

Table 4.2. *Studies on the motivations for foreign bank expansion abroad*

Author	Host/Home country	Proxy for foreign bank presence	Proxy for customer-following factors	Proxy for local opportunities and / or host country factors	Main conclusions
US. as a *host* nation					
Goldberg and Grosse (1994)	US by state 1972-1989	Foreign assets share/ offices (agencies, branches and subsidiaries)	Inward FDI (+) related to foreign bank assets but not significant with office numbers; Trade by total not significant	Market size measured by total banking assets	Market size is the most important explanatory factor
Goldberg and Saunders (1981a)	US 1972-1979 (quarterly data)	Foreign bank assets / offices (one model for subsidiaries and another for branches, agencies, investment companies and agreement corporations)	Non-financial service inwards FDI (+); Imports to the US not significant	Difference between quarterly average Federal fund rate and three-month Eurodollar rate (bigger gap means cost of funds is lower abroad than in the US) (-) ; Market growth (GNP growth) not significant; Price-earning ratios (-) (low stock price, cheaper to acquire shares)	The two most important determinants of foreign bank growth in the US are interest rate differentials and price-earning ratio of US bank shares
Goldberg and Saunders (1981b)	US 1972-1980 (quarterly data)	Foreign bank assets (three separate models for branches, agencies and subsidiaries)	Imports to the US (+) agencies	Interest margin (+) agencies; Growth rate of domestic investment (+) agencies, branches and subsidiaries	Different factors affect organizational forms differently, agencies focus on short run profit-maximizing objective, while branches and subsidiaries focus on longer-term strategies (future growth of local businesses)
* Grosse and Goldberg (1991)	US 1980-1988	Foreign bank assets / the number of foreign bank offices (agencies, branches and subsidiaries)	Inward FDI and portfolio investment by country of origin (+); Bilateral trade (+); Geographic distance (+) (further away the higher level of presence); Exports (-), Imports (+)	Not applicable	Both FDI and trade positively correlated with foreign bank presence
Hultman and McGee (1989)	US 1973-1986	Foreign bank assets / offices (one model for subsidiaries and another for branches and agencies)	Non-financial service inward FDI by total (+)	Price-earning ratio of US bank stocks (-)	FDI positively and significantly correlated with foreign bank participation; Price-earning ratio only (-) with subsidiaries

Table 4.2. Studies on the motivations for foreign bank expansion abroad (cont.)

Author	**Host/Home country**	**Proxy for foreign bank presence**	**Proxy for customer-following factors**	**Proxy for local opportunities and / or host country factors**	**Main conclusions**
US. as a *home* nation					
Goldberg and Johnson (1990)	US as a home country to 22 host countries 1972-1985	Foreign bank assets / number of branch offices	Outward FDI to host countries from the US (+) foreign assets but (-) office numbers; Export (+), Import (+)	GNP per capita (-); Population (-); Domestic deposits (-); Change in exchange rate (-); Fewer regulatory restrictions (+)	FDI (+) assets, (-) number of offices, this seems to suggest that large bank follow clients, but small banks are less motivated by this factor
Miller and Parkhe (1998)	US as a home country to 32 host countries 1987-1995	Bank assets (1990-1995) / Bank offices (1987-1995) in foreign countries	Outward FDI to host countries from the US (+); Bilateral trade (-)	Size (demand + time deposits) (+); Development of the host country's banking market (total claims of deposits bank) (+); Entry barriers, capital stringency (-); Tax rate differentials (-) subsidiaries, (+) branches	FDI (+) branches, subsidiaries in developed countries, but in developing countries FDI (+) only number of offices (p. 376) Bilateral trade (-) US bank presence abroad [only assets (+) bilateral trade in developing countries]
Nigh et al. (1986)	US a home country to 30 host countries 1976-1982	Changes in bank branch assets	Outward FDI to host countries from the US (+)	The amount of manufacturing production in host country, as a proxy for local opportunity, not significant; (More) openness (+)	FDI strongly correlated for all countries and sub-samples of countries regardless of economic development Local profit opportunity has no impact
Sagari (1992)	US a home country to 21 host countries 1977	Bank FDI	Outward non-bank FDI to host countries from the US (+)	Market size (GNP) not significant; Regulatory restrictions (-)	Bank FDI is determined by non-bank FDI and regulation in host countries

Table 4.2. Studies on the motivations for foreign bank expansion abroad (cont.)

Author	**Host/Home country**	**Proxy for foreign bank presence**	**Proxy for customer-following factors**	**Proxy for local opportunities and / or host country factors**	**Main conclusions**
European					
* Fisher and Molyneux (1996)	UK (London) 1980-1989	Number of banks (not the actual number of offices) / number of employees of banks	Inward FDI by country of origin (-, not significant, consistent with Magri, Mori and Rossi, 2005) and outward FDI (+, significant with number of staff); Bilateral trade (+); Geographic distance (+) consistent with Grosse and Goldberg (1991); Separated trade: exports (+), imports (-) staff numbers	Not applicable	The size of the banking market of the home country is one of the most important determinants of foreign bank presence in London while FDI into the UK shows no significant relationship with foreign bank presence
Buch (2000)	German as a home country to 38 host countries 1981-1998	Bank FDI direct and indirect stocks / bank assets in foreign countries	Outward non-financial sector FDI (+); Bilateral trade (+); Distance not significant	GDP per capita (+)	Non-financial service FDI and bilateral trade exert a more significant impact on German banks foreign activities than per capita GDP (lower significance level)
Wezel (2004)	German as home country to 20 host countries 1994-2001	Bank FDI direct and indirect stocks	Lagged outward non-financial sector FDI (+); Lagged bilateral trade (+), but not robust to different specifications	Real GDP per capita (+); Stock market capitalization (+); Real interest rate (+); Interest margin (-); Risk (+) (high score, low risk)	FDI dominates other factors in pulling German banks overseas, other variables have less or even no effects

Table 4.2. Studies on the motivations for foreign bank expansion abroad (cont.)

Author	Host/Home country	Proxy for foreign bank presence	Proxy for customer-following factors	Proxy for local opportunities and / or host country factors	Main conclusions
Europe					
Magri et al. (2005)	Italy as a host country 1983-1998	Foreign assets / the number of branches and subsidiaries of foreign banks	Inward FDI by country of origin not significant; Bilateral trade (+), Distance in time zones (-)	Difference in interest rate spread (loan rate minus short term rate on Government bonds) Risk differential (host – home) (+) [separated as level, home risk (-) entry, meaning that lower risk of home country leads to higher entry, this conflicts with Grosse and Goldberg (1991)]	Trade plays a (more) important role than profit opportunities which loses some significance in the second period following introduction of a (deregulatory) banking law in 1993 (p. 1309)
Mutinelli and Piscitello (2001)	Italy as a home country to 46 host countries 1989-1999	Number of branches and representative offices in a foreign country	Manufacturing FDI (+) (measured by employees and offices of manufacturing firms); Exports (+)	Bank size (+) (alternatively measured by total employees, number of counters, financial income, bank's deposits and funds); International experience (age) (+); Business opportunities (+) but marginally affect representative offices (market size = total deposits; efficiency = interest rate spread; banking development = total claims of deposit money bank); Financial centre (+); Risk (100 = lowest risk) not significant	Manufacturing FDI strongly significant Host country's characteristics and business opportunities do not influence the set up of foreign branches but marginally affect the set up of representative office (p. 679)
Japan					
Yamori (1998)	Japan as home country to 44 host countries	Financial service FDI accumulated 1951-1994 in each country	Outward non-financial sector FDI into host country accumulated 1951-1994 (+); Bilateral trade (+); FDI and trade used in two separate estimates; Separated trade: exports (+), imports (-)	Per capita GNP of host country (+); Broad money M2 of host country not significant; Country risk (+) (foreign banks expand to stable countries); Real interest rates not significant	Local market opportunities are important factors determining Japanese banks to expand overseas in addition to following manufacturing sector firms

Table 4.2. Studies on the motivations for foreign bank expansion abroad (cont.)

Author	Host/Home country	Proxy for foreign bank presence	Proxy for customer-following factors	Proxy for local opportunities and / or host country factors	Main conclusions
Multi-host or multi-home country basis					
Brealey and Kaplanis (1996)	37 home and 82 host nations 1992 (1000 largest banks by assets size)	Number of offices	Bilateral FDI, inward FDI into host countries (+); Imports (+); Exports (+)	GDP (+)	FDI from home to host country (+) while host to home FDI has no effects; Trade (+)
Cerutti et al. (2007)	Latin America and Eastern Europe 2002 (100 largest banks by assets size)	Probit regression (dummy for branches and subsidiaries; dummy for presence and no presence)	Dummy for regulations control over inward and outward FDI; Home-host proximity (including language/legal origin, bilateral trade and distance) (not reported)	Bank regulation (-) (entry and activity restrictions, regulation on foreign bank branches); Corporate taxes (+); Total GDP not significant, GDP per capita (-); (Higher) Economic risk (-) branches, but (+) subsidiaries	Regulation on foreign bank branches and corporate taxes are important factors regarding foreign bank presence
Focarelli and Pozzolo (2005)	Both host and home countries belonging to 29 OECD countries (260 large banks) Average 1994-1997	Probit regression (dummy for branches and subsidiaries) 1998 data	Geographic distance (-); Bilateral trade (+)	Per capita GDP (-); Inflation (-); Schooling (+); Size of banking sector (credit market size) (+); Local banking (less) efficiency (+) (proxied by free cash flow, cost-income ratio and ROA, all at average country level)	Both trade and profit opportunities positively correlated to the setting up of branches or subsidiaries; However, profit opportunities have greater explanatory power than economic linkages
Moshirian and Van der Laan (1998)	US, UK and German are home countries 1985-1995 (quarterly data)	Foreign bank assets	Non-bank FDI (-)	Foreign financial liabilities (+); Domestic loans (-); International bond issue (-); Interest rate differentials (-); National income (+)	Non-bank FDI reduces banks in home countries to expand overseas; National income is one of the major determinants of foreign bank assets

Note: Compiled by the author. Studies associate with (*) control for home country factors

4.3. Methodology and Data

4.3.1. *Methodology*

The general model is expressed as follows:

$$fp_{i,j,h,t} = f(\omega_{i,j,t-1}, \pi_{i,j,t-1}, \delta_{j,t}, \eta_{j,h}, \lambda_{i,j,h}) \qquad (4.1)$$

The subscripts i, j, h, t stand for foreign bank i in host country j from foreign country h at time t. The dependent variable is foreign bank presence, which is alternatively measured by the percentage of share of bank i in country j held by foreign bank(s) at time t and the assets of foreign bank i to total banking assets in country j at time t. $\omega_{i,j,t-1}$ is the vector reflecting customer-following aspects; $\pi_{i,j,t-1}$ is the vector reflecting local profit opportunities; $\delta_{j,t}$ is the vector reflecting differences in macro-banking and economic conditions of host countries j; $\eta_{j,h}$ is the vector reflecting the distance, colonised relationship and the extent to which home country h and host country j share a common legal origin; $\lambda_{i,j,h}$ is the vector reflecting differences in entry timing and organizational form of foreign bank i from home country h in country j. Equation (4.1) is estimated with time dummies.

The model shown above is constructed for analysing the motivations of foreign bank participation in the South East Asian market. We try to test two types of incentive factors determining foreign bank entry corresponding to two strands of the theoretical literature: customer-following and profit-exploiting motives.

The first group of variables ($\omega_{i,j,t-1}$) reflects customer-following aspects and includes two variables: manufacturing sector inward FDI and bilateral trade (following Fisher & Molyneux, 1996; Goldberg & Saunders, 1981a; Grosse & Goldberg, 1991; Nigh et al., 1986; Yamori, 1998). These variables are expected to increase foreign bank presence in South East Asia.

However, as profit seeking firms, banks may also enter foreign markets to exploit local business opportunities as noted in the literature review (Table 4.2). In order to capture these effects, the second group of variables ($\pi_{i,j,t-1}$) includes those that reflect local profit opportunities. The first proxy for profitability is the income of foreign banks measured by the net return on assets. The second proxy is local banking system cost efficiency (following Focarelli & Pozzolo, 2005, p. 6) computed using the DEA frontier approach. As suggested by the literature, foreign banks are likely to be attracted to markets where efficiency is low because they could take advantage of their superior management skills to earn profits through their more effective operations. Therefore, the average cost

efficiency of a country's banking system is expected to have an inverse relationship with foreign bank participation. Focarelli and Pozzolo (2005) also consider this proxy but they simply use a country level cost-income ratio to proxy for efficiency.

Additionally, in order to control for host country differences in market size, regulation and macroeconomic conditions, the third group of variables ($\delta_{j,t}$) included are household expenditure, real interest rates and a regulation indicator. Several previous studies have included GDP per capita (Buch, 2000; Wezel, 2004) or GNP growth (Goldberg & Saunders, 1981a) to control for market size in host countries. However, GDP per capita does not directly reflect consumption because, arguably, higher income may not be associated with higher expenditure. GDP or GNP growth, on the other hand, tends to be higher (compared to developed countries) in less developed countries. Therefore, in the present paper, the growth rate of local household expenditure per capita is used. It is expected that higher growth rate would increase the expansion of foreign banks to serve the rapidly developing retail markets. Similarly, higher real interest rates foster entry because higher real rates of interest mean lower levels of inflation (following Wezel, 2004; Yamori, 1998), which indicates more attractive economic conditions in host countries.

The regulatory index is constructed from four different indicators for a country's banking market. First is the bank activity restriction, which reflect the ability of banks to involve in securities, insurance and real estate activity. Second is the banking entry requirements, which include submissions legally required prior to issuing a banking license. Third is the diversification index, which distinguishes whether there are explicit guidelines for asset diversification and whether banks are allowed to make loans abroad or not. The final component is the index for the independence of supervisory authority, which measures the degree to which the supervisory authority is independent from the government and legally protected from the banking industry. Therefore, the overall regulatory indicator is the sum of banking entry requirement and activity restriction scores minus the diversification and independency scores (because higher scores of the latter two are associated with less restriction). Higher score reflects a more restricted banking system. In contrast to the aforementioned variables, regulatory restrictions should slow entry (Goldberg & Johnson, 1990; Miller & Parkhe, 1998; Nigh et al., 1986; Sagari, 1992).

Furthermore, the extent to which home and host countries share a common legal system and culture are also expected to affect foreign bank expansion. The fourth group of

variables ($\eta_{j,h}$) to reflect these impacts includes a dummy variable to distinguish differences between legal systems, distance measured by differences in time zones (following Magri et al., 2005) and colonised relationship (following Cerutti et al., 2007). Banks in home countries may be more likely to expand to host countries that share a common legal origin. This is because similar legal norms would facilitate smoother operation, particularly at the start. Distance measured by the differences in time zones between home and host countries is believed to reflect not only geographical proximity but also cultural similarities. Given the importance of information on local customers and business practices, understanding cultural differences would help to attract more customers. Colonised relationship also plays a certain role in determining banks to select where to locate overseas. Thanks to the relationship in the past, banks in home countries have opportunities to understand the culture, social and economic conditions in host (colonised) countries, this would help banks to be more convenient in establishing and operating their foreign offices. In addition, past relationship could also push the economic integration between the two countries and this perhaps facilitates banks to expand into former colonised nations. Therefore, banks in countries with greater distance, different legal origin and non-existence of colonised relationships are expected to be less likely to expand to the South East Asian region.

In order to control for different factors affecting the time of entry and the organizational forms, a fifth group of variables ($\lambda_{i,j,h}$) are introduced comprising year of entry (following Cerutti et al., 2007) and dummies for different forms of organization such as branch, subsidiary, acquisition and joint-venture.

First, equation (4.1) is estimated using pooled cross-sectional time-series heteroskedasticity-consistent OLS as shown in (4.2).

$$\begin{aligned} fp_{i,j,h,t} = {} & \alpha_1 + \alpha_2.FDI_{j,h,t-1} + \alpha_3.Trade_{j,h,t-1} + \alpha_4.ROA_{i,j,t-1} + \alpha_5.Efficiency_{j,t-1} + \alpha_6.Household_{j,t} \\ & + \alpha_7.Interestrate_{j,t} + \alpha_8.Regulation_j + \alpha_9.Legal_{j,h} + \alpha_{10}.Colony_{j,h} + \alpha_{11}.Distance_{j,h} \\ & + \alpha_{12}.Yearentry_{i,j,h} + \alpha_{13}.Form_{i,j,h} + \alpha_{14}.Timedummy_t + \varepsilon_{i,j,h,t} \end{aligned} \quad (4.2)$$

Where:

- The subscripts i, j, h and t denote foreign bank i in host country j from home country h at time t
- $fp_{i,j,h,t}$: is the percentage of share of bank i in country j held by foreign bank(s) or the assets of foreign bank i to total banking assets in country j from country h, at year t

- $FDI_{j,h,t-1}$: Inward manufacturing sector FDI to country j from country h at year t-1
- $Trade_{j,h,t-1}$: Two-way trade between host country j and home country h at year t-1
- $ROA_{i,j,t-1}$: after-tax return on assets of foreign bank i in country j at year t-1
- $Efficiency_{j,t-1}$: the average cost efficiency in country j at year t-1, estimated by the non-parametric DEA approach applied to all financial institutions
- $Household_{j,t}$: the growth rate of household expenditure per capita in country j at year t
- $Interestrate_{j,t}$: real interest lending rate in country j at year t
- $Regulation_j$: regulation restriction index in country j, this is a composite index = (Bank activity restrictions + Banking entry requirements – Diversification – Independence of the supervisory authority). Restrictions on bank activities reflect the ability of banks to be involved in securities, insurance and real estate activities. Banking entry requirements reflects the types of legal submissions required to obtain a banking license. Diversification distinguishes whether there are explicit guidelines for asset diversification and whether banks are allowed to make loans abroad or not.. Independence of the supervisory authority reflects the degree to which the supervisory authority is independent from the government and legally protected from the banking industry. A higher score means the banking system is more restricted. Information is obtained from Barth, Caprio and Levine (2006). For further details of the construction of these indexes, please see the Appendix A3.1.
- $Legal_{j,h}$: Dummy for a common legal origin between country j and country h
- $Colony_{j,h}$: Dummy for colonised relationship between country j and country h
- $Distance_{j,h}$: difference in time zones between country j and country h
- $Yearentry_{i,j,h}$: the year foreign bank i setting-up or being acquired by foreign bank from country h
- $Form_{i,j,h}$: Dummy for organizational form of foreign bank i, including branch, acquisition, subsidiary and joint-venture, we drop joint-venture
- $Timedummy_t$: Dummy for the years 1999 to 2004, we drop year 1999 (because we use lagged ROA, so the number of years reduce by one, say 1998)
- α_1 is constant, α_2 to α_{14} are coefficients and $\varepsilon_{i,j,h,t}$ is the error term

Equation (4.2) is estimated based on the assumption that variation between banks and variation over time in a specific variable in any of the independent variables have the same effects on the presence of foreign banks. However, the motivations (customer-

following and / or profit-exploiting) may be different for banks from different regions over time and as such; we turn to estimate a second model as shown in (4.3).

The model (4.3), 'between' regression analysis, estimates the determinants of foreign bank presence as a relationship with the individual bank mean values of all variables. Variation 'within' banks is therefore eliminated. The model is as follows:

$$\begin{aligned} fp^{*}_{i,j,h} = {} & \beta_1 + \beta_2.FDI^{*}_{j,h} + \beta_3.Trade^{*}_{j,h} + \beta_4.ROA^{*}_{i,j} + \beta_5.Efficiency^{*}_{j} + \beta_6.Household^{*}_{j} + \\ & + \beta_7.Interestrate^{*}_{j} + \beta_8.Regulation_{j} + \beta_9.Legal_{j,h} + \beta_{10}.Colony_{j,h} + \beta_{11}.Distance_{j,h} + \\ & + \beta_{12}.Yearentry_{i,j,h} + \beta_{13}.Form_{i,j,h} + \beta_{14}.Timedummy_{t} + \varepsilon_{i,j,h,t} \qquad (4.3) \end{aligned}$$

where $fp^{*}_{i,j,h} = \sum_{t=1}^{T} fp_{i,j,h,t} / T$ where T is the total number of years; other variables are defined the same as in equation (4.2).

Motivations for foreign bank expansion may change over time. For example, during the 1960s, banks perhaps may followed their clients as a consequence of the expansion of multinational corporations, while in the 1980s banks may have been more motivated by banking deregulation and the increasing local opportunities in the developing markets (BIS, 2004). Such a decision to participate in a foreign market may be randomly affected by the removal of entry restrictions and this could be applied to the motivations for new foreign bank entry. For this reason, the random-effects GLS estimator is used to estimate equation (4.1) as shown in (4.4).

$$\begin{aligned} fp_{i,j,h,t} = {} & \alpha_1 + \alpha_2.FDI_{j,h,t-1} + \alpha_3.Trade_{j,h,t-1} + \alpha_4.ROA_{i,j,t-1} + \alpha_5.Efficiency_{j,t-1} + \alpha_6.Household_{j,t} \\ & + \alpha_7.Interestrate_{j,t} + \alpha_8.Regulation_{j} + \alpha_9.Legal_{j,h} + \alpha_{10}.Colony_{j,h} + \alpha_{11}.Distance_{j,h} \\ & + \alpha_{12}.Yearentry_{i,j,h} + \alpha_{13}.Form_{i,j,h} + \alpha_{14}.Timedummy_{t} + \varepsilon_{i,j,h,t} \qquad (4.4) \end{aligned}$$

While figuring out the bank ownership structure, we notice that the increase of ownership stakes in domestic banks is likely to be associated with foreign banks that have already owned some proportion of stakes. This is widespread in Indonesia and Thailand. The foreign partners are normally the same when the local government relax the ownership limits after the crisis, only the stakes are acquired more. Based on this observation, we predict that the foreign bank presence measured by foreign ownership may have a dynamic structure. In other words, there exists a persistence of foreign bank share in South East Asia in the period of our study. In order to test this, we estimate (4.1) applying dynamic panel model as demonstrated in (4.5). For dynamic estimation, the individual bank effects are eliminated by applying a first-difference transformation of all variables. Variables that have no time dimension are dropped.

$$\Delta fp_{i,j,h,t} = \lambda_1 + \lambda_2.\Delta fp_{i,j,h,t-1} + \lambda_3.\Delta FDI_{j,h,t-1} + \lambda_4.\Delta Trade_{j,h,t-1} + \lambda_5.\Delta ROA_{i,j,t-1} + \\ + \lambda_6.\Delta Efficiency_{j,t-1} + \lambda_7.\Delta Household_{j,t} + \lambda_8.\Delta Interestrate_{j,t} + \Delta\varepsilon_{i,j,h,t} \quad (4.5)$$

4.3.2. *Data*

Our sample includes commercial banks from five countries in South East Asia: Indonesia, Malaysia, Philippines, Thailand and Vietnam. The period of study is after the 1997/1998 financial crisis, from 1998 to 2004. Bank level data, except those for Vietnam, are obtained from the Bankscope database. For Vietnam-located banks, the data are provided by the State Bank of Vietnam and individual banks. In order to classify foreign banks, ownership structure information from various sources has been used. The main sources are Bankscope and Thomson Financial. We also use individual bank website information to date the percentage of share hold by foreign partners when this is not available from the Bankscope and Thomson Financial. There have been substantial changes in the ownership structure of banks, particularly in Indonesia and Thailand since 1998 following a bank restructuring programme. Information on foreign share is cross-checked with other sources, mainly academic papers[6] and ASEAN Bankers Association (regional updates).

The country-level data are obtained from various sources. Manufacturing sector inward FDI to host South East Asian countries are obtained from (ASEAN Secretariat) ASEAN Statistical Year Book, various issues from 2002 to 2005. Using FDI from one single source ensures consistency in measurement of these financial flows. Information on bilateral trade is obtained from the IMF Direction of Trade Statistics. Data on trade with Taiwan is not available from this source, so for countries that have foreign banks that originate from Taiwan, namely in Indonesia, Philippines and Vietnam, we obtain the Taiwan trade information from the Bank Indonesia, Philippines National Statistical Coordination Board and the General Statistics Office of Vietnam. Information on the regulation index and legal origin are from Barth et al. (2006). Colony relationship and distance in time zones are from the CIA's World Fact Book. Other country-level variables are obtained from the World Bank, World Development Indicators 2006.

[6] These include Bekaert and Harvey (2004); Chou (2000), Chua (2003), Coppel and Davies (2003), Detragiache and Gupta (2004), Foceralli (2003), Megginson (2005), Montreevat (2000), Tschoegl (2001), Tschoegl (2003). Other sources are McMillan (2002), Montlake (2003), US Embassy in Jakarta (2005), World Bank (2000).

Table 4.3. *Definition of variables and sources*

Variables	Abbreviations	Definitions	Sources
Foreign bank presence	$fp_{i,j,h,t}$	The percentage of share of bank i in country j owned by foreign bank(s) from country h or the assets of foreign bank i from country h to total banking assets in country j, at year t	Bankscope, State Bank of Vietnam (hand collected in Vietnam), Thomson Financial, individual and central bank websites, academic papers, and ASEAN Bankers Association
Manufacturing sector FDI	$FDI_{j,h,t-1}$	Inward manufacturing sector FDI to host country j from home country h at year t-1	ASEAN Statistical Year Book (various issues), Bank Indonesia Annual Report 2000 and 2004
Trade	$Trade_{j,h,t-1}$	Two-way trade between host country j and home country h at year t-1	IMF Direction of Trade Statistics, Bank Indonesia Annual Report 2000 and 2004, Philippines National Statistical Coordination Board, and General Statistics Office of Vietnam
Bank profits	$ROA_{i,j,t-1}$	After-tax return on assets of foreign bank i in country j at year t-1	Bankscope, State Bank of Vietnam and individual banks in Vietnam
Banking system cost efficiency	$Efficiency_{j,t-1}$	The average cost efficiency in country j at year t-1, estimated by using the DEA approach applied to all financial institutions	Computed by the author using data from Bankscope, State Bank of Vietnam and individual banks in Vietnam
Household expenditure	$Household_{j,t}$	The growth rate of household expenditure per capita in country j at year t	World Development Indicators, World Bank
Real interest rate	$Interestrate_{j,t}$	Real interest lending rate in country j at year t	World Development Indicators, World Bank
Regulation	$Regulation_j$	Regulation restriction in country j, this is a composite index including (1) bank activity restrictions (reflecting the ability of banks to be involved in securities, insurance and real estate activity); (2) banking entry requirements (legal submissions required to obtain a banking license); (3) diversification (distinguishing whether there are explicit guidelines for asset diversification and banks are allowed to make loans abroad or not); (4) the independence of the supervisory authority (the degree to which the supervisory authority is independent from the government and legally protected from the banking industry), higher score [(1) + (2) - (3) - (4)] means more restricted	Barth, Caprio and Levine (2006) (survey in early 2000, see the quantification of these indexes in the Appendix A3.1)
Legal system	$Legal_{j,h}$	Dummy for a common legal origin between country j and country h	Barth, Caprio and Levine (2006)
Colony	$Colony_{j,h}$	Dummy for colonised relationship between host country j and home country h	CIA's World Fact Book
Distance	$Distance_{j,h}$	Difference in time zones between host country j and home country h	CIA's World Fact Book
Year entry	$Yearentry_{i,j,h}$	The year bank i set-up or is acquired by foreign bank from country h	Bankscope, State Bank of Vietnam and individual banks in Vietnam, Thomson Financial, ASEAN Bankers Association
Form	$Form_{i,j,h}$	Dummy for branch, acquisition, subsidiary and joint-venture, we drop joint-venture	
Time dummy	$Timedummy_t$	Dummy for the years 1999 to 2004, we drop year 1999	Not applicable

4.3.3. *Foreign Bank Definition and Measurement of their Presence*

Most of the earlier studies use foreign bank assets or the number of offices to measure foreign bank presence (Table 4.2). Although the usage of assets captures size effects, such a variable does not sufficiently explain the motivations of smaller banks to locate overseas because measuring foreign banking activity in terms of assets is weighted towards banks of larger size (Fisher & Molyneux, 1996). The number of offices, in contrast, is less related to the impact of bank size, but the offices do not reflect the value-added nature in banking (and other) services[7]. For this reason, it is preferable to use staffing figures to proxy for foreign bank activity (except in the case of foreign acquisition of domestic banks) (Brealey & Kaplanis, 1996, p. 579). However, because data on the number of employees of foreign banks are often not available, measuring foreign bank activity in terms of employment is problematic in most cases. Fisher and Molyneux (1996) is the only study in the empirical literature which uses the number of staff to proxy for foreign bank presence (in London).

Goldberg and Johnson (1990) provided evidence which may be relevant to the above arguments. When foreign bank presence is proxied by assets, the authors found a positive and significant relationship between US foreign bank branches and FDI from the US. Nevertheless, when foreign bank activity is alternatively measured by the number of branch offices, the relationship between foreign presence and FDI becomes negative and significant (albeit with small coefficients). Goldberg and Johnson (1990, p. 134) suggested that this may indicate that larger banks may follow their customers while small banks may not.

In the present paper, foreign bank presence is proxied by the ownership stakes held in local banks. Foreign banks are defined and selected as those with a 10% or more stakes owned by foreign bank partners[8]. Because we wish to examine purely the motivations of banks, banks with over 10% of their stakes held by foreign non-banks are excluded from

[7] For instance, while around one in five foreign banks operating in London have three staff or less, at one point the number of employees of Citibank in London reached nearly 6,000 (Brealey & Kaplanis, 1996, p. 579).

[8] This selection of foreign banks is different from several studies that define foreign banks as those having at least 30% (Barajas et al., 1999) or 50% (Claessens et al., 2001) ownership stakes owned by foreign partners. The present paper considers 10% for two reasons. First, studies stated above mainly examine the effects of foreign bank entry in domestic markets, the ownership of 50% of shares or more may reflect the control of foreign partners over the decision-making process in locally incorporated banks. However, this paper focuses on analysing the motivations for foreign entry so it is less relevant to take accounts the dominant role of foreign partners. Second, given the low level of foreign bank presence in South East Asia, the threshold of 50% foreign ownership would reduce significantly our sample size.

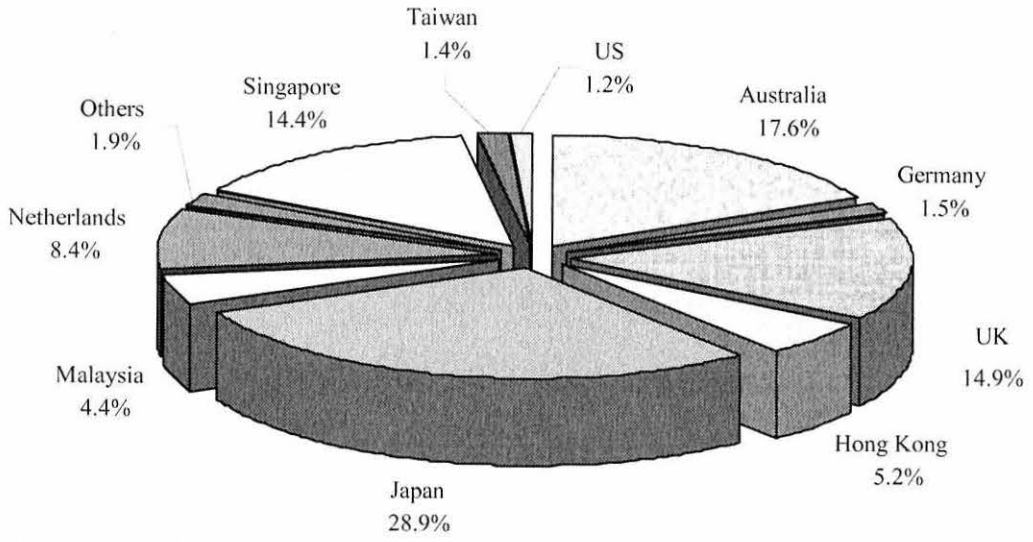
the sample. In addition, since we use lagged independent variables, only banks with two consecutive accounting years are selected.

Measuring foreign bank presence by the ownership of local banks is sensitive to changes in regulation, which over time has been relaxed in South East Asia. While there have been substantial changes in these ceilings (Table 4.1) other restrictions on foreign banks such as branching and activity limits have changed less. We would argue that our proxy for foreign bank entry is reflective of the actions taken by foreign banks who desire to enter or expand their operation in the South East Asian region. For comparison, we also use foreign bank assets over total banking system assets to proxy for foreign bank presence in South East Asia as normally employed in the literature.

4.4. Results and Discussion

4.4.1. *Descriptive Foreign Bank Presence by Assets and Share*[9]

Figure 4.1. *Foreign bank assets by country of origin in South East Asia 1998-2004*



Note: Compiled by the author using data from Bankscope, Thomson Financial, State Bank of Vietnam, bank websites, central banks, academic papers and ASEAN Bankers Association

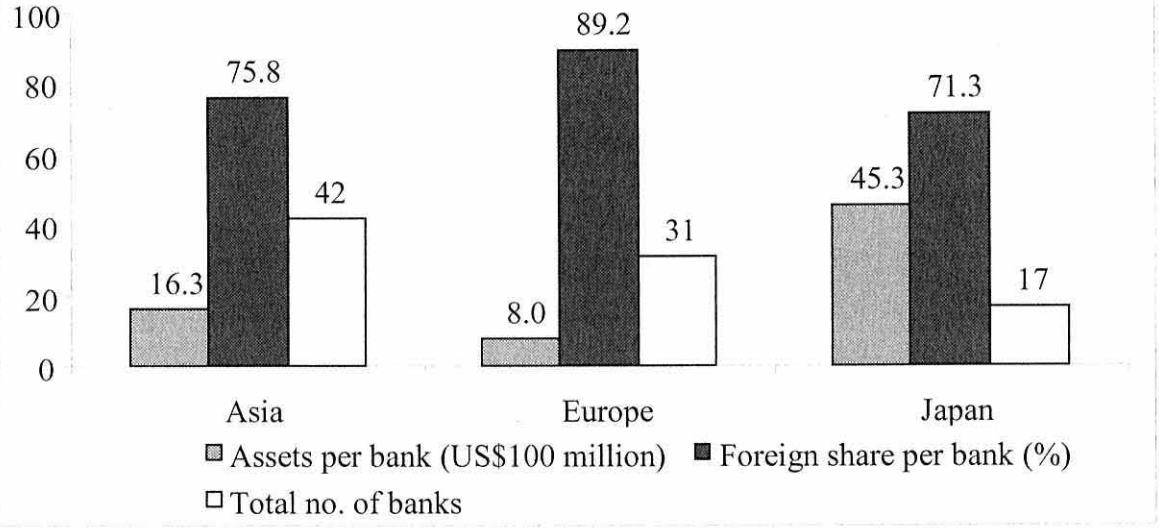
As shown in Figure 4.1, the overall picture seems to suggest that banks from (developed) countries that are geographically close to South East Asian nations tend to dominate the regional banking market. In terms of assets, Japanese foreign banks lead the

[9] For detailed calculations of figures shown in Figure 4.1 and 4.2, see the Appendix A4.1.

South East Asia banking market with total assets accounting for nearly 30%. Australian banks have a 17% assets share followed by Singaporean banks with a 14% assets share.

However, banks from one European country, UK, appear to be important players who accounted for approximately 15% of the market, higher than even Singaporean banks. It is noted that the presence of UK banks, in our sample, mainly relates to the operations of two major institutions: Hong Kong and Shanghai Banking Corporation (HSBC) and Standard Chartered Bank (SCB). Apart from the recent acquisition of domestic bank shares, for instance, in Thailand, the presence of these banks in various countries can date back to the nineteenth century (1875 for HBSC in Philippines and 1884 for HSBC in Malaysia). This large scale presence of UK banks, to some degree, relates to historical (colonial) linkages.

Figure 4.2. *Foreign bank size and share by country of origin in South East Asia 1998-2004*



Note: Compiled by the author using data from Bankscope, Thomson Financial, State Bank of Vietnam, bank websites, central banks, academic papers and ASEAN Bankers Association

Regarding the average size of a foreign bank, Figure 4.2 indicates that on average, the size of a Japanese foreign bank is nearly three times larger than that of a foreign bank coming from other Asian countries, over USD4,500 million assets size compared to just over USD1,600 million. In turn, a foreign bank from Asian countries (excluding Japan) is on average twice as large as a foreign bank from Europe. Here the average assets size of an Asian foreign bank amounts to over USD1,600 million, compared to the average assets size of a European foreign bank at around USD800 million.

The figures on the average share owned by foreign partner(s) in a foreign bank show that Europeans hold on average over 13% larger stakes than Asian foreign partners in an Asian foreign bank, who, in turn, hold over 4% more than Japanese partner(s).

4.4.2. *Foreign Bank Size and Share: What Do These Figures Suggest?*

The descriptive section above seems to suggest that Asian foreign banks, particularly Japanese institutions, prefer to acquire lower ownership stakes in large domestic banks while European banks tend to acquire higher stakes in smaller local institutions. We predict that European banks are more likely to enter into the South East Asian region by opening branches or subsidiaries rather than acquiring domestic institutions (in the period of our study). In contrast, acquisition is a more popular mode of overseas expansion by Japanese banks into South East Asia than de novo entry.

If these assumptions are true, there may be different strategies or motivations to enter the South East Asian region between foreign banks from Asia and those from Europe. Specifically, Asian banks may aim at developing retail businesses whereas European banks' main target may be to serve their home clients by providing wholesale and other niche banking services. One of the possible explanations is that because Asian banks are closer to South East Asia in terms of culture, business practice as well as geography, they understand domestic niches better than their European foreign bank counterparts, which yields comparative advantages in servicing retail customers. Japanese banks appear to acquire small stakes in large domestic banks that already have extensive local branch networks, wider scope of activities as well as broader customer bases in their host countries. European banks, on the other hand, may be disadvantaged, except for those with long-established presence (such as HSBC) and these are more likely to enter to serve their home customers whether by acquiring controlling shares in small domestic banks or setting up foreign branches or subsidiaries[10] in the period 1998 to 2004.

4.4.3. *Comparative Performance Analysis*

4.4.3.1. *Foreign banks versus domestic banks.*

As shown in Table 4.4.1 (row 10, column 3, from left), on average, the (net) return on assets of foreign banks is more than one dollar (per hundred dollars of assets) higher

[10] The presence of foreign bank subsidiaries, particularly those from Europe, in the South East Asian region, is limited, for example, HSBC, SCB in Malaysia (originating from branches) and SBC in Thailand (formed by acquisition). These subsidiaries have extensive local service delivery network.

than domestic banks (in four out of the five countries in the sample). This higher after-tax profit of foreign banks is mainly thanks to their higher gross income and lower loan-loss provisions. On average, foreign banks earn 6 cents more in interest income and 71 cents more in non-interest income (rows 3 and 4, from top) and save 6 cents in loan-loss provisions per hundred dollars of assets (row 7)[11]. The higher gross income and lower loan-loss provisions compensated for their higher overhead costs (row 6) and higher tax (row 8).

Table 4.4. *Comparative performance analysis*

	4.4.1. Foreign (F) versus Domestic (D)				**4.4.2. Asia (A) versus Europe (E)**			
Ratio	Average	(F – D)	(+)	(-)	Average	(A – E)	(+)	(-)
Total income	**F>D**	**0.65**			**A<E**	**-0.60**		
INT	F>D	0.06	I,M,T	P, V	A>E	0.14	I,M,V	P,T
NON	F>D	0.71	I, M,T,V	P	A<E	-1.34	I,M,P,T,V	
Total cost	**F>D**	**0.14**			**A<E**	**-0.95**		
OVH	F>D	0.27	M, P,T,V	I	A<E	-0.86	I,M,P,T,V	
LLP	F<D	-0.06	M,T,V	I,P	A<E	-1.95	I,P,T	M
TAX	F>D	0.20	I,M,T	P,V	A<E	-0.04	M,T,V	I,P
PBT	F>D	**1.20**	I,M,T,V	P	A>E	**1.25**	I,T,V	M,P
ROA	F>D	**1.03**	I,M,T,V	P	A>E	**1.13**	I,T,V	M,P
DEA	F>D	**0.11**	I,M,P,V	T	A>E	**0.04**	M,T,V	I,P

Note: F-D means the relative ratios of foreign banks minus those of domestic bank. A-E denotes the relative ratios of Asian foreign banks minus those of European foreign banks (including Canada and the US). (+) means the results from these subtractions are positive; (-) means negative results. INT = interest income; NON = non-interest income; OVH = overheads costs; LLP = loan-loss provisions; TAX = tax on profit; PBT = profit before tax; ROA = net income over total assets. All these ratios are expressed as a share of total bank assets. DEA = cost efficiency score computed using the DEA technique. I, M, P, T, and V denote Indonesia, Malaysia, Philippines, Thailand and Vietnam, respectively. The differences sometimes do not sum to totals because of missing values. For instance, the differences look fine in row 2 and row 9 (Table 4.4.1), total income equals INT plus NON and ROA approximately equals PBT minus TAX.

These figures seem to suggest that foreign banks, while incurring higher overhead costs and paying higher taxes, have superior banking techniques and skills as well as better risk management that helps them to gain greater total earnings leading to higher net

[11] Slightly lower loan-loss provisions may imply that (any) information disadvantages of foreign banks have been offset by their better risk management or alternatively, domestic banks are worse in credit screening and monitoring or local state-owned banks, which dominate the banking sectors in most countries in the sample, are influenced by direct credit policy.

profits. The cost efficiency scores computed using the DEA approach supports the descriptive results from the accounting ratios. Foreign banks are 11% more cost efficient than domestic banks (row 11).

4.4.3.2. *Asian foreign banks versus European foreign banks.*

Turning to Table 4.4.2, Asian foreign banks have higher (net) profits than European foreign banks (row 10, column 2). However, the higher profits of Asian foreign banks are thanks to their lower costs rather than higher income (as is the case for all foreign banks compared to domestic banks) because the total income of Asian foreign banks are 60 cents lower than that of European banks.

The higher cost of European foreign banks is mainly due to higher loan-loss provisions. On average, European foreign banks incur costs of two dollars more per hundred dollars of assets for loan losses than Asian foreign banks (row 7). This significant difference seems to imply that European foreign banks face substantial information disadvantages. The explanation could be that while Asian foreign banks tend to rely on soft information to grant loans, European foreign banks, because of cultural barriers and unfamiliarity in business practices, are more likely to rely on hard information which is not plentifully available due to the low level of transparency and the lack of market discipline in South East Asian banking markets. In terms of income, European banks earn higher non-interest income (in all five countries) than Asian foreign banks, which leads to higher total income for European foreign banks (rows 4 and 2). This source of non-interest income may be from serving their large corporate home clients. However, higher non-interest income by European banks can not offset their lower interest income and higher cost (rows 3, 6, 7 and 8). This is again consistent with the DEA measures. On average, the cost efficiency of Asian foreign banks is 4% higher than that for European foreign banks.

In conclusion, these descriptive statistics suggest that foreign banks outperform domestic banks in South East Asia reflected in higher net profits thanks to higher total income. These results occur with most studies on bank performance in developing nations that use both accounting ratios (Barajas et al., 1999; Claessens et al., 2001; Denizer, 2000) and frontier approaches (Bonin et al., 2005; Hasan & Marton, 2003; Havrylchyk, 2005; Kraft et al., 2002; Weil, 2003; Williams & Intarachote, 2003). In this case, profit opportunities seem to be a dominant motivation for foreign bank entry as suggested by the local business opportunity hypothesis (Section 4.2.2.3). In addition, foreign banks from

Asian countries are shown to perform better than those from Europe. However, the higher profits of Asian banks originate from their lower costs and not from higher income.

4.4.4. *Empirical Results*

In order to investigate the determinants of foreign bank entry into South East Asia, we include measures proxied for customer-following and profit-exploiting motives in a single model as shown earlier in equation (4.1). Foreign bank presence, which enters as the dependent variable, is alternatively measured by the percentage of share owned by foreign partner(s) and the ratio of foreign bank assets to total banking assets. This general model, as presented in equation (4.1), is estimated using four different techniques including pooled OLS, 'between' regression, random-effects GLS and the dynamic panel approach. The relative technical presentations of these estimates are shown, respectively, in equations (4.2), (4.3), (4.4) and (4.5). Model 2a uses foreign bank share as the dependent variable while model 2b uses foreign bank assets to total banking assets as the dependent variable in equation (4.2). Models 3a, 3b, 4a, 4b, 5a and 5b correspond to equations (4.3), (4.4) and (4.5), respectively.

4.4.4.1. *Pooled OLS regression.*

As shown in Table 4.5, the results from the pooled OLS, where foreign bank participation is measured by the percentage of share held by foreign banks (model 2a), indicate that both variables that proxy for local business opportunities are significantly correlated with foreign bank presence and have the expected signs. The first proxy for local profit opportunity is the bank's profitability measured by the lagged return on assets, which has a positive sign. The second is the banking system's costs efficiency computed by using the DEA approach, which has a negative sign suggesting that banks are attracted to countries where local markets are operating at low levels of efficiency as our expectation.

Table 4.5. *The motivations for foreign bank entry in South East Asia – OLS estimates*

		Dependent variable	
	Independent variable	**Foreign SHARE (2a)**	**Foreign ASSETS (2b)**
Testing 'customer-following' hypothesis	Manufacturing FDI	0.00005*	-0.000002
		(0.00003)	(0.000002)
	Bilateral trade	-0.000002	0.0000004**
		(0.000002)	(0.0000002)
Testing 'profit-exploiting' hypothesis	ROA	0.2157**	0.0036
		(0.0873)	(0.0046)
	Banking cost efficiency	-0.6526***	0.0252**
		(0.1489)	(0.0120)
Controlling for host country conditions	Household expenditure	0.0068*	0.0003
		(0.0036)	(0.0004)
	Real interest rate	0.0067***	0.0002
		(0.0026)	(0.0003)
	Regulation restriction	-0.0176**	-0.0036***
		(0.0091)	(0.0008)
Controlling for bilateral relationship	Legal origin	0.0996***	-0.0058**
		(0.0341)	(0.0028)
	Colonized relationship	0.0137	0.0020
		(0.0216)	(0.0019)
	Time difference	-0.0012	-0.0001
		(0.0023)	(0.0003)
	Opening year	0.0001	-0.0002***
		(0.0004)	(0.0000)
Dummy for different organizational forms	Branch	0.2790***	0.0039**
		(0.0303)	(0.0018)
	Acquisition	-0.3414***	0.0083**
		(0.0547)	(0.0036)
	Subsidiary	0.1663**	-0.0240***
		(0.0788)	(0.0065)
Dummy for years	Year 2000	0.0799**	0.0044
		(0.0332)	(0.0044)
	Year 2001	0.0502	0.0051
		(0.0317)	(0.0034)
	Year 2002	0.0544	0.0015
		(0.0335)	(0.0036)
	Year 2003	0.0542	0.0021
		(0.0357)	(0.0038)
	Year 2004	-0.0100	0.0043
		(0.0580)	(0.0051)
	Constant	1.1585	0.3944***
		(0.8083)	(0.0667)
	Number of observations	307	323
	R^2	0.57	0.38
	Mean VIF	2.45	2.44

Note: Robust standard errors in parentheses. The results are from the estimation equation (4.2) using pooled heteroskedasticity-consistent OLS. The dependent variable is foreign bank presence, alternatively measured by foreign share and foreign assets. Foreign share is the percentage of share of bank i in country j held by foreign bank(s) while foreign asset is the assets of foreign bank i to total banking assets in country j at time t. For definition of variables, please see Table 4.3. Mean VIF = mean value of variance inflation factor. As the rule of thumb, if VIF exceeds 10, multicollinearity is severe. *, **, *** denote significance at 0.1, 0.05, and 0.01 level, respectively.

In addition, among the customer-following variables, manufacturing FDI is also statistically and positively significant. However, looking at the size of the coefficients and the level of significance, ROA and banking cost efficiency appear to have greater explanatory power in terms of foreign share than manufacturing FDI. These results may suggest that foreign banks are mainly attracted to the South East Asian region by local profit opportunities rather than as a consequence of following their home clients. Specifically, foreign banks tend to enter countries where they can earn higher (net) profits and where there are lower levels of bank efficiency.

The positive significance of household expenditure and real interest rates, also in model 2a, suggest that foreign banks tend to enter countries with higher growth rates of household expenditure and higher real rates of interest. The negative relationship between regulatory restrictions and foreign bank share indicates that countries that restrict entry (as expected) exhibit lower levels of foreign presence. This broad evidence is consistent with our expectations.

Turning to the OLS regression where foreign bank presence is measured by assets to total banking assets (model 2b), the general results change for those variables that proxy for domestic profit opportunities. The significance of ROA vanishes while bank cost efficiency becomes positively significant. This is in contrast to the results from model 2a and is contrary to our expectations. The significance of expenditure growth and real interest rates also collapses while the dummy variable for different legal origin becomes negative and significant. This result conflicts with the notion that the greater the extent to which home and host countries share a common legal origin, the more likely banks from home countries expand into these host nations. There is one variable that supports the customer-following hypothesis, this is the positive and significant value for bilateral trade (this compares with the manufacturing FDI in model 2a).

Comparing the dummy variables for different types of organizational forms, both models, 2a and 2b show strong significance. In our sample, we classified banks into four organizational forms: joint-venture banks, banks being acquired by foreign banks, foreign bank branches and foreign bank subsidiaries[12]. The results can be interpreted as follows.

For model 2a, looking at the acquisition dummy, the average share acquired by foreign partners in a local bank are 34% lower than that of foreigners in joint-venture banks. Given the popularity of the type of joint-venture in Indonesia (where the authorities

[12] We drop the type of joint-venture

allowed foreign partners to contribute a maximum 85% of share prior to 1999), we infer that the average percentage of acquisition is about 51% (85% minus 34%) in a local bank in the South East Asian region during the period 1998 and 2004. Branches and subsidiaries have 28% and 17% higher foreign ownership share than joint-ventures. Because both these forms of organizations are wholly foreign-owned (the difference is that subsidiaries are locally incorporated while branches are not), one would expect the close coefficients between branches and subsidiaries. However, subsidiaries in South East Asia have, as mentioned, been formed from acquisitions; most of them have 1% or 2% of shares still in the hands of domestic partners as required by laws (this is the case for subsidiaries in Indonesia). Another reason for this difference is attributed to disturbance in estimates, particularly dummy techniques.

For model 2b, the ratio of foreign assets ownership to total banking assets is highest for an acquired bank; the coefficient for this dummy is 0.0083, doubles that for the branch dummy. This seems to be in accord with the belief that foreign banks, particularly Japanese, tend to acquire large domestic banks with many local service delivery outlets as shown in the descriptive section (Section 4.4.2). The negative coefficient for the subsidiary dummy may reflect that the average size of this organizational form tends to be smaller than for joint-ventures.

In sum, the results from the pooled OLS regression show that either manufacturing FDI (model 2a) or bilateral trade (model 2b) can be significantly and positively correlated with foreign bank presence. However, both of these customer-following proxies have marginal effects on foreign bank presence. Proxies for local profit opportunities lose their significance in model 2b, providing inconclusive evidence for the appeal of local opportunities to foreign bank entry. In addition, regulatory restrictions in the host country significantly reduce foreign bank entry as shown in the estimates for both models.

4.4.4.2. *'Between' regression.*

Pooled cross-sectional time-series OLS regression in section 4.4.4.1 is based on the assumption that variation between banks and variation over time in any specific independent variable have the same effects on the presence of foreign banks. This may not be the case given the possibly different motivations for foreign expansion among Japanese, other Asian and European banks as implied in the descriptive analysis (Section 4.4.2). We now relax this assumption and estimate the similar model applying 'between' regression techniques. Foreign bank presence is related to the individual bank mean values

of all variables capturing differences in motivations 'between' banks (following, for example, Goddard, Molyneux, & Wilson, 2004).

The results from our 'between' regression (Table 4.6), applied to model 3a, are to a large extent similar to those from the pooled OLS. ROA is positively and banking system cost efficiency is negatively correlated with foreign bank presence measured by ownership share. Both these variables are statistically significant. In contrast, manufacturing FDI and bilateral trade are insignificant even though they have positive signs. This seems to indicate that profit opportunities in domestic markets are more robust across models than customer-following indicators. Dummies for our branch and acquisition, legal system variables and real interest rate also reveal similar results as those from the pooled OLS.

Moving onto model 3b where foreign bank presence is measured by assets, our 'between' regression shows that almost all the significant variables that were found in the pooled OLS estimates now disappear. Only regulatory restrictions and subsidiary dummy remain statistically significant (as do two year dummies).

In conclusion, by applying the 'between' regression analysis, the proxies for local market profit opportunities in model 3a are consistent with model 2a estimated using the pooled OLS while customer-following variables becomes insignificant. In model 3b, none of these variables are statistically significant. The results seem to suggest the necessity for applying further techniques prior to reaching a conclusion on the determinants of foreign bank entry.

Table 4.6. *The motivations for foreign bank entry in South East Asia – 'Between' regression*

		Dependent variable	
	Independent variable	**Foreign SHARE (3a)**	**Foreign ASSETS (3b)**
Testing 'customer-following' hypothesis	Manufacturing FDI	0.00002	0.00001
		(0.00009)	(0.00001)
	Bilateral trade	0.000001	0.000000
		(0.000005)	(0.000001)
Testing 'profit-exploiting' hypothesis	ROA	0.7068**	-0.0253
		(0.3307)	(0.0399)
	Banking cost efficiency	-0.7574*	0.0759
		(0.4304)	(0.0502)
Controlling for host country conditions	Household expenditure	0.0156	0.0032
		(0.0354)	(0.0041)
	Real interest rate	0.0335*	0.0032
		(0.0173)	(0.0020)
	Regulation restriction	-0.0190	-0.0042***
		(0.0126)	(0.0014)
Controlling for bilateral relationship	Legal origin	0.1122*	-0.0020
		(0.0648)	(0.0076)
	Colonized relationship	-0.0542	0.0021
		(0.0889)	(0.0110)
	Time difference	-0.0052	0.0000
		(0.0068)	(0.0008)
	Opening year	-0.0015	-0.0001
		(0.0013)	(0.0002)
Dummy for different organizational forms	Branch	0.3229***	-0.0006
		(0.0781)	(0.0096)
	Acquisition	-0.2181**	0.0000
		(0.0848)	(0.0105)
	Subsidiary	0.1589	-0.0404**
		(0.1643)	(0.0203)
Dummy for years	Year 2000	0.0932	0.0343*
		(0.1586)	(0.0204)
	Year 2001	0.8437**	0.0441*
		(0.3396)	(0.0236)
	Year 2002	-0.8942***	0.0077
		(0.2975)	(0.0320)
	Year 2003	0.3790*	0.0089
		(0.1935)	(0.0238)
	Year 2004	-0.2519	0.0304
		(0.1657)	(0.0195)
	Constant	4.1496	0.2118
		(2.6595)	(0.3304)
	Number of observations	307	323
	R^2	0.73	0.40

Note: Standard errors in parentheses. The results are from the estimation equation (4.3) using the 'between' regression. The dependent variable is foreign bank presence, alternatively measured by foreign shares and foreign assets. Foreign share is the percentage of share of bank i in country j held by foreign bank(s) while foreign asset is the assets of foreign bank i to total banking assets in country j at time t. For definition of variables, please see Table 4.3. *, **, *** denote significance at 0.1, 0.05, and 0.01 level, respectively.

4.4.4.3. *Random-effects GLS estimates.*

By taking the mean values of all independent variables, the 'between' regression technique has one major disadvantage, which is the elimination of all 'within' bank variations. This may be as weak as an assumption in the pooled OLS estimates where it is believed that variations over time across banks have similar effects on the presence of foreign entry. This assumption is rather dubious given that we know that regulations on foreign bank entry in the countries of our sample have changed considerably over the period of study (Table 4.1). It could be that the decision of entry into South East Asia by foreign banks may be randomly affected by these regulatory changes. Therefore, we apply random-effects GLS estimation to our sample.

The results from the random-effects GLS (Table 4.7) show negative and strongly significant coefficients in model 4b for one variable that proxies for local profit opportunities: banking system cost efficiency. This result is consistent with the results generated by model 2a but conflicts with positive coefficient sign on cost efficiency for model 2b. In model 2b, where foreign bank presence is also measured by foreign bank assets, the coefficient of banking system cost efficiency is positive. Considering the assumptions associated with pooled OLS, we believe that the random-effects GLS estimates generate relatively more reliable results. Bilateral trade is significant but the coefficient again is small, suggesting the effects of trade on foreign bank presence are negligible.

Real interest rates, legal origin and regulatory restrictions still show similar results to those produced by the OLS estimates where the first two variables are positively and the third is negatively related to foreign bank presence.

Looking at the time dummies, the random-effects GLS estimates, unlike the OLS and 'between' estimates, show positive and significant coefficients for all years in model 4a. The result suggests that foreign bank share in host banks has increased (around 5% yearly on average) over the period 1998 to 2004 and this is in line with the relaxation of ownership limits on foreign bank entry.

In conclusion, the random-effects GLS results suggest that local profit opportunities are more important factors than the expansion of home country's manufacturing sector in driving foreign banks to expand overseas. In other words, banks are attracted by profit opportunities in the host nations, entering countries where average banking system cost efficiency are low, rather than following home clients abroad.

Table 4.7. *The motivations for foreign bank entry in South East Asia – Random-effects GLS*

		Dependent variable	
	Independent variable	**Foreign SHARE (4a)**	**Foreign ASSETS (4b)**
Testing 'customer-following' hypothesis	Manufacturing FDI	0.00001	-0.000001
		(0.00001)	(0.000001)
	Bilateral trade	-0.000001	0.0000003**
		(0.000002)	(0.0000001)
Testing 'profit-exploiting' hypothesis	ROA	0.0423	-0.0010
		(0.0305)	(0.0015)
	Banking cost efficiency	-0.0633	-0.0072***
		(0.0596)	(0.0026)
Controlling for host country conditions	Household expenditure	-0.0020	0.0001
		(0.0016)	(0.0001)
	Real interest rate	0.0017*	0.0000
		(0.0010)	(0.0000)
	Regulation restriction	-0.0004	-0.0031***
		(0.0092)	(0.0010)
Controlling for bilateral relationship	Legal origin	0.1362***	-0.0058
		(0.0418)	(0.0036)
	Colonised relationship	-0.0310	0.0042
		(0.0895)	(0.0107)
	Time difference	0.0012	0.0000
		(0.0050)	(0.0005)
	Opening year	-0.0015	-0.0001
		(0.0013)	(0.0001)
Dummy for different organizational forms	Branch	0.1924***	0.0071
		(0.0639)	(0.0074)
	Acquisition	-0.3556***	0.0105
		(0.0700)	(0.0083)
	Subsidiary	0.0963	-0.0093
		(0.1114)	(0.0126)
Dummy for years	Year 2000	0.0450***	0.0013**
		(0.0127)	(0.0006)
	Year 2001	0.0476***	0.0003
		(0.0125)	(0.0006)
	Year 2002	0.0578***	-0.0003
		(0.0123)	(0.0006)
	Year 2003	0.0630***	-0.0002
		(0.0130)	(0.0006)
	Year 2004	0.0673***	-0.0009
		(0.0166)	(0.0008)
	Constant	3.7384	0.2304
		(2.5407)	(0.3017)
	Number of observations	307	323
	R^2	0.51	0.36

Note: Standard errors in parentheses. The results are from the estimation equation (4.4) using the random-effects GLS estimates. The dependent variable is foreign bank presence, alternatively measured by foreign share and foreign assets. Foreign share is the percentage of share of bank i in country j held by foreign bank(s) while foreign asset is the assets of foreign bank i to total banking assets in country j at time t. For definition of variables, please see Table 4.3. *, **, *** denote significance at 0.1, 0.05, and 0.01 level, respectively.

4.4.4.4. *Dynamic panel estimates.*

As a further robustness test, dynamic panel GMM is employed. In dynamic estimation, the individual bank effects are eliminated by applying a first-difference transformation of all variables. Variables that have no time dimension are dropped.

One of the first notable points, from the dynamic panel results as shown in Table 4.8, is the strong significance between the dependent and its lagged variables in both models 5a and 5b. This suggests that foreign bank presence in South East Asia has a dynamic structure as having expected. The existing percentage of share in a foreign bank exerts a positive impact on future foreign share. In other words, foreign banks that have already operated in South East Asian host countries tend to increase their presence in the region by acquiring more share. The sign on the coefficient of lagged foreign bank assets is opposite to that of foreign shares. The negative and significant sign seems to reflect the restructuring process by foreign banks when they acquire significant shares of domestic banks. This includes downsizing to cut overhead costs, which has led to a reduction in bank size during the period 1998 to 2004 or it may seem to mean that foreign banks are taking bigger stakes in smaller banks.

Concerning our main variables that proxy for customer-following and profit-exploiting motivations, the results show that while both proxies for the former are insignificant, those for the latter remain significant. In model 5a, ROA is positively and significantly correlated with foreign bank shares at the 10% significance level. In model 5b, banking system cost efficiency is negatively related to foreign bank assets (the significance level is 5%). This result increases our confidence from those generated by the pooled OLS (model 2a), the 'between' regression and the random-effects GLS estimates. The supplementary tests that show no over-identification restrictions (model 5a) and second-order autocorrelation (both models 5a and 5b) support the appropriateness of applying dynamic GMM[13].

In conclusion, dynamic panel estimates show that local profit opportunities appear to be the main determinant in foreign banks' decision to establish a presence in South East Asia. The dynamic panel model at the same time also shows the existence of persistence in foreign bank ownership in South East Asia.

[13] Our sample is large enough in size to produce a reliable result from dynamic panel estimates which perform better in the case of large number of observations and short-time span. The number of observations is 170 for foreign share and 181 for foreign bank assets while a typical large sample for dynamic panel estimate could be around 100.

Table 4.8. *The motivations for foreign bank entry in South East Asia-Dynamic panel estimates*

		Dependent variable	
	Independent variable	**Foreign SHARE (5a)**	**Foreign ASSETS (5b)**
	Lagged dependent variable	0.3401***	-0.3636***
		(0.1354)	(0.1192)
Testing 'customer-following' hypothesis	Manufacturing FDI	0.00001	0.00000
		(0.00001)	(0.00000)
	Bilateral trade	0.00000	0.00000
		(0.00000)	(0.00000)
Testing 'profit-exploiting' hypothesis	ROA	0.1670*	-0.0033
		(0.0967)	(0.0061)
	Banking cost efficiency	-0.0089	-0.0060**
		(0.0394)	(0.0025)
Controlling for host country conditions	Household expenditure	0.0012	0.0001
		(0.0011)	(0.0001)
	Real interest rate	0.0001	0.0000
		(0.0009)	(0.0000)
	Constant	0.0002	-0.0004***
		(0.0023)	(0.0001)
Supplementary tests	Number of observations	170	181
	Sargan test	1.39	36.48***
	1st order auto-covariance test	-2.3**	0.19
	2nd order auto-covariance test	0.15	-0.38

Note: Standard errors in parentheses. The results are from the estimation equation (4.5) using dynamic panel estimates. The dependent variable is foreign bank presence, alternatively measured by foreign share and foreign assets. Foreign share is the percentage of share of bank i in country j held by foreign bank(s) while foreign asset is the assets of foreign bank i to total banking assets in country j at time t Sargan test for over-identifying restrictions shows χ^2 value. Tests for first- and second-order of auto-covariance show z value. The model is estimated without time dummies. For definition of variables, please see Table 4.3. *, **, *** denote significance at 0.10, 0.05, and 0.01 level, respectively.

4.5. Conclusions

The main conclusion[14] of our paper is that profit opportunities appear to matter more than customer-following incentives as motivating factors for foreign banks to participate in South East Asian banking markets between 1998 and 2004. Banks tend to expand to countries where they can make more profits (consistent with Focarelli & Pozzolo, 2005; Goldberg & Saunders, 1981b; Magri et al., 2005) and where banking systems are less efficient (consistent with Focarelli & Pozzolo, 2005)[15]. FDI and trade,

[14] Because other studies such as Grosse and Goldberg (1991) (export -; import +, p. 1108), Fisher and Molyneux (1996) (export +; import -, p. 275) have found different results for trade variables when exports and imports are used alternatively, we estimate models in which trade includes only either imports or exports. The results are reported in the Appendix A4.2a, b, c and d and are similar to those where trade is measured by bilateral trade.

[15] This result is also broadly in-line with those suggested by Berger (2007), who found that high level of foreign bank ownership, 70% on average, in developing compared to 15% in developed European countries is due to more comparative advantages associated with foreign banks (and low government entry barriers) in developing economies.

that reflect customer-following motivations, on the other hand, exert a marginal and non-robust effect on foreign bank presence.

Although a large body of literature has found that FDI (Goldberg & Grosse, 1994; Goldberg & Johnson, 1990; Goldberg & Saunders, 1981a; Grosse & Goldberg, 1991; Hultman & McGee, 1989; Miller & Parkhe, 1998; Nigh et al., 1986; Sagari, 1992) and/or trade (Brealey & Kaplanis, 1996; Buch, 2000; Magri et al., 2005; Moshirian & Van der Laan, 1998; Mutinelli & Piscitello, 2001; Wezel, 2004; Yamori, 1998) significantly explains foreign bank presence, some empirical studies have found that inward host country FDI has no (Fisher & Molyneux, 1996; Magri et al., 2005) or even negative (Moshirian & Van der Laan, 1998) effects on the participation of foreign banks. Similarly, trade is found to affect negatively the foreign activity of US banks (Miller & Parkhe, 1998).

In this paper, our models sought to capture the main motivation for foreign entry and they are estimated applying four different techniques. The results from these regressions, to a large extent, are consistent. The exception is the case of the pooled OLS, where the results are different between two proxies for foreign bank presence, namely, foreign bank share and foreign bank assets. We attribute this difference to the weak assumptions associated with the pooled OLS and its miss-specification as revealed by dynamic panel estimates.

The second conclusion is that the regulatory environment in host countries significantly impacts on foreign bank entry, namely, more restricted banking systems reduce foreign bank presence (consistent with Goldberg & Johnson, 1990; Miller & Parkhe, 1998; Nigh et al., 1986; Sagari, 1992). Thirdly, the macroeconomic environment, as reflected in real interest rates, shows a positive and significant relationship with foreign bank entry. We interpret this result that countries with low levels of inflation (high levels of real interest rates) attract more foreign bank entry (consistent with Focarelli & Pozzolo, 2005; Wezel, 2004). Finally, the larger the extent to which home and host countries share a common legal origin, the more likely banks in home countries will expand to these host countries.

4.5.1. *Limitations*

The fact that dominant forms of entry are associated with specific countries in our sample may cause some bias towards the motivations of the specific organizational forms. Foreign bank subsidiaries and branches are more common in Malaysia and Vietnam while joint-ventures are more popular in Indonesia, while acquisition is the most used form of foreign entry in Thailand. These differences, to a certain extent, are controlled for by differences in regulatory restrictions[16] and dummies for different organizational forms. However, the regulation index used in our paper, obtained from the survey of Barth et al. (2006) where indexes for all sampled countries are available may be inappropriate because substantial changes in entry restrictions have taken place in the countries under study in this paper.

Secondly, given a small sample of only five countries, the inclusion of several, particularly time invariant, variables may not allow us draw strong conclusions. Also the fact that we did not have the full population of banks in our sample, to a certain extent, may limit the findings of our analysis.

Thirdly, it is likely that the entry of Japanese banks into South East Asia is motivated by factors which are different from those of banks from other regions, such as Europe or other Asian countries. For example, Japanese banks may be more strongly attracted by local business opportunities than European banks (Sections 4.4.1 and 4.4.2) as they have more similarities in cultures and business practices. The same argument can be applied to long-established banks. Because of the size of our sample, the separation of Japanese banks into a sub-sample induces a small number of observations which may not generate reliable outcomes for comparison.

While bearing in mind some of the limitations stated above, the present paper contributes to the literature in the following ways. Firstly, this paper is one of the few studies that examines foreign entry from various home countries to several host developing countries and is first to analyse the motivations for foreign bank entry into South East Asia. Focarelli and Pozzolo (2005) study the expansion of banks from home to host OECD countries and include only three developing countries (Czech Republic, Poland and Turkey) in their sample of 29 host countries. Similarly, Cerutti et al. (2007) study the expansion of the world's 100 largest banks to developing countries but these

[16] There are several foreign bank branches in Thailand. The data is, however, unavailable from Bankscope while Bank of Thailand's website only publicizes the balance sheet statements. This factor apparently could not be captured by the regulation index.

relate to entry into Latin America and Eastern Europe. Brealey and Kaplanis (1996) study 37 home to 82 host nations of the world's 1,000 largest banks. The sample includes four out of five countries in our sample. However, this study examines bank entry for just one year, 1992. Moshirian and Van der Laan's (1998) study includes only three home countries: US, UK and Germany compared to over 10 home countries in our sample[17]. Besides, we use more contemporary information capturing entry after the 1997/1998 Asian crisis when various changes in entry restrictions were implement - most of the earlier studies examine the time period prior to 1998.

In addition, the present paper, to our knowledge, is only the second study to apply new panel estimation approach, namely dynamic panel GMM. The earlier study to use this approach is Moshirian and Van der Laan (1998). Most of the previous studies use OLS or in a fewer cases, probit regression, to examine the determinants of foreign banks to expand overseas or to establish a specific organizational form. In our paper, the OLS estimates exhibit reasonable outcomes with most variables having the expected sign and being statistically significant (where foreign bank presence is measured by foreign share). However, the dynamic panel estimates, when applied, have shown the strong significance of the lagged dependent variables. This indicates a dynamic relationship in foreign bank share and assets. The results of no over-identification restrictions and no second-order autocorrelation further support the application of dynamic estimates to our sample. This raises certain concerns about the results from prior studies that use OLS regression estimates for examining foreign bank entry.

From the results presented in this paper, studies in the literature could be extended to empirically test for causal relationship by applying Granger techniques to the same sample. Because profit opportunities appear to be important drivers, it is hypothesized that sometimes bank may lead and customers follow.

4.5.2. *Policy Implications*

Since 1998, several changes in foreign entry regulation in South East Asian countries have been witnessed. Policy makers expect that the inflow of foreign banks would help to increase banking system competition and efficiency. Therefore, the

[17] Most of the remaining studies concern a single home or host country. For the US as host countries see: Goldberg and Grosse (1994); Goldberg and Saunders (1981a); Goldberg and Saunders (1981b); Grosse and Goldberg (1991) and Hultman and McGee (1989), as home country, see: Goldberg and Johnson (1990); Miller and Parkhe (1998); Nigh et al. (1986) and Sagari (1992); for the UK, see: Fisher and Molyneux (1996); for Germany, see: Buch (2000) and Wezel (2004); for Italy, see: Magri et al. (2005) and Mutinelli and Piscitello (2001); for Japan, see: Yamori (1998). Details are presented in Table 4.2.

understanding of motivations for entry is relevant to the legal process in creating a more competitive banking sector.

As shown by our empirical study, foreign banks are mainly attracted by business opportunities in local markets rather than attracted by their pre-existing bank-client relationships. Therefore, an effective method of attracting foreign bank entry is to develop an environment that is conducive to promoting the profit opportunities of new entrants. Tax regulation could be one possible policy that provides incentive for new foreign bank entrants.

Also, because of the pursuit of profit-maximizing objectives, upon entry, foreign banks tend to focus on market segments that generate more earnings. Thus, the competitive effects from foreign participation are likely to be concentrated on certain market niches which may be different from those that regulators are attempting to develop. In order to orient foreign banks to the desired segments, restrictions could be placed on areas that policy makers deem 'undesirable' from a foreign bank entry perspective.

Policy makers, of course, should also be aware of the positive and negative effects of foreign bank penetration. Foreign banks may stimulate competition (Levine, 1996), improve banking system efficiency (Claessens et al., 2001) and supply on-job training (Sagari, 1992) but may also 'cherry' pick some market niches (Bhattacharya, 1993), seize the opportunity of "learning by doing" from domestic infant banks (Stiglitz, 1993) and be less sensitive to the wishes of local government (Terrell, 1986). As a result, regulations should be conducted in a manner so that costs are minimised and benefits are maximised while understanding that domestic profit opportunities are the prominent factor that explain foreign bank motivations to operate in host nations (and not customer-following motives). This would need a cost-and-benefit analysis based on certain criteria for different cases and is subject to decisions made by regulators.

Chapter 5

Competition and Bank Risk in South East Asian Commercial Banking

Abstract

The present paper investigates the effects of competition on risk-taking behaviour at the bank level in South East Asia. The Panzar and Rosse (1987) H-statistic is used as a measure of banking competition for a study of commercial banks from a sample of four countries in South East Asia (Indonesia, Malaysia, Philippines and Vietnam) and we show that it is not necessary for policy makers to increase bank systemic risk in return for a more competitive banking system. In contrast, the results reveal that competition helps to decrease instability. Our results are robust to alternative risk indicators, different H-statistic modelling and specifications.

5.1. Introduction

One of the major objectives in liberalizing financial sectors in South East Asia is to foster competition. However, after nearly a decade of liberalizing the financial systems since the early 1990s, several countries in South East Asia apparently do not have an effective framework for supervision and regulation. Therefore, it is unclear whether the 1997/1998 crisis that have occurred are partially attributed to weak supervision and/or to excessive competition leading to risky investments. Having experienced a severe financial crisis, countries in South East Asia, on the one hand, launched further reforms which concentrated on improving prudential regulation. On the other hand, these countries encouraged consolidation as a step to create more resilience in the banking system.

With the consolidation process still in progress and competition continuing to be fostered by foreign entry and structural deregulation, regulators remain concerned about the consequences of competition policy on their banking systems. Specifically, whether competition induces more risky behaviour on banks? And if competition generates substantial beneficial effects, does bank consolidation impair competition?

Studies of the relationship between competition and bank risk employ different measurements for both competition and risk, and this leads to ambiguous findings. For example, Dick (2006), Keeley (1990) and Rhoades and Rutz (1982), all studied banking samples in the US and found that under competitive pressures banks tend to get involved in more risky investments. This implies that competition damages financial stability. In contrast, other studies by Boyd, De Nicolo and Jalal (2006), Jayaratne and Strahan (1998) and Yeyati and Micco (2007) indicate that in a more competitive banking market, the probability of failure is lower, suggesting that competition helps to enhance financial stability. Overall, the empirical evidence on the relationship between competition and risk-taking in banking can be described as inconclusive at best and conflicting at worst.

This paper is an attempt to investigate the impact of competition on risk-taking behaviour in four South East Asian countries in order to explore some policy implications for regulators. The main purpose is to answer the question: does competition lead banks to take-on more risk? In addition, we also examine the evolution of the competitive environment in four South East Asian banking systems post-1997 - a period characterised by several further reforms in the financial sectors.

The paper is outlined as follows. The next part, section 5.2 discusses the current literature on the relationship between competition and bank risk-taking. This section first presents theoretical arguments and modelling frameworks that have been developed in

order to study bank risk-taking focusing on either competition for deposits or loans. Second, the empirical evidence is explored. The approaches to measure competition as well as the theory of contestable market are also included. Section 5.3 covers the methodology and data used in this paper. The Panzar and Rosse (1987) H-statistic is introduced, particularly the underlying assumptions. Then, the risk indicators and second-stage regressions are presented. In section 5.4, H-statistic, modelled according to various specifications, risk measurement and other variables are described. The results from the second-stage regressions are presented with detailed discussion. The conclusions and limitations of the paper follow in section 5.5.

5.2. Does Competition Induce Risk-Taking Behaviour?

This section provides a literature review on the relationship between competition and risk-taking incentives in banking. The first part highlights the key theoretical arguments, and this follows on by an overview of the modelling frameworks that have been developed in order to study bank risk-taking focusing on either competition for deposits or loans. Finally, we discuss the empirical evidence on the relationship between competition and risk-taking behaviour.

5.2.1. *The Theoretical Arguments about Competition and Bank Risk-Taking*

Competition policy which aims at restricting the creation and exploitation of market power has been deployed in many banking markets. The underlying reason is to increase the efficiency of resources allocation and banking operation. On the one hand, there is the argument that competition is needed to improve bank management, increase transparency and lower asymmetric information and so on. Thanks to improved management and less asymmetric information, banks could respond better to risks. Therefore, increased banking sector competition is likely to lead to less risk-taking and a more stable banking system.

Competition is considered as the key factor to help bank managers to achieve full textbook efficiency. As a result, according to this view, policies fostering competition should be encouraged. Berger and Humphrey (1997) note in their survey of 130 bank efficiency studies that banks are on average 77% efficient - that is to say, there is still room for a 20% plus efficiency improvement if banks can exploit input usage or boost

output through better management[1]. It is widely believed that competition acts as a strong fillip to boost efficiency. However, competition issues are multi-faceted of which the consequences are dependent on various regulatory and institutional factors.

On the other hand, there are also arguments to support the restriction of competition. This argument suggests that competition forces banks to offer more competitive prices to retain their market share. Profits of banks, subsequently, may be eroded. Upon facing a decline in profits, bank managers tend to adopt more risky activities in order to seek higher returns, particularly those managers whose incomes are based on their performance. The fact that bank managers do not always take prudent risks could endanger the whole financial system. If increased systemic risk occurs as a result of respective increased individual bank risk resulting from excessive competition, there is likely to be a trade-off between competition policy and financial system stability.

The competition-instability nexus is still subject to debate. In the case of a systemic crisis the costs of resolving such a crisis can have a significant impact on a country's economic resources. Hoggarth, Reis, and Saporta (2002), for instance, examined losses incurred during banking crises in countries around the globe and found that on average the resolution costs alone accounted for 4.5% of GDP. The aforementioned authors also show that cross-country estimates suggest that the fiscal resolution costs for banking crises were considerably higher in countries of lower income and higher dependency on bank intermediation (17.6% compared to just over 12% of GDP in high-income countries). The outputs losses defined as the difference between the actual outputs and the forecast level of outputs during crises were estimated about 6.3% of GDP.

Given the substantial losses that may be caused by policies favouring competition, and the uncertainty of the corresponding efficiency benefits (Canoy, van Dijk, Lemmen, de Mooij, & Weigand, 2001), regulators may be cautious in implementing policies that foster competitions in many countries.

5.2.2. *Scenario Analytical Frameworks for the Impacts of Competition on Risk*

Although a large part of the theoretical literature predicts that banks would pursue more risky strategies when encountering increased market competition, Boyd and De Nicolo (2005) demonstrated that there are two risk-incentive mechanisms which operate in adverse dimension. Specifically, banks could become more risky in a less competitive

[1] This follows the idea from Allen and Gale (2003)

environment and less risky in an increased competitive environment, which depends on the focus on one or both sides of bank balance sheets.

One strand of the modelling framework that have been developed in order to study bank risk-taking assumes that allocation of bank assets is determined by solving a portfolio problem, focusing on the deposit side of the bank balance sheet. With this assumption, increased competition would lead to more risk on banks and ultimately cause systemic failure. This is due to the fact that upon confronting competition (on the deposit side), banks tend to increase their offered rate to attract depositors. When paying higher rates, without recognising the effects of competition from the lending market, bank earnings decline. In order to cover the lost profits, banks are likely to accept more risky investments. In contrast, when competition is restrained, banks exercise market power by paying lower deposits rates and, therefore, can increase their profits. As a result, banks in less competitive markets are less willing to invest in low probability and high return projects. So, failure is less likely to occur.

Matutes and Vives (2000) developed a theoretical model to assess the connection between competition in the deposit market and bank risk-taking incentives. The two authors focused on one side of the balance sheet; any effects of competition for loans and investment projects were disregarded. After developing the model and building up different scenarios, the authors concluded that when competition is intense and portfolio risk is observable, banks will not want to take risk on the asset side if the deposit rate is constrained by a ceiling rate, because bank assets and liabilities are complements. If portfolio risk is unobservable or moral hazard exists (which is normally the case), depositors do not realize how deposit rate and asset allocation determine the probability of bank failure and the expected return, and so banks will take maximal asset risk. In a world with flat-premium deposit insurance, banks will become aggressive competitors and take maximal assets risk if the competition for deposit is intense because there are no incentives to penalise bank risk-taking behaviour. With the introduction of risk-based deposit insurance, banks will take minimal asset risk because the risk-based insurance scheme makes banks fully liable.

Alternatively, another strand of the analysis assumes that banks solve an optimal contracting problem. This kind of moral hazard problem has put competition into a completely new and more positive role. The analysis captures competition on both sides of the bank balance sheet. In the less competitive market, on the deposit side, banks can earn more rents as previously argued. However, banks could also charge higher interest to

borrowers on the lending market as well. The less competitive the market, the higher the interest rate the borrowers have to pay. Facing the higher borrowing rate, borrowers tend to invest in more risky projects and, therefore, their probability of bankruptcy increases. This risk mechanism is exploited further by the moral hazard problem on the bank borrower's side. As a result, banks become more risky in a less competitive market.

Koskela and Stenbacka (2000) constructed a model of mean-shifting investment technologies to investigate the relationship between credit market competition and bank risk-taking. The central question of their study is whether there is a trade-off between competition in the loan market and financial fragility. Under the assumptions of their model, Koskela and Stenbacka (2000) indicated that the introduction of competition in bank credit markets will lower interest charged on bank borrowers and yield higher investment without increasing the equilibrium probability of default by bank borrowers. Thus, it is not necessary to have a trade-off between competition in the lending market and financial vulnerability. It is also important to note that, during the analysis, investments are assumed to be financed fully by debt. Such an assumption generates the strongest limited liability effects. It means limited liability effects will be lower when the investments are partially funded by bank equity. For this reason, in the context of Koskela and Stenbacka's (2000) analysis, the argument supporting the absence of the trade-off can be stronger in all generalizations where investment projects are financed both by debt and equity. The study also shows that such a trade-off is still absent disregarding whether credit rationing exists or not. Koskela and Stenbacka (2000) stated that in fact banks operating in monopolistic markets do not conduct credit rationing while banks in competitive environments do, provided that the risk premium goes in hand with the volume of investment.

Unlike Matutes and Vives (2000) and Koskela and Stenbacka (2000) who focused on one side of bank balance sheet, Boyd and De Nicolo (2005) developed a model that allows for the existence of competition on both deposits and loans markets. In the framework of the model, these authors assume that the project risk is determined by bank borrowers, which depends on the interest charged by banks. The portfolio problem is transformed into a contracting problem with the existence of moral hazard. Banks with market power will charge lower rates on deposits and higher rate on loans. In this context, portfolio theory suggests that banks are less incentivised to take-on risk because they can earn monopoly profits: less competition, less risk. However, the contracting problem as introduced has put competition in a new role. That is, higher loan rates force bank

borrowers to seek for more risky projects that induce more risk on (monopoly) banks: less competition creates more risk. The same mechanism runs exactly in the opposite dimension, competitive banks will offer lower loans rates and, therefore, reduce the moral hazard problems. Banks, as a result, face less risk because their borrowers are less likely to pursue risky investments.

5.2.3. *Evidence on the Relationship between Competition and Risk-Taking*

One of the early studies on competition and bank risk-taking was conducted by Rhoades and Rutz (1982) in the US banking market. They investigated the empirical evidence on the 'quiet life' hypothesis. According to this hypothesis, bank managers in concentrated markets would prefer risk-avoidance behaviour in order to enjoy a 'quiet life' and make fewer efforts to maximize bank operating efficiency due to the lack of competitive pressure. Rhoades and Rutz (1982) tested whether banks with market power would take-on lower levels of risk than those in competitive banking environments. These researchers use a large sample including 6,500 unit banks which have operated in the US over the ten-year period from 1969 to 1978. Rhoades and Rutz (1982) used bank profit volatility to measure overall risk and other risk indicators to reflect risk of bank's balance sheets including the ratio of equity to assets, total loans to total assets and net loan losses to total loans. The three-bank deposit concentration ratio is used to measure bank market power. The results reveal that concentration is negatively and statistically correlated with three out of four risk indicators. This empirical evidence generally suggests that banks with more market power tend to reduce their risk-taking. One could infer that banks in more competitive markets, then, will be in a more risky position.

Unlike Rhoades and Rutz (1982) who used accounting ratios, Keeley (1990) employed the market value of capital-to-asset ratio and interest rates on large CDs to proxy for risk. Keeley (1990) examined a sample of 150 largest bank holding companies which accounted for 40% of all bank assets in the US over the period 1970 and 1986. The researcher observed a decline of market value of bank capital-to-asset ratios, after about a decade of growth. The downward trend commenced in the mid-1960s and was coincident with a period when the restrictions on branching, multi-bank holding companies and interstate expansion were removed. Therefore, Keeley (1990) tested whether increased competition stimulated by the liberalization of entry lowered bank market charter capital, which, in turn, increased incentives for banks to take-on excessive risk.

In order to measure market power, Keeley (1990) applied Tobin's q which is identified as the ratio of market value over book value of bank assets. Market value of bank assets is calculated as the sum of market value of bank equity plus book value of bank liability. Banks with more market power are assumed to have higher market-to-book assets. Risk is measured by the capital-to-asset ratio, which is calculated as the market value of bank equity over market value of bank equity plus book value of bank liabilities, and interest paid on large CDs. Banks with more capital are assumed to have fewer incentives to take-on risk, therefore, their probabilities of bankruptcy are lower. Subsequently, these banks would pay lower rates on large CDs.

To conduct the empirical test, Keeley (1990) estimated two sets of regressions. In the first set, the market power, proxied by q, was related to the branching relaxation dummy: years in which restrictions were in place took a value of zero and those where prohibition was liberalized took a value of a unity. In the second set of regressions, q is used as an independent variable to explain bank-risk behaviour. The results show that the relaxation of interstate branching barriers statistically reduced bank market power. In addition, banks with less market power (lower market-to-book assets) tended to take-on excessive risk (lower capital-to-asset ratio and paying higher rates on large CDs). In sum, competition resulted in increased bank risk-taking.

However, it is noted that the common proxy for risk, the capital-to-asset ratio (either book or market value), which is used in both Rhoades and Rutz (1982) and Keeley (1990) studies, is indirectly related to the probability of bank default.

Using another measure of bank risk, the ratio of loan charge-offs to total loans and loan-loss provisions to total loans, Dick (2006) related these risk proxies to branching relaxation as a proxy for market competition. Banks are expected to take-on more risk when being allowed to expand their operation in any States because geographic diversification may provide a hedge against increased risk. Dick (2006) focused her study on the latter stage of banking deregulation in the US with the full removal of geographic restrictions in 1994. Therefore, the data used covers the period 1993 to 1999. The results indicated that, following deregulation in banking, loan charge-offs increased. This also applies when loan-loss provisions replaced loan charge-offs. The evidence suggests, then, that competition increased bank credit risk. It is germane to point out that all of the above studies were conducted on bank samples covering different periods in the US.

Contrary to the results reported by the above-mentioned studies, which suggest a positive link between bank competition and risk, Jayaratne and Strahan (1998) found that

branching relaxation sharply reduces bank risk. These two researchers used US State-level aggregate data available from 1975 to 1992 for their regression analysis. The results show that nonperforming loans, net loan charge-offs and loan-loss provisions are all negatively and significantly correlated to the intrastate branching indicator. Jayaratne and Strahan (1998) estimated the decline in loan-loss provisions, after branching barriers were lifted, to be 48% on average. The authors explained that competition helped bank managers to screen and monitor better their borrowers. Consequently, they offer safer loans after relaxation of entry barriers. In other words, competition reduces the probability of bank failure.

De Nicolo (2000) examined the relationships between bank size, charter value and risk for a sample of listed banks from 21 advanced economies over the period 1988 and 1998. The market value Z-index is used as an indicator of risk, which is regressed against bank size measured by the accounting value of bank assets. The analysis reveals that larger banks tend to have lower levels of charter capital and a respective higher probability of insolvency. One may argue that larger banks are likely to have greater market share; therefore they gain more market power. So, the result from this study could at least suggest that banks with more market power take-on greater risk or competitive banks are less risky. However, bank size alone may not be an adequate indicator of bank market power.

Elaborating from the previous work by De Nicolo (2000), De Nicolo, Bartholomew, Zaman and Zephirin (2004) used a banking sample from 100 countries to explore the effects of consolidation on risk during the period 1993 to 2000. In the first part, these researchers use a firm-level risk indicator, which is measured by the Z-index, to see its relationship with bank size. The estimates show that there is some evidence that large banks exhibit a higher level of risk-taking than small banks. It appears that risk incentives from moral hazard problems seem to outweigh risk reduction through scale, scope economies, geographic expansion and product diversification. This result is consistent with De Nicolo (2000). In the second section, the authors use country-level data to document whether market concentration increases the probability of systemic risk. Drawing from the evidence of risk-taking at the firm-level, De Nicolo et al. (2004) suggest that consolidation would increase the size of banking firms and because of the 'large size' effects, the probability of failure increases. Therefore, systemic risk becomes more potential. However, systemic risk could also decline with consolidation if the level of transparency increases. Higher transparency helps markets and policy makers to monitor

banks better by reducing moral hazard problems. As a result of enhanced monitoring, banks would be more incentivised to manage their internal risk and the probability of default will subsequently reduce.

In order to measure systemic risk, the researchers constructed an aggregated Z-index which equals the average Z-index of the five largest banks in each country. These Z-indexes are regressed against a set of five-bank concentration ratios after controlling for individual country macroeconomic factors. The regression results reveal that the systemic risk indicator is negatively and significantly correlated with concentration ratios. This evidence suggests that more concentrated banking systems are more vulnerable to systemic failure. That is to say, increased competition lessens the probability of systemic crisis.

Boyd et al. (2006) extended the previous study by Boyd and De Nicolo (2005) in order to find evidence on the new role of competition when it is introduced to the loan market. As discussed earlier in the theoretical literature, two theories so far predict conflicting relationship between competition and stability. The first theory suggests that the risk of bank failure increases when the number of competitors increases because banks lose profits due to higher rates paid on deposits. This theory normally disregards competition on the loan side. In this case, banks are assumed to invest in risk-free instruments such as government bonds. This theory suggests that there is a trade-off between banking competition and financial stability. The second theory proposes that banks use their mobilised deposits to make loans and have to face a contracting problem; this should be the case in real banking businesses. The increasing number of banks will lower the interest rates charged on loans. Lower loan rates reduce moral hazard because bank borrowers have fewer incentives to get involved in risky projects. Therefore, the probability of failure of banks is lessened. The trade-off between competition and bank risk does not exist. So, competition enhances financial stability.

In empirical tests for these two conflicting predictions, Boyd et al. (2006) employed two sets of data. The first set of the data includes 2,500 US banks operating in rural areas in 2003. In order to be able to conduct a pure test on the link of competition, which is measured by Herfindahl-Hirschman deposit concentration index, banks operating in more than one deposit area are deleted. This is done after the concentration index of the bank deposit market have been calculated. Then the risk indicated by the Z-index is regressed cross-sectionally against the Herfindahl-Hirschman deposit concentration index at county level with the inclusion of bank-specific and county-specific effects. The results

show that deposit concentration is negatively and statistically correlated with the Z-index suggesting that more concentrated banking systems are associated with higher probability of increased risk. These results are robust to various model specifications. In searching for the influential components of the Z-index leading to the negative coefficient with concentration, these researchers estimate regressions for separate components of the Z-index. At this more detailed level, the volatility of ROA appears to drive the relationship. The positive and significant coefficient of ROA volatility is more than offset by the positive relationship between ROA and concentration; whereas bank equity shows no statistical relationship with concentration in the sample.

The similar variables of risk and competition are applied to an international sample including banks from 134 non-industrialized nations. For this sample, the researchers alternatively use three concentration ratios, based on deposits, loans and assets. After controlling for bank and country differences, the regression outcomes also reveal similar results as those obtained from the US sample. Specifically, the Herfindahl-Hirschman index for deposits, loans and assets are all negatively and highly correlated with the Z-index. However, the coefficient between the asset concentration and the Z-index is higher than that of deposits which, in turn, is larger than the loan concentration coefficient. Arguably, the asset concentration ratio should better reflect bank activities than either loan or deposit concentration because assets capture all bank activities (Boyd et al., 2006). In the same estimation, Boyd et al. (2006) also found that bank size is negatively related to the Z-index, indicating that large banks face a higher risk of failure than small banks. The results are in-line with the findings by De Nicolo (2000) and De Nicolo et al. (2004). Similar to what has been undertaken with the US sample, the researchers attempted to examine the components of Z-index which principally determine the negative link between Z-index and concentration. The regression results show that ROA volatility, similar to evidence from the US and bank equity (not found in the US sample) is the main drivers of the relationship.

Taken together, through empirical tests applying to two different bank samples, Boyd et al. (2006) found relatively strong evidence that concentration in banking increases the risk of failure, implying that increased competition improves financial stability.

Yeyati and Micco (2007) studied the link between competition and risk of banks in eight Latin American countries. The authors use the Panzar and Rosse (1987) H-statistic as a proxy for competition and the Z-index as a proxy for bank risk. The H-statistic seems to be more appealing than the concentration ratio because the H-statistic measures

competition based on direct observation of bank behaviour in respect of changes in factor price inputs. Higher values of the H-statistic are assumed to be associated with a more competitive banking environment. The Z-index, which consists of three components: bank equity, ROA and ROA volatility, gauges the capacity of banks to use their capital and profits to absorb risk reflected by the variation in bank profit. As a result, safer banks have higher values of the Z-index. Yeyati and Micco (2007, p. 10) found a negative correlation between the H-statistic and the inverse of the Z-index. The results indicate that competition leads banks to take-on less risky activities.

In general, the empirical studies of the direct connection between competition and risk in banking, similar to theoretical arguments, suggest ambiguous findings. One of the reasons for the inconclusive findings relates to the varying methodologies as well as the different risk and competition measures used in these studies.

5.2.4. *Measurement of Competition*

5.2.4.1. *Empirical approaches to measure competition.*

Generally, competition has been measured in the banking literature by two different approaches: the structural and non-structural approach.

The structural approach examines competition by relying on the structure of the market. It assumes that markets with only a few large banks could foster collusive behaviour; banks may set the price higher than those in markets with many players. For this reason, the level of competition depends on the number and the size of existing banks. This approach, therefore, uses concentration ratios to infer competition and more concentrated markets would be considered as less competitive.

This traditional structural approach has two conflicting strands. One strand proposes that market concentration (structure) leads to collusive activities (conduct) among banks and ultimately increases bank profits (performance). This structure-conduct-performance (S-C-P) hypothesis suggests that banks earn high profits thanks to collusion regardless of the efficiency of banking firms. Therefore, higher concentration leads to lower levels of competition as mentioned above. Another strand of the structural literature, the efficiency hypothesis, stresses the importance of bank efficiency. Specifically, the better performance of one bank compared to another is the result of a higher level of efficiency. A higher degree of efficiency could help banks to enlarge their size and gain more market share. Efficient banks with more market share, then, would drive other banks out of the market and strengthen their market power. Thus, from this theoretical point of

view, the causality runs from competition to concentration through the efficiency: higher competition leads to higher levels of concentration. However, the first-order effects of concentration on competition appear to be more popular and, hence, in empirical studies (for example, Bikker & Haaf, 2002; Casu & Girardone, 2006; Claessens & Laeven, 2004; Yeyati & Micco, 2007), competition usually enters as the dependent rather than independent variable.

The non-structural approach, on the other hand, relies on bank behaviour, instead of the structure of the market, to infer competitive condition. Specifically, competition indexes are estimated based on input price factors and bank revenue equations. In this case, the contestability of markets could also be tested through the magnification of the H-statistic. Therefore, in contrast to the structural approach, researchers using non-structural approaches, to a certain extent, assume that potential players also impact on the conduct, and subsequently influence competitive condition, of existing players.

One of the techniques to measure competition, which adopts a non-structural approach, is suggested by Panzar and Rosse (1987). Panzar and Rosse (1987) developed the H-statistic to infer the level of competition based on the observation of a bank's behaviour. The H-statistic is calculated from a reduced-form revenue equation in which factor price inputs and bank outputs are related. Since this approach observes bank's reaction to changes in input prices, the H-statistic equals the sum of the coefficients of input price factors in respect of bank revenue.

Shaffer (1982) was the first to employ the H-statistic to measure competition in the banking industry. For a sample of banks in New York, Shaffer (1982) found that the H-statistic value ranged from 0.32 to 0.36 indicating that banks operate under monopolistic competition. Nathan and Neave (1989) apply the same model to a set of data for banks, trust companies and mortgage companies in Canada. Except for the year 1982, these researchers also found the H value lies between zero and a unity showing that banks earned revenue under monopolistic competition. Molyneux, Lloyd-Williams, and Thornton (1994) were the first authors to use the H-statistic to examine competition in European banking from 1986 to 1989. Using similar models to those of Shaffer (1982) and Nathan and Neave (1989), Molyneux et al. (1994) reported the condition of monopolistic competition for banking markets in four countries in their sample: Germany, UK, France and Spain. Only one country's banking market, Italy, exhibited monopolistic conditions. In the Japanese banking context, Molyneux, Thornton, and Lloyd-Williams (1996) estimated the contestable characteristics of Japanese banks in the years 1986 and 1988. In

one year, 1986, these authors cannot reject the assumption that banks earned revenue as if operating under monopoly and in another year, 1988, as if operating under monopolistic competition.

In recent years, measuring competition using the H-statistic has become increasingly popular in the empirical banking literature. Most of these studies also find that banking markets are typically characterised by monopolistic competition (for example, Bikker & Haaf, 2002; Casu & Girardone, 2006; Claessens & Laeven, 2004; Coccorese, 2004; De Bandt & Davis, 2000; Gelos & Roldos, 2004; Hondroyiannis, Lolos, & Papapetrou, 1999; Matthews, Murinde, & Zhao, 2007; Molyneux et al., 1996; Staikouras & Koutsomanoli-Fillipaki, 2006; Yeyati & Micco, 2007; Yildirim & Philippatos, 2007). Only one study (Al-Muharrami, Matthews, & Khabari, 2006) found evidence of banks earning revenues as if under perfectly competitive conditions (in the three Arab GCC countries of Kuwait, Saudi Arabia and UAE) (Table 5.2).

Some studies compare the degree of competition classified by bank size. For a sample of three European nations, France, Germany and Italy, De Bandt and Davis (2000) found that large banks face fiercer competition than small banks (with a USD3 billion asset size cut-off point). Also, Staikouras and Koutsomanoli-Fillipaki (2006) applied the H-statistic to a large number of European banking systems examining competition in 15 old and 10 new European member states. These authors found that large banks (those with assets greater than EUR5 billion) only encounter stiffer competition in earning interest revenues. When total revenues are observed, the opposite occurs: small banks face a higher pressure of competition. There are also studies that compare competition at the local, national and global market level. Bikker and Haaf (2002) suggest that the degree of competition is strongest in international and weakest in local markets. It is noted that Bikker and Haaf (2002) also relied on bank size to classify banks as local, national and global. Therefore, the results are to some extent consistent with the findings by De Bandt and Davis (2000). In another stream, some researchers try to explain the determinants of competition (for example, Casu & Girardone, 2006; Claessens & Laeven, 2004). The empirical results show that concentration does not necessarily determine the level of competition. Others, in contrast, use the H-statistic to explain bank performance (Buchs and Mathisen, 2005) or bank risk-taking (Yeyati & Micco, 2007). Even though there is certain evidence that competition improves cost efficiency, the relationship between competition and bank risk-taking is still subject to debate as previously reviewed.

5.2.4.2. *Contestable markets.*

Theoretical predictions as well as several empirical studies, to a large extent, have viewed the relationship between concentration and competition with the ignorance of bank regulation. If regulation is taken into account, it should impact significantly on bank behaviour. For instance, with restrictions on entry and activities, a market with many banks could also create collusive conduct.

Baumol, Panzar and Willig (1982) suggest a theory of contestable markets. According to Baumol et al. (1982), a perfectly contestable market is one where banks can enter and withdraw from the market freely and without sunk costs. Technically, a contestable market has no entry barriers both in terms of legal and economic respects. So, if one market is characterised as contestable, even though it is highly concentrated, this could be competitive because, without entry barriers, incumbent banks face potential competition from future players in the market. The threat of entry by potential banks will reduce the incentives for existing banks to set higher prices. In sum, therefore, regulation can matter, in addition to the concentration level, to the degree of market competition.

5.2.4.3. *Competition and concentration: recent evidence.*

The concentration ratio has long been used as a standard measure of banking competition. If concentration impairs competition as the S-C-P theory suggests, one should find that concentration (proxied by, for instance, the sum of the assets of three biggest banks over total banking assets or the Herfindahl Hirschman index) is negatively correlated to competition (proxied by, for example, the H-statistic or entry barriers). There have been attempts to test whether the inference of competition from the concentration index is appropriate.

Bikker and Haaf (2002) examined how market structure affects competitive conditions in 23 countries. N-bank concentration ratios and Herfindahl-Hirschman index are alternatively used as proxies for market structure while the H-statistic is computed from reduced-form revenue equations to measure competitive pressure. The empirical results indicate that higher concentration leads to lower levels of competition, supporting the traditional wisdom. However, recent empirical studies provide evidence against the conventional belief about the negative relationship between concentration and competition.

Demirgüc-Kunt, Laeven and Levine (2004) examined the effects of banking system concentration on the cost of financial intermediation as measured by net interest

margins as a share of total interest-bearing assets. These authors used a sample of commercial bank-level data from 72 countries and employed a GLS estimator with random-effects, controlling for cross-bank and cross-country differences. They found that, without controlling for the country regulatory restrictions on banking, three-bank concentration always shows a positive correlation with bank net interest margins and the correlation is statistically significant at the 5% level. On the perspective of the S-C-P paradigm, banks in concentrated systems tend to pay lower rates on deposits and charge higher loan rates, subsequently, they gain wider interest margins. Therefore, net interest margins, arguably, may reflect the competitive nature of banking operations: wider margins means less competitive pressure. So, this result is consistent with the conventional predictions of the adverse relationship between concentration and competition. However, when regulatory restrictions and macroeconomic variables are added into the regression, the positive correlation between concentration and net interest margins collapses. This evidence casts some doubts on the usage of concentration to infer about the competitive environment in banking industry.

In another study, Beck, Demirgüc-Kunt and Levine (2006) investigated whether there is a trade-off between banking competition and financial stability. They measured competition, first, by using concentration ratios and later, by entry and activity restrictions. Systemic risk is indicated by dating the occurrence of crises in each country. The study exploits data from 69 countries over the period 1980 to 1997 and applies a logit probability model. Concentration is found to be negatively and significantly correlated to the probability of banking fragility after controlling for country economic impacts. In the later stage, entry and activity restrictions as a proxy for competition enter as explanatory variable. The results demonstrate that the reduction of restrictions on entry and activity also negatively influence systemic vulnerabilities. In short, more concentration and more competition (measured by a lowering of entry and activity restrictions) both lead to lower systemic risk.

Using a relatively more straightforward indicator of competition, Claessens and Laeven (2004) applied the H-statistic to the banking markets of 50 countries in an attempt to investigate the drivers of competition. Concentration and regulatory restrictions (on banking entry and activity) are then included among the explanatory factors. These two authors find no evidence which supports the negative connection between the five-bank concentration ratio and competitiveness. On the contrary, there is some evidence that more concentrated banking sectors are more competitive. In addition, Claessens and Laeven

(2004) found that countries with fewer restrictions on banking are more competitive. The result may imply that market structure has very limited negative effects on competition or even impacts concentration in adverse dimensions to conventional beliefs. The contestable nature of the market, rather than the structure, matters most in terms of competitive conditions. Similarly, Casu and Girardone (2006) also examined the determinants of banking competition in 15 European countries. Like Bikker and Haaf (2002), Casu and Girardone (2006) used three- and five-bank concentration ratios and the Herfindahl-Hirschman index to measure concentration and the H-statistic to measure competition. Nevertheless, none of their estimates show a statistically significant link between concentration and competition. This result is different from the findings of Bikker and Haaf (2002). Furthermore, for a sample of eight Latin American countries, Yeyati and Micco (2007) employed similar indicators for concentration and competition to those used in Casu and Girardone (2006). These researchers found that concentration does not restrict competition and both competition and the three-bank concentration ratio are negatively related to the (inverse) Z-index although the former is statistically significant while the latter is not.

In summary, firstly, theory predicts conflicting relationship between competition and risk-taking behaviour. Focusing on the deposit side, banks are assumed to take-on more risk when competition intensifies because more competitive pressures reduce banks' profits. Turning into loan side, competition is argued to lessen the risk of bank failure. This is interpreted as competition in lending market helps to lower borrowing rates, which reduces moral hazard because bank borrowers have fewer incentives to get involved in risky projects. Therefore, the probability of failure on banks declines. Empirical evidence, similarly, provides ambiguous findings. Some studies suggest that competition increases bank risk (Dick, 2006; Keeley, 1990; Rhoades & Rutz, 1982) whilst others show that competition decreases bank risk-taking behaviour (Boyd et al., 2006; De Nicolo, 2000; De Nicolo et al., 2004; Jayaratne & Strahan, 1998; Yeyati & Micco, 2007).

Secondly, recent empirical evidence has indicated that it could be inappropriate to adopt structural approach to measure competition because the adverse effects of concentration on competition do not always hold as it is traditionally expected (Beck et al., 2006; Casu & Girardone, 2006; Claessens & Laeven, 2004; Demirgüc-Kunt et al., 2004; Yeyati & Micco, 2007).

In the empirical work that follows, we attempt to contribute to the current literature by investigating the relationship between competition and risk in South East Asian

banking. In order to avoid the likely miss-measurement of competition by the concentration ratio, the H-statistic is used as a proxy for competition.

5.3. Methodology and Data

5.3.1. *Methodology*

5.3.1.1. *Panzar and Rosse (1987) H-statistic.*

As reviewed earlier, using concentration to measure competition could provide inappropriate indicators of competition. The present paper, therefore, follows a non-structural approach, employing the H-statistic developed by Panzar and Rosse (1987) to analyze competition in South East Asian banking. This involves the inference about market competition based on observation of firms' behaviour. The H-statistic has been increasingly applied in recent empirical banking literature (Bikker & Haaf, 2002; Casu & Girardone, 2006; Claessens & Laeven, 2004; De Bandt & Davis, 2000; Gelos & Roldos, 2004; Molyneux et al., 1994; Molyneux et al., 1996; Nathan & Neave, 1989; Shaffer, 1982; Yeyati & Micco, 2007).

Specifically, Panzar and Rosse (1987) introduce a test based on the impacts of input price factors on bank revenue. The H-statistic is computed from a reduced form revenue equation and equals the sum of elasticities of bank revenue with respect to input prices. In this paper, the H-statistic is estimated using the following revenue equation for a pooled country sample. The equation is presented below.

$$\ln\left(r^{*}_{i,j,t}\right)=\lambda+\delta_1.\ln\left(p_{1,i,j,t}\right)+\delta_2.\ln\left(p^{*}_{2,i,j,t}\right)+\delta_3.\ln\left(p_{3,i,j,t}\right)+\delta_4.\ln\left(b_{1,i,j,t}\right)+\delta_5.\ln\left(b_{2,i,j,t}\right)+\delta_6.\ln\left(b_{3,i,j,t}\right)+\delta_7.d+\varepsilon_{i,j,t} \quad (5.1)$$

Where:

- The ln and subscripts i, j and t denote natural logarithms, bank i, country j and year t, respectively
- $r^{*}_{i,j,t}$ is the ratio of gross interest revenue over total assets (as a proxy for output price of loans)
- $p_{1,i,j,t}$ is the ratio of interest expenses over total deposits (as a proxy for input price of deposits)
- $p^{*}_{2,i,j,t}$ is the ratio of personnel expenses over total assets (as a proxy for input price of staff)
- $p_{3,i,j,t}$ is the ratio of other operating expenses over total assets (as a proxy for input price of bank physical capital)

- $b_{1,i,j,t}$ is the ratio of equity over total assets. Because there are banks with negative equity, the $b^{1}_{1,i,j,t} = (b_{1,i,j,t} + 1)$ variable is used
- $b_{2,i,j,t}$ is the ratio of net loans over total assets
- $b_{3,i,j,t}$ is total assets
- d is the time dummies for the years 1998 to 2004, we drop the time dummy for the year 1998
- λ, δ_1, δ_2, δ_3, δ_4, δ_5, δ_6, δ_7, $\varepsilon_{i,j,t}$ are constant, coefficients and error term

The former three independent variables reflect the price factors of bank inputs while the latter three are control variables. These are included to capture bank capital level effects; risk effects (with assumption that banks with higher loans over assets is more risky) and bank size effects respectively, following Claessens and Laeven (2004) and Goddard and Wilson (2006).

The H-statistic equals $(\delta_1 + \delta_2 + \delta_3)$ in (5.1) and is interpreted as follows. H is less than or equal to zero if a banking firm is operating in monopolistic market. This is due to the fact that in monopolistic markets, when input prices increase, marginal costs should increase. Firms, subsequently, produce less, which leads to the reduction in equilibrium output. The decline in output leads to a reduction in a firm's revenue (Molyneux et al., 1996, p. 35). H is positive but less than a unity if the market is characterised by monopolistic competition. In this context, when input prices increase, a firm's revenue also increases, but by a smaller proportion than costs (Goddard & Wilson, 2006, p. 5). H equals to a unity if banking firms are operating in a perfectly competitive market or in a monopolistic market which is perfectly contestable. In this case, when input prices change, marginal and average costs also change and the demand adjusts in the long run so selling price and revenue increase by the same proportion as costs. In other words, input price increases raise both marginal and average costs without reducing the optimal output of individual firms (Molyneux et al., 1994, p. 448).

The interpretation of the H-statistic when it equals a unity holds if one assumes one of three following conditions. First, banks are considered as single-output firms. This is untrue for banking firms, particularly large banks. Second, the production function is homothetic, which there is little evidence to support. Third, input prices change by the same proportions across observations in the sample (Molyneux et al., 1994, p. 448).

The advantages of the H-statistic are that it facilitates the use of bank-level data and differences in bank production functions. Also, it enables one to examine the degree

of competition for banks belonging to different ownership types, sizes and specializations (Claessens & Laeven, 2004). However, the correct calculation of the H-statistic basically relies on one critical assumption[2]. That is the markets are in long-run equilibrium when the data are observed. The equilibrium condition can be tested by computing equation (5.1) using ROA or ROE as the dependent variable[3]. The equation as shown in equation (5.2):

$$\ln(ROA_{i,j,t}) = \lambda + \delta_1.\ln(p_{1,i,j,t}) + \delta_2.\ln(p^*_{2,i,j,t}) + \delta_3.\ln(p_{3,i,j,t}) + \delta_4.\ln(b_{1,i,j,t}) + \delta_5.\ln(b_{2,i,j,t}) + \delta_6.\ln(b_{3,i,j,t}) + \delta_7.d + \varepsilon_{i,j,t} \quad (5.2)$$

where ROA is before-tax return on assets (before-tax profit over total assets). Because ROA could be a negative number which is less than a unity, the dependent variable to be computed is $ROA^1_{i,j,t} = \ln(ROA_{i,j,t} + 1)$ with $ROA_{i,j,t}$ is the original before-tax return on assets. Other variables are similarly defined as those in (5.1).

E-statistic, which equals $(\delta_1 + \delta_2 + \delta_3)$ in (5.2), is associated with the state of equilibrium. If the long-run equilibrium is satisfied, return should not be statistically correlated with input prices. That means the sum of elasticities of profits with input prices equals to zero or E-statistic = $(\delta_1 + \delta_2 + \delta_3) = 0$ could not be rejected. When the market is in disequilibrium, input prices increase led to a decline in returns and vice versa (Molyneux et al., 1996, p. 38), therefore E-statistic equals zero should be rejected by using F-test.

5.3.1.2. *Alternative H-statistic specifications and modelling.*

There are four different H-statistics depending on reduced-revenue form specifications. H^1 is produced when the dependent variable, $r^*_{i,j,t}$ in (5.1), is the ratio of gross interest revenue over total assets and the independent variable $p^*_{2,i,j,t}$ is the ratio of personnel expenses over total assets. H^2 is generated when the dependent variable $r^*_{i,j,t}$ remains unchanged but $p^*_{2,i,j,t}$ is the ratio of personnel expenses over total loans plus deposits. H^3 is the case when $r^*_{i,j,t}$ is the ratio of total revenue over total assets while the right-hand side variables are similar to H^1. H^4 is referred to when $r^*_{i,j,t}$ is the ratio of total revenue with right-hand side variables are the same as H^2.

[2] In addition, the Panzar-Rosse H-statistic approach fails to capture the strategic interaction and oligopoly. When using H-statistic, we also assume that banks are price takers for financial capital, labour and physical assets. However, it might be that there is a possible simultaneity between input prices and revenue. This could arise if bank exercise monopsony power in their factor markets.

[3] This is justified on the underpinnings that in long-run equilibrium, returns should not be statistically correlated with prices of inputs (see, for example, Molyneux et al., 1996; Nathan & Neave, 1989; Shaffer, 1982).

The H-statistic is computed using three different regression techniques. First, pooled cross-sectional time-series OLS with time dummies is applied to each country sample. Second, the fixed-effects GLS is employed as commonly applied in the banking literature, in this case $\lambda = \lambda_i$ in equation (5.1). In the OLS and fixed-effects GLS estimation, the H-statistic equals $(\delta_1 + \delta_2 + \delta_3)$ in (5.1). Third, as a further step to check robustness of our estimates, we compute the H-statistic using a GMM dynamic panel estimator as suggested by Goddard and Wilson (2006). The GMM H-statistic equation is as follows:

$$\Delta \ln\left(r^{*}_{i,j,t}\right) = \lambda + \delta_0.\Delta \ln\left(r^{*}_{i,j,t-1}\right) + \delta_1.\Delta \ln\left(p_{1,i,j,t}\right) + \delta_2.\Delta \ln\left(p^{*}_{2,i,j,t}\right) + \delta_3.\Delta \ln\left(p_{3,i,j,t}\right) + \delta_4.\Delta \ln\left(b_{1,i,j,t}\right) + \delta_5.\Delta \ln\left(b_{2,i,j,t}\right) + \delta_6.\Delta \ln\left(b_{3,i,j,t}\right) + \Delta\varepsilon_{i,j,t} \qquad (5.3)$$

For dynamic GMM estimation, the individual bank effects are eliminated by applying a first-difference transformation of all variables denoted by Δ. In the case of dynamic estimation, H-statistic equals $(\delta_1 + \delta_2 + \delta_3)/(1 - \delta_0)$ in (5.3).

Table 5.1. *Summary of H-statistic specifications and modelling*

	Reduced revenue form specification		**Regression models**		
H-statistic	Dependent	Independent	Pooled OLS	Fixed-effects GLS	Dynamic GMM
H^1 (Spec 1)	Interest revenue over total assets	personnel expenses over total assets	Hb^1	Hf^1	Hd^1
H^2 (Spec 2)	Interest revenue over total assets	personnel expenses over total loans plus deposits	Hb^2	Hf^2	Hd^2
H^3 (Spec 3)	Total revenue over total assets	personnel expenses over total assets	Hb^3	Hf^3	Hd^3
H^4 (Spec 4)	Total revenue over total assets	personnel expenses over total loans plus deposits	Hb^4	Hf^4	Hd^4

5.3.1.3. *Methodological issues.*

One of the limitations of the H-statistic, as mentioned, lies in the assumption that the market should be observed in long-run equilibrium. In a comprehensively review of methods for assessing competition and suggesting improvements for newer (structural) methods, Shaffer (2004, p. 308) applied the H-statistic to a sample of four banks in the US

with different versions of reduced form revenue equations. In the equilibrium test, the researcher found that long-run equilibrium conditions were rejected in most cases, 10 out of 16 cases. The disequilibrium in the market was attributed to the dynamic changes in the banking environment during the sampling period. However, the implication of the disequilibrium, as stated by Shaffer (2004), is that the actual behaviour of one or more of those banks in the sample may be close to competitive or contestable behaviour even though, statistically, a unity H value is rejected. As a result, the first methodological issue is that observing a bank's conduct in disequilibrium may cause some distortion to the H-statistic when a perfectly competitive environment is statistically rejected. According to Shaffer (2004), nevertheless, the rejection of a negative H-statistic does not invalidate the result if a bank's behaviour is not observed in long-run equilibrium.

The second methodological issue was raised by Molyneux et al. (1996, p. 37). Using the H-statistic, one should assume that banks have the same cost functions. This assumption may result in positively biased H values as increased input prices may be associated with higher quality of services which results in higher revenues. In other words, revenue rises by a higher proportion than cost, as a consequence of higher service quality. However, if one rejects the hypothesis of competitive or contestable markets, the bias could be acceptable.

Also originating from the critical assumption underlying the Panzar and Rosse (1987) H-statistic, that the data should be observed in long-run equilibrium at each point in time, but Goddard and Wilson (2006) raise concerns in another aspect. In reality, the speed of adjustment towards equilibrium may be partial rather than instantaneous, driving the market condition out of long-run equilibrium "either occasionally, or frequently, or always". Goddard and Wilson (2006) argues that if the adjustment towards equilibrium, replying to changes in input prices, is partial, the static estimation of H-statistic, as normally applied in the empirical studies, could be subject to misspecification.

Goddard and Wilson (2006) suggest that, in order to correct this problem, a dynamic version of the reduced revenue equation should be used to include the lagged dependent variable. This inclusion captures the speed of adjustment towards equilibrium. Therefore, when using dynamic models to estimate the H-statistic, researchers could examine directly the speed of adjustment through the coefficient of the lagged dependent variable. The assumption of long-run equilibrium is no longer necessary because the dynamic estimation enables researchers to incorporate instantaneous adjustments as special circumstances.

Goddard and Wilson (2006) conduct a Monte-Carlo simulation exercise allowing for either partial or instantaneous adjustments and providing factors that determine the performance of H-statistic produced by static and dynamic revenue equations. The simulation shows that in the case where partial adjustment exists, estimation of the H-statistic using a fixed-effects model produces H value which is significantly biased towards zero. In contrast, the application of Arellano and Bond's (1991) dynamic panel technique to the revenue equation generates H values that appear virtually unbiased.

Goddard and Wilson (2006) empirically compared the H-statistics for a sample of banking systems in 25 countries over the years 1998 and 2004. Because the dynamic panel approach performs poorly with small samples, the selected countries must have at least 100 bank-year observations available for the dynamic estimator to provide a strong outcome. The outliers are also eliminated according to the first and ninetieth percentiles of the dependent variable's distribution. The results reveal that when using the fixed-effects estimator, the H-statistics tend to be smaller and closer to zero than those derived from the dynamic panel estimator. The mean difference between dynamic panel and fixed-effects estimates of the H-statistic are 0.146 for the group of advanced economies and 0.030 for the group of developing and transition economies. The evidence supports the conclusions from the simulation exercise: dynamic panel estimation produces more reliable and larger H-statistics than fixed-effects estimation.

Applying the test for long-run equilibrium, where profit replaces interest or total revenue on the left-hand side of the revenue equation, the estimation indicates that up to 16 out of 25 sampling countries exhibit short-run persistence of profits. That means the adjustment towards long-run equilibrium is not instantaneous for a significant number of countries and this result raises some sceptical thoughts on the critical assumption underlying the H-statistic.

The results from Goddard and Wilson (2006) are very supportive to their own argument. Looking back the earlier studies employed H-statistic; many of them show that the relevant markets are in disequilibrium when the data are observed (Table 5.2).

As a result of the issues raised by Goddard and Wilson (2006) in this paper the H-statistic is also estimated using Arellano and Bond's (1991) generalized method of moments (GMM) dynamic panel technique in addition to fixed-effects estimation.

Table 5.2. *Summary of H-statistic estimates and equilibrium test outcomes*

Authors	Sample period	Country	Results	Equilibrium
Shaffer (1982)	1979	US (New York)	Monopolistic competition	Yes
Nathan and Neave (1989)	1982-1984	Canada	Monopolistic competition	Not estimated
Molyneux et al. (1994)	1986-1989	France, Germany, Italy, Spain and UK	Monopolistic competition, except Italy (monopoly)	No (France: 1987, Italy: 1986, 1987, Spain: 1987, 1989 and UK: 1987, 1989)
Molyneux et al. (1996)	1986 and 1988	Japan	Monopolistic competition in 1988; monopoly in 1986	Yes
Hondroyiannis et al. (1999)	1993-1995	Greek	Monopolistic competition	No (1993, 1994)
De Bandt and Davis (2000)	1992-1996	France, Germany, Italy, and US	Monopolistic competition Monopoly for small banks in France and Germany	No (for large banks in Italy)
Bikker and Haaf (2002)	1988-1998 (varying)	23 industrialized nations	Monopolistic competition	Yes, not reported (p. 2200)
Hempell (2002)	1993-1998	Germany	Monopolistic competition	Not estimated
Claessens and Laeven (2004)	1994-2001	50 countries	Monopolistic competition, competition in more advanced nations tend to be less intense	Yes, most countries (not reported)
Coccorese (2004)	1997-1999	Italy	Monopolistic competition	Yes
Gelos and Roldos (2004)	1994-1999 (varying)	8 emerging countries	Monopolistic competition	No (3 countries)
Shaffer (2004)	March 1984-June 1994	US (4 banks, quarterly)	Monopolistic competition	No (10 out of 16 cases)
Buchs and Mathisen (2005)	1998-2003	Ghana	Monopolistic competition	Yes
Al-Muharrami et al. (2006)	1993-2002	6 Arab GCC countries	Monopolistic competition	No (for country-pooled estimation)
Casu and Girardone (2006)	1997-2003	15 European countries	Monopolistic competition except 2 countries	Yes, most countries, (p.461)
Goddard and Wilson (2006)	1998-2004	25 countries	Monopolistic competition	No (16 countries)
Laeven (2006)	1994-2004 (varying)	7 East Asian countries	Monopolistic competition	Not estimated
Staikouras and Koutsomanoli-Fillipaki (2006)	1998-2002	25 European countries	Monopolistic competition	No (for small banks)
Matthews et al. (2007)	1980-2004	UK	Monopolistic competition	No (full sample period)
Yeyati and Micco (2007)	1993-2002 (varying)	8 Latin American countries	Monopolistic competition	Not estimated
Yildirim and Philippatos (2007)	1993-2000	13 Latin American countries	Monopolistic competition	No (4 countries)

Note: Compiled by the author

5.3.1.4. *Risk indicators.*

As the independent variable of our study, risk is proxied by four different accounting indicators. One of these is the loan-loss reserves of banks. The general model implied here is that when loans-loss reserves increase, banks are in a more risky position and vice versa. However, some may argue that loan-loss reserves only reflect expected losses. Therefore, when banks reserve more for loan losses, they become less risky because they have substantial resources to cover losses if they are incurred. Because loan-loss reserves are stock items, banks managers may determine the timing of these stocks at their discretion to reduce regulatory costs (Altunbas, Carbo, Gardener, & Molyneux, 2007). For this reason, loan-loss provisions are used as another risk measurement, following, for example, Dick (2006) and Jayaratne and Strahan (1998). Contrary to loan-loss reserves, loan-loss provisions are flowing items, which reflects the actual sum of money banks have already spent to cover loan losses. Subsequently, loan-loss provisions are more appropriate to measure bank risk.

Nevertheless, both of the above mentioned accounting items are closely related to bank credit risk on a loan-by-loan basis, while risk is today more diversified. So, the volatility of (net) ROA is used as an additional risk indicator (following Demirgüc-Kunt et al., 2004) which is assumed to reflect market risk. Finally, the Z-index, originally developed by Hannan and Hanweck (1988), is used. The Z-index is defined as the ratio of the sum of ROA and equity-to-asset ratio over the volatility of ROA. The Z-index reflects the thickness of the book value cushion to absorb losses, thus, in contrast to other risk indicators: higher value of Z means lower risk. Z-index is very attractive to measuring risk because it captures three important components. First, it includes ROA, which is widely used as an especially informative measure of bank performance. Second, it consists of ROA volatility, which is known as a measure of risk in bank financial management. Third, it incorporates bank equity-to-asset ratio (the reciprocal of the equity multiplies). This has been increasingly used as a standard 'safety and soundness' criteria for the banking industry (Nash & Sinkey, 1997, p. 96). Z-index has been used to measure risk by, for example, Boyd et al. (2006), De Nicolo (2000), De Nicolo et al. (2004), Nash and Sinkey (1997) and Yeyati and Micco (2007).

5.3.1.5. *Second-stage regression model.*

In order to investigate the impact of competition on bank risk, we relate the four above-mentioned risk indicators to twelve H-statistics using robust OLS estimates with

heteroskedasticity-consistent standard errors. For our robustness tests, random-effects GLS estimates are also applied because it allows for time invariant variables.

We specify an equation that includes variables derived from various studies on risk, competition and capital adequacy regulation (for example, Altunbas et al., 2007; Beck et al., 2006; Bikker & Haaf, 2002; Casu & Girardone, 2006; Claessens & Leaven, 2004; De Bandt & Davis, 2000; De Nicolo, 2000; Demirgüc-Kunt et al., 2004; Gelos & Roldos, 2004; Gonzalez, 2005; Jagtiani, Saunders, & Udell, 1995; Wagner, 2006). The equation is as follows:

$$Risk_{i,j,t} = \alpha + \beta_1.Competition_j + \beta_2.Size_{i,j,t} + \beta_3.Liquidity_{i,j,t} + \beta_4.Off.balance_{i,j,t} + \beta_5.Lending_{i,j,t} + \beta_6.Foreign.share_{i,j,t} + \beta_7.Interest.rate_{j,t} + \beta_8.Concentration_{j,t} + \beta_9.Regulation_j + \beta_{10}.Dummy + \varepsilon_{i,j,t} \quad (5.4)$$

Where:

- The subscripts i, j and t denote bank i in country j at time t
- $Risk_{i,j,t}$ is the risk indicators, alternatively, the ratio of loan-loss reserves over total loans; the ratio of loan-loss provisions over total loans; the volatility of bank after-tax return on assets and the natural logarithm of the Z-index. The Z-index is defined as the ratio of the sum of return on assets and equity-to-asset ratio over the volatility of return on assets. Because sometimes Z-index could take big negative value, the value to be taken logarithm is (Z-index +150)
- $Competition_j$ is measured by the H-statistic computed from equation (5.1) and (5.3)
- $Size_{i,j,t}$ is the natural logarithm of total assets
- $Liquidity_{i,j,t}$ is the ratio of liquid assets over total deposits
- $Off.balance_{i,j,t}$ is the ratio of off-balance sheet items over total assets
- $Lending_{i,j,t}$ is the ratio of net loans over total assets
- $Foreign.share_{i,j,t}$ is the percentage of share owned by foreign partner(s)
- $Interest.rate_{j,t}$ is real interest lending rate
- $Concentration_{j,t}$ is the ratio of the three largest bank assets over total banking sector assets
- $Regulation_j$ is a score = (Bank activity restrictions + Banking entry requirements – Diversification). Higher scores reflect a more restricted banking environment. Activity restrictions reflects the ability of banks to be involved in securities, insurance and real estate activities; banking entry requirements reflect the types of legal submissions required to obtain a banking license; and diversification reflects whether there are explicit guidelines for asset diversification and whether banks are

allowed to make loans abroad or not. For further details of the construction of these indexes, please see the Appendix A3.1.

- Dummy is the year dummies from 1998 through 2004, we drop 1998 dummy
- α is constant, β_1 to β_{10} are coefficients and $\varepsilon_{i,j,t}$ is the error term

Besides competition as the main independent variable, in this second-stage regression, several explanatory variables are included to capture differences across banks and countries. The first variable added is total bank assets which take the natural logarithm. The growth in bank assets is believed to intensify competition because evidence shows that bigger banks face more competitive pressure (De Bandt & Davis, 2000) and take higher levels of risk (De Nicolo, 2000) than small banks. The second variable is bank liquid assets which are measured by liquid assets divided by total deposits. One would expect that highly liquid banks could encounter less risk because they have excess reserves to cover losses in case of crisis; however, there is a study (Wagner, 2006) that provides adverse evidence: highly liquid banks tend to be more risky. The next two bank-level explanatory variables are off-balance sheet items and loans. The former is expected to reduce bank risk[4]. The latter which is measured by net loans divided by total assets, in contrast, is predicted to increase risk (Altunbas et al., 2007). The variable for foreign bank share is also included since the increasing presence of foreign banks may also increase competitive pressures in domestic markets as shown by Gelos and Roldos (2004) and, therefore, could influence on bank risk-taking behaviour.

One of the country-level control variables relates to the national regulation of banking activity (following Claessens & Leaven, 2004; Demirgüc-Kunt et al., 2004). The higher regulation index is associated with more restricted banking systems, which is shown to induce incentives for banks to take-on risk (Barth, Caprio, & Levine, 2004; Gonzalez, 2005). This variable also captures the effects of regulatory barriers on banking market competition and reflects the contestability of the markets. Another variable is the concentration ratio. This ratio is added to investigate whether market structure or contestable characteristics matter to competition (following Bikker & Haaf, 2002; Casu & Girardone, 2006) and how these two variables affect risk (following Beck et al., 2006). If market structure negatively determines competition, the concentration-risk relationship and competition-risk relationship is expected to be opposite. Real interest rate is the final

[4] Banks are expected to increase off-balance sheet items as to increase fee-based income and avoid capital requirements regulated on on-balance sheets operations (Lewis, 1991, p. 155)

variable reflecting a country's overall macroeconomic condition. The real interest rate is closely and negatively related to a country's inflation. Countries with higher rates of inflation are more likely to be confronted with economic shocks. Therefore, banks operating in countries with higher real rates of interest tend to face lower risk (following Beck et al., 2006).

5.3.2. *Data*

The data used in this study comprises financial information for commercial banks[5] from four South East Asian countries: Indonesia, Malaysia, Philippines and Vietnam. The period of study is from 1998 to 2004. Bank-level data for Indonesia, Malaysia and Philippines are obtained from the Bankscope database of IBCA. Data for commercial banks in Vietnam are hand-collected from individual banks and the State Bank of Vietnam. Bank ownership structure is classified based on information from various sources, mainly from Bankscope, Thomson Financial, individual bank websites, central bank websites, academic papers[6] and the ASEAN Bankers Association. Country-level data are obtained from Barth, Caprio and Levine (2006), Beck, Demirgüc-Kunt and Levine (2000) and the World Bank, World Development Indicators 2006.

5.4. Results and Discussion

In this section, we first report the H-statistics which are computed by three different estimators under four specifications. The pooled OLS regression is applied to the data first; then, the fixed-effects GLS is employed; finally, dynamic panel generalized method of moments model developed by Arellano and Bond (1991) is used. Second, the H-statistics from these estimators are compared and the summary of risk indicators is presented. Third, the results from the second-stage regressions, our main empirical evidence, are displayed and discussed.

5.4.1. *The Pooled OLS and Fixed-Effects GLS Estimates of the H-Statistic*[7]

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[5] Total observations (975) are distributed as follows, Indonesia: 355, Malaysia: 207, Philippines: 192 and Vietnam: 221. For further details, please see Table 3.3 (Chapter 3). Because of missing values, particularly the off-balance sheet items, this does not match with that of the empirical estimates

[6] These include Bekaert and Harvey (2004), Chou (2000), Chua (2003), Coppel and Davies (2003), Detragiache and Gupta (2004), Foceralli (2003), Megginson (2005), Montreevat (2000), Tschoegl (2001), Tschoegl (2003). Other sources are McMillan (2002), Montlake (2003) and World Bank (2000).

[7] This is estimated for a pooled country sample yielding one H-statistic for each country. We have tried to compute yearly H-statistics following Molyneux et al. (1994) and Yeyati and Micco (2007). However, the calculation shows irregular results. The similar experiences are mentioned, for instance, by De Bandt and Davis (2000). In addition, applying dynamic panel to estimate the H-statistic requires sufficient observations for reliable outcomes. In our study, the minimum number of observations for dynamic estimates is 100 for

Estimates of the H-statistic by applying the pooled OLS and fixed-effects GLS to (5.1) are shown in Table 5.3 and Table 5.4, respectively. Overall, most input price factors are positively and significantly (in many cases) correlated with either interest or total revenue in both regression techniques. The coefficients of unit price of deposits are always statistically significant with bank revenue at the 1% level in all countries. The unit price of labour is also statistically and positively related to bank revenue in most cases at the same level of significance. The coefficients of unit price of physical capital are often statistically and positively related to bank revenue, except for the Philippines where the pooled OLS is employed, the sign on the coefficients is negative. These results are consistent with previous studies (Molyneux et al., 1994; Bikker & Haaf, 2002; Casu & Girardone, 2006) which show that the role of unit price of deposits is the most important while that of physical capital is the least important. These coefficients may imply that banks with more funds need more unit cost of labour and physical capital to process these funds into earning assets and therefore, gain higher revenue.

Table 5.3. *Competitive test – Pooled OLS estimates*

Pooled OLS	**Indonesia**		**Malaysia**		**Philippines**		**Vietnam**	
	Spec 1	Spec 3	Spec 1	Spec 3	Spec 1	Spec 3	Spec 1	Spec 3
$\ln(p_1)$	0.2304***	0.1988***	0.5584***	0.4608***	0.2205***	0.2525***	0.3807***	0.2710***
	(0.0278)	(0.0313)	(0.0286)	(0.0315)	(0.0532)	(0.0527)	(0.0453)	(0.0296)
$\ln(p^*_2)$	0.2232***	0.2049***	0.0710**	0.1132***	0.2685***	0.3117***	-0.0371	0.0283
	(0.0312)	(0.0351)	(0.0345)	(0.0381)	(0.0362)	(0.0333)	(0.0607)	(0.0397)
$\ln(p_3)$	0.0115	0.0775***	0.0664**	0.0842***	-0.1282***	-0.1167***	-0.0574	0.1347***
	(0.0257)	(0.0289)	(0.0295)	(0.0325)	(0.0478)	(0.0440)	(0.0601)	(0.0393)
$\ln(b_1)$	0.1414**	0.2321***	0.4710**	0.5506**	-1.0456***	-0.6397***	-0.5556	-0.4048*
	(0.0630)	(0.0710)	(0.2122)	(0.2340)	(0.2324)	(0.2226)	(0.3619)	(0.2368)
$\ln(b_2)$	0.0132	0.0351	0.0645***	-0.0114	0.0959*	0.0922*	0.3371***	0.0867**
	(0.0199)	(0.0224)	(0.0234)	(0.0258)	(0.0537)	(0.0494)	(0.0613)	(0.0401)
$\ln(b_3)$	0.0005	-0.0015	0.0222**	0.0167	-0.0898***	-0.0514***	0.0014	-0.0154
	(0.0093)	(0.0105)	(0.0096)	(0.0106)	(0.0114)	(0.0113)	(0.0257)	(0.0168)
constant	0.0544	0.3930***	-0.4366***	-0.2815	-0.1337	0.0045	-1.8559***	-0.8085***
	(0.1146)	(0.1301)	(0.1634)	(0.1802)	(0.1783)	(0.1641)	(0.3299)	(0.2159)
R^2	0.79	0.75	0.88	0.82	0.77	0.74	0.45	0.54
H-statistic	0.47	0.48	0.70	0.66	0.36	0.45	0.29	0.43
F-test H = 0	172.99***	144.13***	368.08***	270.78***	35.91***	61.46***	18.26***	98.07***
F-test H = 1	228.78***	167.56***	70.36***	73.04***	112.74***	93.67***	113.59***	166.88***

Note: Standard errors are in parentheses. Spec 1 uses the natural logarithm of interest income over total assets as the dependent variable in equation (5.1). Spec 3 uses total income as the dependent variable in equation (5.1). The table presents the results of H-statistic from pooled OLS regressions. The model is estimated with time dummies (but not reported). $\ln(p_1)$ = natural logarithm of interest expenses over deposits; $\ln(p^*_2)$ = natural logarithm of personnel expenses over total assets; $\ln(p_3)$ = natural logarithm of other operating expenses over total assets; $\ln(b_1)$ = natural logarithm of net loans over total assets; $\ln(b_2)$ = natural logarithm of equity capital over total assets; $\ln(b_3)$ = natural logarithm of total assets. For detailed definition of variables, please see the Appendix A5.1. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level

each country (following Goddard & Wilson, 2006). This selection additionally leads us to compute H-statistic at country level and to drop Thailand out of the sample.

Table 5.4. *Competitive test – Fixed-effects GLS estimates*

Fixed-effects	**Indonesia**		**Malaysia**		**Philippines**		**Vietnam**	
GLS	Spec 1	Spec 3	Spec 1	Spec 3	Spec 1	Spec 3	Spec 1	Spec 3
$\ln(p_1)$	0.3145***	0.3112***	0.5154***	0.4459***	0.3602***	0.3420***	0.2446***	0.1822***
	(0.0336)	(0.0350)	(0.0328)	(0.0415)	(0.0595)	(0.0537)	(0.0460)	(0.0417)
$\ln(p^*_2)$	0.2681***	0.2849***	0.0476	0.1877***	0.1976***	0.1527***	0.1133	0.1360**
	(0.0546)	(0.0569)	(0.0468)	(0.0592)	(0.0577)	(0.0539)	(0.0721)	(0.0653)
$\ln(p_3)$	0.0336	0.0421	0.1742***	0.1196**	-0.0358	0.0040	0.2576***	0.2463***
	(0.0265)	(0.0275)	(0.0399)	(0.0504)	(0.0510)	(0.0456)	(0.0622)	(0.0564)
$\ln(b_1)$	0.1352**	0.1331**	-0.5065	-0.2499	0.0752	-0.0075	-0.5709	-0.0315
	(0.0575)	(0.0597)	(0.3123)	(0.3951)	(0.4053)	(0.3633)	(0.4860)	(0.4404)
$\ln(b_2)$	0.0677**	0.0151	0.0319	0.0220	0.0837*	0.0210	0.2394***	0.0537
	(0.0319)	(0.0334)	(0.0358)	(0.0453)	(0.0477)	(0.0420)	(0.0586)	(0.0531)
$\ln(b_3)$	0.0015	-0.0582	0.0204	0.0423	0.2055***	0.1163**	0.0822	0.1159*
	(0.0517)	(0.0539)	(0.0504)	(0.0638)	(0.0561)	(0.0523)	(0.0755)	(0.0684)
constant	0.4967**	1.0345***	-0.0439	0.1239	-1.8391***	-1.2412***	-0.5427	-0.7165
	(0.2424)	(0.2522)	(0.4023)	(0.5089)	(0.4815)	(0.4406)	(0.5715)	(0.5179)
R^2	0.87	0.85	0.93	0.87	0.87	0.84	0.55	0.57
H-statistic	0.62	0.64	0.74	0.75	0.52	0.50	0.62	0.56
F-test H = 0	114.04***	113.47***	291.46***	190.07***	45.72***	47.53***	63.92***	65.49***
F-test H = 1	44.24***	36.46***	37.01***	20.41***	38.34***	48.03***	24.96***	38.98***

Note: Standard errors are in parentheses. Spec 1 uses the natural logarithm of interest income over total assets as the dependent variable in equation (5.1). Spec 3 uses total income as the dependent variable in equation (5.1). The table presents the results of H-statistic from fixed-effects GLS regressions. The model is estimated with time dummies (but not reported). $\ln(p_1)$ = natural logarithm of interest expenses over deposits; $\ln(p^*_2)$ = natural logarithm of personnel expenses over total assets; $\ln(p_3)$ = natural logarithm of other operating expenses over total assets; $\ln(b_1)$ = natural logarithm of net loans over total assets; $\ln(b_2)$ = natural logarithm of equity capital over total assets; $\ln(b_3)$ = natural logarithm of total assets. For detailed definition of variables, please see the Appendix A5.1. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level

Other independent (control) variables, to a large extent, also reveal positive coefficients except the equity to assets ratio which shows mixed results. According to Molyneux et al. (1994), one can expect a negative relationship between bank equity capital and revenue because lower capital levels should generate higher revenue.

Nevertheless, in another respect, lower capital levels can induce incentives for banks to pursue risky lending strategies[8], which may lessen bank revenue. For this reason, bank equity could show a positive connection with revenue. Even though the number of significant cases is limited and the level of significance varies across countries and types of revenue, the positive and significant relationship between equity capital and bank revenue is more common in our study. The Philippines, again, is the only country of which the coefficients are statistically significant and negative (when estimated by the pooled

[8] Estimation of the effects of competition on risk in the second stage, where equity capital is included as an explanatory variable, shows that banks that hold lower levels of equity tend to increase their risk taking. The coefficients are negatively (positively for Z-index) and statistically significant in all estimates at the 1% level. This implies that the positive relationship between bank equity capital and revenue is relatively widespread in our sample.

OLS), complying with the findings of Molyneux et al. (1994) and conflicting with the positive coefficients found in other countries. The outcomes may suggest that in South East Asia during the study period, banks with greater equity capital to assets, loans and larger size earned higher revenues.

The H-statistics estimated are all significantly different from zero and a unity at the 1% level suggesting that banks in the region earn revenues under the environment characterised by monopolistic competition. This result is consistent with earlier empirical findings (Table 5.2). The high R^2 indicates goodness of fit over 70% for OLS and over 80% for GLS. However, for Vietnam the R^2 is much lower, just over 55%. Also, it is noted that the OLS method yields H values which are considerably lower and more dispersed than those generated by GLS. The H-statistic ranks from the highest of 0.70 in Malaysia to the lowest of 0.29 in Vietnam when estimated by the OLS. When the fixed-effects GLS is employed, the highest H value is 0.75, also in Malaysia. The lowest H-statistic shifts from Vietnam to the Philippines, with an H value of 0.50. Within each regression, the difference in H-statistic between interest revenue and total revenue should be pointed out. The mean difference in OLS estimator is about 0.07 while that observed for the GLS estimator is only around 0.03.

If one assumes that higher values of H may reflect fiercer competition, we could directly compare the competitive pressure cross countries. Considering the H-statistic as a continuous measure, banks in Malaysia operate in the most competitive environment according to both estimates. The banking environment in Vietnam is closest to monopolistic condition if estimated using OLS while Philippines would take this place if the H-statistic was estimated using fixed-effects GLS.

5.4.2. *Tests for Long-Run Equilibrium Condition*

As mentioned, the key assumption associated with the estimation of the H-statistic is the observation of bank behaviour in long-run equilibrium. We conduct the equilibrium test by estimating equation (5.2) using OLS and GLS corresponding to those methods used to calculate the H-statistic. Basically, the E-statistic is estimated by replacing the dependent variable of H-statistic equation by a bank profit variable. The E-statistics from the equilibrium tests are displayed in Table 5.5.

For Indonesia and Malaysia the E-statistic takes a small positive value and the hypothesis of the E-statistic equalling zero cannot be rejected using the F-test. That means changes in input price factors do not statistically affect bank profits. This evidence

confirms that the behaviour of banks in Indonesia and Malaysia are observed in long-run equilibrium during the period 1998 to 2004. In contrast, the F-tests for Philippines and Vietnam show that banks in these two countries exhibited disequilibrium. The hypothesis of the E-statistic equalling zero can be rejected at the 1% level of significance. It is noted that coefficients of input price factors are rarely statistically significant with bank profits.

Table 5.5. *Equilibrium test – OLS and fixed-effects GLS estimates*

	Indonesia		**Malaysia**		**Philippines**		**Vietnam**	
	OLS	GLS	OLS	GLS	OLS	GLS	OLS	GLS
$\ln(p_1)$	-0.0019	0.0338	0.0036	0.0090	-0.0186***	-0.0046	-0.0032*	-0.0018
	(0.0221)	(0.0365)	(0.0038)	(0.0057)	(0.0058)	(0.0081)	(0.0018)	(0.0021)
$\ln(p^*_2)$	0.0187	0.0548	-0.0001	0.0064	-0.0039	-0.0046	-0.0065***	-0.0017
	(0.0246)	(0.0592)	(0.0046)	(0.0082)	(0.0039)	(0.0079)	(0.0024)	(0.0033)
$\ln(p_3)$	0.0084	0.0064	0.0001	-0.0116*	-0.0250***	-0.0123*	-0.0014	-0.0035
	(0.0204)	(0.0291)	(0.0039)	(0.0069)	(0.0052)	(0.0069)	(0.0024)	(0.0029)
$\ln(b_1)$	1.0476***	1.0923***	0.1681***	0.1625***	0.0651***	-0.0159	0.0339**	0.0986***
	(0.0561)	(0.0726)	(0.0281)	(0.0545)	(0.0252)	(0.0552)	(0.0141)	(0.0225)
$\ln(b_2)$	-0.0097	-0.0334	-0.0021	0.0117*	0.0115**	0.0010	0.0036	0.0089***
	(0.0157)	(0.0344)	(0.0031)	(0.0062)	(0.0058)	(0.0065)	(0.0024)	(0.0027)
$\ln(b_3)$	0.0109	0.0758	0.0034***	0.0075	-0.0015	-0.0166**	-0.0024**	0.0069**
	(0.0075)	(0.0553)	(0.0013)	(0.0088)	(0.0012)	(0.0076)	(0.0010)	(0.0035)
constant	-0.1867**	-0.3994	-0.0317	-0.0652	-0.1414***	0.0406	-0.0191	-0.0516**
	(0.0903)	(0.2611)	(0.0216)	(0.0702)	(0.0194)	(0.0656)	(0.0129)	(0.0256)
R^2	0.63	0.61	0.24	0.17	0.32	0.18	0.17	0.18
E-statistic	0.0252	0.0949	0.0036	0.0039	-0.0475	-0.0216	-0.0111	-0.007
F-test E = 0	0.82	2.31	0.57	0.26	52.90***	4.22**	17.92***	3.89**

Note: Standard errors are in parentheses. OLS means the results from the estimation of (5.2), using pooled OLS. GLS means the results from the estimation of (5.2) using fixed-effects GLS. Both models are estimated with time dummies (but not reported). $\ln(p_1)$ = natural logarithm of interest expenses over deposits; $\ln(p^*_2)$ = natural logarithm of personnel expenses over total assets; $\ln(p_3)$ = natural logarithm of other operating expenses over total assets; $\ln(b_1)$ = natural logarithm of net loans over total assets; $\ln(b_2)$ = natural logarithm of equity capital over total assets; $\ln(b_3)$ = natural logarithm of total assets. For detailed definition of variables, please see the Appendix A5.1. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level

The disequilibrium conditions found in the Philippines and Vietnam raise certain concerns because the computation of the H-statistic breaks the critical assumption. The result is in-line with several empirical observations (see Table 5.2) supported in arguments by Goddard and Wilson (2006), which is, in practice, that adjustments towards long-run equilibrium are not always immediate. The slow speed of adjustment (sometimes or often) appears to drive the revenue earning behaviour of banks in the aforementioned systems out of long-run equilibrium. In this case, inferring competition conditions from the H-statistic may be biased.

5.4.3. *Static versus Dynamic H-Statistic*

In order to increase the robustness of our second-stage regression analysis where risk indicators are related to competition measured by the H-statistic, we adopt the dynamic panel estimator to compute the H-statistic as suggested by Goddard and Wilson

(2006). The application of the dynamic panel approach allows us to eliminate the requirement for long-run equilibrium because this factor is captured by the lagged dependent coefficient. The second reason for using dynamic estimates of the H-statistic derives from theoretical discussions and empirical evidence in Goddard and Wilson (2006). These two authors found that H-statistic produced by static fixed-effects GLS is biased towards zero for a sample of 25 countries during the period 1998 to 2004. They suggest that the dynamic panel estimation approach should be used to estimate the H-statistic as this approach is believed to generate more reliable H values.

The results of the H-statistics, estimated by using the generalized method of moments dynamic panel approach developed by Arellano and Bond (1991), are reported in Table 5.6. First, regarding the lagged dependent variables, the positive coefficients are statistically significant for Malaysia and Philippines showing a dynamic relationship in bank revenue. As in the results for the H-statistic that used OLS and fixed-effects GLS, the unit price of funds shows a positive and statistical relationship with bank revenues in all cases at the 1% level of significance, stressing the importance of deposits inputs. For the other two unit prices of inputs, the number of significant cases is fewer than that produced by OLS and fixed-effects GLS, despite having the same positive sign. In other respects, the coefficients of variables reflecting bank capital, risk and size vary in terms of sign and level of significance. This provides a relatively different picture from the estimates derived from fixed-effects GLS and, to a lesser extent, OLS. In addition, the number of significant coefficients is fewer.

The Sargan test and auto-covariance test show that there are over-identifying restrictions and one circumstance of second-order autocorrelation in the case where interest revenue is used as the dependent variable. Taken together, models in which total revenue is used as the dependent variable appear more amenable to dynamic panel estimation compared to those that use interest revenue, and perhaps this broader approach is more relevant given the increasingly important role of bank non-interest income.

Table 5.6. *Competitive test – Dynamic GMM estimates*

	Indonesia		**Malaysia**		**Philippines**		**Vietnam**	
	Spec 1	Spec 3	Spec 1	Spec 3	Spec 1	Spec 3	Spec 1	Spec 3
$\Delta \ln(r^*_{t-1})$	0.0323	0.0367	0.0836**	0.1047*	0.1539**	0.1301**	-0.0214	-0.0297
	(0.0270)	(0.0294)	(0.0409)	(0.0570)	(0.0667)	(0.0654)	(0.1176)	(0.0870)
$\Delta \ln(p_1)$	0.5425***	0.5083***	0.4731***	0.4939***	0.6895***	0.3873***	0.3212***	0.2883***
	(0.0337)	(0.0377)	(0.0367)	(0.0499)	(0.0463)	(0.0419)	(0.0683)	(0.0590)
$\Delta \ln(p^*_2)$	0.0530	0.0442	0.1519***	0.2994***	0.0773	0.2113***	0.1942*	0.1094
	(0.0557)	(0.0619)	(0.0508)	(0.0678)	(0.0656)	(0.0684)	(0.1115)	(0.0985)
$\Delta \ln(p_3)$	0.0589*	0.0097	0.1369***	0.0620	-0.0029	0.1156	0.2320**	0.2959***
	(0.0312)	(0.0346)	(0.0462)	(0.0632)	(0.0796)	(0.0780)	(0.1001)	(0.0859)
$\Delta \ln(b_1)$	-0.1162	-0.1986**	-0.9671**	0.9566	0.9915	0.3560	-2.2555***	-1.0502
	(0.0797)	(0.0881)	(0.4515)	(0.6289)	(0.6718)	(0.6255)	(0.8418)	(0.7112)
$\Delta \ln(b_2)$	0.0679**	0.0316	0.0007	-0.0829	0.0026	-0.0088	0.0680	0.0268
	(0.0329)	(0.0383)	(0.0519)	(0.0723)	(0.0562)	(0.0508)	(0.0856)	(0.0735)
$\Delta \ln(b_3)$	-0.2319***	-0.2890***	-0.0833	0.0205	0.1770*	0.1491	0.0898	0.0951
	(0.0594)	(0.0650)	(0.0749)	(0.1042)	(0.1032)	(0.1055)	(0.1209)	(0.1082)
constant	0.0417***	0.0554***	-0.0025	-0.0077	0.0307**	0.0028	-0.0513**	-0.0551***
	(0.0114)	(0.0126)	(0.0102)	(0.0134)	(0.0129)	(0.0102)	(0.0264)	(0.0225)
H dynamic	0.68	0.58	0.83	0.96	0.90	0.82	0.73	0.67
Observations	207	206	125	125	105	103	146	146
Sargan test	34.25***	15.24	33.48***	14.67	29.82***	16.25	12.23	12.65
1st order	0.5	-2.1**	-1.82*	-2.31**	-0.41	-1.6	-4.46***	-3.02***
2nd order	-1.42	-1.35	0.09	-0.86	-1.76*	-0.38	0.89	-1.2

Note: Standard errors are in parentheses. Spec 1 uses the natural logarithm of interest income over total assets as the dependent variable in equation (5.3). Spec 3 uses total income as the dependent variable in equation (5.3). The results are estimated from one-step dynamic panel generalized method of moments. The model is estimated without time dummies. $\Delta \ln(r^*_{t-1})$ = natural logarithm of the lagged dependent variable; $\Delta \ln(p_1)$ = natural logarithm of interest expenses over deposits; $\Delta \ln(p^*_2)$ = natural logarithm of personnel expenses over total assets; $\Delta \ln(p_3)$ = natural logarithm of other operating expenses over total assets; $\Delta \ln(b_1)$ = natural logarithm of net loans over total assets; $\Delta \ln(b_2)$ = natural logarithm of equity capital over total assets; $\Delta \ln(b_3)$ = natural logarithm of total assets. All are in first differences. For detailed definition of variables, please see the Appendix A5.1. Sargan test for over-identifying restrictions shows χ^2 values. Tests for first- and second-order of auto-covariance show z values. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level

Table 5.7. *H-statistic: Comparison of OLS, fixed-effects GLS and dynamic GMM estimates*

	Indonesia			**Malaysia**			**Philippines**			**Vietnam**		
Spec	OLS	GLS	GMM	OLS	GLS	GMM	OLS	GLS	GMM	OLS	GLS	GMM
1	0.47	0.62	0.68	0.70	0.74	0.83	0.36	0.52	0.90	0.29	0.62	0.73
2	0.44	0.46	0.62	0.68	0.72	0.80	0.36	0.50	0.90	0.27	0.54	0.52
3	0.48	0.64	0.58	0.66	0.75	0.96	0.45	0.50	0.82	0.43	0.56	0.67
4	0.46	0.47	0.53	0.65	0.74	0.94	0.45	0.49	0.81	0.41	0.50	0.55
Mean	0.46	0.55	0.60	0.67	0.74	0.88	0.41	0.50	0.86	0.35	0.56	0.62

Note: For brevity, individual coefficients are unreported. Details are presented in the Appendix A5.2a, b, c and d. Spec 1 = bank revenue is interest revenue as the dependent variable; unit cost of labour is measured by personnel expenses over total assets, Spec 2 = unit cost of labour is measured by personnel expenses over loans plus deposits, Spec 3 = bank revenue is total revenue, unit cost of labour is measured similarly to Spec 1, Spec 4 = total revenue as the dependent variable, unit cost of labour is measured by personnel expenses over loans plus deposits (for details, see Table 5.1). All other variables are as defined in equations (5.1) and (5.3). OLS, GLS and GMM are H-statistics computed using OLS regression, fixed-effects GLS and generalized method of moments dynamic estimator, respectively, applied to equations (5.1) and (5.3). All H-statistics are significantly different from both zero and a unity.

Table 5.7 compares the H-statistics derived from the different estimation approaches. In general, the dynamic panel estimates produce higher values of the H-statistic than OLS and GLS. This evidence is consistent with empirical evidence presented by Goddard and Wilson (2006). In their study of 25 countries, of which 16 banking systems earned revenues in short-run equilibrium, the authors found that dynamic H-statistics tended to be larger than those produced by fixed-effects estimation. This evidence may imply that the H-statistics estimated by static models could underestimate the pressure of competition. The mean difference of the H-statistic estimated by GLS and GMM, averaged over the four specifications, ranges from 0.06 for Vietnam to 0.36 for Philippines. OLS estimators generate the lowest H-statistics. The mean difference between dynamic GMM and OLS estimation varies from 0.27 for Vietnam to 0.45 for the Philippines.

Looking at further details, if one could assume that higher H-statistics are associated with a more competitive environment (for example, Bikker & Haaf, 2002; Casu & Girardone, 2006), the comparison of H-statistics computed by different specifications raises serious empirical implication.

Disregarding the magnification of the H-statistics, GMM estimates can provides a varying picture of competition depending on whether interest earning and non-interest earning activities are considered in the dependent variable. GMM estimates show that H-statistics with interest revenue as the dependent variables (Spec 1 and 2) are *higher* than those computed when total revenue is used as the dependent variable (Spec 3 and 4) (in Indonesia, Philippines and Vietnam). In contrast, H-statistics with interest revenue as the dependent variables (Spec 1 and 2) are *lower* than those when total revenue is used as the dependent variables (Spec 3 and 4) when computed by OLS (in the same countries). Results from GMM estimates conflict with GLS's in the same manner as seen between GMM and OLS for Indonesia (Spec 1, 3 and 2, 4) and Vietnam (Spec 2, 4).

5.4.4. *Risk Indicators and their Correlations with the Independent Variables*

The summary of the mean values of the risk indicators are shown in Table 5.8, revealing that the Indonesian banking system is associated with the highest loan-loss reserves, loan-loss provisions and return volatility. This implies that the Indonesian banking sector faces the highest probability of failure. The Z-index is also consistent with other risk proxies. As a component of the Z-index, the capital-to-asset ratio of other countries is nearly 13% on average but the same mean ratio for Indonesian banking during

1998 and 2004 is just below 7%. Negative return on assets, high volatility of returns and low levels of equity capital yield very low Z-value for Indonesian banking. As mentioned, the Z-index reflects the capacity of bank profits and equity capital to absorb unexpected losses. Higher value of Z means less risk for banks, when Z equals to zero, then banks are insolvent. Therefore, low Z-indexes for Indonesian commercial banks are an indication of a high level of risk. In contrast to Indonesia, Malaysian banks have the highest Z-index of the four countries - nearly doubles that of Indonesia. Turning to loan-loss provisions, this item for Malaysia just accounts for 1.5% of total loans while the similar item reaches over 6% for Indonesian banks over the studied period. Loan-loss provisions in the other two countries lie somewhere in-between.

Table 5.8. *Descriptive statistics of risk and competition variables 1998 to 2004*

	Indonesia	Malaysia	Philippines	Vietnam	Min	Max	Mean
LLR	0.1462	0.0683	0.0682	0.0100	0.0100	0.1462	0.0732
LLP	0.0620	0.0153	0.0177	0.0155	0.0153	0.0620	0.0276
ROA	-0.0352	0.0080	0.0046	0.0099	-0.0352	0.0099	-0.0032
EAR	0.0692	0.1072	0.1681	0.1675	0.0692	0.1681	0.1280
ROA volatility	0.0757	0.0107	0.0115	0.0103	0.0103	0.0757	0.0270
Z-index	44.42	86.98	74.66	75.56	44.42	86.98	70.41
OLS H-statistic	0.46	0.67	0.41	0.35	0.35	0.67	0.47
GLS H-statistic	0.55	0.74	0.50	0.56	0.50	0.74	0.59
GMM H-statistic	0.60	0.88	0.86	0.62	0.60	0.88	0.74

Note: Figures are averaged over the 1998-2004 period. LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility (see the Appendix A5.1). OLS and GLS H-statistic = average of four H-statistics from spec 1 to spec 4 estimated using OLS and fixed-effects GLS estimates, respectively, applied to equation (5.1). GMM H-statistic = average of H-statistics from four specifications using dynamic GMM applied to equation (5.3) (see Table 5.1).

Regarding the H-statistic, Malaysia has the highest H-statistic for all estimators. The dynamic panel technique produces the highest H-statistic of 0.88 whereas fixed-effects GLS and OLS generate H-statistic of 0.74 and 0.67, respectively. In comparison with Malaysia, Indonesia has the lowest H-statistic estimated by dynamic panel model. Indonesian H-statistics computed by the other two techniques, GLS and OLS, are both the second lowest. The Vietnamese banking system has the lowest H-statistic when calculated using OLS and the Philippines has the lowest H-statistic when estimated via GLS.

Looking at the simple correlations, shown in Table 5.9, between risk measurements and competition (proxied by the H-statistics) there are negative signs on loan-loss reserves, loan-loss provisions and return volatility whereas there is a positive

sign for the Z-index (column 4 from left). The same signs are consistent for all three different types of H-statistic estimations. The correlation coefficients between risk proxies and dynamic panel estimates of the H-statistic are the largest.

In short, a simple comparison of risk measures and H-statistics provides some indicative signs of an inverse relationship between competition and risk-taking in South East Asian banking during the period of 1998 and 2004. This indication conflicts with the widespread expectation of a positive link between competition and risk.

Table 5.9. *Correlation between risk indicators and the independent variables*

Dependent	H-statistic specification	Obs.	H	Size	Liquidity	Off-balance sheet	Lending	Foreign share	Real interest rate	C-3	Reg.
LLR	OLS	704	-0.09	-0.21	0.12	-0.03	-0.15	0.11	-0.33	0.12	0.24
	GLS		-0.14								
	GMM		-0.27								
LLP	OLS	693	-0.04	-0.02	-0.01	-0.04	0.06	-0.07	-0.35	0.00	0.08
	GLS		-0.04								
	GMM		-0.09								
ROA volatility	OLS	745	-0.09	-0.14	-0.02	-0.10	0.02	0.01	-0.55	0.02	0.23
	GLS		-0.13								
	GMM		-0.26								
Z-index	OLS	745	0.01	0.03	0.08	0.07	0.02	0.05	0.12	-0.06	-0.13
	GLS		0.03								
	GMM		0.14								

Note: LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. OLS, GLS and GMM H-statistic = average of four H values from spec 1 to spec 4 estimated using OLS, GLS and GMM estimators respectively (see Table 5.1), applied to equations (5.1) and (5.3). Obs. = the total number of observations. C-3 = concentration ratio measured by three-bank assets over total banking assets (obtained from Beck et al., 2000). Reg. = regulation index. For detailed definition of variables, see the Appendix A5.1.

5.4.5. *Empirical Results*

5.4.5.1. *Competition and risk.*

In order to investigate the impact of competition on bank risk-taking incentives, we apply the robust OLS regression technique[9]. Because the H-statistic is computed using three different models, the first table (Table 5.10) reports the empirical results of regressions in which the H-statistic is computed using pooled OLS in the previous stage. The following tables (Tables 5.11 and 5.12) present the regression outcomes when the H-statistics are calculated using the fixed-effects GLS and GMM dynamic estimators, respectively. In each table, two specifications of H-statistic are included. One specification

[9] Robust OLS is used to correct for heteroskedasticity

is associated with the reduced revenue equation in which interest revenue is the dependent variable (Spec 1). The second specification replaces interest revenue with total revenue as the dependent variable (Spec 3), in order to account for the increasing importance of non-interest earning activities of banks.

The results show that competition does not induce incentives for banks to take-on more risk as suggested by opponents to competition policy[10]. In contrast, nearly all of our estimates show a negative relationship between competition and risk and they are statistically significant at 1% level. The large coefficients on the competition measures compared to those for other control variables suggest an important explanatory role of competition on risk. The R^2 reaches 40% for models in which risks are measured by volatility of return, reflecting a relative goodness of fit. For the Z-index risk proxy, the R^2 falls to 9%, but, in these cases it is rare to find a statistically significant relationship. Therefore, during the period 1998 to 2004, competition appears to reduce the probability of bank failure and increases financial stability. These findings confirm our results from the earlier simple correlation analysis of market competition and bank risk. The results provide some support in favour of competition policy which has been launched in South East Asia. According to these results, competition could be viewed as one policy aimed at two (not mutually exclusive) targets: improving efficiency and strengthening stability of the banking system.

Our results on the adverse relationship between competition and risk support evidences from, for example, Boyd et al. (2006), De Nicolo (2000), De Nicolo et al. (2004), Jayaratne and Strahan (1998) and Yeyati and Micco (2007) but conflict with those reported by Dick (2006), Keeley (1990) and Rhoades and Rutz (1982)[11].

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[10] The H-statistic is computed from reduced form revenue equations in which banks are assumed to use deposits, labour and physical assets to produce loans and total earning assets. Following this intermediation approach, the degree and the nature of competition for loans and for deposits are treated as being independent (De Bandt & Davis, 2000, p. 1049). If so, one would expect that H-statistic should be positively correlated to risk as assumed by theoretical arguments focus on deposit side of bank balance sheets.

[11] Of these studies, only one (Yeyati & Micco, 2007) uses the same proxies for risk (Z-index) and competition (H-statistic) as those in our study (and similar results are found). However, they do not use the volatility of ROA as an alternative risk indicator and their sample is eight Latin American countries. Other studies employ concentration ratio (Boyd et al., 2006; De Nicolo et al., 2004; Rhoades & Rutz, 1982) or branching barrier removal dummies (Jayaratne & Strahan, 1998; Dick, 2006) to proxy for competition. De Nicolo (2000) uses bank size while Keeley (1990) uses market-to-book assets ratio to proxy for market power. Risk are measured by indicators which are inconsistent among studies, from accounting loan-loss provisions (Jayaratne & Strahan, 1998; Dick, 2006); profit volatility (Rhoades & Rutz, 1982) and Z-index (Boyd et al., 2006; De Nicolo et al., 2004) to market value of capital-to-asset ratio (Keeley, 1990) and market value of Z-index (De Nicolo, 2000)

Table 5.10. *Competition (measured using the OLS H-statistic) and risk*

	LLR		**LLP**		**ROA volatility**		**Z-index**	
	Hb^1	Hb^3	Hb^1	Hb^3	Hb^1	Hb^3	Hb^1	Hb^3
Competition	-0.1634***	-0.2818***	-0.1757***	-0.2493***	-0.1623***	-0.2413***	0.2017	0.3213
	(0.04)	(0.0571)	(0.0466)	(0.076)	(0.034)	(0.0501)	(0.2062)	(0.2879)
Size	-0.0003	0.0004	0.0126**	0.0127*	0.0034	0.0036	-0.0082	-0.0087
	(0.0031)	(0.0031)	(0.0064)	(0.0066)	(0.0026)	(0.0026)	(0.01)	(0.0099)
Liquidity	0.041	0.0413	0.0416	0.0417	0.0111	0.0113	0.0858	0.0855
	(0.0269)	(0.0267)	(0.0576)	(0.0577)	(0.0129)	(0.013)	(0.0553)	(0.055)
Off.balance	0.0025	0.0048	0.0169	0.0171	0.0039	0.0048	-0.0081	-0.0101
	(0.0058)	(0.0058)	(0.0196)	(0.0203)	(0.0033)	(0.0034)	(0.0198)	(0.0201)
Lending	-0.0326	-0.0275	0.1481	0.1491	0.0562**	0.0589**	0.0014	-0.0038
	(0.0384)	(0.0385)	(0.1661)	(0.1674)	(0.0249)	(0.0254)	(0.0746)	(0.0753)
Foreign.share	0.0359***	0.0361***	-0.0379	-0.038	0.0075	0.0072	0.0337	0.034
	(0.0121)	(0.0121)	(0.0487)	(0.0487)	(0.0071)	(0.0071)	(0.0362)	(0.0363)
Interest.rate	-0.0032***	-0.0032***	-0.0086***	-0.0088***	-0.0049***	-0.0051***	-0.0001	0.0000
	(0.0006)	(0.0006)	(0.0017)	(0.0017)	(0.0006)	(0.0007)	(0.0021)	(0.0019)
Concentration	-0.4426***	-0.4062***	-0.174*	-0.1054	-0.3271***	-0.2637***	0.7532**	0.6847**
	(0.0615)	(0.0511)	(0.0961)	(0.0917)	(0.0503)	(0.0394)	(0.3285)	(0.2792)
Regulation	0.0141***	0.0124***	0.0095***	0.0072***	0.0126***	0.0105***	-0.0322***	-0.0298***
	(0.0019)	(0.0016)	(0.0019)	(0.0016)	(0.0019)	(0.0015)	(0.0088)	(0.0075)
Year 1999	0.0904***	0.0881***	0.0377	0.0343	0.0374***	0.0342***	-0.0525	-0.0487
	(0.0136)	(0.0134)	(0.035)	(0.0347)	(0.0111)	(0.0107)	(0.0525)	(0.0529)
Year 2000	0.0191	0.0170	-0.0566**	-0.0592***	-0.0422***	-0.0448***	0.1487***	0.1518***
	(0.0148)	(0.0148)	(0.0228)	(0.0226)	(0.0087)	(0.0089)	(0.0581)	(0.0582)
Year 2001	-0.0098	-0.0096	-0.0297	-0.028	-0.0503***	-0.0491***	0.1875***	0.1866***
	(0.0147)	(0.0146)	(0.0284)	(0.0282)	(0.0067)	(0.0067)	(0.0636)	(0.063)
Year 2002	-0.0425***	-0.0409***	-0.0911***	-0.0862**	-0.0516***	-0.0477***	0.2143***	0.2107***
	(0.0098)	(0.0093)	(0.0348)	(0.0349)	(0.0062)	(0.0057)	(0.0626)	(0.06)
Year 2003	-0.0504***	-0.0487***	-0.0421	-0.0366	-0.0575***	-0.0532***	0.2438***	0.2398***
	(0.0108)	(0.0103)	(0.0280)	(0.0276)	(0.0067)	(0.0061)	(0.0815)	(0.0769)
Year 2004	-0.0624***	-0.0629***	-0.0658**	-0.0632**	-0.0698***	-0.0681***	0.2613***	0.2605***
	(0.0103)	(0.0101)	(0.0264)	(0.0259)	(0.0076)	(0.0073)	(0.0711)	(0.0706)
Constant	0.1792***	0.2462***	-0.0548	-0.011	0.0633***	0.1072***	5.1703***	5.1048***
	(0.0380)	(0.0375)	(0.1710)	(0.1567)	(0.02)	(0.0189)	(0.1828)	(0.2166)
R^2	0.28	0.29	0.16	0.16	0.42	0.42	0.09	0.09
Observations	704	704	693	693	745	745	745	745
Mean VIF	2.72	2.47	2.71	2.47	2.69	2.4	2.69	2.4

Note: Hb^1 = H-statistic estimated by OLS in the first stage through specification 1 where interest income is used as the dependent variable in equation (5.1). Hb^3 = H-statistic estimated using OLS in the first stage through specification 3 where total income is the dependent variable in equation (5.1). LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. The second stage is estimated by applying heteroskedasticity-consistent OLS to equation (5.4). Robust standard errors are in parentheses. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. Mean VIF = mean value of the variance inflation factor, used to test for multicollinearity in the regression. As the rule of thumb, if VIF exceeds 10, multicollinearity is severe. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

Table 5.11. *Competition (measured using the fixed-effects GLS H-statistic) and risk*

	LLR		**LLP**		**ROA volatility**		**Z-index**	
	Hf^1	Hf^3	Hf^1	Hf^3	Hf^1	Hf^3	Hf^1	Hf^3
Competition	-0.3136***	-0.2612***	-0.2547***	-0.2553***	-0.2513***	-0.2413***	0.3452	0.3101
	(0.0589)	(0.0582)	(0.0836)	(0.0721)	(0.0524)	(0.0502)	(0.2928)	(0.297)
Size	0.0007	0.00004	0.0126*	0.0127**	0.0036	0.0035	-0.0089	-0.0084
	(0.0031)	(0.0031)	(0.0067)	(0.0065)	(0.0026)	(0.0026)	(0.0098)	(0.01)
Liquidity	0.0415	0.0411	0.0418	0.0417	0.0114	0.0112	0.0853	0.0857
	(0.0266)	(0.0268)	(0.0577)	(0.0576)	(0.013)	(0.0129)	(0.0549)	(0.0552)
Off.balance	0.0059	0.0036	0.0171	0.017	0.0051	0.0044	-0.011	-0.0091
	(0.0058)	(0.0058)	(0.0206)	(0.0199)	(0.0035)	(0.0034)	(0.0202)	(0.0199)
Lending	-0.0251	-0.0302	0.1493	0.1487	0.06**	0.0575**	-0.0062	-0.001
	(0.0385)	(0.0385)	(0.1681)	(0.1667)	(0.0256)	(0.0251)	(0.0755)	(0.0749)
Foreign.share	0.0361***	0.036***	-0.0381	-0.0379	0.007	0.0074	0.0341	0.0338
	(0.0121)	(0.0121)	(0.0486)	(0.0487)	(0.0071)	(0.0071)	(0.0363)	(0.0362)
Interest.rate	-0.0033***	-0.0032***	-0.0089***	-0.0087***	-0.0052***	-0.005***	0.0001	-0.0001
	(0.0006)	(0.0006)	(0.0017)	(0.0017)	(0.0007)	(0.0007)	(0.0019)	(0.002)
Concentration	-0.3755***	-0.43***	-0.0692	-0.1429	-0.2276***	-0.2993***	0.6401***	0.7251**
	(0.0466)	(0.0566)	(0.0931)	(0.093)	(0.0339)	(0.0453)	(0.2599)	(0.3042)
Regulation	0.0145***	0.016***	0.0087***	0.0109***	0.012***	0.014***	-0.0319***	-0.0342***
	(0.0018)	(0.0022)	(0.0019)	(0.0022)	(0.0018)	(0.0021)	(0.0082)	(0.0098)
Year 1999	0.0864***	0.0895***	0.0325	0.0361	0.0323***	0.036***	-0.0463	-0.0509
	(0.0132)	(0.0135)	(0.0343)	(0.0349)	(0.0104)	(0.0109)	(0.0531)	(0.0527)
Year 2000	0.0155	0.0183	-0.0606***	-0.0578***	-0.0462***	-0.0434***	0.1537***	0.15***
	(0.0148)	(0.0148)	(0.0224)	(0.0227)	(0.009)	(0.0088)	(0.0583)	(0.0582)
Year 2001	-0.0091	-0.0098	-0.0271	-0.029	-0.0484***	-0.0498***	0.1858***	0.1872***
	(0.0145)	(0.0147)	(0.0282)	(0.0282)	(0.0067)	(0.0067)	(0.0628)	(0.0634)
Year 2002	-0.0392***	-0.0421***	-0.0836**	-0.0889***	-0.0454***	-0.0499***	0.2081***	0.2129***
	(0.0091)	(0.0095)	(0.0347)	(0.035)	(0.0055)	(0.006)	(0.0589)	(0.0613)
Year 2003	-0.0468***	-0.05***	-0.0337	-0.0397	-0.0506***	-0.0557***	0.2369***	0.2422***
	(0.01)	(0.0106)	(0.0278)	(0.0277)	(0.0058)	(0.0065)	(0.0748)	(0.0793)
Year 2004	-0.0625***	-0.0628***	-0.0618**	-0.0647**	-0.0669***	-0.0691***	0.2593***	0.2611***
	(0.01)	(0.0102)	(0.0258)	(0.0262)	(0.0071)	(0.0075)	(0.0704)	(0.0708)
Constant	0.2414***	0.2211***	-0.0256	-0.0218	0.0941***	0.0953***	5.1176***	5.1258***
	(0.0367)	(0.0377)	(0.1561)	(0.1628)	(0.0183)	(0.019)	(0.2057)	(0.2072)
R^2	0.29	0.29	0.16	0.16	0.42	0.42	0.09	0.09
Observations	704	704	693	693	745	745	745	745
Mean VIF	2.43	2.69	2.42	2.68	2.33	2.63	2.33	2.63

Note: Hf^1 = H-statistic estimated by fixed-effects GLS in the first stage through specification 1 where interest income is used as the dependent variable in equation (5.1). Hf^3 = H-statistic estimated using the fixed-effects GLS in the first stage through specification 3 where total income is the dependent variable in equation (5.1). LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. The second stage is estimated by applying heteroskedasticity-consistent OLS to equation (5.4). Robust standard errors are in parentheses. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. Mean VIF = mean value of variance inflation factor, used to test for multicollinearity in the regression. As the rule of thumb, if VIF exceeds 10 multicollinearity is severe. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

Table 5.12. *Competition (measured using the dynamic GMM H-statistic) and risk*

	LLR		**LLP**		**ROA volatility**		**Z-index**	
	Hd^1	Hd^3	Hd^1	Hd^3	Hd^1	Hd^3	Hd^1	Hd^3
Competition	-0.4124***	-0.2733***	-0.1944***	-0.1848***	-0.3271***	-0.1893***	1.001***	0.2781
	(0.053)	(0.0442)	(0.053)	(0.0726)	(0.0475)	(0.0405)	(0.2492)	(0.2127)
Size	-0.0028	0.0013	0.0096*	0.0125*	0.0008	0.0036	-0.0057	-0.0091
	(0.0028)	(0.0031)	(0.0058)	(0.0069)	(0.0022)	(0.0026)	(0.0089)	(0.0096)
Liquidity	0.0421	0.0419	0.0415	0.0419	0.0113	0.0116	0.0848	0.0849
	(0.0265)	(0.0264)	(0.0578)	(0.0578)	(0.0129)	(0.0131)	(0.0548)	(0.0545)
Off.balance	-0.0045	0.0081	0.0077	0.0168	-0.0034	0.0054	-0.0022	-0.0124
	(0.0049)	(0.0057)	(0.018)	(0.0213)	(0.0023)	(0.0036)	(0.0187)	(0.0205)
Lending	-0.042	-0.02	0.1316	0.1492	0.0451**	0.0618**	0.0061	-0.011
	(0.0362)	(0.0385)	(0.1638)	(0.1696)	(0.0233)	(0.0261)	(0.0713)	(0.0759)
Foreign.share	0.0328***	0.036***	-0.0397	-0.0382	0.005	0.0065	0.0376	0.0348
	(0.0121)	(0.012)	(0.0495)	(0.0486)	(0.0072)	(0.0071)	(0.037)	(0.0365)
Interest.rate	-0.0039***	-0.0036***	-0.0094***	-0.0091***	-0.0057***	-0.0054***	0.0012	0.0004
	(0.0007)	(0.0006)	(0.0018)	(0.0017)	(0.0008)	(0.0007)	(0.0017)	(0.0018)
Concentration	-0.2031***	-0.2714***	0.0621	0.0179	-0.0804***	-0.1357***	0.3034	0.5126**
	(0.0383)	(0.0406)	(0.0945)	(0.1074)	(0.0195)	(0.0244)	(0.2042)	(0.2362)
Regulation	n.a	0.0022	n.a	-0.0003	n.a	0.0029***	n.a	-0.0189**
		(0.0015)		(0.0028)		(0.0008)		(0.0094)
Year 1999	0.0795***	0.0808***	0.0279	0.0283	0.0268***	0.0278***	-0.0315	-0.0398
	(0.0128)	(0.0128)	(0.0341)	(0.0332)	(0.01)	(0.0097)	(0.0528)	(0.0535)
Year 2000	0.0121	0.0109	-0.063***	-0.0638***	-0.0489***	-0.0497***	0.1633***	0.1588***
	(0.0149)	(0.0148)	(0.0227)	(0.0216)	(0.0092)	(0.0093)	(0.0583)	(0.0583)
Year 2001	-0.0011	-0.007	-0.0207	-0.0247	-0.042***	-0.0463***	0.1749***	0.1833***
	(0.0142)	(0.0145)	(0.0289)	(0.0285)	(0.0063)	(0.0066)	(0.0612)	(0.0622)
Year 2002	-0.0212**	-0.0325***	-0.0693**	-0.077**	-0.0309***	-0.0393***	0.1806***	0.2002***
	(0.0087)	(0.0088)	(0.0329)	(0.0336)	(0.0051)	(0.0049)	(0.0555)	(0.0572)
Year 2003	-0.0264***	-0.0394***	-0.0178	-0.0264	-0.0342***	-0.0438***	0.2058***	0.2281***
	(0.0091)	(0.0095)	(0.0299)	(0.0289)	(0.0051)	(0.0051)	(0.0675)	(0.0706)
Year 2004	-0.0465***	-0.06***	-0.0485*	-0.058**	-0.0538***	-0.0636***	0.2385***	0.2555***
	(0.0093)	(0.0098)	(0.028)	(0.026)	(0.0061)	(0.0067)	(0.0709)	(0.0703)
Constant	0.5533***	0.3979***	0.0739	0.0607	0.3444***	0.1844***	4.1605***	4.9746***
	(0.0548)	(0.0426)	(0.2017)	(0.1236)	(0.0362)	(0.0274)	(0.2652)	(0.2866)
R^2	0.28	0.30	0.15	0.16	0.41	0.42	0.09	0.09
Observations	704	704	693	693	745	745	745	745
Mean VIF	2.11	2.66	2.1	2.65	2.01	2.59	2.01	2.59

Note: Hd^1 = H-statistic estimated using the dynamic panel estimator in the first stage through specification 1 where interest income is the dependent variable in equation (5.3). Hd^3 = H-statistic estimated using the dynamic panel estimator in the first stage through specification 3 where total income is as the dependent variable in equation (5.3). LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. The second stage is estimated by applying heteroskedasticity-consistent OLS to equation (5.4). Robust standard errors are in parentheses. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. Mean VIF = mean value of variance inflation factor, used to test for multicollinearity in the regression. As the rule of thumb, if VIF exceeds 10 multicollinearity is severe. N.a means non-applicable because regulation variable is dropped due to severe multicollinearity. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

The following section discusses the relationship between bank risk and other control variables. Part of the results is shown in Table 5.10, 5.11 and 5.12. However, for comparison and cross-checking with robustness tests where random-effects GLS is used in addition to robust OLS in the second stage, we refer the full results that are reported in the Appendix A5.3a to A5.3f. Because the Appendix also includes the aforementioned tables, the full results for each variable are summarized and discussed in the following respective sections.

5.4.5.2. *Bank size and risk.*

Table 5.13. *Summarized results on bank size and risk*

	Second-stage regression							
	LLR		LLP		ROA		Z-index	
First-stage H-statistic	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS
Pooled OLS								
Hb^1	(–)	** (–)	** (+)	* (+)	(+)	(+)	(–)	(–)
Hb^2	(–)	** (–)	** (+)	* (+)	(+)	(+)	(–)	(–)
Hb^3	(+)	(–)	* (+)	* (+)	(+)	(+)	(–)	(–)
Hb^4	(+)	(–)	* (+)	* (+)	(+)	(+)	(–)	(–)
Fixed-effects GLS								
Hf^1	(+)	(–)	* (+)	* (+)	(+)	(+)	(–)	(–)
Hf^2	(+)	(–)	* (+)	* (+)	(+)	(+)	(–)	(–)
Hf^3	(+)	* (–)	** (+)	* (+)	(+)	(+)	(–)	(–)
Hf^4	(+)	(–)	* (+)	* (+)	(+)	(+)	(–)	(–)
Dynamic GMM								
Hd^1	(–)	* (–)	* (+)	(+)	(+)	(–)	(–)	(–)
Hd^2	(–)	* (–)	(+)	* (+)	(+)	(+)	(–)	(–)
Hd^3	(+)	(–)	* (+)	* (+)	(+)	(+)	(–)	(–)
Hd^4	(+)	(–)	* (+)	* (+)	(+)	(+)	(–)	(–)

Note: LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. Size is proxied by natural logarithm of assets. Hb^1 to Hd^4 correspond four specifications of H-statistics (Table 5.1) estimated by three different models, pooled OLS, fixed-effects GLS (applied to equation 5.1) and dynamic GMM (applied to equation 5.3), in the first stage. In the second stage, two models are applied: robust OLS and random-effects GLS (equation 5.4). For detailed results please see the Appendix A5.3a to A5.3f. (+) means the coefficients bear the positive sign, (-) negative. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

The first bank-level control variable is bank assets, which are extensively used in the literature to reflect bank size. One stream of literature studies bank risk in relation to the deposit insurance schemes and finds that deposit insurance induces incentives for bank to take-on risk (Demirgüc-Kunt & Detragiache, 2002). From this perspective, banks are treated as processing risky portfolios. Production technologies and bank size are viewed as unimportant. If regulatory attitudes are indifferent for insured banks of all sizes, this

literature expects no connection between bank size and risk. In practice, however, under the 'too-big-too-fail' doctrine, the bankruptcy of large banks raises more concerns than that of small banks (Boyd & Runkle, 1993). Therefore, the insured package funded to large banks becomes more valuable than for those banks of small size. As a result, large banks take-on more risk than small banks, so risk increases with size. Another stream of the literature suggests that larger banks benefit from economies of scale and scope; they could allocate their risk portfolio through geographic and product diversification and subsequently tend to face less risk (Demsetz & Strahan, 1997; Liang & Rhoades, 1988; Shiers, 2002). So, size may inversely affect risk.

Our regression results (Table 5.13) show that for all other risk indicators, except loan-loss reserves, the coefficients bear consistent signs (positive for loan-loss provisions, return volatility and negative for Z-index). However, only two risk indicators are significant. Risk proxied by loan-loss reserves associates with significantly negative signs while the similar proxied by loan-loss provisions has the significantly positive signs. Given the weaker reflective power of risk by loan-loss reserves and fewer significant cases (5 compared to over 20 cases), loan-loss provisions seem to produce more believable results. This suggests that large banks are likely to be involved in more risky activities than small banks in our sample. The evidence conflicts with arguments derived from economies of scale and scope in banking, but is in-line with the results found by, for instance, De Nicolo et al. (2004). The aforementioned researchers found that large banks face higher probability of bankruptcy than small banks. One possible explanation for this is that the risk induced by size is more than offset by risk reduction through diversification.

5.4.5.3. *Liquidity, off-balance sheet activity, lending, foreign presence and risk.*

Bank liquidity is used as the second bank-level control variable. Liquidity is argued to reduce bank risk because when there is a banking panic, more liquid banks have better resources to fund deposits outflows. In contrast to this expectation, Wagner (2007) suggests that the high liquidation of assets increases bank risk since it reduces the cost of bank failure. For instance, a highly liquid loan may induce incentives for banks to offset risks they have transferred from their balance sheets because highly liquid loans enable banks to liquidate these more easily in the occurrence of crisis. For this reason, banks tend to take-on new risk which exceeds the beneficial effects of liquid assets being held on their balance sheets.

Looking at our regression outcomes (Table 5.14), the coefficients of bank liquidity, measured by liquid assets as a share of deposits, and risk are related in a positive manner except Z-index but none of them shows significant links.

Table 5.14. *Summarized results on bank liquidity and risk*

	Second-stage regression							
	LLR		LLP		ROA		Z-index	
First-stage H-statistic	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS
Pooled OLS								
Hb^1	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Hb^2	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Hb^3	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Hb^4	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Fixed-effects GLS								
Hf^1	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Hf^2	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Hf^3	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Hf^4	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Dynamic GMM								
Hd^1	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Hd^2	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Hd^3	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Hd^4	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)

Note: LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. Liquidity is proxied by a ratio of liquid assets over deposits. Hb^1 to Hd^4 correspond four specifications of H-statistics (Table 5.1) estimated by three different models, pooled OLS, fixed-effects GLS (applied to equation 5.1) and dynamic GMM (applied to equation 5.3), in the first stage. In the second stage, two models are applied: robust OLS and random-effects GLS (equation 5.4). For detailed results please see the Appendix A5.3a to A5.3f. (+) means the coefficients bear the positive sign, (-) negative.

Given the loose capital adequacy regulations to capture off-balance sheet activities in countries of our sample during the period of study, we expect banks that are more likely to get involved in off-balance sheet operations to earn fee-based income. This will affect the level of bank risk. Our results show three significant cases. For loan-loss reserves, off-balance sheet items appear to be correlated negatively with risk in one model (OLS) but positively in another model (GLS) (Table 5.15). For ROA volatility, off-balance sheet items indicate a negative relationship with risk. So, taken together, there is some evidence that banks with more off-balance sheet items face lower level of risk.

Table 5.15. *Summarized results on bank off-balance sheet activities and risk*[a]

	Second-stage regression							
	LLR		LLP		ROA		Z-index	
First-stage H-statistic	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS
Pooled OLS								
Hb^1	(+)	(+)	(+)	(+)	(+)	(+)	(–)	(–)
Hb^2	(+)	(+)	(+)	(+)	(+)	(+)	(–)	(–)
Hb^3	(+)	(+)	(+)	(+)	(+)	(+)	(–)	(–)
Hb^4	(+)	(+)	(+)	(+)	(+)	(+)	(–)	(–)
Fixed-effects GLS								
Hf^1	(+)	(+)	(+)	(+)	(+)	(+)	(–)	(–)
Hf^2	(+)	(+)	(+)	(+)	(+)	(+)	(–)	(–)
Hf^3	(+)	(+)	(+)	(+)	(+)	(+)	(–)	(–)
Hf^4	(+)	(+)	(+)	(+)	(+)	(+)	(–)	(–)
Dynamic GMM								
Hd^1	(–)	* (+)	(+)	(+)	(–)	(+)	(–)	(–)
Hd^2	* (–)	* (+)	(+)	(+)	*** (–)	(+)	(+)	(–)
Hd^3	(+)	(+)	(+)	(+)	(+)	(+)	(–)	(–)
Hd^4	(+)	(+)	(+)	(+)	(+)	(+)	(–)	(–)

[a] See note to Table 5.16

Table 5.16. *Summarized results on bank lending and risk*[a]

	Second-stage regression							
	LLR		LLP		ROA		Z-index	
First-stage H-statistic	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS
Pooled OLS								
Hb^1	(–)	*** (–)	(+)	*** (+)	** (+)	*** (+)	(+)	(+)
Hb^2	(–)	*** (–)	(+)	*** (+)	** (+)	*** (+)	(+)	(+)
Hb^3	(–)	** (–)	(+)	*** (+)	** (+)	*** (+)	(–)	(+)
Hb^4	(–)	** (–)	(+)	*** (+)	** (+)	*** (+)	(–)	(+)
Fixed-effects GLS								
Hf^1	(–)	** (–)	(+)	*** (+)	** (+)	*** (+)	(–)	(+)
Hf^2	(–)	** (–)	(+)	*** (+)	** (+)	*** (+)	(–)	(+)
Hf^3	(–)	** (–)	(+)	*** (+)	** (+)	*** (+)	(–)	(+)
Hf^4	(–)	** (–)	(+)	*** (+)	** (+)	*** (+)	(–)	(+)
Dynamic GMM								
Hd^1	(–)	(–)	(+)	*** (+)	** (+)	*** (+)	(+)	(+)
Hd^2	* (–)	(–)	(+)	*** (+)	(+)	*** (+)	(+)	(+)
Hd^3	(–)	** (–)	(+)	*** (+)	** (+)	*** (+)	(–)	(+)
Hd^4	(–)	** (–)	(+)	*** (+)	** (+)	*** (+)	(–)	(+)

Note: [a] LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. Off-balance sheet activity is measured by off-balance sheet items over total assets. Bank lending is proxied by net loans over total assets. Hb^1 to Hd^4 correspond four specifications of H-statistics (Table 5.1) estimated by three different models, pooled OLS, fixed-effects GLS (applied to equation 5.1) and dynamic GMM (applied to equation 5.3), in the first stage. In the second stage, two models are applied: robust OLS and random-effects GLS (equation 5.4). For detailed results please see the Appendix A5.3a to A5.3f. (+) means the coefficients bear the positive sign, (-) negative. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

In contrast, bank loans as measured by the ratio of net loans to total assets, show a positive relationship with risk indicators (except for loan-loss reserves) (Table 5.16). Bank loans are statistically correlated with ROA volatility and loan-loss provisions at the significance level of 1% at strongest and 5% at weakest. The results imply that banks with higher volumes of lending tend to face higher level of risk.

Turning to the level of foreign ownership in individual banks proxied by the foreign equity ownership variable, Table 5.17 shows that foreign share is positively correlated with loan-loss reserves (statistically significant at the 1% level) and ROA volatility (not significant). However, the sign on coefficients between foreign share and loan-loss provisions is negative (not significant). The coefficients of the Z-index are positive and consistent with those of loan-loss provisions given higher Z-index inferring lower risk.

Table 5.17. *Summarized results on foreign ownership and risk*

	Second-stage regression							
	LLR		LLP		ROA		Z-index	
First-stage H-statistic	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS
Pooled OLS								
Hb^1	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Hb^2	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Hb^3	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Hb^4	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Fixed-effects GLS								
Hf^1	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Hf^2	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Hf^3	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Hf^4	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Dynamic GMM								
Hd^1	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Hd^2	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Hd^3	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)
Hd^4	*** (+)	(+)	(–)	(–)	(+)	(+)	(+)	(+)

Note: LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. Foreign ownership is the percentage of share owned by foreign partner(s) in a bank. Hb^1 to Hd^4 correspond four specifications of H-statistics (Table 5.1) estimated by three different models, pooled OLS, fixed-effects GLS (applied to equation 5.1) and dynamic GMM (applied to equation 5.3), in the first stage. In the second stage, two models are applied: robust OLS and random-effects GLS (equation 5.4). For detailed results please see the Appendix A5.3a to A5.3f. (+) means the coefficients bear the positive sign, (-) negative. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

The results may suggest that banks with higher foreign ownership reserve more for loan losses and are likely to have more volatile returns. Meanwhile, there is weak evidence that foreign partners help to improve credit screening and monitoring leading to lower credit risk proxied by loan-loss provisions. The Z-index exhibits the similar picture to that of loan-loss provisions, implying that banks with higher foreign share tend to be less risky. This can be explained as the high volatility of ROA, associated with banks of higher foreign ownership is offset by their high ROA and capital levels, the two latter components as the numerators of Z-ratio, leading to less risk measured by the Z-index (Table 5.17).

5.4.5.4. *Bank concentration, regulation, inflation and risk.*

Concerning variables that capture the cross-country differences in macroeconomic conditions, we find that the concentration ratio proxied by the three biggest banks' assets over total banking assets (obtained from Beck et al., 2000) is negatively (positively for Z-index) and statistically correlated to banks risk in most estimates (Table 5.18). The results imply that banks in more concentrated systems appear to take-on less risk, a finding consistent with Beck et al. (2006). Using a completely different approach to the one presented in our paper, the aforementioned authors use a sixty-nine-country sample and date the occurrence of country crisis as a proxy for risk. They find that the probability of bank failure is more likely to happen in countries with less concentrated banking systems.

The same effects of both competition, measured by the H-statistic, and concentration on bank risk again cast certain doubts on the traditionally expected link between concentration and competition. There are several studies that use the concentration ratios to measure competition based on the grounds that more concentrated banking system could create collusion among banks and, subsequently, be less competitive. If the concentration-competition relationship is negative, one would expect that concentration and competition affect bank risk in an opposite direction. However, as our results show, concentration and competition impact on risk in the same way: both of them reduce risk. This implies that concentration may not be an appropriate measure of competition or their relationship could be different depending on regulation as suggested by the contestable market theory.

Table 5.18. *Summarized results on concentration and risk*

	Second-stage regression							
	LLR		LLP		ROA		Z-index	
First-stage H-statistic	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS
Pooled OLS								
Hb^1	*** (–)	(–)	* (–)	(–)	*** (–)	*** (–)	** (+)	** (+)
Hb^2	*** (–)	(–)	* (–)	(–)	*** (–)	*** (–)	** (+)	** (+)
Hb^3	*** (–)	(–)	(–)	(–)	*** (–)	*** (–)	** (+)	** (+)
Hb^4	*** (–)	(–)	(–)	(–)	*** (–)	*** (–)	*** (+)	** (+)
Fixed-effects GLS								
Hf^1	*** (–)	(–)	(–)	(–)	*** (–)	*** (–)	*** (+)	** (+)
Hf^2	*** (–)	(–)	(–)	(–)	*** (–)	*** (–)	** (+)	** (+)
Hf^3	*** (–)	(–)	(–)	(–)	*** (–)	*** (–)	** (+)	** (+)
Hf^4	*** (–)	(–)	(–)	(–)	*** (–)	*** (–)	** (+)	** (+)
Dynamic GMM								
Hd^1	*** (–)	*** (+)	(+)	(+)	*** (–)	(+)	(+)	(+)
Hd^2	*** (–)	*** (+)	(+)	(+)	*** (–)	(+)	*** (+)	(+)
Hd^3	*** (–)	(–)	(+)	(+)	*** (–)	*** (–)	** (+)	** (+)
Hd^4	*** (–)	(–)	(–)	(–)	*** (–)	*** (–)	** (+)	** (+)

Note: LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. Concentration is measured by the three largest banks' assets to total banking assets. Hb^1 to Hd^4 correspond four specifications of H-statistics (Table 5.1) estimated by three different models, pooled OLS, fixed-effects GLS (applied to equation 5.1) and dynamic GMM (applied to equation 5.3), in the first stage. In the second stage, two models are applied: robust OLS and random-effects GLS (equation 5.4). For detailed results please see the Appendix A5.3a to A5.3f. (+) means the coefficients bear the positive sign, (-) negative. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

Contrary to concentration, regulatory restrictions are positively related to risk-taking in banking (Table 5.19). This positive connection is significant in most cases at the 1% level. The results suggest that banks in more restricted systems tend to be involved in greater risk-taking activities, being consistent with Gonzalez's (2005) evidence on 251 banks in 36 countries over the 1995 and 1999 period. This finding supports the view in favour of policies that remove banking activity barriers to foster competition. The opposite effects of regulation and competition on risk are expected because less restricted banking sectors tend to be more competitive.

Table 5.19. *Summarized results on regulation restrictions and risk*

	Second-stage regression							
	LLR		LLP		ROA		Z-index	
First-stage H-statistic	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS
Pooled OLS								
Hb^1	*** (+)	** (+)	*** (+)	* (+)	*** (+)	*** (+)	*** (–)	*** (–)
Hb^2	*** (+)	** (+)	*** (+)	* (+)	*** (+)	*** (+)	*** (–)	*** (–)
Hb^3	*** (+)	** (+)	*** (+)	(+)	*** (+)	*** (+)	*** (–)	*** (–)
Hb^4	*** (+)	** (+)	*** (+)	(+)	*** (+)	*** (+)	*** (–)	*** (–)
Fixed-effects GLS								
Hf^1	*** (+)	*** (+)	*** (+)	* (+)	*** (+)	*** (+)	*** (–)	*** (–)
Hf^2	*** (+)	* (+)	*** (+)	(+)	*** (+)	*** (+)	*** (–)	*** (–)
Hf^3	*** (+)	** (+)	*** (+)	* (+)	*** (+)	*** (+)	*** (–)	*** (–)
Hf^4	*** (+)	** (+)	*** (+)	(+)	*** (+)	*** (+)	*** (–)	*** (–)
Dynamic GMM								
Hd^1	n.a	*** (–)	n.a	(–)	n.a	(–)	n.a	(+)
Hd^2	n.a	*** (+)	n.a	(+)	n.a	*** (+)	n.a	* (–)
Hd^3	(+)	(–)	(–)	(–)	*** (+)	(+)	** (–)	* (–)
Hd^4	(+)	(+)	(–)	(–)	*** (+)	(+)	* (–)	(–)

Note: LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. Regulation restrictions include bank activity restrictions, banking entry requirements and diversification; a higher score reflects a more restricted banking sector (for details, see the Appendix A3.1). Hb^1 to Hd^4 correspond four specifications of H-statistics (Table 5.1) estimated by three different models, pooled OLS, fixed-effects GLS (applied to equation 5.1) and dynamic GMM (applied to equation 5.3), in the first stage. In the second stage, two models are applied: robust OLS and random-effects GLS (equation 5.4). For detailed results please see the Appendix A5.3a to A5.3f. (+) means the coefficients bear the positive sign, (-) negative. N.a means non-applicable because regulation variable is dropped in the relative estimates due to severe multicollinearity. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

Regarding interest rate, as shown in Table 5.20, banks in countries with higher real interest rates tend to face lower probability of failure. Statistically, bank-risk indicators are strongly and negatively correlated with real interest rates. This may imply that banks in countries with higher inflation rate are more prone to risk. The results support the findings by Beck et al. (2006), who studied on a sixty-nine-country sample.

Table 5.20. *Summarized results on real interest rates and risk*

	Second-stage regression							
	LLR		LLP		ROA		Z-index	
First-stage H-statistic	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS	Robust OLS	Random-effects GLS
Pooled OLS								
Hb^1	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(–)	(–)
Hb^2	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(–)	(–)
Hb^3	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(+)	(–)
Hb^4	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(+)	(–)
Fixed-effects GLS								
Hf^1	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(+)	(+)
Hf^2	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(+)	(+)
Hf^3	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(–)	(–)
Hf^4	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(+)	(+)
Dynamic GMM								
Hd^1	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(+)	(+)
Hd^2	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(+)	(+)
Hd^3	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(+)	(+)
Hd^4	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	*** (–)	(+)	(+)

Note: LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. Real interest rate is real interest lending rate. Hb^1 to Hd^4 correspond four specifications of H-statistics (Table 5.1) estimated by three different models, pooled OLS, fixed-effects GLS (applied to equation 5.1) and dynamic GMM (applied to equation 5.3), in the first stage. In the second stage, two models are applied: robust OLS and random-effects GLS (equation 5.4). For detailed results please see the Appendix A5.3a to A5.3f. (+) means the coefficients bear the positive sign, (-) negative. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

In another aspect, the time dummy coefficients (displayed in Table 5.21) seem to suggest that risk in the banking sectors follows a declining trend over the period 1998 to 20004 in South East Asia. The sign on the significant coefficients between years and risk is negative mostly for loan-loss reserves, loan-loss provisions and ROA volatility and positive for the Z-index[12]. On average, the significant coefficients reveal that loan-loss reserves and loan-loss provisions decline by 5% and 7% annually, respectively (details are in the Appendix A5.3a to A5.3f). Bank (net) return on assets is also less volatile by 5% year by year. Given the negative influence of competition on risk, it could be inferred that competition has become more intense during the period of study irrespective of the consolidation process that has taken place in all countries since 1998 (Bank Indonesia, Annual Report, 2000, p. 98 and 2001, p. 149; Bank Negara Malaysia, Annual Report, various issues, from 2000 to 2005; Bank of Thailand, Annual Report, 1998 and 1999; Chua, 2003; Matthews & Ismail, 2006; State Bank of Vietnam, Annual Report, 2002).

[12] Only one year, 1999, often shows positive and significant relationship with most risk indicators

Table 5.21. *The tendency of competition and risk in South East Asia 1998-2004*

Second-stage: Four risk indicators are regressed against twelve H-statistics by two modellings		First-stage: H-statistics from three modellings and four specifications											
		Pooled OLS				Fixed-effects GLS				Dynamic GMM			
		Hb^1	Hb^2	Hb^3	Hb^4	Hf^1	Hf^2	Hf^3	Hf^4	Hd^1	Hd^2	Hd^3	Hd^4
LLR	Robust OLS	*** (–) (2002, 2003, 2004)	*** (–) (2002, 2003, 2004)	*** (–) (2002, 2003, 2004)	*** (–) (2002, 2003, 2004)	*** (–) (2002, 2003, 2004)	*** (–) (2002, 2003, 2004)	*** (–) (2002, 2003, 2004)	*** (–) (2002, 2003, 2004)	*** (–) (**2002, 2003, 2004)	*** (–) (2002, 2003, 2004)	*** (–) (2002, 2003, 2004)	*** (–) (2002, 2003, 2004)
	Random-effects GLS	*** (–) 2004	*** (–) 2004	*** (–) 2004	*** (–) 2004	(–) (**2003, ***2004)	(–) (*2002, **2003, ***2004)	(–) (**2003, ***2004)	(–) (*2002, **2003, ***2004)	** (–) 2004	*** (–) 2004	(–) (**2003, ***2004)	(–) (*2001, **2003, ***2004)
LLP	Robust OLS	*** (–) (2000, 2002, 2004)	*** (–) (2000, 2002, 2004)	*** (–) (2000, 2002, 2004)	*** (–) (2000, 2002, 2004)	** (–) (***2002, 2003, 2004)	** (–) (***2002, 2003, 2004)	** (–) (***2002, 2003, 2004)	** (–) (***2002, 2003, 2004)	(–) (***2002, **2003, *2004)	(–) (***2002, **2003, *2004)	** (–) (***2002, 2003, 2004)	** (–) (***2002, 2003, 2004)
	Random-effects GLS	** (–) -2002	** (–) -2002	** (–) 2002	** (–) 2002	** (–) 2002	* (–) (2000, 2002)	** (–) 2002	* (–) 2002	* (–) 2000	* (–) 2000	* (–) (2000, 2002)	* (–) 2002
ROA	Robust OLS	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000- 2004)	*** (–) (2000- 2004)	*** (–) (2000- 2004)	*** (–) (2000- 2004)
	Random-effects GLS	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000-2004)	*** (–) (2000, 2001, *2002, *2003, 2004)	*** (–) (2000, 2001, *2002, *2003, 2004)	*** (–) (2000-2004)	*** (–) (2000-2004)
Z-index	Robust OLS	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)
	Random-effects GLS	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000-2004)	*** (+) (2000, 2001, **2002, 2003, 2004)	*** (+) (2000, 2001, **2002, 2003, 2004)	*** (+) (2000-2004)	*** (+) (2000-2004)

Note: LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. Hb^1 to Hd^4 correspond four specifications of H-statistics (Table 5.1) estimated by three different models, applied to equations (5.1) and (5.3) in the first stage. In the second stage, robust OLS and random-effects GLS are used to apply to equation (5.4). Figures are the years. For detailed results please see the Appendix A5.3a to A5.3f. (+) means the coefficients bear the positive sign, (-) negative. * Significant at 0.1 level, ** Significant at 0.05 level and *** Significant at 0.01 level.

5.4.5.5. *Loan-loss reserves and risk.*

Higher loan-loss reserves are assumed to be associated with greater risk-taking in banking. However, loan-loss reserves are stock items which bank managers may determine the timing at their discretion to save regulatory costs (Altunbas et al., 2007). Loan-loss reserves simply reflect expected losses, not actual losses that have already occurred. Therefore, banks with more loan-loss reserves may likely to face lower risks because excessively reserved banks cover losses better.

Our regression results above (Sections 5.4.5.2 and 5.4.5.3) show some evidence that the expected positive relationship between loan-loss reserves and risk does not always hold. For example, size measured by bank assets is found to be positively and significantly correlated with risk proxied by loan-loss provisions (Table 5.13). The coefficients are negative for the Z-index and positive for ROA volatility. Nevertheless, in estimates applying random-effects GLS, the same coefficients are negative and significant between bank assets and loan-loss reserves (Table 5.13, column 3, from left). If one expects that more loan-loss reserves are associated with higher risks, this negative relationship may suggest that bigger bank face less risk. However, by using alternative risk indicators to check for consistency, loan-loss reserves appear to be less consistent than other risk measures.

The second example concerns bank lending proxied by net loans over total assets. Bank loans show a positive and strongly significant relationship with bank risk measured by both ROA volatility and loan-loss provisions (Table 5.16, columns 5, 6 and 7 from left). The results conflict with Altunbas et al. (2007), who found that banks with higher lending volume face lower levels of risk. However, when coefficients between bank net loans and loan-loss reserves are observed (Table 5.16, columns 2 and 3 from left), banks loans are negatively and significantly correlated with risks and this is consistent with Altunbas et al. (2007) who also used loan-loss reserves to proxy for risk due to data unavailability. Since loan-loss provisions are flowing items, reflecting actual losses incurred and ROA volatility captures risk beyond loan-by-loan basis, we believe that the positive and significant relationship between loans and risk measured by these two indicators is more reliable.

So, the evidence seems to suggest that higher loan-loss reserves reflect lower level of risk in banks rather than the opposite as usually presumed.

5.5. Conclusions

In this paper, the relationship between competition and risk in banking has been investigated using a sample of commercial banks from four South East Asian countries during the period 1998 to 2004.

The non-structural approach is followed to measure banking sector competition in South East Asia. Specifically, the H-statistic developed by Panzar and Rosse (1987) is estimated to proxy for market competition. Risk is measured by four alternative indicators ranging from loan-loss reserves, loan-loss provisions, ROA volatility to the Z-index.

The results from our regressions show that the H-statistic is negatively and significantly correlated with risk indicators in most cases. Our main finding, therefore, is that competition does not increase bank risk-taking behaviour and the results appear robust to different model specifications, estimation approaches and variable construction.

Besides this major finding, we also found that concentration is negatively correlated to bank risk suggesting that more concentrated banking systems are less prone to systemic risk. The negative influence of both competition and concentration on bank risk-taking perhaps suggests that banks in concentrated systems pursue a 'quiet life'. Regulatory restrictions are also found to positively affect bank risk.

Overall, the present paper contributes to the literature in two main regards. Firstly, this is one of the first studies to estimate the H-statistic using dynamic panel estimators to compare the competitive environment in banking markets. The application of the dynamic panel approach allows us to eliminate one critical assumption, long-run equilibrium, underlying the traditional estimation of the H-statistic as suggested by Goddard and Wilson (2006). The violation of the long-run equilibrium condition, which exists in two countries in our sample, could reduce the reliability of H-statistic estimated by static models such as fixed-effects. The application of dynamic model, as suggested by Goddard and Wilson (2006), also produces unbiased H-statistics compared with those derived from static OLS and fixed-effects GLS approaches. Secondly, as far as we are aware, this is the first paper that has examined the relationship between competition and risk in South East Asian banking systems.

5.5.1. *Limitations*

Our study has three main limitations. Firstly, the estimation of the H-statistic is conducted on a country-level basis; one country has one H-statistic throughout the years 1998 and 2004. So, basically, a sample of four countries only produces four values of H-

statistic. This may limit the strength of our conclusion about the relationship between competition and risk found in this paper. Because yearly estimates of the H-statistic may yield erratic results due to small bank sample sizes, future research should seek to develop larger bank databases to enable more accurate yearly estimates of H values for these countries.

Secondly, even though several risk indicators are used in our paper, all of these are accounting variables (or constructed from accounting values) that can be subject to the criticism that they are all backward looking. In the future, similar analysis could be applied to publicly-listed banks where risk is measured using market values.

Thirdly, our regression estimates do not control for one factor that could affect bank risk-taking behaviour, namely the introduction and features of country deposit insurance schemes. This could be examined in future work on risk-competition issues in banking.

5.5.2. *Policy Implications*

There is evidence that excessive competition can place banking systems in a vulnerable position (Dick, 2006; Keeley, 1990; Rhoades & Rutz, 1982). This raises a major concern for policy makers because if the aforementioned relationship holds in their banking markets they will need to counterbalance the undesirable outcomes of competition with the benefits that competition can achieve. Liberalization of the financial sector leads to a removal of barriers and restrictions which should lead to a more competitive environment. If there is a trade-off between competition and financial stability, regulators face conflicting policies: competition-oriented or stability-oriented.

The findings of our paper, however, suggest that in the South East Asian banking systems of Indonesia, Malaysia, Philippines and Vietnam there is no such trade-off as enhanced competition appears to reduce risk, therefore, enhancing financial stability.

Furthermore, our results also suggest that concentrated nature of banking systems and the ongoing consolidation trend in South East Asia do not necessarily influence the competitive environment adversely. It also appears that the general liberalization programme, through the removal of banking restrictions, has helped to enhance competition in South East Asian banking systems between 1998 and 2004 and this has ultimately lowered banking sector risk.

Chapter 6

OVERALL CONCLUSIONS

This final section presents a summary of the thesis. For each essay, the main results are highlighted and the limitations and major contributions outlined. Areas for extending the research are also suggested together with possible policy implications.

6.1. Deregulation and Bank Efficiency

The first essay, presented in chapter 3, examines the determinants of bank efficiency in Indonesia, Malaysia, Philippines, Thailand and Vietnam. We provide evidence that deregulation does not always improve the level of bank efficiency, at least in the short-run. In particular, the efficiency of banks in the region, over 1998 to 2004, appears to have declined. Also, there are gaps in efficiency among banks belonging to different ownership categories. Those with majority foreign ownership are found to be the most efficient. However, state-owned banks are more efficient than their local private sector counterparts. On the other hand, equity capital and banking sector development show significant relationships with bank efficiency. Specifically, efficient banks in South East Asia tend to hold higher levels of capital and those in countries with higher levels of intermediation (to the private sector) are more efficient.

This essay has contributed to the extant literature by enriching the limited number of studies that use a cross-country sample to analyse bank efficiency issues in the East Asian region. It is the first, as far as we are aware, that includes data on banks in Vietnam. In addition, the available ownership structure allows us to examine the effects of ownership on bank efficiency using a dynamic specification (yearly percentage of foreign stakes) rather than the usual dummy variable basis.

In terms of policy implications, evidence of a significant decline in efficiency, following various reform efforts after 1998 in South East Asia reminds policy makers that deregulatory programmes may take a while to feed through into improved financial sector performance. Efficiency gains may not materialise rapidly and perhaps, therefore, long-term commitments to deregulation may be necessary. Secondly, the positive link between bank capital and efficiency suggest that enhancing capital adequacy appears necessary both for efficiency improvements as well as a risk cushion. Thirdly, at the country-level, credit granted to the private sector also indicates a positive connection with efficiency, proposing that lending to the private sector should be encouraged. However, the fact that superior efficiency associated with state-owned banks (compared to local private banks) may be a result of implicit government subsidies show the necessity to reduce government ownership in the banking sector through possible future privatization programmes.

One of the main limitations of this essay relates to the data sample. Given the small population of banks in the countries under study this meant we had to include some banks that had quite diverse production features. The existence of a broad variety of banks in the sample therefore may well have created outliers even though inputs and outputs were scaled by assets to limit excessive influence. Another limitation relates to the methodological approach adopted. The basic DEA model used in the first stage of the estimations does not capture the existence of slacks and the risk-taking behaviour of bank managers which may exert considerable impact on the quantity and quality of outputs.

Future analysis could be expanded by estimating bank efficiency in South East Asia using alternative estimation approaches, such as advanced DEA techniques (that allow users to deal with slacks and/or risk-taking) and/or parametric techniques such as stochastic frontier analysis to test for consistency of the estimates (although larger data sets would need to be made more publicly available). Also, these two techniques could be used to analyse productivity change in the respective banking systems.

6.2. Motivations for Foreign Bank Entry

From the perspective of host developing countries, the second essay, presented in chapter 4, is an attempt to analyse the reasons for banks to expand their operations in developing economies. In order to purely focus on the motivations of banking firms, only banks whose (10%) stakes are owned by foreign banks are selected for the study, those that are owned by non-banks are excluded. We identify around 90 foreign banks operating in South East Asia on this basis over the period 1998 to 2004.

We test two alternative hypotheses as to why banks go overseas. The first hypothesis relates to the customer-following strategy where banks are assumed to expand overseas to serve their home multinational clients, and the second is the profit-exploiting hypothesis where banks are expected to go abroad because of local business opportunities. Our results show that there is little evidence for the customer-following motive. In contrast, local business opportunities appear to be the prominent factors in attracting foreign bank entry in the region.

The main limitation of this essay relates to our sample and involves the dominant ownership form of entry associated with specific countries. This may cause bias towards the motivations of the specific organizational form. For example, foreign bank subsidiaries and branches are more common in Malaysia and Vietnam while joint-ventures are more popular in Indonesia. In Thailand, on the other hand, acquisition is the most commonly

used form of foreign entry. Different forms of operation, to a certain extent, have been controlled for by regulatory restrictions and dummy variables for organizational types in our estimation. However, available regulation indexes lag behind the changes in regulation concerning foreign bank entry. Secondly, the fact that we did not have the full population of banks in our sample, to a certain extent, may limit the findings of our analysis.

While bearing in mind the aforementioned limitations, the paper contributes to the literature on the following fronts. Firstly, this paper is one of the few studies that investigate foreign bank entry on a multi-home and host developing countries basis. Secondly, on a methodological front, the paper is the only study to apply new panel estimation approaches, namely dynamic panel GMM, to foreign bank entry issues. Thirdly, the paper is one of the first that uses bank-level foreign shares to measure foreign bank presence. The usage of shares is believed to better reflect foreign entry that might be motivated by the relaxation of foreign bank limits on ownership.

The empirical research could be expanded by examining causal relationships that explain bank entry as our main finding suggests that banks sometimes lead corporate customers (by exploiting business opportunities corporations follow banks into new markets). Granger causality techniques could be applied to investigate such relationships in later research.

Regarding policy implications, our results suggest that offering opportunities for foreign banks to make profits, providing tax incentives, for instance, may be helpful in attracting foreign participation and ultimately boosting competition. This is because foreign entrants are found to be incentivised by local business opportunities rather than determined by pre-existing relationships with their home customers. In addition, in searching for profits, foreign banks may concentrate on market segments which generate greater earnings. As a result, competition could become intense in some product segments but produce limited effects in others. Policy makers, therefore, could perhaps orient the activities of foreign banks towards market niches where competition is needed and divert foreign banks away from segments where competition has become excessive.

6.3. Competition and Bank Risk-Taking Behaviour

The trade-off between competition and financial stability has long concerned policy makers. If excessive competition leads to higher levels of bank risk, as suggested by one strand of the literature, there should be a trade-off between competition, which acts to boost efficiency, and the soundness and safety of the financial sector. The third essay,

presented in chapter 5, explores the relationship between competition and bank risk-taking incentives for commercial banks in Indonesia, Malaysia, Philippines and Vietnam over the period 1998 to 2004. Employing the Panzar-Rosse H-statistic to measure competition using bank-level data and various accounting measures of risk, we show that there does not appear to be a trade-off between competition and a stable financial system. In contrast, competition reduces systemic risk by lowering individual banks' incentives to take-on risk. Furthermore, concentration is also found to lessen bank risk. The negative influence of both competition and concentration on bank risk-taking illustrates the limitations of the use of structural measures (concentration indexes) to infer competitive conditions.

The first limitation of this paper relates to the relatively time invariant H-statistic in a sample of four countries. Since the H-statistic is estimated on a country basis, each country is associated with one H value; the conclusion about the adverse impact of competition on risk is not strong. Secondly, even though various risk indicators have been used to measure risk in our study, all of them are accounting ratios or constructed from accounting values which are backward looking.

Therefore, in future analysis, larger datasets (including more quoted banks) could be constructed to draw stronger conclusions about the competition-stability nexus, and in particular market risk measures (volatility of stock returns, for instance) could be used as a further robustness check. In addition, further investigation into the relationship between competition and concentration may yield new insights given the recent rapid consolidation process.

Overall, the main contribution of the third paper is that it estimates the Panzar-Rosse H-statistic using a dynamic panel GMM approach. The application of the dynamic approach allows us to eliminate one critical assumption in interpreting the H-statistic: the assumption of long-run equilibrium, as argued by Goddard and Wilson (2006).

The empirical evidence also has interesting policy implications. Based on our findings policy makers should not be worried about the negative influence of competition policy on financial stability. In contrast, competition could be considered as one policy that shoots two targets: improving efficiency and lowering systemic risk. Besides, concentration that may result from the consolidation process in South East Asia does not necessarily impair competition because both concentration and competition negatively affect bank risk.

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Appendixes

A3.1. Survey on regulatory environment in banking

Variable	Definition	Source and Quantification	World Bank Guide Questions
1. Bank Activity Restrictions			
(a) Securities Activities	The extent to which banks may engage in underwriting, brokering and dealing in securities, and all aspects of the mutual fund industry.	OCC and WBG 4.1 (higher values, more restrictive) Unrestricted = 1 = full range of activities can be conducted directly in the bank; Permitted = 2 = full range of activities can be conducted, but some or all must be conducted in subsidiaries; Restricted = 3 = less than full range of activities can be conducted in the bank or subsidiaries; and Prohibited = 4 = the activity cannot be conducted in either the bank or subsidiaries.	4.1 What is the level of regulatory restrictiveness for bank participation in securities activities (the ability of banks to engage in the business of securities underwriting, brokering, dealing, and all aspects of the mutual fund industry)?
(b) Insurance Activities	The extent to which banks may engage in insurance underwriting and selling.	OCC and WBG 4.2 (higher values, more restrictive) Unrestricted = 1 = full range of activities can be conducted directly in the bank; Permitted = 2 = full range of activities can be conducted, but some or all must be conducted in subsidiaries; Restricted = 3 = less than full range of activities can be conducted in the bank or subsidiaries; and Prohibited = 4 = the activity cannot be conducted in either the bank or subsidiaries.	4.2 What is the level of regulatory restrictiveness for bank participation in insurance activities (the ability of banks to engage in insurance underwriting and selling)?
(c) Real Estate Activities	The extent to which banks may engage in real estate investment, development and management.	OCC and WBG 4.3 (higher values, more restrictive) Unrestricted = 1 = full range of activities can be conducted directly in the bank; Permitted = 2 = full range of activities can be conducted, but some or all must be conducted in subsidiaries; Restricted = 3 = less than full range of activities can be conducted in the bank or subsidiaries; and Prohibited = 4 = the activity cannot be conducted in either the bank or subsidiaries.	4.3 What is the level of regulatory restrictiveness for bank participation in real estate activities (the ability of banks to engage in real estate investment, development, and management)?
2. Banking entry requirements			
(a) Entry into Banking Requirements	Whether various types of legal submissions are required to obtain a banking license.	WBG 1.8.1 -1.8.8 Yes = 1; No = 0 Higher values indicating greater stringency.	1.8 Which of the following are legally required to be submitted before issuance of the banking license? 1.8.1 Draft by-laws? Yes / No 1.8.2 Intended organization chart? Yes / No 1.8.3 Financial projections for first three years? Yes / No 1.8.4 Financial information on main potential shareholders? Yes / No 1.8.5 Background/experience of future directors? Yes / No 1.8.6 Background/experience of future managers? Yes / No 1.8.7 Sources of funds to be disbursed in the capitalization of new banks? Yes / No 1.8.8 Market differentiation intended for the new bank? Yes / No

A3.1 (cont.) Survey on regulatory environment in banking

Variable	Definition	Source and Quantification	World Bank Guide Questions
3. Capital Regulatory Requirements			
(a) Overall Capital Stringency	Whether the capital requirement reflects certain risk elements and deducts certain market value losses from capital before minimum capital adequacy is determined.	WBG 3.1.1 + 3.3 + 3.9.1 + 3.9.2 + 3.9.3 + (1 if 3.6 < 0.75) Yes = 1; No = 0 Higher values indicating greater stringency.	3.1.1 Is the minimum capital-asset ratio requirement risk weighted in line with the Basel guidelines? Yes / No 3.3 Does the minimum ratio vary as a function of market risk? Yes / No 3.9.1 Are market value of loan losses not realized in accounting books deducted? Yes / No 3.9.2 Are unrealized losses in securities portfolios deducted? Yes / No 3.9.3 Are unrealized foreign exchange losses deducted? Yes / No 3.6 What fraction of revaluation gains is allowed as part of capital?
(b) Initial Capital Stringency	Whether certain funds may be used to initially capitalize a bank and whether they are officially verified.	WBG 1.5: Yes = 1, No = 0: WBG 1.6&1.7: Yes=0, No=1. Higher values indicating greater stringency.	1.5 Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? Yes / No 1.6 Can the initial disbursement or subsequent injections of capital be done with assets other than cash or government securities? Yes / No 1.7 Can initial disbursement of capital be done with borrowed funds? Yes / No
(c) Capital Regulatory Index	The sum of (a) and (b).	(a) + (b) Higher values indicate greater stringency.	
4. Diversification Index			
(a) Diversification Index	Whether there are explicit, verifiable, quantifiable guidelines for asset diversification, and banks are allowed to make loans abroad.	WBG 7.1 + (7.2 - 1) * (-1) Yes = 1; No = 0 Sum of these assigned values, with higher values indicating more diversification.	7.1 Are there explicit, verifiable, and quantifiable guidelines regarding asset diversification? Yes / No 7.2 Are banks prohibited from making loans abroad? Yes / No
5. Official Supervisory Independence			
(a) Independence of Supervisory Authority-Political	The degree to which the supervisory authority is independent within the government from political influence.	WBG 12.2, 12.2.1 and 12.2.2 1 = low independence; 2 = medium independence; 3 = high independence	12.2 To whom are the supervisory bodies responsible or accountable? 12.2.1 How is the head of the supervisory agency (and other directors) appointed? 12.2.2 How is the head of the supervisory agency (and other directors) removed?
(b) Independence of Supervisory Authority - Banks	The degree to which the supervisory authority is protected by the legal system from the banking industry.	WBG 12.14 Yes=0; No=1	12.14 Are supervisors legally liable for their actions?
(c) Independence of Supervisory Authority – Overall	The degree to which the supervisory authority is independent from the government and legally protected from the banking industry.	WBG (b) + (c) Higher values signify greater independence	

A3.1 (cont.) Survey on regulatory environment in banking

Variable	Definition	Source and Quantification	World Bank Guide Questions
6.Private Monitoring Index			
(a) Certified Audit Required	Whether there is a compulsory external audit by a licensed or certified auditor.	WBG 5.1 * 5.3 (Yes = 1; No = 0)	5.1 Is an external audit a compulsory obligation for banks? Yes / No 5.3 Are auditors licensed or certified? Yes / No
(b) Percent of 10 Biggest Banks Rated by International Rating Agencies	The percentage of the top ten banks that are rated by international credit rating agencies.	WBG 10.7.1 (percent)	10.7.1 What percent of the top ten banks are rated by international credit rating agencies (e.g., Moody's, Standard and Poor)?
(c) No Explicit Deposit Insurance Scheme	Whether there is an explicit deposit insurance scheme and, if not, whether depositors were fully compensated the last time a bank failed.	WBG 1 if 8.1 = 0 and 8.4 = 0; 0 otherwise Yes =1; No =0 Higher values indicate more private supervision	8.1 Is there an explicit deposit insurance protection system? Yes / No 8.4 Were depositors wholly compensated (to the extent of legal protection) the last time a bank failed? Yes / No
(d) Bank Accounting	Whether the income statement includes accrued or unpaid interest or principal on nonperforming loans and whether banks are required to produce consolidated financial statements.	WBG (10.1.1 - 1)*(-1) + 10.3 + 10.6 Yes=1; No=0 Sum of assigned values, with higher values indicating more informative bank accounts.	10.1.1 Does accrued, though unpaid interest/principal enter the income statement while the loan is still non-performing? 10.3 Are financial institutions required to produce consolidated accounts covering all bank and any non-bank financial subsidiaries? 10.6 Are bank directors legally liable if information disclosed is erroneous or misleading?
(e) Private Monitoring Index	Whether (a) occurs, (b) equals 100%, (c) occurs, (d) occurs, off-balance sheet items are disclosed to the public, banks must disclose risk management procedures to the public, and subordinated debt is allowable (required) as a part of regulatory capital	WBG (a) + [1 if (b) equals 100%; 0 otherwise] + (c) + (d) + 10.4.1 + 10.5 + 3.5 Yes = 1; No = 0 Higher values indicating more private supervision.	10.4.1 Are off-balance sheet items disclosed to the public? Yes / No 10.5 Must banks disclose their risk management procedures to the public? Yes / No 3.5 Is subordinated debt allowable (required) as part of capital? Yes / No

Note: Adapted from the first survey on regulatory, supervisory and deposit insurance variables conducted in 2000 by Barth, Caprio and Levine (2006). OCC and WBG stand for Office of the Comptroller of the Currency and World Bank Guide, respectively. For further details, please see Barth, Caprio and Levine (2004) and Barth, Caprio and Levine (2006). Regulation index for the paper 1, presented in chapter 3, includes (1) Bank activity restrictions + (2) Banking entry requirements + (3) Capital regulatory requirements – (4) Diversification – (5) Independence of the supervisory authority – (6) Private monitoring index. For paper 2, presented in chapter 4, regulation index includes (1) Bank activity restrictions + (2) Banking entry requirements – (3) Diversification – (4) Independence of the supervisory authority. For paper 3, presented in chapter 5, regulation index is (1) Bank activity restrictions + (2) Banking entry requirements – (3) Diversification. The selection of the component indexes based on assumptions of the most influential type of regulatory restriction to the issues under study in each separate paper; however, it is more decisive by random choice.

A3.2. Determinants of *technical* efficiency in South East Asia 1998-2004
(Under different specifications of inputs and outputs)

	Technical efficiency as the dependent variable			
Independent variables	Model F1A	Model F1B	Model F1C	Model F1D
Size	0.198	0.486***	-0.126	0.249
	(0.171)	(0.156)	(0.182)	(0.163)
Profit	-0.145*	-0.126	-0.152***	-0.058
	(0.085)	(0.078)	(0.091)	(0.082)
Capital	0.452***	0.524***	0.425***	0.468***
	(0.058)	(0.054)	(0.062)	(0.056)
Bank private credit	0.112***	0.148***	0.132***	0.162***
	(0.040)	(0.037)	(0.043)	(0.038)
Regulation	-0.021***	-0.026***	-0.012**	-0.019***
	(0.006)	(0.005)	(0.006)	(0.006)
Economic growth	0.017***	0.012***	0.023***	0.015***
	(0.004)	(0.003)	(0.004)	(0.003)
Inflation	-0.001	-0.001	-0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Country-level of state ownership	0.002	0.003***	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Foreign ownership dummy	0.053**	0.057**	0.048*	0.051**
	(0.024)	(0.022)	(0.026)	(0.023)
Private ownership dummy	-0.088***	-0.082***	-0.085***	-0.078***
	(0.022)	(0.020)	(0.023)	(0.021)
Year 1999	-0.186***	-0.128***	-0.233***	-0.144***
	(0.038)	(0.034)	(0.040)	(0.036)
Year 2000	-0.223***	-0.107***	-0.270***	-0.107***
	(0.043)	(0.039)	(0.046)	(0.041)
Year 2001	-0.130***	-0.058*	-0.179***	-0.079**
	(0.036)	(0.033)	(0.039)	(0.034)
Year 2002	-0.243***	-0.183***	-0.318***	-0.221***
	(0.039)	(0.035)	(0.042)	(0.037)
Year 2003	-0.288***	-0.180***	-0.323***	-0.205***
	(0.042)	(0.037)	(0.045)	(0.039)
Year 2004	-0.255***	-0.185***	-0.288***	-0.198***
	(0.045)	(0.040)	(0.048)	(0.042)
Constant	1.066***	1.012***	1.046***	0.982***
	(0.053)	(0.048)	(0.057)	(0.051)
No. of observations	1419	1419	1419	1419
Pseudo R^2	0.318	0.441	0.275	0.389

Note: Model F1 refers to efficiency calculated based on yearly separate-country data. Model F1A, F1B, F1C and F1D are equivalent to four different specifications of inputs and outputs. For details, see Table 3.13. The results are estimated using Tobit regression technique in which technical efficiency enters as the dependent variable in equation (3.7). The standard errors are in parentheses. For detailed definition of variables and efficiency methodological estimates, see section 3.3.1. ***, **, * denote significant level at 0.01, 0.0.5 and 0.1, respectively.

A3.3a. Determinants of *technical* efficiency in South East Asia 1998-2004
(Under different assumptions of technological change and frontiers)

	Technical efficiency as the dependent variable			
Independent variables	Model F1	Model F2	Model F3	Model F4
Size	0.198	0.018	0.452**	0.045
	(0.171)	(0.142)	(0.152)	(0.097)
Profit	-0.145*	0.108	-0.0001	0.056
	(0.085)	(0.070)	(0.075)	(0.048)
Capital	0.452***	0.217***	0.289***	0.012
	(0.058)	(0.044)	(0.048)	(0.030)
Bank private credit	0.112***	0.238***	-0.056	0.190***
	(0.040)	(0.033)	(0.035)	(0.023)
Regulation	-0.021***	0.006	-0.023***	0.008**
	(0.006)	(0.005)	(0.005)	(0.003)
Economic growth	0.017***	0.009***	0.011***	0.006***
	(0.004)	(0.003)	(0.003)	(0.002)
Inflation	-0.001	0.002*	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Country-level of state ownership	0.002	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Foreign ownership dummy	0.053**	0.010	0.029	-0.011
	(0.024)	(0.020)	(0.021)	(0.014)
Private ownership dummy	-0.088***	-0.108***	-0.032*	-0.037***
	(0.022)	(0.018)	(0.019)	(0.012)
Year 1999	-0.186***	-0.076**	-0.136***	-0.051**
	(0.038)	(0.030)	(0.032)	(0.021)
Year 2000	-0.223***	-0.066*	-0.184***	-0.049**
	(0.043)	(0.035)	(0.037)	(0.024)
Year 2001	-0.130***	0.006	-0.147***	-0.032
	(0.036)	(0.029)	(0.031)	(0.020)
Year 2002	-0.243***	-0.174***	-0.153***	-0.016
	(0.039)	(0.031)	(0.034)	(0.022)
Year 2003	-0.288***	-0.206***	-0.186***	-0.040*
	(0.042)	(0.033)	(0.036)	(0.023)
Year 2004	-0.255***	-0.233***	-0.204***	-0.049**
	(0.045)	(0.036)	(0.039)	(0.025)
Constant	1.066***	0.325***	0.977***	0.064**
	(0.053)	(0.043)	(0.046)	(0.030)
No. of observations	1419	1419	1419	1419
Pseudo R^2	0.318			

Note: Model F1, F2, F3 and F4 are equivalent to four different assumptions of technology and national differences in banking conditions leading to four different efficiency frontiers. For details, see Table 3.14. The results are estimated using Tobit regression technique in which technical efficiency enters as the dependent variable in equation (3.7). The standard errors are in parentheses. For detailed definition of variables and efficiency methodological estimates, see section 3.3.1. ***, **, * denote significant level at 0.0.1, 0.5 and 0.1, respectively.

A3.3b. Determinants of *cost* efficiency in South East Asia 1998-2004
(Under different assumptions of technological change and frontiers)

	Cost efficiency as the dependent variable			
Independent variables	Model F1	Model F2	Model F3	Model F4
Size	-0.345*	-0.306**	-0.178	-0.172**
	(0.183)	(0.136)	(0.153)	(0.069)
Profit	0.098	0.170**	0.101	-0.034
	(0.091)	(0.067)	(0.076)	(0.034)
Capital	0.195***	0.159***	0.082*	0.081***
	(0.058)	(0.042)	(0.048)	(0.021)
Bank private credit	0.184***	0.115***	0.105**	0.050**
	(0.043)	(0.032)	(0.036)	(0.016)
Regulation	0.001	0.008*	-0.013***	-0.001
	(0.006)	(0.005)	(0.005)	(0.002)
Economic growth	0.011*	0.004	0.011***	0.001
	(0.004)	(0.003)	(0.003)	(0.001)
Inflation	-0.002	0.002**	-0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.000)
Country-level of state ownership	-0.002	-0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Foreign ownership dummy	0.078**	0.036*	0.088***	-0.001
	(0.026)	(0.019)	(0.022)	(0.009)
Private ownership dummy	-0.106***	-0.091***	-0.033*	-0.025**
	(0.023)	(0.018)	(0.019)	(0.009)
Year 1999	-0.125**	-0.015	-0.152***	-0.008
	(0.040)	(0.029)	(0.033)	(0.015)
Year 2000	-0.198***	-0.055*	-0.189***	-0.003
	(0.045)	(0.033)	(0.037)	(0.017)
Year 2001	-0.162***	-0.059**	-0.149***	-0.001
	(0.038)	(0.028)	(0.032)	(0.014)
Year 2002	-0.233***	-0.237***	-0.145***	0.017
	(0.041)	(0.030)	(0.034)	(0.015)
Year 2003	-0.248***	-0.140***	-0.178***	0.007
	(0.044)	(0.032)	(0.036)	(0.016)
Year 2004	-0.239***	-0.139***	-0.199***	0.005
	(0.047)	(0.034)	(0.039)	(0.017)
Constant	0.712***	0.211***	0.618***	0.043**
	(0.056)	(0.041)	(0.047)	(0.021)
No. of observations	1419	1419	1419	1419
Pseudo R^2	0.296			

Note: Model F1, F2, F3 and F4 are equivalent to four different assumptions of technology and national differences in banking conditions leading to four different efficiency frontiers. For details, see Table 3.14. The results are estimated using Tobit regression technique in which cost efficiency enters as the dependent variable in equation (3.7). The standard errors are in parentheses. For detailed definition of variables and efficiency methodological estimates, see section 3.3.1. ***, **, * denote significant level at 0.01, 0.5 and 0.1, respectively.

A3.3c. Determinants of *allocative* efficiency in South East Asia 1998-2004
(Under different assumptions of technological change and frontiers)

	Allocative efficiency as the dependent variable			
Independent variables	Model F1	Model F2	Model F3	Model F4
Size	-0.532***	-0.539***	-0.551***	-0.572***
	(0.154)	(0.136)	(0.150)	(0.103)
Profit	0.240**	0.215***	0.190***	-0.177***
	(0.079)	(0.067)	(0.074)	(0.051)
Capital	-0.014	0.032	-0.075	0.264***
	(0.049)	(0.042)	(0.047)	(0.032)
Bank private credit	0.115***	0.067**	0.231***	0.164***
	(0.036)	(0.032)	(0.035)	(0.024)
Regulation	0.026***	0.010**	-0.002	-0.003
	(0.005)	(0.005)	(0.005)	(0.003)
Economic growth	0.001	-0.001	0.010***	-0.002
	(0.003)	(0.003)	(0.003)	(0.002)
Inflation	0.000	0.002**	-0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Country-level of state ownership	-0.005***	-0.003*	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Foreign ownership dummy	0.062**	0.066***	0.120***	0.023
	(0.022)	(0.019)	(0.021)	(0.014)
Private ownership dummy	-0.062***	-0.047**	-0.038**	-0.067***
	(0.019)	(0.017)	(0.019)	(0.013)
Year 1999	-0.014	0.023	-0.136***	0.024
	(0.033)	(0.029)	(0.032)	(0.022)
Year 2000	-0.084**	-0.095**	-0.166***	0.036
	(0.038)	(0.033)	(0.037)	(0.025)
Year 2001	-0.100**	-0.159***	-0.127***	0.017
	(0.032)	(0.028)	(0.031)	(0.021)
Year 2002	-0.104**	-0.376***	-0.121***	0.023
	(0.035)	(0.030)	(0.033)	(0.022)
Year 2003	-0.088**	-0.064**	-0.143***	0.033
	(0.037)	(0.032)	(0.035)	(0.024)
Year 2004	-0.103*	-0.013	-0.165***	0.032
	(0.04)	(0.035)	(0.038)	(0.026)
Constant	0.645***	0.636***	0.663***	0.475***
	(0.047)	(0.041)	(0.046)	(0.031)
No. of observations	1419	1419	1419	1419
Pseudo R^2	0.464			

Note: Model F1, F2, F3 and F4 are equivalent to four different assumptions of technology and national differences in banking conditions leading to four different efficiency frontiers. For details, see Table 3.14. The results are estimated using Tobit regression technique in which allocative efficiency enters as the dependent variable in equation (3.7). The standard errors are in parentheses. For detailed definition of variables and efficiency methodological estimates, see section 3.3.1. ***, **, * denote significant level at 0.01, 0.5 and 0.1, respectively.

A4.1. Calculations of foreign bank assets and share

1. Average assets (share) per year, per bank in country j from foreign country h:

$$\bar{a}_{j,h}(\bar{s}_{j,h}) = \sum_{n=1}^{N} \frac{\sum_{t=1}^{T} \frac{a_{i,j,h,t}(s_{i,j,h,t})}{T}}{N} \qquad \text{(A4.1a)}$$

2. Average assets (share) per year, per bank, per country from foreign country h:

$$\bar{a}_{h}(\bar{s}_{h}) = \sum_{j=1}^{J} \frac{\bar{a}_{j,h}(\bar{s}_{j,h})}{J} \qquad \text{(A4.1b)}$$

3. Average of assets per foreign bank per year from country h in SEA:

$$\bar{a}_{SEA,h} = \sum_{j=1}^{J} \bar{a}_{j,h} \qquad \text{(A4.1c)}$$

4. Percentage of assets per foreign bank per year from country h in SEA region:

$$a_{SEA,h} = \frac{\bar{a}_{SEA,h}}{\sum_{h=1}^{H} \bar{a}_{SEA,h}} \qquad \text{(A4.1d)}$$

(Results shown in Figure 4.1)

5. Average assets (share) per year, per bank, per country from foreign region R in SEA:

$$\bar{a}_{R}(\bar{s}_{R}) = \sum_{h=1}^{H} \frac{\bar{a}_{h,h\in R}(\bar{s}_{h,h\in R})}{H} \qquad \text{(A4.1e)}$$

(Results shown in Figure 4.2)

Where:

- $a_{i,j,h,t}$: assets of foreign bank i, from home country h, in country j, at time t
- $s_{i,j,h,t}$: foreign share of foreign bank i (defined as banks with at least 10% of stakes owned by foreign banks) from home country h, in country j, at time t
- $t \in [1,T]$: the number of years, from 1998 to 2004
- $n \in [1,N]$: the number of foreign banks from country h in country j
- $j \in [1,J]$: the number of host country in South East Asia
- $h \in [1,H]$: the number of foreign home country in the South East Asian region

A4.2a. Motivations for foreign bank entry in South East Asia – Pooled OLS estimates
(Comparison of estimates using bilateral trade, exports and imports)

Pooled OLS	**Foreign SHARE (2a)**			**Foreign ASSETS (2b)**		
	Bilateral trade	**Export**	**Import**	**Bilateral trade**	**Export**	**Import**
Manufacturing FDI	0.00005*	0.00003	0.00007***	-0.000002	-0.000001	-0.000002
	(0.00003)	(0.00003)	(0.00002)	(0.000002)	(0.000002)	(0.000002)
Trade	-0.000002	0.000001	-0.00001***	0.0000004**	0.000001**	0.000001
	(0.000002)	(0.000003)	(0.000004)	(0.0000002)	(0.000000)	(0.000001)
ROA	0.2157**	0.2202**	0.2112**	0.0036	0.0034	0.0035
	(0.0873)	(0.0880)	(0.0881)	(0.0046)	(0.0046)	(0.0046)
Banking cost efficiency	-0.6526***	-0.6238***	-0.6447***	0.0252**	0.0260**	0.0219*
	(0.1489)	(0.1526)	(0.1457)	(0.0120)	(0.0122)	(0.0118)
Household expenditure	0.0068*	0.0065*	0.0072**	0.0003	0.0003	0.0003
	(0.0036)	(0.0036)	(0.0036)	(0.0004)	(0.0004)	(0.0004)
Real interest rate	0.0067***	0.0066**	0.0067***	0.0002	0.0002	0.0003
	(0.0026)	(0.0026)	(0.0026)	(0.0003)	(0.0003)	(0.0003)
Regulation restriction	-0.0176**	-0.0162*	-0.0190**	-0.0036***	-0.0037***	-0.0037***
	(0.0091)	(0.0091)	(0.0089)	(0.0008)	(0.0008)	(0.0008)
Legal origin	0.0996***	0.0960***	0.1014***	-0.0058**	-0.0058**	-0.0056**
	(0.0341)	(0.0338)	(0.0340)	(0.0028)	(0.0027)	(0.0028)
Colonized relationship	0.0137	0.0158	0.0127	0.0020	0.0020	0.0018
	(0.0216)	(0.0212)	(0.0217)	(0.0019)	(0.0019)	(0.0019)
Time difference	-0.0012	-0.0023	0.0004	-0.0001	-0.00004	-0.0001
	(0.0023)	(0.0023)	(0.0024)	(0.0003)	(0.0003)	(0.0003)
Opening year	0.0001	-0.0001	0.0003	-0.0002***	-0.0002***	-0.0002***
	(0.0004)	(0.0004)	(0.0004)	(0.0000)	(0.0000)	(0.0000)
Branch	0.2790***	0.2749***	0.2825***	0.0039**	0.0040**	0.0039**
	(0.0303)	(0.0303)	(0.0305)	(0.0018)	(0.0018)	(0.0017)
Acquisition	-0.3414***	-0.3373***	-0.3397***	0.0083**	0.0084**	0.0078**
	(0.0547)	(0.0550)	(0.0541)	(0.0036)	(0.0036)	(0.0034)
Subsidiary	0.1663**	0.1445*	0.1914**	-0.0240***	-0.0230***	-0.0241***
	(0.0788)	(0.0789)	(0.0777)	(0.0065)	(0.0065)	(0.0066)
Year 2000	0.0799**	0.0759**	0.0798**	0.0044	0.0043	0.0047
	(0.0332)	(0.0333)	(0.0328)	(0.0044)	(0.0045)	(0.0043)
Year 2001	0.0502	0.0481	0.0520	0.0051	0.0051	0.0052
	(0.0317)	(0.0317)	(0.0318)	(0.0034)	(0.0034)	(0.0034)
Year 2002	0.0544	0.0508	0.0559*	0.0015	0.0015	0.0017
	(0.0335)	(0.0338)	(0.0329)	(0.0036)	(0.0036)	(0.0036)
Year 2003	0.0542	0.0498	0.0580	0.0021	0.0022	0.0022
	(0.0357)	(0.0357)	(0.0355)	(0.0038)	(0.0038)	(0.0038)
Year 2004	-0.0100	-0.0139	-0.0082	0.0043	0.0043	0.0045
	(0.0580)	(0.0575)	(0.0579)	(0.0051)	(0.0051)	(0.0051)
Constant	1.1585	1.3944*	0.8242	0.3944***	0.3820***	0.3991***
	(0.8083)	(0.7797)	(0.8069)	(0.0667)	(0.0656)	(0.0705)
Number of observations	307	307	307	323	323	323
R^2	0.57	0.57	0.57	0.38	0.38	0.38
Mean VIF	2.45	2.44	2.41	2.44	2.43	2.41

Note: Robust standard errors in parentheses. The results are from the estimation of equation (4.2) using pooled OLS. The dependent variable is foreign bank presence, alternatively measured by foreign share and foreign assets. Foreign share is the percentage of share of bank i in country j held by foreign bank(s) while foreign asset is the assets of foreign bank i to total banking assets in country j at time t. For definition of variables, please see Table 4.3. Mean VIF = mean value of variance inflation factor. As the rule of thumb, if VIF exceeds 10, multicollinearity is severe. *, **, *** denote significance at 0.1, 0.05, and 0.01 level, respectively.

A4.2b. Motivations for foreign bank entry in South East Asia – 'Between' regression
(Comparison of estimates using bilateral trade, exports and imports)

'Between' regression	**Foreign SHARE (3a)**			**Foreign ASSETS (3b)**		
	Bilateral trade	**Export**	**Import**	**Bilateral trade**	**Export**	**Import**
Manufacturing FDI	0.00002	-0.00003	0.0001	0.00001	0.00001	0.000002
	(0.00009)	(0.00009)	(0.0001)	(0.00001)	(0.00001)	(0.00001)
Trade	0.000001	0.00001	-0.00001	0.000000	0.000000	0.000002
	(0.000005)	(0.00001)	(0.00001)	(0.000001)	(0.000001)	(0.000001)
ROA	0.7068**	0.7401**	0.6944**	-0.0253	-0.0276	-0.0256
	(0.3307)	(0.3282)	(0.3262)	(0.0399)	(0.0401)	(0.0394)
Banking cost efficiency	-0.7574*	-0.7456*	-0.6859	0.0759	0.0770	0.0684
	(0.4304)	(0.4256)	(0.4289)	(0.0502)	(0.0501)	(0.0502)
Household expenditure	0.0156	0.0191	0.0102	0.0032	0.0029	0.0035
	(0.0354)	(0.0350)	(0.0349)	(0.0041)	(0.0041)	(0.0040)
Real interest rate	0.0335*	0.0307*	0.0369**	0.0032	0.0035*	0.0030
	(0.0173)	(0.0171)	(0.0170)	(0.0020)	(0.0020)	(0.0020)
Regulation restriction	-0.0190	-0.0177	-0.0205	-0.0042***	-0.0043***	-0.0041***
	(0.0126)	(0.0125)	(0.0125)	(0.0014)	(0.0014)	(0.0014)
Legal system	0.1122*	0.1026	0.1249*	-0.0020	-0.0011	-0.0027
	(0.0648)	(0.0641)	(0.0638)	(0.0076)	(0.0076)	(0.0074)
Colonized relationship	-0.0542	-0.0562	-0.0511	0.0021	0.0022	0.0018
	(0.0889)	(0.0880)	(0.0879)	(0.0110)	(0.0110)	(0.0109)
Time difference	-0.0052	-0.0076	-0.0012	0.0000	0.0002	-0.0003
	(0.0068)	(0.0065)	(0.0066)	(0.0008)	(0.0008)	(0.0008)
Opening year	-0.0015	-0.0017	-0.0011	-0.0001	-0.0001	-0.0001
	(0.0013)	(0.0013)	(0.0013)	(0.0002)	(0.0002)	(0.0002)
Branch	0.3229***	0.3201***	0.3230***	-0.0006	-0.0004	-0.0006
	(0.0781)	(0.0774)	(0.0773)	(0.0096)	(0.0096)	(0.0095)
Acquisition	-0.2181**	-0.2119**	-0.2105**	0.0000	-0.0001	-0.0009
	(0.0848)	(0.0841)	(0.0841)	(0.0105)	(0.0105)	(0.0105)
Subsidiary	0.1589	0.1157	0.2210	-0.0404**	-0.0368*	-0.0445**
	(0.1643)	(0.1617)	(0.1606)	(0.0203)	(0.0202)	(0.0200)
Year 2000	0.0932	0.0810	0.1048	0.0343*	0.0352*	0.0326
	(0.1586)	(0.1571)	(0.1566)	(0.0204)	(0.0204)	(0.0202)
Year 2001	0.8437**	0.8551**	0.8188**	0.0441*	0.0439*	0.0464**
	(0.3396)	(0.3361)	(0.3360)	(0.0236)	(0.0235)	(0.0234)
Year 2002	-0.8942***	-0.9374***	-0.8263***	0.0077	0.0109	0.0037
	(0.2975)	(0.2936)	(0.2935)	(0.0320)	(0.0319)	(0.0317)
Year 2003	0.3790*	0.3825**	0.3949**	0.0089	0.0091	0.0072
	(0.1935)	(0.1915)	(0.1917)	(0.0238)	(0.0238)	(0.0237)
Year 2004	-0.2519	-0.2732	-0.2390	0.0304	0.0319	0.0298
	(0.1657)	(0.1645)	(0.1631)	(0.0195)	(0.0195)	(0.0192)
Constant	4.1496	4.4709*	3.3790	0.2118	0.1783	0.2695
	(2.6595)	(2.6125)	(2.6439)	(0.3304)	(0.3281)	(0.3288)
Number of observations	307	307	307	323	323	323
R^2	0.73	0.74	0.74	0.40	0.40	0.41

Note: Standard errors in parentheses. The results are from the estimation of equation (4.3) using 'between' regression. The dependent variable is foreign bank presence, alternatively measured by foreign share and foreign assets. Foreign share is the percentage of share of bank i in country j held by foreign bank(s) while foreign asset is the assets of foreign bank i to total banking assets in country j at time t. For definition of variables, please see Table 4.3. *, **, *** denote significance at 0.1, 0.05, and 0.01 level, respectively.

A4.2c. Motivations for foreign bank entry in South East Asia – Random-effects GLS
(Comparison of estimates using bilateral trade, exports and imports)

Random-effects GLS	**Foreign SHARE (4a)**			**Foreign ASSETS (4b)**		
	Bilateral trade	**Export**	**Import**	**Bilateral trade**	**Export**	**Import**
Manufacturing FDI	0.00001	0.00001	0.00001	-0.000001	-0.000001	-0.000001
	(0.00001)	(0.00001)	(0.00001)	(0.000001)	(0.000001)	(0.000001)
Trade	-0.000001	0.000000	0.00000	0.0000003**	0.0000004*	0.000001**
	(0.000002)	(0.000004)	(0.00001)	(0.0000001)	(0.0000002)	(0.000000)
ROA	0.0423	0.0430	0.0402	-0.0010	-0.0012	-0.0008
	(0.0305)	(0.0305)	(0.0307)	(0.0015)	(0.0015)	(0.0015)
Banking cost efficiency	-0.0633	-0.0617	-0.0646	-0.0072***	-0.0073***	-0.0074***
	(0.0596)	(0.0599)	(0.0596)	(0.0026)	(0.0026)	(0.0026)
Household expenditure	-0.0020	-0.0021	-0.0020	0.0001	0.0001	0.0001
	(0.0016)	(0.0016)	(0.0016)	(0.0001)	(0.0001)	(0.0001)
Real interest rate	0.0017*	0.0017	0.0018*	0.0000	0.0000	0.0000
	(0.0010)	(0.0010)	(0.0010)	(0.0000)	(0.0000)	(0.0000)
Regulation restriction	-0.0004	-0.0002	-0.0009	-0.0031***	-0.0032***	-0.0031***
	(0.0092)	(0.0091)	(0.0091)	(0.0010)	(0.0010)	(0.0010)
Legal system	0.1362***	0.1349***	0.1364***	-0.0058	-0.0057	-0.0057
	(0.0418)	(0.0417)	(0.0416)	(0.0036)	(0.0036)	(0.0036)
Colonised relationship	-0.0310	-0.0285	-0.0320	0.0042	0.0041	0.0039
	(0.0895)	(0.0890)	(0.0886)	(0.0107)	(0.0107)	(0.0106)
Time difference	0.0012	0.0006	0.0019	0.0000	0.0000	-0.0001
	(0.0050)	(0.0050)	(0.0050)	(0.0005)	(0.0005)	(0.0005)
Opening year	-0.0015	-0.0015	-0.0014	-0.0001	-0.0001	-0.0001
	(0.0013)	(0.0013)	(0.0013)	(0.0001)	(0.0001)	(0.0001)
Branch	0.1924***	0.1935***	0.1938***	0.0071	0.0072	0.0066
	(0.0639)	(0.0635)	(0.0632)	(0.0074)	(0.0075)	(0.0074)
Acquisition	-0.3556***	-0.3552***	-0.3543***	0.0105	0.0106	0.0103
	(0.0700)	(0.0696)	(0.0694)	(0.0083)	(0.0083)	(0.0082)
Subsidiary	0.0963	0.0851	0.1105	-0.0093	-0.0081	-0.0094
	(0.1114)	(0.1097)	(0.1105)	(0.0126)	(0.0126)	(0.0125)
Year 2000	0.0450***	0.0442***	0.0452***	0.0013**	0.0013**	0.0013**
	(0.0127)	(0.0128)	(0.0126)	(0.0006)	(0.0006)	(0.0006)
Year 2001	0.0476***	0.0455***	0.0495***	0.0003	0.0005	0.0004
	(0.0125)	(0.0124)	(0.0123)	(0.0006)	(0.0006)	(0.0006)
Year 2002	0.0578***	0.0565***	0.0589***	-0.0003	-0.0002	-0.0003
	(0.0123)	(0.0123)	(0.0122)	(0.0006)	(0.0006)	(0.0006)
Year 2003	0.0630***	0.0616***	0.0646***	-0.0002	0.0000	-0.0002
	(0.0130)	(0.0129)	(0.0130)	(0.0006)	(0.0006)	(0.0006)
Year 2004	0.0673***	0.0654***	0.0686***	-0.0009	-0.0008	-0.0008
	(0.0166)	(0.0166)	(0.0164)	(0.0008)	(0.0008)	(0.0008)
Constant	3.7384	3.7717	3.6260	0.2304	0.2236	0.2390
	(2.5407)	(2.5218)	(2.5199)	(0.3017)	(0.3021)	(0.2993)
Number of observations	307	307	307	323	323	323
R^2	0.51	0.52	0.52	0.36	0.36	0.36

Note: Standard errors in parentheses. The results are from the estimation equation (4.4) using random-effects GLS estimates. The dependent variable is foreign bank presence, alternatively measured by foreign share and foreign assets. Foreign share is the percentage of share of bank i in country j held by foreign bank(s) while foreign asset is the assets of foreign bank i to total banking assets in country j at time t. For definition of variables, please see Table 4.3. *, **, *** denote significance at 0.1, 0.05, and 0.01 level, respectively.

A4.2d. Motivations for foreign bank entry in South East Asia – Dynamic panel model (Comparison of estimates using bilateral trade, exports and imports)

Dynamic panel estimates	**Foreign SHARE (5a)**			**Foreign ASSETS (5b)**		
	Bilateral trade	**Export**	**Import**	**Bilateral trade**	**Export**	**Import**
Lagged dependent	0.3401***	0.3415***	0.3430***	-0.3636***	-0.3705***	-0.3486***
	(0.1354)	(0.1360)	(0.1361)	(0.1192)	(0.1200)	(0.1177)
Manufacturing FDI	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000
	(0.00001)	(0.00001)	(0.00001)	(0.00000)	(0.00000)	(0.00000)
Trade	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
ROA	0.1670*	0.1654*	0.1699*	-0.0033	-0.0034	-0.0033
	(0.0967)	(0.0967)	(0.0971)	(0.0061)	(0.0061)	(0.0061)
Banking cost efficiency	-0.0089	-0.0086	-0.0111	-0.0060**	-0.0060**	-0.0060**
	(0.0394)	(0.0394)	(0.0392)	(0.0025)	(0.0025)	(0.0025)
Household expenditure	0.0012	0.0011	0.0012	0.0001	0.0001	0.0001
	(0.0011)	(0.0011)	(0.0011)	(0.0001)	(0.0001)	(0.0001)
Real interest rate	0.0001	0.0002	0.0001	0.0000	0.0000	0.0000
	(0.0009)	(0.0009)	(0.0010)	(0.0000)	(0.0000)	(0.0000)
Constant	0.0002	0.0002	0.0002	-0.0004***	-0.0004***	-0.0004***
	(0.0023)	(0.0022)	(0.0023)	(0.0001)	(0.0001)	(0.0001)
Number of observations	170	170	170	181	181	181
Sargan test	1.39	1.62	1.05	36.48***	36.28***	36.99***
1^{st} order	-2.3**	-2.3**	-2.3**	0.19	0.23	0.07
2^{nd} order	0.15	0.18	0.13	-0.38	-0.4	-0.33

Note: Standard errors in parentheses. The results are from the estimation equation (4.5) using one-step dynamic panel GMM estimates. The dependent variable is foreign bank presence, alternatively measured by foreign share and foreign assets. Foreign share is the percentage of share of bank i in country j held by foreign bank(s) while foreign asset is the assets of foreign bank i to total banking assets in country j at time t. Sargan test for over-identifying restrictions shows χ^2 value. Tests for first- and second-order auto-covariance show z value. The model is estimated without time dummies. For definition of variables, please see Table 4.3. *, **, *** denote significance at 0.1, 0.05, and 0.01 level, respectively.

A5.1. Detailed definition of variables on competition and risk

Variables abbreviation	Definition
First-stage H-statistic	
$r^{*}_{i,j,t}$	the ratio of gross interest revenue over total assets (Specification 1 and 2) *or* the ratio of total revenue over total assets (Specification 3 and 4)
$p_{1,i,j,t}$	the ratio of interest expenses over total deposits
$p^{*}_{2,i,j,t}$	the ratio of personnel expenses over total assets (Specification 1 and 3) *or* the ratio of personnel expenses over total loans plus deposits (Specification 2 and 4)
$p_{3,i,j,t}$	the ratio of other operating expenses over total assets
$b_{1,i,j,t}$	the ratio of equity over total assets
$b_{2,i,j,t}$	the ratio of net loans over total assets
$b_{3,i,j,t}$	total assets
Second-stage regression	
$LLR_{i,j,t}$	the ratio of loan-loss reserves over total loans
$LLP_{i,j,t}$	the ratio of loan-loss provisions over total loans
ROA volatility$_{i,j,t}$	the deviation of individual bank's ROA from the sample mean within one period
$EAR_{i,j,t}$	the ratio of equity capital over total assets;
Z-index$_{i,j,t}$	equals (ROA + EAR)/ROA volatility
Competition$_{j}$	measured by the H-statistic
$Size_{i,j,t}$	the natural logarithm of total assets
Liquidity$_{i,j,t}$	the ratio of liquid assets over total deposits
Off.balance$_{i,j,t}$	the ratio of off-balance sheet items over total assets
Lending$_{i,j,t}$	the ratio of net loans over total assets
Foreign.share$_{i,j,t}$	the percentage of share owned by foreign partner(s)
Interest.rate$_{j,t}$	the real interest lending rates
Concentration$_{j,t}$	the ratio of assets of the three biggest banks over total banking sector assets
Regulation$_{j}$	an index = (bank activity restrictions + banking entry requirements – diversification). Higher score is in accordance with a more restricted banking environment. Bank activity restriction reflects the ability of banks to be involved in securities, insurance and real estate activities. Banking entry requirements reflect the types of legal submissions required to obtain a banking license Diversification distinguishes whether there are explicit guidelines for asset diversification and whether banks are allowed to make loans abroad or not

Note: The subscripts i, j, t denote bank i, in country j at time t. All variables in the first stage are in logarithms. Bank level data for Indonesia, Malaysia, Philippines and Thailand are obtained from Bankscope database of IBCA. Data for commercial banks in Vietnam are hand-collected from individual banks and the State Bank of Vietnam. Bank ownership structure is classified based on information from various sources, mainly from Bankscope, Thomson Financial, individual bank websites, central bank websites, academic papers and ASEAN Bankers Association. Interest rates are from the World Bank, World Development Indicators. Concentration is from Beck, Demirgüc-Kunt and Levine (2000). Regulation is from Barth, Caprio and Levine (2006) (please see the Appendix A3.1 for the quantification and construction of the regulation index).

A5.2. H-statistic estimates

Note to appendixes A5.2a1 to A5.2d3:

[a] Spec 1 uses natural logarithm of interest income over total assets as the dependent variable in equation (5.1). Spec 3 uses total income as the dependent variable in equation (5.1). Spec 2 = Spec 1, replacing (natural logarithm of) personnel expenses over total assets by personnel expenses over loans plus deposits. Spec 4 = Spec 3, replacing personnel expenses over total assets by personnel expenses over loans plus deposits. The models are estimated by using OLS and fixed-effects GLS with time dummies (but not reported). $Ln(p_1)$ = natural logarithm of interest expenses over deposits; $ln(p^*_2)$ = natural logarithm of personnel expenses over total assets or personnel expenses over loans plus deposits; $ln(p_3)$ = natural logarithm of other operating expenses over total assets; $ln(b_1)$ = natural logarithm of net loans over total assets; $ln(b_2)$ = natural logarithm of equity capital over total assets; $ln(b_3)$ = natural logarithm of total assets. E1 = test for long-run equilibrium of Spec 1 and 3, E2 = test for long-run equilibrium of Spec 2 and 4, using equation (5.2). * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

[b] Spec 1 uses natural logarithm of interest income as the dependent variable in equation (5.3). Spec 3 uses total income as the dependent variable in equation (5.3). Spec 2 = Spec 1, replacing personnel expenses over total assets by personnel expenses over loans plus deposits. Spec 4 = Spec 3, replacing personnel expenses over total assets by personnel expenses over loans plus deposits. The results are estimated by one-step general method of moment dynamic panel. The model is estimated without time dummies. $\Delta ln(r^*_{t-1})$ = natural logarithm of the lagged dependent variable; $\Delta ln(p_1)$ = natural logarithm of interest expenses over deposits; $\Delta ln(p^*_2)$ = natural logarithm of personnel expenses over total assets or personnel expenses over loans plus deposits; $\Delta ln(p_3)$ = natural logarithm of other operating expenses over total assets; $\Delta ln(b_1)$ = natural logarithm of net loans over total assets; $\Delta ln(b_2)$ = natural logarithm of equity capital over total assets; $\Delta ln(b_3)$ = natural logarithm of total assets. All variables are in first differences. Sargan test for over-identifying restrictions shows χ^2 value. Tests for first- and second-order of auto-covariance show z value. Tests for long-run equilibrium are not conducted because the adjustment towards equilibrium is assumed to be captured by the lagged dependent coefficients. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.2a. Indonesian H-statistic

A5.2a1. H-statistic – OLS estimates[a] – Indonesia

	Spec 1	Spec 2	Spec 3	Spec 4	E 1	E 2
$ln(p_1)$	0.2304***	0.2291***	0.1988***	0.1834***	-0.0019	-0.0047
	(0.0278)	(0.0305)	(0.0313)	(0.0334)	(0.0221)	(0.232)
$ln(p^*_2)$	0.2232***	0.1543***	0.2049***	0.1819***	0.0187	0.0215
	(0.0312)	(0.0351)	(0.0351)	(0.0385)	(0.0246)	(0.0266)
$ln(p_3)$	0.0115	0.0525**	0.0775***	0.0978***	0.0084	0.0080
	(0.0257)	(0.0265)	(0.0289)	(0.0289)	(0.0204)	(0.0202)
$ln(b_1)$	0.1414**	0.0657	0.2321***	0.1570**	1.0476***	1.0390***
	(0.0630)	(0.0654)	(0.0710)	(0.0716)	(0.0561)	(0.0558)
$ln(b_2)$	0.0132	0.0397*	0.0351	0.0681***	-0.0097	-0.0055
	(0.0199)	(0.0222)	(0.0224)	(0.0244)	(0.0157)	(0.0168)
$ln(b_3)$	0.0005	-0.0076	-0.0015	-0.0055	0.0109	0.0108
	(0.0093)	(0.0097)	(0.0105)	(0.0106)	(0.0075)	(0.0074)
Constant	0.0544	-0.0112	0.3930***	0.4246***	-0.1867**	-0.1719*
	(0.1146)	(0.1312)	(0.1301)	(0.1447)	(0.0903)	(0.0992)
R-squared	0.79	0.77	0.75	0.74	0.63	0.63
H-statistic (E)	0.47	0.44	0.48	0.46	0.03	0.02
F-test H (E) = 0	172.99***	141.79***	144.13***	131.71***	0.82	0.81
F-test H = 1	228.78***	237.52***	167.56***	177.02***		

A5.2a2. H-statistic – Fixed-effects GLS estimates[a] – Indonesia

	Spec 1	Spec 2	Spec 3	Spec 4	E 1	E 2
$\ln(p_1)$	0.3145***	0.3248***	0.3112***	0.3245***	0.0338	0.0299
	(0.0336)	(0.0368)	(0.0350)	(0.0386)	(0.0365)	(0.0381)
$\ln(p^*_2)$	0.2681***	0.0781	0.2849***	0.0754	0.0548	0.0404
	(0.0546)	(0.0517)	(0.0569)	(0.0549)	(0.0592)	(0.0550)
$\ln(p_3)$	0.0336	0.0595**	0.0421	0.0706**	0.0064	0.0083
	(0.0265)	(0.0273)	(0.0275)	(0.0284)	(0.0291)	(0.0291)
$\ln(b_1)$	0.1352**	0.1080*	0.1331**	0.1067*	1.0923***	1.0781***
	(0.0575)	(0.0617)	(0.0597)	(0.0644)	(0.0726)	(0.0770)
$\ln(b_2)$	0.0677**	0.1059***	0.0151	0.0556	-0.0334	-0.0232
	(0.0319)	(0.0329)	(0.0334)	(0.0344)	(0.0344)	(0.0340)
$\ln(b_3)$	0.0015	-0.0893*	-0.0582	-0.1588***	0.0758	0.0688
	(0.0517)	(0.0526)	(0.0539)	(0.0553)	(0.0553)	(0.0542)
Constant	0.4967**	0.3368***	1.0345***	0.8598***	-0.3994	-0.4045
	(0.2424)	(0.2530)	(0.2522)	(0.2636)	(0.2611)	(0.2631)
R-squared	0.87	0.86	0.85	0.84	0.61	0.60
H-statistic (E)	0.62	0.46	0.64	0.47	0.09	0.08
F-test H (E) = 0	114.04***	76.88***	113.47***	72.95***	2.31	2.01
F-test H = 1	44.24***	103.89***	36.46***	92.41***		

A5.2a3. H-statistic – Dynamic panel GMM estimates[b] – Indonesia

	Spec 1	Spec 2	Spec 3	Spec 4
$\Delta\ln(r^*_{t-1})$	0.0323	0.0315	0.0367	0.0374
	(0.0270)	(0.0270)	(0.0294)	(0.0295)
$\Delta\ln(p_1)$	0.5425***	0.5493***	0.5083***	0.5167***
	(0.0337)	(0.0335)	(0.0377)	(0.0378)
$\Delta\ln(p^*_2)$	0.0530	-0.0145	0.0442	-0.0238
	(0.0557)	(0.0496)	(0.0619)	(0.0595)
$\Delta\ln(p_3)$	0.0589*	0.0696**	0.0097	0.0194
	(0.0312)	(0.0307)	(0.0346)	(0.0340)
$\Delta\ln(b_1)$	-0.1162	-0.1076	-0.1986**	-0.1842**
	(0.0797)	(0.0818)	(0.0881)	(0.0908)
$\Delta\ln(b_2)$	0.0679**	0.0712**	0.0316	0.0345
	(0.0329)	(0.0329)	(0.0383)	(0.0374)
$\Delta\ln(b_3)$	-0.2319***	-0.2647***	-0.2890***	-0.3217***
	(0.0594)	(0.0570)	(0.0650)	(0.0626)
Constant	0.0417***	0.0472***	0.0554***	0.0612***
	(0.0114)	(0.0108)	(0.0126)	(0.0120)
Dynamic H-statistic	0.68	0.62	0.58	0.53
Observations	207	207	206	206
Sargan test for over-identifying restrictions	34.25***	34.87***	15.24	16.22
Z-test 1st order auto-covariance	0.5	0.57	-2.1**	-2**
Z-test 2nd order auto-covariance	-1.42	-1.43	-1.35	-1.32

A5.2b. Malaysian H-statistic

A5.2b1. H-statistic – OLS estimates[a] – Malaysia

	Spec 1	Spec 2	Spec 3	Spec 4	E 1	E 2
$\ln(p_1)$	0.5584***	0.5577***	0.4608***	0.4579***	0.0036	0.0037
	(0.0286)	(0.0288)	(0.0315)	(0.0318)	(0.0038)	(0.0038)
$\ln(p^*_2)$	0.0710**	0.0420	0.1132***	0.0952***	-0.0001	-0.0013
	(0.0345)	(0.0344)	(0.0381)	(0.0379)	(0.0046)	(0.0045)
$\ln(p_3)$	0.0664**	0.0821***	0.0842***	0.0923***	0.0001	0.0008
	(0.0295)	(0.0301)	(0.0325)	(0.0332)	(0.0039)	(0.0039)
$\ln(b_1)$	0.4710**	0.4623**	0.5506**	0.4709*	0.1681***	0.1711***
	(0.2122)	(0.2239)	(0.2340)	(0.2468)	(0.0281)	(0.0294)
$\ln(b_2)$	0.0645***	0.0792***	-0.0114	0.0181	-0.0021	-0.0024
	(0.0234)	(0.0245)	(0.0258)	(0.0270)	(0.0031)	(0.0032)
$\ln(b_3)$	0.0222**	0.0219**	0.0167	0.0162	0.0034***	0.0034***
	(0.0096)	(0.0096)	(0.0106)	(0.0106)	(0.0013)	(0.0013)
Constant	-0.4366***	-0.4779***	-0.2815	-0.2771	-0.0317	-0.0349
	(0.1634)	(0.1711)	(0.1802)	(0.1885)	(0.0216)	(0.0225)
R-squared	0.88	0.88	0.82	0.82	0.24	0.24
H-statistic (E)	0.70	0.68	0.66	0.65	0.0036	0.0032
F-test H (E) = 0	368.08***	363.77***	270.78***	268.41***	0.57	0.46
F-test H = 1	70.36***	79.25***	73.04***	81.01***		

A5.2b2. H-statistic – Fixed-effects GLS estimates[a] – Malaysia

	Spec 1	Spec 2	Spec 3	Spec 4	E 1	E 2
$\ln(p_1)$	0.5154***	0.5204***	0.4459***	0.4486***	0.0090	0.0091
	(0.0328)	(0.0329)	(0.0415)	(0.0417)	(0.0057)	(0.0057)
$\ln(p^*_2)$	0.0476	0.0095	0.1877***	0.1667***	0.0064	0.0059
	(0.0468)	(0.0455)	(0.0592)	(0.0577)	(0.0082)	(0.0079)
$\ln(p_3)$	0.1742***	0.1918***	0.1196**	0.1280***	-0.0116*	-0.0114
	(0.0399)	(0.0398)	(0.0504)	(0.0505)	(0.0069)	(0.0069)
$\ln(b_1)$	-0.5065	-0.5235*	-0.2499	-0.4103	0.1625***	0.1569***
	(0.3123)	(0.3149)	(0.3951)	(0.3992)	(0.0545)	(0.0547)
$\ln(b_2)$	0.0319	0.0408	0.0220	0.0621	0.0117*	0.0131**
	(0.0358)	(0.0350)	(0.0453)	(0.0444)	(0.0062)	(0.0061)
$\ln(b_3)$	0.0204	0.0151	0.0423	0.0401	0.0075	0.0075
	(0.0504)	(0.0506)	(0.0638)	(0.0641)	(0.0088)	(0.0088)
Constant	-0.0439	-0.0825	0.1239	0.1796	-0.0652	-0.0629
	(0.4023)	(0.4067)	(0.5089)	(0.5156)	(0.0702)	(0.0707)
R-squared	0.93	0.93	0.87	0.87	0.17	0.17
H-statistic (E)	0.74	0.72	0.75	0.74	0.0039	0.0036
F-test H (E) = 0	291.46***	282.99***	190.07***	186.76***	0.26	0.24
F-test H = 1	37.01***	42.04***	20.41***	22.28***		

A5.2b3. H-statistic – Dynamic panel GMM estimates[b] – Malaysia

	Spec 1	Spec 2	Spec 3	Spec 4
$\Delta \ln(r^*_{t-1})$	0.0836**	0.0779*	0.1047*	0.1067*
	(0.0409)	(0.0414)	(0.0570)	(0.0573)
$\Delta \ln(p_1)$	0.4731***	0.4747***	0.4939***	0.4937***
	(0.0367)	(0.0373)	(0.0499)	(0.0503)
$\Delta \ln(p^*_2)$	0.1519***	0.1176**	0.2994***	0.2885***
	(0.0508)	(0.0511)	(0.0678)	(0.0674)
$\Delta \ln(p_3)$	0.1369***	0.1450***	0.0620	0.0589
	(0.0462)	(0.0471)	(0.0632)	(0.0640)
$\Delta \ln(b_1)$	-0.9671**	-1.1093**	0.9566	0.6261
	(0.4515)	(0.4590)	(0.6289)	(0.6321)
$\Delta \ln(b_2)$	0.0007	0.0365	-0.0829	-0.0168
	(0.0519)	(0.0505)	(0.0723)	(0.0693)
$\Delta \ln(b_3)$	-0.0833	-0.1001	0.0205	0.0100
	(0.0749)	(0.0760)	(0.1042)	(0.1048)
Constant	-0.0025	-0.0021	-0.0077	-0.0072
	(0.0102)	(0.0103)	(0.0134)	(0.0135)
Dynamic H-statistic	0.83	0.80	0.96	0.94
Observations	125	125	125	125
Sargan test for over-identifying restrictions	33.48***	32.38***	14.67	14.23
Z-test 1st order auto-covariance	-1.82*	-1.7*	-2.31**	-2.16**
Z-test 2nd order auto-covariance	0.09	0.12	-0.86	-0.86

A5.2c. Philippine H-statistic

A5.2c1. H-statistic – OLS estimates[a] – The Philippines

	Spec 1	Spec 2	Spec 3	Spec 4	E 1	E 2
$\ln(p_1)$	0.2205***	0.2293***	0.2525***	0.2629***	-0.0186***	-0.0189***
	(0.0532)	(0.0529)	(0.0527)	(0.0521)	(0.0058)	(0.0058)
$\ln(p^*_2)$	0.2685***	0.2676***	0.3117***	0.3119***	-0.0039	-0.0033
	(0.0362)	(0.0357)	(0.0333)	(0.0328)	(0.0039)	(0.0039)
$\ln(p_3)$	-0.1282***	-0.1329***	-0.1167***	-0.1228***	-0.0250***	-0.0252***
	(0.0478)	(0.0479)	(0.0440)	(0.0439)	(0.0052)	(0.0052)
$\ln(b_1)$	-1.0456***	-1.3272***	-0.6397***	-0.9668***	0.0651***	0.0686***
	(0.2324)	(0.2357)	(0.2226)	(0.2256)	(0.0252)	(0.0257)
$\ln(b_2)$	0.0959*	0.1956***	0.0922*	0.2079***	0.0115**	0.0101*
	(0.0537)	(0.0537)	(0.0494)	(0.0494)	(0.0058)	(0.0059)
$\ln(b_3)$	-0.0898***	-0.0919***	-0.0514***	-0.0536***	-0.0015	-0.0014
	(0.0114)	(0.0113)	(0.0113)	(0.0112)	(0.0012)	(0.0012)
Constant	-0.1337	0.0610	0.0045	0.2333	-0.1414***	-0.1431***
	(0.1783)	(0.1865)	(0.1641)	(0.1713)	(0.0194)	(0.0203)
R-squared	0.77	0.77	0.74	0.75	0.32	0.32
H-statistic (E)	0.36	0.36	0.45	0.45	-0.05	-0.05
F-test H (E) = 0	35.91***	36.65***	61.46***	63.34***	52.90***	52.54***
F-test H = 1	112.74***	111.96***	93.67***	93.11***		

A5.2c2. H-statistic – Fixed-effects GLS estimates[a] – The Philippines

	Spec 1	Spec 2	Spec 3	Spec 4	E 1	E 2
$\ln(p_1)$	0.3602***	0.3623***	0.3420***	0.3416***	-0.0046	-0.0046
	(0.0595)	(0.0599)	(0.0537)	(0.0537)	(0.0081)	(0.0081)
$\ln(p^*_2)$	0.1976***	0.1788***	0.1527***	0.1457***	-0.0046	-0.0047
	(0.0577)	(0.0567)	(0.0539)	(0.0524)	(0.0079)	(0.0077)
$\ln(p_3)$	-0.0358	-0.0381	0.0040	0.0013	-0.0123*	-0.0122*
	(0.0510)	(0.0514)	(0.0456)	(0.0458)	(0.0069)	(0.0070)
$\ln(b_1)$	0.0752	-0.0219	-0.0075	-0.1104	-0.0159	-0.0121
	(0.4053)	(0.4233)	(0.3633)	(0.3772)	(0.0552)	(0.0573)
$\ln(b_2)$	0.0837*	0.1480***	0.0210	0.0723*	0.0010	-0.0007
	(0.0477)	(0.0488)	(0.0420)	(0.0429)	(0.0065)	(0.0066)
$\ln(b_3)$	0.2055***	0.2049***	0.1163**	0.1159**	-0.0166**	-0.0166**
	(0.0561)	(0.0564)	(0.0523)	(0.0523)	(0.0076)	(0.0076)
Constant	-1.8391***	-1.8134***	-1.2412***	-1.1901***	0.0406	0.0382
	(0.4815)	(0.4935)	(0.4406)	(0.4491)	(0.0656)	(0.0668)
R-squared	0.87	0.87	0.84	0.84	0.18	0.18
H-statistic (E)	0.52	0.50	0.50	0.49	-0.022	-0.021
F-test H (E) = 0	45.72***	43.52***	47.53***	47.70***	4.22**	4.33**
F-test H = 1	38.34***	42.47***	48.03***	52.25***		

A5.2c3. H-statistic – Dynamic panel GMM estimates[b] – The Philippines

	Spec 1	Spec 2	Spec 3	Spec 4
$\Delta\ln(r^*_{t-1})$	0.1539**	0.1541**	0.1301**	0.1299**
	(0.0667)	(0.0667)	(0.0654)	(0.0655)
$\Delta\ln(p_1)$	0.6895***	0.6892***	0.3873***	0.3883***
	(0.0463)	(0.0463)	(0.0419)	(0.0420)
$\Delta\ln(p^*_2)$	0.0773	0.0808	0.2113***	0.2091***
	(0.0656)	(0.0660)	(0.0684)	(0.0688)
$\Delta\ln(p_3)$	-0.0029	-0.0049	0.1156	0.1108
	(0.0796)	(0.0798)	(0.0780)	(0.0782)
$\Delta\ln(b_1)$	0.9915	0.9279	0.3560	0.2233
	(0.6718)	(0.6854)	(0.6255)	(0.6367)
$\Delta\ln(b_2)$	0.0026	0.0283	-0.0088	0.0582
	(0.0562)	(0.0573)	(0.0508)	(0.0523)
$\Delta\ln(b_3)$	0.1770*	0.1749*	0.1491	0.1460
	(0.1032)	(0.1033)	(0.1055)	(0.1057)
Constant	0.0307**	0.0304**	0.0028	0.0022
	(0.0129)	(0.0130)	(0.0102)	(0.0103)
Dynamic H-statistic	0.90	0.90	0.82	0.81
Observations	105	105	103	103
Sargan test for over-identifying restrictions	29.82***	29.65***	16.25	16.36
Z-test 1st order auto-covariance	-0.41	-0.41	-1.6	-1.6
Z-test 2nd order auto-covariance	-1.76*	-1.77*	-0.38	-0.42

5.2d. Vietnamese H-statistic

A5.2d1. H-statistic – OLS estimates[a] – Vietnam

	Spec 1	Spec 2	Spec 3	Spec 4	E 1	E 2
$\ln(p_1)$	0.3807***	0.4150***	0.2710***	0.2854***	-0.0032*	-0.0028
	(0.0453)	(0.0468)	(0.0296)	(0.0310)	(0.0018)	(0.0019)
$\ln(p^*_2)$	-0.0371	-0.1471***	0.0283	-0.0418	-0.0065***	-0.0044*
	(0.0607)	(0.0590)	(0.0397)	(0.0391)	(0.0024)	(0.0024)
$\ln(p_3)$	-0.0574	-0.0002	0.1347***	0.1686***	-0.0014	-0.0021
	(0.0601)	(0.0605)	(0.0393)	(0.0401)	(0.0024)	(0.0024)
$\ln(b_1)$	-0.5556	-0.2752	-0.4048*	-0.2911	0.0339**	0.0376***
	(0.3619)	(0.3747)	(0.2368)	(0.2482)	(0.0141)	(0.0150)
$\ln(b_2)$	0.3371***	0.2710***	0.0867**	0.0671	0.0036	0.0017
	(0.0613)	(0.0662)	(0.0401)	(0.0438)	(0.0024)	(0.0026)
$\ln(b_3)$	0.0014	-0.0129	-0.0154	-0.0249	-0.0024**	-0.0021**
	(0.0257)	(0.0252)	(0.0168)	(0.0167)	(0.0010)	(0.0010)
Constant	-1.8559***	-2.1171***	-0.8085***	-0.9704***	-0.0191	-0.0149
	(0.3299)	(0.3267)	(0.2159)	(0.2164)	(0.0129)	(0.0131)
R-squared	0.45	0.47	0.54	0.54	0.17	0.15
H-statistic (E)	0.29	0.27	0.43	0.41	-0.011	-0.009
F-test H (E) = 0	18.26***	18.37***	98.07***	99.20***	17.92***	14.02***
F-test H = 1	113.59***	137.39***	166.88***	201.76***		

A5.2d2. H-statistic – Fixed-effects GLS estimates[a] – Vietnam

	Spec 1	Spec 2	Spec 3	Spec 4	E 1	E 2
$\ln(p_1)$	0.2446***	0.2570***	0.1822***	0.1857***	-0.0018	-0.0020
	(0.0460)	(0.0507)	(0.0417)	(0.0461)	(0.0021)	(0.0023)
$\ln(p^*_2)$	0.1133	-0.0060	0.1360**	0.0313	-0.0017	-0.0002
	(0.0721)	(0.0728)	(0.0653)	(0.0663)	(0.0033)	(0.0034)
$\ln(p_3)$	0.2576***	0.2904***	0.2463***	0.2793***	-0.0035	-0.0040
	(0.0622)	(0.0605)	(0.0564)	(0.0551)	(0.0029)	(0.0028)
$\ln(b_1)$	-0.5709	-0.3236	-0.0315	0.1195	0.0986***	0.0959***
	(0.4860)	(0.5432)	(0.4404)	(0.4946)	(0.0225)	(0.0250)
$\ln(b_2)$	0.2394***	0.2393***	0.0537	0.0717	0.0089***	0.0088***
	(0.0586)	(0.0682)	(0.0531)	(0.0621)	(0.0027)	(0.0031)
$\ln(b_3)$	0.0822	0.0863	0.1159*	0.1196*	0.0069**	0.0068**
	(0.0755)	(0.0760)	(0.0684)	(0.0692)	(0.0035)	(0.0035)
Constant	-0.5427	-1.0276*	-0.7165	-1.1162**	-0.0516**	-0.0456
	(0.5715)	(0.6042)	(0.5179)	(0.5501)	(0.0256)	(0.0278)
R-squared	0.55	0.54	0.57	0.56	0.18	0.18
H-statistic (E)	0.62	0.54	0.56	0.50	-0.007	-0.006
F-test H (E) = 0	63.92***	53.61***	65.49***	54.32***	3.89**	3.20*
F-test H = 1	24.96***	38.44***	38.98***	55.97***		

A5.2d3. H-statistic – Dynamic panel GMM estimates[b] – Vietnam

	Spec 1	Spec 2	Spec 3	Spec 4
$\Delta \ln(r^*_{t-1})$	-0.0214	-0.0635	-0.0297	-0.0185
	(0.1176)	(0.1155)	(0.0870)	(0.0881)
$\Delta \ln(p_1)$	0.3212***	0.3262***	0.2883***	0.3058***
	(0.0683)	(0.0711)	(0.0590)	(0.0629)
$\Delta \ln(p^*_2)$	0.1942*	-0.0354	0.1094	-0.0667
	(0.1115)	(0.1105)	(0.0985)	(0.0992)
$\Delta \ln(p_3)$	0.2320**	0.2626***	0.2959***	0.3195***
	(0.1001)	(0.0963)	(0.0859)	(0.0841)
$\Delta \ln(b_1)$	-2.2555***	-1.4575	-1.0502	-0.5060
	(0.8418)	(0.9026)	(0.7112)	(0.7833)
$\Delta \ln(b_2)$	0.0680	0.0786	0.0268	0.0092
	(0.0856)	(0.0996)	(0.0735)	(0.0879)
$\Delta \ln(b_3)$	0.0898	0.0628	0.0951	0.0562
	(0.1209)	(0.1214)	(0.1082)	(0.1109)
Constant	-0.0513**	-0.0546**	-0.0551***	-0.0498**
	(0.0264)	(0.0246)	(0.0225)	(0.0232)
Dynamic H-statistic	0.73	0.52	0.67	0.55
Observations	146	146	146	146
Sargan test over-identifying restrictions	12.23	11.25	12.65	12.4
Z-test 1st order auto-covariance	-4.46***	-4.25***	-3.02***	-3.04***
Z-test 2nd order auto-covariance	0.89	0.5	-1.2	-1.18

A5.3. Competition and risk: regression results

A5.3a1. First stage: Pooled OLS H-statistic – Second stage: Robust OLS – H-statistic specification 1 and 2

(1) OLS robust	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
	Hb^1	Hb^2	Hb^1	Hb^2	Hb^1	Hb^2	Hb^1	Hb^2
Competition	-0.1634***	-0.1709***	-0.1757***	-0.1811***	-0.1623***	-0.1679***	0.2017	0.2097
	(0.04)	(0.0412)	(0.0466)	(0.0485)	(0.034)	(0.0351)	(0.2062)	(0.2122)
Size	-0.0003	-0.0002	0.0126**	0.0126**	0.0034	0.0034	-0.0082	-0.0082
	(0.0031)	(0.0031)	(0.0064)	(0.0064)	(0.0026)	(0.0026)	(0.01)	(0.01)
Liquidity	0.041	0.041	0.0416	0.0416	0.0111	0.0111	0.0858	0.0858
	(0.0269)	(0.0269)	(0.0576)	(0.0576)	(0.0129)	(0.0129)	(0.0553)	(0.0553)
Off.balance	0.0025	0.0026	0.0169	0.0169	0.0039	0.004	-0.0081	-0.0083
	(0.0058)	(0.0058)	(0.0196)	(0.0196)	(0.0033)	(0.0033)	(0.0198)	(0.0198)
Lending	-0.0326	-0.0322	0.1481	0.1482	0.0562**	0.0564**	0.0014	0.0011
	(0.0384)	(0.0384)	(0.1661)	(0.1662)	(0.0249)	(0.0249)	(0.0746)	(0.0747)
Foreign.share	0.0359***	0.0360***	-0.0379	-0.0379	0.0075	0.0075	0.0337	0.0337
	(0.0121)	(0.0121)	(0.0487)	(0.0487)	(0.0071)	(0.0071)	(0.0362)	(0.0362)
Interest.rate	-0.0032***	-0.0032***	-0.0086***	-0.0086***	-0.0049***	-0.0049***	-0.0001	-0.0001
	(0.0006)	(0.0006)	(0.0017)	(0.0017)	(0.0006)	(0.0006)	(0.0021)	(0.0021)
Concentration	-0.4426***	-0.4412***	-0.174*	-0.1694*	-0.3271***	-0.3231***	0.7532**	0.7494**
	(0.0615)	(0.0608)	(0.0961)	(0.0955)	(0.0503)	(0.0496)	(0.3285)	(0.3247)
Regulation	0.0141***	0.0136***	0.0095***	0.0089***	0.0126***	0.0121***	-0.0322***	-0.0316***
	(0.0019)	(0.0018)	(0.0019)	(0.0018)	(0.0019)	(0.0018)	(0.0088)	(0.0084)
Year 1999	0.0904***	0.0903***	0.0377	0.0374	0.0374***	0.0372***	-0.0525	-0.0522
	(0.0136)	(0.0136)	(0.035)	(0.035)	(0.0111)	(0.011)	(0.0525)	(0.0526)
Year 2000	0.0191	0.019	-0.0566**	-0.0568***	-0.0422***	-0.0424***	0.1487***	0.1488***
	(0.0148)	(0.0148)	(0.0228)	(0.0228)	(0.0087)	(0.0087)	(0.0581)	(0.0581)
Year 2001	-0.0098	-0.0098	-0.0297	-0.0296	-0.0503***	-0.0503***	0.1875***	0.1875***
	(0.0147)	(0.0147)	(0.0284)	(0.0283)	(0.0067)	(0.0067)	(0.0636)	(0.0636)
Year 2002	-0.0425***	-0.0425***	-0.0911***	-0.0908***	-0.0516***	-0.0514***	0.2143***	0.2141***
	(0.0098)	(0.0097)	(0.0348)	(0.0349)	(0.0062)	(0.0061)	(0.0626)	(0.0624)
Year 2003	-0.0504***	-0.0504***	-0.0421	-0.0417	-0.0575***	-0.0572***	0.2438***	0.2436***
	(0.0108)	(0.0108)	(0.0280)	(0.0279)	(0.0067)	(0.0067)	(0.0815)	(0.0812)
Year 2004	-0.0624***	-0.0625***	-0.0658**	-0.0656***	-0.0698***	-0.0697***	0.2613***	0.2613***
	(0.0103)	(0.0102)	(0.0264)	(0.0264)	(0.0076)	(0.0076)	(0.0711)	(0.071)
Constant	0.1792***	0.187***	-0.0548	-0.0478	0.0633***	0.0699***	5.1703***	5.1615***
	(0.0380)	(0.0379)	(0.1710)	(0.1696)	(0.02)	(0.0196)	(0.1828)	(0.1875)
R^2	0.28	0.29	0.16	0.16	0.42	0.42	0.09	0.09
Observations	704	704	693	693	745	745	745	745
Mean VIF	2.72	2.69	2.71	2.68	2.69	2.66	2.69	2.66

Note: Hb^1 = H-statistic estimated by OLS estimator in the first stage through specification 1 where interest income is as the dependent variable in equation (5.1). Hb^2 = H-statistic estimated by OLS estimator in the first stage through specification 2 where personnel expenses over assets, as the independent variable in specification 1, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by applying heteroskedasticity-consistent OLS to equation (5.4). Robust standard errors are in parentheses. LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. Mean VIF = mean value of variance inflation factor, used to test for multicollinearity in the regression. As the rule of thumb, if VIF exceeds 10, multicollinearity is severe. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3a2. First stage: Pooled OLS H-statistic – Second stage: Robust OLS – H-statistic specification 3 and 4

(2)OLS robust	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
	Hb^3	Hb^4	Hb^3	Hb^4	Hb^3	Hb^4	Hb^3	Hb^4
Competition	-0.2818***	-0.2871***	-0.2493***	-0.2532***	-0.2413***	-0.2452***	0.3213	0.3269
	(0.0571)	(0.058)	(0.076)	(0.0774)	(0.0501)	(0.051)	(0.2879)	(0.2923)
Size	0.0004	0.0004	0.0127*	0.0127*	0.0036	0.0036	-0.0087	-0.0087
	(0.0031)	(0.0031)	(0.0066)	(0.0066)	(0.0026)	(0.0026)	(0.0099)	(0.0099)
Liquidity	0.0413	0.0413	0.0417	0.0417	0.0113	0.0113	0.0855	0.0855
	(0.0267)	(0.0267)	(0.0577)	(0.0577)	(0.013)	(0.013)	(0.055)	(0.055)
Off.balance	0.0048	0.0049	0.0171	0.0171	0.0048	0.0048	-0.0101	-0.0101
	(0.0058)	(0.0058)	(0.0203)	(0.0203)	(0.0034)	(0.0034)	(0.0201)	(0.0201)
Lending	-0.0275	-0.0274	0.1491	0.1491	0.0589**	0.0589**	-0.0038	-0.0039
	(0.0385)	(0.0385)	(0.1674)	(0.1675)	(0.0254)	(0.0254)	(0.0753)	(0.0753)
Foreign.share	0.0361***	0.0361***	-0.038	-0.038	0.0072	0.0072	0.034	0.034
	(0.0121)	(0.0121)	(0.0487)	(0.0487)	(0.0071)	(0.0071)	(0.0363)	(0.0363)
Interest.rate	-0.0032***	-0.0032***	-0.0088***	-0.0088***	-0.0051***	-0.0051***	0.0000	0.0000
	(0.0006)	(0.0006)	(0.0017)	(0.0017)	(0.0007)	(0.0007)	(0.0019)	(0.0019)
Concentration	-0.4062***	-0.4053***	-0.1054	-0.1041	-0.2637***	-0.2625***	0.6847**	0.6833***
	(0.0511)	(0.051)	(0.0917)	(0.0917)	(0.0394)	(0.0392)	(0.2792)	(0.2785)
Regulation	0.0124***	0.0118***	0.0072***	0.0066***	0.0105***	0.01***	-0.0298***	-0.0291***
	(0.0016)	(0.0015)	(0.0016)	(0.0016)	(0.0015)	(0.0014)	(0.0075)	(0.0073)
Year 1999	0.0881***	0.0881***	0.0343	0.0342	0.0342***	0.0341***	-0.0487	-0.0486
	(0.0134)	(0.0134)	(0.0347)	(0.0347)	(0.0107)	(0.0106)	(0.0529)	(0.0529)
Year 2000	0.0170	0.017	-0.0592***	-0.0593***	-0.0448***	-0.0449***	0.1518***	0.1519***
	(0.0148)	(0.0148)	(0.0226)	(0.0226)	(0.0089)	(0.0089)	(0.0582)	(0.0582)
Year 2001	-0.0096	-0.0096	-0.028	-0.028	-0.0491***	-0.0491***	0.1866***	0.1866***
	(0.0146)	(0.0146)	(0.0282)	(0.0282)	(0.0067)	(0.0067)	(0.063)	(0.063)
Year 2002	-0.0409***	-0.0409***	-0.0862**	-0.0861***	-0.0477***	-0.0477***	0.2107***	0.2106***
	(0.0093)	(0.0093)	(0.0349)	(0.0349)	(0.0057)	(0.0057)	(0.06)	(0.0599)
Year 2003	-0.0487***	-0.0487***	-0.0366	-0.0365	-0.0532***	-0.0531***	0.2398***	0.2397***
	(0.0103)	(0.0103)	(0.0276)	(0.0276)	(0.0061)	(0.0061)	(0.0769)	(0.0768)
Year 2004	-0.0629***	-0.0629***	-0.0632**	-0.0632**	-0.0681***	-0.0681***	0.2605***	0.2603***
	(0.0101)	(0.0101)	(0.0259)	(0.0259)	(0.0073)	(0.0073)	(0.0706)	(0.0705)
Constant	0.2462***	0.2557***	-0.011	-0.003	0.1072***	0.115***	5.1048***	5.0942***
	(0.0375)	(0.0379)	(0.1567)	(0.155)	(0.0189)	(0.0192)	(0.2166)	(0.2233)
R^2	0.29	0.29	0.16	0.16	0.42	0.42	0.09	0.09
Observations	704	704	693	693	745	745	745	745
Mean VIF	2.47	2.47	2.47	2.47	2.4	2.4	2.4	2.4

Note: Hb^3 = H-statistic estimated by OLS estimator in the first stage through specification 3 where total income is as the dependent variable in equation (5.1). Hb^4 = H-statistic estimated by OLS estimator in the first stage through specification 4 where personnel expenses over assets, as the independent variable in specification 3, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by applying heteroskedasticity-consistent OLS to equation (5.4). Robust standard errors are in parentheses. LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. Mean VIF = mean value of variance inflation factor, used to test for multicollinearity in the regression. As the rule of thumb, if VIF exceeds 10, multicollinearity is severe. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3b1. First stage: Fixed-effects GLS H-statistic – Second stage: Robust OLS - H-statistic specification 1 and 2

(3) OLS robust	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
	Hf^1	Hf^2	Hf^1	Hf^2	Hf^1	Hf^2	Hf^1	Hf^2
Competition	-0.3136***	-0.2581***	-0.2547***	-0.1826***	-0.2513***	-0.1854***	0.3452	0.2679
	(0.0589)	(0.0432)	(0.0836)	(0.0685)	(0.0524)	(0.0393)	(0.2928)	(0.2097)
Size	0.0007	0.0012	0.0126*	0.0126*	0.0036	0.0036	-0.0089	-0.0091
	(0.0031)	(0.0031)	(0.0067)	(0.0068)	(0.0026)	(0.0026)	(0.0098)	(0.0096)
Liquidity	0.0415	0.0418	0.0418	0.0419	0.0114	0.0116	0.0853	0.085
	(0.0266)	(0.0265)	(0.0577)	(0.0578)	(0.013)	(0.013)	(0.0549)	(0.0546)
Off.balance	0.0059	0.0076	0.0171	0.0169	0.0051	0.0054	-0.011	-0.0121
	(0.0058)	(0.0057)	(0.0206)	(0.0211)	(0.0035)	(0.0035)	(0.0202)	(0.0204)
Lending	-0.0251	-0.0212	0.1493	0.1493	0.06**	0.0615**	-0.0062	-0.0099
	(0.0385)	(0.0385)	(0.1681)	(0.1692)	(0.0256)	(0.026)	(0.0755)	(0.0758)
Foreign.share	0.0361***	0.0361***	-0.0381	-0.0382	0.007	0.0067	0.0341	0.0346
	(0.0121)	(0.012)	(0.0486)	(0.0486)	(0.0071)	(0.0071)	(0.0363)	(0.0364)
Interest.rate	-0.0033***	-0.0035***	-0.0089***	-0.0091***	-0.0052***	-0.0053***	0.0001	0.0003
	(0.0006)	(0.0006)	(0.0017)	(0.0017)	(0.0007)	(0.0007)	(0.0019)	(0.0018)
Concentration	-0.3755***	-0.3021***	-0.0692	-0.0045	-0.2276***	-0.1598***	0.6401***	0.5478**
	(0.0466)	(0.0413)	(0.0931)	(0.1022)	(0.0339)	(0.026)	(0.2599)	(0.2389)
Regulation	0.0145***	0.0088***	0.0087***	0.0042***	0.012***	0.0075***	-0.0319***	-0.0256***
	(0.0018)	(0.0013)	(0.0019)	(0.0016)	(0.0018)	(0.001)	(0.0082)	(0.0072)
Year 1999	0.0864***	0.0824***	0.0325	0.0294	0.0323***	0.0290***	-0.0463	-0.0416
	(0.0132)	(0.0129)	(0.0343)	(0.0335)	(0.0104)	(0.0099)	(0.0531)	(0.0534)
Year 2000	0.0155	0.0122	-0.0606***	-0.0630***	-0.0462***	-0.0488***	0.1537***	0.1575***
	(0.0148)	(0.0148)	(0.0224)	(0.0218)	(0.009)	(0.0092)	(0.0583)	(0.0583)
Year 2001	-0.0091	-0.0077	-0.0271	-0.0253	-0.0484***	-0.0468***	0.1858***	0.1840***
	(0.0145)	(0.0145)	(0.0282)	(0.0284)	(0.0067)	(0.0066)	(0.0628)	(0.0623)
Year 2002	-0.0392***	-0.0345***	-0.0836**	-0.0787**	-0.0454***	-0.041***	0.2081***	0.2025***
	(0.0091)	(0.0089)	(0.0347)	(0.034)	(0.0055)	(0.0051)	(0.0589)	(0.0575)
Year 2003	-0.0468***	-0.0417***	-0.0337	-0.0283	-0.0506***	-0.0457***	0.2369***	0.2306***
	(0.01)	(0.0096)	(0.0278)	(0.0285)	(0.0058)	(0.0053)	(0.0748)	(0.0715)
Year 2004	-0.0625***	-0.0609***	-0.0618**	-0.059**	-0.0669***	-0.0645***	0.2593***	0.2567***
	(0.01)	(0.0098)	(0.0258)	(0.0259)	(0.0071)	(0.0068)	(0.0704)	(0.0703)
Constant	0.2414***	0.239***	-0.0256	-0.0423	0.0941***	0.0785***	5.1176***	5.1323***
	(0.0367)	(0.0359)	(0.1561)	(0.1546)	(0.0183)	(0.0183)	(0.2057)	(0.1951)
R^2	0.29	0.30	0.16	0.16	0.42	0.42	0.09	0.09
Observations	704	704	693	693	745	745	745	745
Mean VIF	2.43	2.33	2.42	2.33	2.33	2.25	2.33	2.25

Note: Hf^1 = H-statistic estimated by fixed-effects GLS estimator in the first stage through specification 1 where interest income is as the dependent variable in equation (5.1). Hf^2 = H-statistic estimated by fixed-effects GLS estimator in the first stage through specification 2 where personnel expenses over assets, as the independent variable in specification 1, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by applying heteroskedasticity-consistent OLS to equation (5.4). Robust standard errors are in parentheses. LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. Mean VIF = mean value of variance inflation factor, used to test for multicollinearity in the regression. As the rule of thumb, if VIF exceeds 10, multicollinearity is severe. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3b2. First stage: Fixed-effects GLS H-statistic - Second stage: Robust OLS - H-statistic spec 3 and 4

(4) OLS robust	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
	Hf^3	Hf^4	Hf^3	Hf^4	Hf^3	Hf^4	Hf^3	Hf^4
Competition	-0.2612***	-0.2325***	-0.2553***	-0.1768***	-0.2413***	-0.177***	0.3101	0.249
	(0.0582)	(0.0413)	(0.0721)	(0.0617)	(0.0502)	(0.0371)	(0.297)	(0.203)
Size	0.00004	0.0009	0.0127**	0.0126*	0.0035	0.0036	-0.0084	-0.009
	(0.0031)	(0.0031)	(0.0065)	(0.0068)	(0.0026)	(0.0026)	(0.01)	(0.0097)
Liquidity	0.0411	0.0416	0.0417	0.0418	0.0112	0.0115	0.0857	0.0852
	(0.0268)	(0.0266)	(0.0576)	(0.0577)	(0.0129)	(0.0130)	(0.0552)	(0.0547)
Off.balance	0.0036	0.0067	0.017	0.0171	0.0044	0.0053	-0.0091	-0.0115
	(0.0058)	(0.0057)	(0.0199)	(0.0208)	(0.0034)	(0.0035)	(0.0199)	(0.0203)
Lending	-0.0302	-0.0232	0.1487	0.1494	0.0575**	0.0608**	-0.001	-0.008
	(0.0385)	(0.0385)	(0.1667)	(0.1686)	(0.0251)	(0.0258)	(0.0749)	(0.0757)
Foreign.share	0.036***	0.0361***	-0.0379	-0.0381	0.0074	0.0068	0.0338	0.0343
	(0.0121)	(0.0121)	(0.0487)	(0.0486)	(0.0071)	(0.0071)	(0.0362)	(0.0364)
Interest.rate	-0.0032***	-0.0034***	-0.0087***	-0.0090***	-0.005***	-0.0052***	-0.0001	0.0002
	(0.0006)	(0.0006)	(0.0017)	(0.0017)	(0.0007)	(0.0007)	(0.002)	(0.0018)
Concentration	-0.43***	-0.3444***	-0.1429	-0.0392	-0.2993***	-0.1967***	0.7251**	0.5992**
	(0.0566)	(0.0436)	(0.093)	(0.0962)	(0.0453)	(0.0298)	(0.3042)	(0.2479)
Regulation	0.016***	0.01***	0.0109***	0.0051***	0.014***	0.0084***	-0.0342***	-0.027***
	(0.0022)	(0.0014)	(0.0022)	(0.0015)	(0.0021)	(0.0012)	(0.0098)	(0.0071)
Year 1999	0.0895***	0.0847***	0.0361	0.031	0.036***	0.0308***	-0.0509	-0.0442
	(0.0135)	(0.0131)	(0.0349)	(0.034)	(0.0109)	(0.0102)	(0.0527)	(0.0532)
Year 2000	0.0183	0.0141	-0.0578***	-0.0617***	-0.0434***	-0.0474***	0.15***	0.1554***
	(0.0148)	(0.0148)	(0.0227)	(0.0221)	(0.0088)	(0.0091)	(0.0582)	(0.0583)
Year 2001	-0.0098	-0.0085	-0.029	-0.0263	-0.0498***	-0.0477***	0.1872***	0.185***
	(0.0147)	(0.0145)	(0.0282)	(0.0282)	(0.0067)	(0.0066)	(0.0634)	(0.0626)
Year 2002	-0.0421***	-0.0372***	-0.0889***	-0.0813**	-0.0499***	-0.0434***	0.2129***	0.2057***
	(0.0095)	(0.009)	(0.035)	(0.0345)	(0.006)	(0.0053)	(0.0613)	(0.0582)
Year 2003	-0.05***	-0.0447***	-0.0397	-0.0312	-0.0557***	-0.0484***	0.2422***	0.2342***
	(0.0106)	(0.0098)	(0.0277)	(0.028)	(0.0065)	(0.0056)	(0.0793)	(0.0732)
Year 2004	-0.0628***	-0.0619***	-0.0647**	-0.0605**	-0.0691***	-0.0659***	0.2611***	0.2582***
	(0.0102)	(0.0099)	(0.0262)	(0.0258)	(0.0075)	(0.007)	(0.0708)	(0.0703)
Constant	0.2211***	0.2300***	-0.0218	-0.0417	0.0953***	0.0787***	5.1258***	5.1356***
	(0.0377)	(0.0363)	(0.1628)	(0.1574)	(0.019)	(0.0183)	(0.2072)	(0.1945)
R^2	0.29	0.30	0.16	0.16	0.42	0.42	0.09	0.09
Observations	704	704	693	693	745	745	745	745
Mean VIF	2.69	2.36	2.68	2.35	2.63	2.27	2.63	2.27

Note: Hf^3 = H-statistic estimated by fixed-effects GLS estimator in the first stage through specification 3 where total income is as the dependent variable in equation (5.1). Hf^4 = H-statistic estimated by fixed-effects GLS estimator in the first stage through specification 4 where personnel expenses over assets, as the independent variable in specification 3, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by applying heteroskedasticity-consistent OLS to equation (5.4). Robust standard errors are in parentheses. LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. Mean VIF = mean value of variance inflation factor, used to test for multicollinearity in the regression. As the rule of thumb, if VIF exceeds 10, multicollinearity is severe. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3c1. First stage: Dynamic GMM H-statistic – Second stage: Robust OLS - H-statistic spec 1 and 2

(5) OLS robust	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
	Hd^1	Hd^2	Hd^1	Hd^2	Hd^1	Hd^2	Hd^1	Hd^2
Competition	-0.4124***	-0.2831***	-0.1944***	-0.1506**	-0.3271***	-0.2747***	1.001***	0.9047***
	(0.053)	(0.0465)	(0.053)	(0.0617)	(0.0475)	(0.0375)	(0.2492)	(0.2514)
Size	-0.0028	-0.0037	0.0096*	0.0092	0.0008	0.0000	-0.0057	-0.0031
	(0.0028)	(0.0029)	(0.0058)	(0.0059)	(0.0022)	(0.0022)	(0.0089)	(0.0088)
Liquidity	0.0421	0.038	0.0415	0.0401	0.0113	0.0091	0.0848	0.0898
	(0.0265)	(0.0275)	(0.0578)	(0.0568)	(0.0129)	(0.0124)	(0.0548)	(0.0577)
Off.balance	-0.0045	-0.0093*	0.0077	0.0056	-0.0034	-0.0075***	-0.0022	0.0098
	(0.0049)	(0.005)	(0.018)	(0.0179)	(0.0023)	(0.0022)	(0.0187)	(0.0186)
Lending	-0.042	-0.0594*	0.1316	0.1247	0.0451**	0.0308	0.0061	0.0445
	(0.0362)	(0.0357)	(0.1638)	(0.1619)	(0.0233)	(0.0215)	(0.0713)	(0.0703)
Foreign.share	0.0328***	0.0371***	-0.0397	-0.0384	0.005	0.0077	0.0376	0.0318
	(0.0121)	(0.0122)	(0.0495)	(0.0484)	(0.0072)	(0.0072)	(0.037)	(0.0366)
Interest.rate	-0.0039***	-0.0040***	-0.0094***	-0.0093***	-0.0057***	-0.0055***	0.0012	0.0004
	(0.0007)	(0.0007)	(0.0018)	(0.0019)	(0.0008)	(0.0007)	(0.0017)	(0.0018)
Concentration	-0.2031***	-0.2551***	0.0621	0.0219	-0.0804***	-0.1859***	0.3034	0.6829***
	(0.0383)	(0.0566)	(0.0945)	(0.1321)	(0.0195)	(0.0303)	(0.2042)	(0.2696)
Year 1999	0.0795***	0.0843***	0.0279	0.0308	0.0268***	0.0336***	-0.0315	-0.054
	(0.0128)	(0.0138)	(0.0341)	(0.0329)	(0.01)	(0.0108)	(0.0528)	(0.054)
Year 2000	0.0121	0.0149	-0.063***	-0.0611***	-0.0489***	-0.0438***	0.1633***	0.1457***
	(0.0149)	(0.0153)	(0.0227)	(0.0215)	(0.0092)	(0.0091)	(0.0583)	(0.058)
Year 2001	-0.0011	-0.0013	-0.0207	-0.0211	-0.042***	-0.043***	0.1749***	0.1796***
	(0.0142)	(0.0144)	(0.0289)	(0.0298)	(0.0063)	(0.0062)	(0.0612)	(0.0617)
Year 2002	-0.0212**	-0.0239***	-0.0693**	-0.0716**	-0.0309***	-0.036***	0.1806***	0.2002***
	(0.0087)	(0.0096)	(0.0329)	(0.0308)	(0.0051)	(0.0056)	(0.0555)	(0.0579)
Year 2003	-0.0264***	-0.03***	-0.0178	-0.0206	-0.0342***	-0.0402***	0.2058***	0.2284***
	(0.0091)	(0.0099)	(0.0299)	(0.0325)	(0.0051)	(0.0057)	(0.0675)	(0.0691)
Year 2004	-0.0465***	-0.0456***	-0.0485*	-0.0487*	-0.0538***	-0.0546***	0.2385***	0.2436***
	(0.0093)	(0.0094)	(0.028)	(0.0294)	(0.0061)	(0.0063)	(0.0709)	(0.0714)
Constant	0.5533***	0.4848***	0.0739	0.0617	0.3444***	0.3609***	4.1605***	4.0355***
	(0.0548)	(0.0628)	(0.2017)	(0.2435)	(0.0362)	(0.0382)	(0.2652)	(0.307)
R^2	0.28	0.26	0.15	0.15	0.41	0.40	0.09	0.09
Observations	704	704	693	693	745	745	745	745
Mean VIF	2.11	2.42	2.1	2.41	2.01	2.39	2.01	2.39

Note: Hd^1 = H-statistic estimated by dynamic GMM estimator in the first stage through specification 1 where interest income is as the dependent variable in equation (5.3). Hd^2 = H-statistic estimated by dynamic GMM estimator in the first stage through specification 2 where personnel expenses over assets, as the independent variable in specification 1, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by applying heteroskedasticity-consistent OLS to equation (5.4). Robust standard errors are in parentheses. LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. Mean VIF = mean value of variance inflation factor, used to test for multicollinearity in the regression. As the rule of thumb, if VIF exceeds 10, multicollinearity is severe. Regulation is dropped due to severe multicollinearity. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3c2. First stage: Dynamic GMM H-statistic – Second stage: Robust OLS - H-statistic spec 3 and 4

(6) OLS robust	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
	Hd^3	Hd^4	Hd^3	Hd^4	Hd^3	Hd^4	Hd^3	Hd^4
Competition	-0.2733***	-0.2688***	-0.1848***	-0.1977***	-0.1893***	-0.1993***	0.2781	0.2838
	(0.0442)	(0.0464)	(0.0726)	(0.0713)	(0.0405)	(0.042)	(0.2127)	(0.227)
Size	0.0013	0.001	0.0125*	0.0126*	0.0036	0.0036	-0.0091	-0.009
	(0.0031)	(0.0031)	(0.0069)	(0.0068)	(0.0026)	(0.0026)	(0.0096)	(0.0097)
Liquidity	0.0419	0.0417	0.0419	0.0419	0.0116	0.0115	0.0849	0.0851
	(0.0264)	(0.0265)	(0.0578)	(0.0578)	(0.0131)	(0.013)	(0.0545)	(0.0547)
Off.balance	0.0081	0.0071	0.0168	0.017	0.0054	0.0053	-0.0124	-0.0118
	(0.0057)	(0.0057)	(0.0213)	(0.021)	(0.0036)	(0.0035)	(0.0205)	(0.0203)
Lending	-0.02	-0.0223	0.1492	0.1494	0.0618**	0.0611**	-0.011	-0.0089
	(0.0385)	(0.0385)	(0.1696)	(0.1689)	(0.0261)	(0.0259)	(0.0759)	(0.0757)
Foreign.share	0.036***	0.0361***	-0.0382	-0.0381	0.0065	0.0068	0.0348	0.0344
	(0.012)	(0.0121)	(0.0486)	(0.0486)	(0.0071)	(0.0071)	(0.0365)	(0.0364)
Interest.rate	-0.0036***	-0.0034***	-0.0091***	-0.009***	-0.0054***	-0.0053***	0.0004	0.0003
	(0.0006)	(0.0006)	(0.0017)	(0.0017)	(0.0007)	(0.0007)	(0.0018)	(0.0018)
Concentration	-0.2714***	-0.3261***	0.0179	-0.0235	-0.1357***	-0.1802***	0.5126**	0.5765**
	(0.0406)	(0.0424)	(0.1074)	(0.0986)	(0.0244)	(0.0279)	(0.2362)	(0.2432)
Regulation	0.0022	0.0019	-0.0003	-0.0009	0.0029***	0.0024***	-0.0189**	-0.0184*
	(0.0015)	(0.0015)	(0.0028)	(0.0028)	(0.0008)	(0.0009)	(0.0094)	(0.0099)
Year 1999	0.0808***	0.0837***	0.0283	0.0303	0.0278***	0.0300***	-0.0398	-0.0431
	(0.0128)	(0.0130)	(0.0332)	(0.0338)	(0.0097)	(0.0101)	(0.0535)	(0.0533)
Year 2000	0.0109	0.0133	-0.0638***	-0.0623***	-0.0497***	-0.048***	0.1588***	0.1563***
	(0.0148)	(0.0148)	(0.0216)	(0.022)	(0.0093)	(0.0092)	(0.0583)	(0.0583)
Year 2001	-0.007	-0.0082	-0.0247	-0.0259	-0.0463***	-0.0473***	0.1833***	0.1846***
	(0.0145)	(0.0145)	(0.0285)	(0.0283)	(0.0066)	(0.0066)	(0.0622)	(0.0625)
Year 2002	-0.0325***	-0.0361***	-0.077**	-0.0802**	-0.0393***	-0.0423***	0.2002***	0.2043***
	(0.0088)	(0.0089)	(0.0336)	(0.0343)	(0.0049)	(0.0052)	(0.0572)	(0.0579)
Year 2003	-0.0394***	-0.0434***	-0.0264	-0.0299	-0.0438***	-0.0472***	0.2281***	0.2326***
	(0.0095)	(0.0097)	(0.0289)	(0.0282)	(0.0051)	(0.0054)	(0.0706)	(0.0724)
Year 2004	-0.06***	-0.0615***	-0.058**	-0.0598**	-0.0636***	-0.0653***	0.2555***	0.2575***
	(0.0098)	(0.0099)	(0.026)	(0.0258)	(0.0067)	(0.0069)	(0.0703)	(0.0703)
Constant	0.3979***	0.422***	0.0607	0.0963	0.1844***	0.218***	4.9746***	4.9357***
	(0.0426)	(0.0477)	(0.1236)	(0.1227)	(0.0274)	(0.0324)	(0.2866)	(0.3195)
R^2	0.30	0.30	0.16	0.16	0.42	0.42	0.09	0.09
Observations	704	704	693	693	745	745	745	745
Mean VIF	2.66	2.84	2.65	2.83	2.59	2.78	2.59	2.78

Note: Hd^3 = H-statistic estimated by dynamic GMM estimator in the first stage through specification 3 where total income is as the dependent variable in equation (5.3). Hd^4 = H-statistic estimated by dynamic GMM estimator in the first stage through specification 4 where personnel expenses over assets, as the independent variable in specification 3, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by applying heteroskedasticity-consistent OLS to equation (5.4). Robust standard errors are in parentheses. LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. Mean VIF = mean value of variance inflation factor, used to test for multicollinearity in the regression. As the rule of thumb, if VIF exceeds 10, multicollinearity is severe. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3d1. First stage: Pooled OLS H-statistic-Second stage: Random-effects GLS - H-statistic spec 1 and 2

(7) GLS	LLR		LLP		ROA volatility		Z-index	
random-effects	Hb^1	Hb^2	Hb^1	Hb^2	Hb^1	Hb^2	Hb^1	Hb^2
Competition	0.0131	0.0086	-0.1757	-0.1811	-0.1457***	-0.1512***	0.1797	0.1872
	(0.0734)	(0.0759)	(0.1143)	(0.1177)	(0.0477)	(0.0492)	(0.2146)	(0.2212)
Size	-0.01**	-0.0098**	0.0126*	0.0126*	0.0018	0.0019	-0.0093	-0.0093
	(0.005)	(0.005)	(0.0067)	(0.0067)	(0.0029)	(0.0029)	(0.0129)	(0.0129)
Liquidity	0.0075	0.0075	0.0416	0.0416	0.0107	0.0107	0.0822	0.0822
	(0.0142)	(0.0142)	(0.0308)	(0.0308)	(0.0116)	(0.0116)	(0.0548)	(0.0548)
Off.balance	0.005	0.0051	0.0169	0.0169	0.003	0.0031	-0.0053	-0.0055
	(0.0077)	(0.0077)	(0.0142)	(0.0142)	(0.0058)	(0.0058)	(0.0263)	(0.0263)
Lending	-0.0656***	-0.0654***	0.1481***	0.1482***	0.0614***	0.0617***	0.0235	0.0232
	(0.0265)	(0.0265)	(0.0533)	(0.0533)	(0.0204)	(0.0204)	(0.0944)	(0.0944)
Foreign.share	0.0234	0.0235	-0.0379	-0.0379	0.0044	0.0044	0.0367	0.0367
	(0.0172)	(0.0172)	(0.0251)	(0.0251)	(0.0108)	(0.0108)	(0.0477)	(0.0477)
Interest.rate	-0.0034***	-0.0033***	-0.0086***	-0.0086***	-0.0048***	-0.0048***	-0.0002	-0.0002
	(0.0006)	(0.0006)	(0.0016)	(0.0016)	(0.0005)	(0.0005)	(0.0026)	(0.0026)
Concentration	-0.0863	-0.0901	-0.174	-0.1694	-0.3086***	-0.3059***	0.7031**	0.7003**
	(0.1031)	(0.1025)	(0.205)	(0.203)	(0.0728)	(0.072)	(0.3341)	(0.3302)
Regulation	0.0064**	0.0065**	0.0095*	0.0089*	0.0122***	0.0117***	-0.0305***	-0.0299***
	(0.003)	(0.0030)	(0.0052)	(0.0049)	(0.002)	(0.002)	(0.0093)	(0.0089)
Year 1999	0.0573***	0.0574***	0.0377	0.0374	0.0344***	0.0343***	-0.044	-0.0439
	(0.0146)	(0.0146)	(0.0434)	(0.0434)	(0.0136)	(0.0136)	(0.0681)	(0.0681)
Year 2000	-0.0057	-0.0056	-0.0566	-0.0568	-0.0454***	-0.0455***	0.1546***	0.1548***
	(0.0129)	(0.0129)	(0.0383)	(0.0383)	(0.0121)	(0.0121)	(0.0604)	(0.0604)
Year 2001	-0.0076	-0.0078	-0.0297	-0.0296	-0.0515***	-0.0514***	0.1883***	0.1883***
	(0.0137)	(0.0137)	(0.0408)	(0.0408)	(0.013)	(0.013)	(0.0648)	(0.0648)
Year 2002	-0.0194	-0.0197	-0.0911**	-0.0908**	-0.0519***	-0.0518***	0.2131***	0.213***
	(0.0159)	(0.0159)	(0.0444)	(0.0443)	(0.0143)	(0.0143)	(0.071)	(0.0709)
Year 2003	-0.0256	-0.026	-0.0421	-0.0417	-0.0566***	-0.0564***	0.2408***	0.2407***
	(0.0163)	(0.0163)	(0.0445)	(0.0445)	(0.0145)	(0.0145)	(0.0718)	(0.0716)
Year 2004	-0.0486***	-0.0489***	-0.0658	-0.0656	-0.0687***	-0.0687***	0.2556***	0.2556***
	(0.0148)	(0.0148)	(0.0427)	(0.0427)	(0.014)	(0.014)	(0.0699)	(0.0699)
Constant	0.1318*	0.1336*	-0.0548	-0.0478	0.0622	0.0685	5.1719***	5.1638***
	(0.0733)	(0.0748)	(0.1138)	(0.1161)	(0.0457)	(0.0467)	(0.2049)	(0.2093)
R^2	0.24	0.24	0.13	0.13	0.40	0.40	0.05	0.05
Observations	704	704	693	693	745	745	745	745

Note: Hb^1 = H-statistic estimated by pooled OLS estimator in the first stage through specification 1 where interest income is as the dependent variable in equation (5.1). Hb^2 = H-statistic estimated by pooled OLS estimator in the first stage through specification 2 where personnel expenses over assets, as the independent variable in specification 1, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by applying random-effects GLS to equation (5.4). LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3d2. First stage: Pooled OLS H-statistic-Second stage: Random-effects GLS - H-statistic spec 3 and 4

(8) GLS	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
random-effects	Hb^3	Hb^4	Hb^3	Hb^4	Hb^3	Hb^4	Hb^3	Hb^4
Competition	-0.0919	-0.0954	-0.2493	-0.2532	-0.2272***	-0.2311***	0.2942	0.2994
	(0.1102)	(0.112)	(0.1616)	(0.1641)	(0.0686)	(0.0697)	(0.3061)	(0.3109)
Size	-0.0083	-0.0082	0.0127*	0.0127*	0.0021	0.0021	-0.0098	-0.0098
	(0.005)	(0.005)	(0.0067)	(0.0067)	(0.0029)	(0.0029)	(0.0129)	(0.0129)
Liquidity	0.0078	0.0078	0.0417	0.0417	0.0109	0.0109	0.0819	0.0819
	(0.0142)	(0.0142)	(0.0308)	(0.0308)	(0.0116)	(0.0116)	(0.0548)	(0.0548)
Off.balance	0.0074	0.0075	0.0171	0.0171	0.0041	0.0041	-0.0074	-0.0074
	(0.0078)	(0.0078)	(0.0143)	(0.0143)	(0.0059)	(0.0059)	(0.0265)	(0.0265)
Lending	-0.0621**	-0.062**	0.1491***	0.1491***	0.0646***	0.0646***	0.0184	0.0183
	(0.0266)	(0.0266)	(0.0535)	(0.0535)	(0.0205)	(0.0205)	(0.095)	(0.095)
Foreign.share	0.0249	0.0249	-0.038	-0.0380	0.004	0.004	0.037	0.037
	(0.0171)	(0.0171)	(0.0251)	(0.0251)	(0.0108)	(0.0108)	(0.0477)	(0.0477)
Interest.rate	-0.0032***	-0.0032***	-0.0088***	-0.0088***	-0.0049***	-0.0049***	-0.0001	-0.0001
	(0.0006)	(0.0006)	(0.0015)	(0.0015)	(0.0005)	(0.0005)	(0.0025)	(0.0025)
Concentration	-0.1282	-0.1286	-0.1054	-0.1041	-0.261***	-0.2601***	0.6482**	0.647**
	(0.0952)	(0.095)	(0.1789)	(0.1785)	(0.0622)	(0.062)	(0.2824)	(0.2817)
Regulation	0.007**	0.0068**	0.0072	0.0066	0.0105***	0.01***	-0.0285***	-0.0278***
	(0.0028)	(0.0028)	(0.0045)	(0.0044)	(0.0018)	(0.0018)	(0.0081)	(0.0079)
Year 1999	0.0589***	0.0589***	0.0343	0.0342	0.032**	0.032**	-0.0411	-0.041
	(0.0145)	(0.0145)	(0.0432)	(0.0432)	(0.0135)	(0.0135)	(0.0677)	(0.0677)
Year 2000	-0.0049	-0.0049	-0.0592	-0.0593	-0.0473***	-0.0474***	0.1571***	0.1572***
	(0.0129)	(0.0129)	(0.0382)	(0.0382)	(0.0121)	(0.0121)	(0.0602)	(0.0602)
Year 2001	-0.0097	-0.0098	-0.028	-0.028	-0.0505***	-0.0505***	0.1875***	0.1875***
	(0.0136)	(0.0136)	(0.0406)	(0.0406)	(0.0129)	(0.0129)	(0.0645)	(0.0645)
Year 2002	-0.0239	-0.0239	-0.0862**	-0.0861**	-0.0491***	-0.049***	0.2103***	0.2102***
	(0.0155)	(0.0155)	(0.0436)	(0.0435)	(0.014)	(0.014)	(0.0695)	(0.0695)
Year 2003	-0.0307**	-0.0307**	-0.0366	-0.0365	-0.0534***	-0.0534***	0.2377***	0.2376***
	(0.0159)	(0.0159)	(0.0435)	(0.0435)	(0.0141)	(0.0141)	(0.0699)	(0.0699)
Year 2004	-0.0525***	-0.0526***	-0.0632	-0.0632	-0.0676***	-0.0675***	0.255***	0.255***
	(0.0146)	(0.0146)	(0.0423)	(0.0423)	(0.0139)	(0.0139)	(0.0692)	(0.0692)
Constant	0.1854**	0.1896**	-0.011	-0.003	0.1083**	0.1157**	5.1087***	5.0989***
	(0.0867)	(0.0892)	(0.1303)	(0.1337)	(0.0529)	(0.0544)	(0.2358)	(0.2424)
R^2	0.23	0.23	0.13	0.13	0.40	0.40	0.05	0.05
Observations	704	704	693	693	745	745	745	745

Note: Hb^3 = H-statistic estimated by OLS estimator in the first stage through specification 3 where total income is as the dependent variable in equation (5.1). Hb^4 = H-statistic estimated by OLS estimator in the first stage through specification 4 where personnel expenses over assets, as the independent variable in specification 3, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by random-effects GLS to equation (5.4). LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3e1. First stage: Fixed-effects GLS H-statistic–Second stage: Random-effects GLS-H-statistic spec 1 and 2

(9) GLS	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
random-effects	Hf^1	Hf^2	Hf^1	Hf^2	Hf^1	Hf^2	Hf^1	Hf^2
Competition	-0.1592	-0.2024**	-0.2547	-0.1826	-0.2407***	-0.1805***	0.3191	0.2501
	(0.1155)	(0.0859)	(0.1657)	(0.1208)	(0.0706)	(0.0514)	(0.3144)	(0.2283)
Size	-0.0074	-0.0061	0.0126*	0.0126*	0.0021	0.0021	-0.01	-0.0102
	(0.005)	(0.005)	(0.0067)	(0.0067)	(0.0029)	(0.0029)	(0.0129)	(0.0128)
Liquidity	0.0079	0.0082	0.0418	0.0419	0.011	0.0112	0.0817	0.0814
	(0.0141)	(0.0141)	(0.0308)	(0.0308)	(0.0116)	(0.0116)	(0.0548)	(0.0548)
Off.balance	0.0089	0.0115	0.0171	0.0169	0.0045	0.0049	-0.0082	-0.0094
	(0.0078)	(0.0078)	(0.0143)	(0.0143)	(0.0059)	(0.0059)	(0.0266)	(0.0267)
Lending	-0.0596**	-0.054**	0.1493***	0.1493***	0.066***	0.0679***	0.016	0.0121
	(0.0266)	(0.0266)	(0.0535)	(0.0536)	(0.0205)	(0.0206)	(0.0952)	(0.0956)
Foreign.share	0.0254	0.0258	-0.0381	-0.0382	0.0038	0.0032	0.0373	0.0378
	(0.0171)	(0.0170)	(0.0251)	(0.0251)	(0.0107)	(0.0107)	(0.0476)	(0.0476)
Interest.rate	-0.0032***	-0.0032***	-0.0089***	-0.0091***	-0.005***	-0.0052***	0.000002	0.0002
	(0.0005)	(0.0005)	(0.0015)	(0.0015)	(0.0005)	(0.0005)	(0.0025)	(0.0024)
Concentration	-0.1355	-0.1186	-0.0692	-0.0045	-0.231***	-0.1714***	0.6098**	0.528**
	(0.0916)	(0.0874)	(0.1686)	(0.1571)	(0.0581)	(0.0543)	(0.2628)	(0.2451)
Regulation	0.0083***	0.0051*	0.0087*	0.0042	0.012***	0.0077***	-0.0305***	-0.0247***
	(0.0031)	(0.0029)	(0.0049)	(0.0043)	(0.002)	(0.0018)	(0.0088)	(0.0079)
Year 1999	0.0591***	0.0581***	0.0325	0.0294	0.0306**	0.0277**	-0.0391	-0.035
	(0.0145)	(0.0144)	(0.0432)	(0.0431)	(0.0135)	(0.0135)	(0.0676)	(0.0676)
Year 2000	-0.005	-0.006	-0.0606	-0.063*	-0.0485***	-0.0506***	0.1587***	0.162***
	(0.0129)	(0.0128)	(0.0382)	(0.0382)	(0.012)	(0.0121)	(0.0602)	(0.0603)
Year 2001	-0.0104	-0.0105	-0.0271	-0.0253	-0.0498***	-0.0484***	0.1868***	0.1851***
	(0.0136)	(0.0135)	(0.0406)	(0.0405)	(0.0129)	(0.0128)	(0.0644)	(0.0643)
Year 2002	-0.0251	-0.0248*	-0.0836**	-0.0787*	-0.0472***	-0.0432***	0.208***	0.2029***
	(0.0153)	(0.015)	(0.0432)	(0.0427)	(0.0138)	(0.0137)	(0.0689)	(0.0681)
Year 2003	-0.0321**	-0.0319**	-0.0337	-0.0283	-0.0513***	-0.0469***	0.2352***	0.2295***
	(0.0156)	(0.0152)	(0.0431)	(0.0425)	(0.0139)	(0.0137)	(0.0691)	(0.0681)
Year 2004	-0.0539***	-0.0550***	-0.0618	-0.059	-0.0666***	-0.0645***	0.2541***	0.2517***
	(0.0145)	(0.0143)	(0.0421)	(0.0418)	(0.0138)	(0.0137)	(0.0688)	(0.0683)
Constant	0.2113***	0.2553***	-0.0256	-0.0423	0.0984**	0.086*	5.1186***	5.1302***
	(0.0842)	(0.0818)	(0.1245)	(0.1187)	(0.0503)	(0.0476)	(0.2241)	(0.2118)
R^2	0.23	0.23	0.13	0.13	0.40	0.40	0.05	0.05
Observations	704	704	693	693	745	745	745	745

Note: Hf^1 = H-statistic estimated by fixed-effects GLS estimator in the first stage through specification 1 where interest income is as the dependent variable in equation (5.1). Hf^2 = H-statistic estimated by fixed-effects GLS estimator in the first stage through specification 2 where personnel expenses over assets, as the independent variable in specification 1, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by applying random-effects GLS to equation (5.4). LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3e2. First stage: Fixed-effects GLS H-statistic – Second stage: Random-effects GLS- H-statistic spec. 3 and 4

(10) GLS	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
random-effects	Hf^3	Hf^4	Hf^3	Hf^4	Hf^3	Hf^4	Hf^3	Hf^4
Competition	-0.0302	-0.1496*	-0.2553	-0.1768	-0.222***	-0.1711***	0.2801	0.2314
	(0.1095)	(0.0817)	(0.1655)	(0.1158)	(0.0697)	(0.0494)	(0.3123)	(0.2194)
Size	-0.0092*	-0.0067	0.0127*	0.0126*	0.002	0.0022	-0.0096	-0.0101
	(0.005)	(0.005)	(0.0067)	(0.0067)	(0.0029)	(0.0029)	(0.0129)	(0.0128)
Liquidity	0.0076	0.0081	0.0417	0.0418	0.0108	0.0111	0.082	0.0816
	(0.0142)	(0.0141)	(0.0308)	(0.0308)	(0.0116)	(0.0116)	(0.0548)	(0.0548)
Off.balance	0.006	0.0101	0.017	0.0171	0.0035	0.0047	-0.0063	-0.0088
	(0.0078)	(0.0078)	(0.0142)	(0.0143)	(0.0058)	(0.0059)	(0.0264)	(0.0267)
Lending	-0.0642**	-0.0571**	0.1487***	0.1494***	0.0629***	0.0670***	0.0211	0.0141
	(0.0265)	(0.0266)	(0.0534)	(0.0536)	(0.0204)	(0.0206)	(0.0947)	(0.0954)
Foreign.share	0.0242	0.0257	-0.0379	-0.0381	0.0043	0.0035	0.0368	0.0375
	(0.0172)	(0.0171)	(0.0251)	(0.0251)	(0.0108)	(0.0107)	(0.0477)	(0.0476)
Interest.rate	-0.0033***	-0.0032***	-0.0087***	-0.0090***	-0.0049***	-0.0051***	-0.0002	0.0001
	(0.0006)	(0.0005)	(0.0016)	(0.0015)	(0.0005)	(0.0005)	(0.0025)	(0.0025)
Concentration	-0.1094	-0.1327	-0.1429	-0.0392	-0.2888***	-0.2041***	0.6814**	0.5738**
	(0.0994)	(0.0893)	(0.1922)	(0.1621)	(0.0676)	(0.0557)	(0.3087)	(0.2515)
Regulation	0.0071**	0.006**	0.0109*	0.0051	0.0136***	0.0086***	-0.0323***	-0.0259***
	(0.0034)	(0.0028)	(0.0057)	(0.0042)	(0.0023)	(0.0017)	(0.0103)	(0.0078)
Year 1999	0.0582***	0.0589***	0.0361	0.031	0.0334***	0.0293**	-0.0428	-0.0373
	(0.0145)	(0.0144)	(0.0433)	(0.0431)	(0.0136)	(0.0135)	(0.0679)	(0.0676)
Year 2000	-0.0052	-0.0053	-0.0578	-0.0617	-0.0462***	-0.0494***	0.1557***	0.1602***
	(0.0129)	(0.0128)	(0.0383)	(0.0382)	(0.0121)	(0.012)	(0.0603)	(0.0602)
Year 2001	-0.0087	-0.0106	-0.029	-0.0263	-0.0511***	-0.0492***	0.1881***	0.1861***
	(0.0137)	(0.0135)	(0.0407)	(0.0405)	(0.0129)	(0.0128)	(0.0647)	(0.0643)
Year 2002	-0.0217	-0.0254*	-0.0889**	-0.0813*	-0.0508***	-0.0454***	0.2121***	0.2058***
	(0.0158)	(0.0152)	(0.044)	(0.043)	(0.0142)	(0.0137)	(0.0703)	(0.0685)
Year 2003	-0.0282**	-0.0325**	-0.0397	-0.0312	-0.0553***	-0.0493***	0.2397***	0.2328***
	(0.0161)	(0.0154)	(0.044)	(0.0428)	(0.0143)	(0.0138)	(0.0709)	(0.0686)
Year 2004	-0.0505***	-0.0547***	-0.0647	-0.0605	-0.0683***	-0.0657***	0.2555***	0.2532***
	(0.0148)	(0.0144)	(0.0425)	(0.042)	(0.014)	(0.0137)	(0.0696)	(0.0685)
Constant	0.1514*	0.2258***	-0.0218	-0.0417	0.0939*	0.085*	5.1301***	5.1342***
	(0.0819)	(0.0808)	(0.1258)	(0.1186)	(0.0509)	(0.0477)	(0.2276)	(0.2123)
R^2	0.24	0.23	0.13	0.13	0.40	0.40	0.05	0.05
Observations	704	704	693	693	745	745	745	745

Note: Hf^3 = H-statistic estimated by fixed-effects GLS estimator in the first stage through specification 3 where total income is as the dependent variable in equation (5.1). Hf^4 = H-statistic estimated by fixed-effects GLS estimator in the first stage through specification 4 where personnel expenses over assets, as the independent variable in specification 3, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by random-effects GLS to equation (5.4). LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3f1. First stage: Dynamic GMM H-statistic – Second stage: Random-effects GLS- H-statistic spec 1 and 2

(11) GLS	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
random-effects	Hd^1	Hd^2	Hd^1	Hd^2	Hd^1	Hd^2	Hd^1	Hd^2
Competition	-2.9854***	3.0694***	-0.9793	1.0786	-0.9517***	-1.0443***	1.9451	-2.0205
	(0.5459)	(0.5677)	(1.0654)	(1.05)	(0.3743)	(0.3798)	(1.749)	(1.7604)
Size	-0.0087*	-0.0079*	0.0106	0.0109*	-0.0001	0.0002	-0.008	-0.0084
	(0.0046)	(0.0046)	(0.0065)	(0.0065)	(0.0028)	(0.0028)	(0.0123)	(0.0124)
Liquidity	0.0088	0.0088	0.0417	0.0418	0.0113	0.0114	0.0809	0.0808
	(0.0139)	(0.0139)	(0.0308)	(0.0308)	(0.0116)	(0.0116)	(0.0547)	(0.0547)
Off.balance	0.0126*	0.0136*	0.011	0.012	0.00002	0.0008	-0.0053	-0.0065
	(0.0073)	(0.0074)	(0.0134)	(0.0136)	(0.0055)	(0.0056)	(0.025)	(0.0253)
Lending	-0.0377	-0.0369	0.1387***	0.1406***	0.0629***	0.0645***	0.012	0.0101
	(0.0262)	(0.0262)	(0.053)	(0.0532)	(0.0207)	(0.0207)	(0.0953)	(0.0955)
Foreign.share	0.0177	0.0185	-0.0392	-0.0391	0.0009	0.0009	0.0415	0.0412
	(0.0166)	(0.0166)	(0.0251)	(0.0251)	(0.0107)	(0.0107)	(0.0475)	(0.0475)
Interest.rate	-0.0046***	-0.0045***	-0.0099***	-0.0099***	-0.0059***	-0.0059***	0.0016	0.0015
	(0.0006)	(0.0006)	(0.0016)	(0.0016)	(0.0005)	(0.0005)	(0.0026)	(0.0026)
Concentration	0.3417***	0.3069***	0.2458	0.2424	0.0556	0.0538	0.0518	0.0801
	(0.1175)	(0.1138)	(0.2799)	(0.2572)	(0.101)	(0.095)	(0.4817)	(0.4497)
Regulation	-0.0717***	0.097***	-0.0222	0.0353	-0.0174	0.0383***	0.0279	-0.0829*
	(0.0146)	(0.0169)	(0.0298)	(0.0298)	(0.0105)	(0.0108)	(0.0493)	(0.0499)
Year 1999	0.0383***	0.0397***	0.0184	0.0183	0.0179	0.0179	-0.0132	-0.0144
	(0.0146)	(0.0146)	(0.0449)	(0.0446)	(0.0142)	(0.0141)	(0.0709)	(0.0704)
Year 2000	-0.0207	-0.0198	-0.0709*	-0.071*	-0.0572***	-0.0574***	0.17778***	0.1771***
	(0.013)	(0.0129)	(0.0395)	(0.0393)	(0.0126)	(0.0125)	(0.0626)	(0.0623)
Year 2001	0.0051	0.0036	-0.017	-0.0173	-0.041***	-0.0413***	0.1719***	0.1729***
	(0.0134)	(0.0134)	(0.0407)	(0.0406)	(0.013)	(0.0129)	(0.0646)	(0.0645)
Year 2002	0.0125	0.0092	-0.0575	-0.0582	-0.025*	-0.0255*	0.168**	0.1706**
	(0.0159)	(0.0157)	(0.045)	(0.0443)	(0.0146)	(0.0144)	(0.072)	(0.071)
Year 2003	0.0092	0.0056	-0.0048	-0.0056	-0.0265*	-0.0271*	0.1906***	0.1934***
	(0.0163)	(0.016)	(0.0453)	(0.0444)	(0.0148)	(0.0145)	(0.0729)	(0.0717)
Year 2004	-0.0329**	-0.0354***	-0.0439	-0.0448	-0.0514***	-0.0521***	0.2294***	0.2315***
	(0.0142)	(0.0142)	(0.0417)	(0.0415)	(0.0137)	(0.0137)	(0.0682)	(0.0679)
Constant	3.5495***	-3.9097***	0.9568	-1.5853	1.0548***	-1.4108***	3.0912	7.9774***
	(0.6273)	(0.7509)	(1.2001)	(1.408)	(0.4202)	(0.5113)	(1.9577)	(2.3746)
R^2	0.25	0.25	0.13	0.13	0.40	0.40	0.05	0.05
Observations	704	704	693	693	745	745	745	745

Note: Hd^1 = H-statistic estimated by dynamic GMM estimator in the first stage through specification 1 where interest income is as the dependent variable in equation (5.3). Hd^2 = H-statistic estimated by dynamic GMM estimator in the first stage through specification 2 where personnel expenses over assets, as the independent variable in specification 1, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by applying random-effects GLS to equation (5.4). LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.

A5.3f2. First stage: Dynamic GMM H-statistic – Second stage: Random-effects GLS- H-statistic spec 3 and 4

(12) GLS	**LLR**		**LLP**		**ROA volatility**		**Z-index**	
random-effects	Hd^3	Hd^4	Hd^3	Hd^4	Hd^3	Hd^4	Hd^3	Hd^4
Competition					-			
	-0.236***	-0.1907**	-0.1848	-0.1977	0.1845***	-0.1934***	0.2599	0.2644
	(0.0878)	(0.0922)	(0.1234)	(0.13)	(0.0523)	(0.0554)	(0.2325)	(0.2462)
Size	-0.0057	-0.0064	0.0125*	0.0126*	0.0021	0.0021	-0.0102	-0.0102
	(0.0049)	(0.005)	(0.0067)	(0.0067)	(0.0029)	(0.0029)	(0.0128)	(0.0128)
Liquidity	0.0083	0.0081	0.0419	0.0419	0.0113	0.0111	0.0813	0.0815
	(0.0141)	(0.0141)	(0.0308)	(0.0308)	(0.0116)	(0.0116)	(0.0547)	(0.0548)
Off.balance	0.0124	0.0108	0.0168	0.017	0.0049	0.0048	-0.0096	-0.0091
	(0.0078)	(0.0078)	(0.0143)	(0.0143)	(0.0059)	(0.0059)	(0.0267)	(0.0267)
Lending	-0.052**	-0.0558**	0.1492***	0.1494***	0.0685***	0.0674***	0.011	0.0132
	(0.0266)	(0.0266)	(0.0536)	(0.0536)	(0.0206)	(0.0206)	(0.0957)	(0.0955)
Foreign.share	0.0257	0.0258	-0.0382	-0.0381	0.003	0.0034	0.0381	0.0377
	(0.017)	(0.017)	(0.0251)	(0.0251)	(0.0107)	(0.0107)	(0.0476)	(0.0476)
Interest.rate	-0.0032***	-0.0032***	-0.0091***	-0.0090***	-0.0052***	-0.0051***	0.0003	0.0001
	(0.0005)	(0.0005)	(0.0015)	(0.0015)	(0.0005)	(0.0005)	(0.0024)	(0.0024)
Concentration	-0.1032	-0.1278	0.0179	-0.0235	-0.1497***	-0.1895***	0.4964**	0.5537**
	(0.0869)	(0.0883)	(0.1556)	(0.1595)	(0.0543)	(0.0549)	(0.2452)	(0.2477)
Regulation	-0.0005	0.0003	-0.0003	-0.0009	0.0033	0.0027	-0.0184*	-0.0179
	(0.0039)	(0.0041)	(0.0055)	(0.0057)	(0.0024)	(0.0025)	(0.0105)	(0.011)
Year 1999	0.0574***	0.0586***	0.0283	0.0303	0.0267**	0.0286**	-0.0335	-0.0363
	(0.0144)	(0.0144)	(0.0432)	(0.0431)	(0.0135)	(0.0135)	(0.0676)	(0.0675)
Year 2000	-0.0067	-0.0056	-0.0638*	-0.0623	-0.0514***	-0.0500***	0.1632***	0.161***
	(0.0128)	(0.0128)	(0.0382)	(0.0382)	(0.0121)	(0.0120)	(0.0603)	(0.0602)
Year 2001	-0.0102	-0.0106	-0.0247	-0.0259	-0.0478***	-0.0488***	0.1844***	0.1857***
	(0.0134)	(0.0135)	(0.0405)	(0.0405)	(0.0128)	(0.0128)	(0.0642)	(0.0643)
Year 2002	-0.0239	-0.0252*	-0.077*	-0.0802*	-0.0417***	-0.0444***	0.2009***	0.2046***
	(0.015)	(0.0151)	(0.0426)	(0.0429)	(0.0136)	(0.0137)	(0.0679)	(0.0683)
Year 2003	-0.031**	-0.0324**	-0.0264	-0.0299	-0.0452***	-0.0482***	0.2273***	0.2314***
	(0.0152)	(0.0153)	(0.0424)	(0.0427)	(0.0136)	(0.0137)	(0.0679)	(0.0684)
Year 2004	-0.0549***	-0.0549***	-0.058	-0.0598	-0.0636***	-0.0652***	0.2507***	0.2526***
	(0.0143)	(0.0144)	(0.0417)	(0.0419)	(0.0136)	(0.0137)	(0.0681)	(0.0684)
Constant	0.4069***	0.3722***	0.0607	0.0963	0.1897***	0.2208***	4.9823***	4.9475***
	(0.1193)	(0.1307)	(0.1677)	(0.1854)	(0.0686)	(0.0766)	(0.3039)	(0.3396)
R^2	0.23	0.23	0.13	0.13	0.40	0.40	0.05	0.05
Observations	704	704	693	693	745	745	745	745

Note: Hd^3 = H-statistic estimated by dynamic GMM estimator in the first stage through specification 3 where total income is as the dependent variable in equation (5.3). Hd^4 = H-statistic estimated by dynamic GMM estimator in the first stage through specification 4 where personnel expenses over assets, as the independent variable in specification 3, is replaced by personnel expenses over loans plus deposits. The second stage is estimated by random-effects GLS to equation (5.4). LLR = loan-loss reserves over total loans; LLP = loan-loss provisions over total loans; ROA = net income over total assets; EAR = equity capital over total assets; ROA volatility = the deviation of individual bank's ROA from the sample mean within one period; Z-index = (ROA + EAR)/ROA volatility. For detailed definition of variables, please see the Appendix A5.1. Years from 1999 to 2004 are time dummies. We drop the year 1998. * Significant at 0.1 level, ** significant at 0.05 level and *** significant at 0.01 level.