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## **DOCTOR OF PHILOSOPHY**

### **Emerging banking systems- Mergers and acquisitions, foreign bank entry and productivity change**

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# **Emerging Banking Systems – Mergers and Acquisitions, Foreign Bank Entry and Productivity Change**

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June, 2009

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## **Dedication**

*To my parents*

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## Abstract

This thesis studies three related issues regarding recent banking reforms in emerging markets, namely mergers and acquisitions (M&As), foreign bank entry and productivity change. First of all, we analyse 84 banking M&A transactions in Asian and Latin American emerging markets between 1998 and 2005. Two event study methodologies that use the OLS market model and GARCH model are applied to examine the value effects of these transactions on bank shareholders. The results suggest that these transactions are moderately successful as targets' shareholders gain significant abnormal returns, whereas acquirers, on the other hand, tend not to lose value. When we take account of time-varying beta using the GARCH model approach this provides statistically similar findings to the OLS market model. However, different event study methodologies tend to yield different results in terms of the determinants of value creation. Secondly, we also examine the impact of foreign bank entry on banking competitive conditions in Argentina, Brazil, China and India between 2000 and 2006. We use the Lerner index to measure banking sector competition. As well as using a fixed effects estimator, the generalised method of moments (GMM) dynamic panel data estimator is applied to obtain the Lerner index in order to mitigate possible misspecifications due to long-run equilibrium assumption imposed by the fixed effects estimator. Our results tentatively suggest that the Lerner index estimated using the dynamic procedure is the preferred measure of competitive conditions. Using a dynamic panel regression model, we then examine the impact of foreign bank presence and other bank and country specific factors on banking competition. Overall, our results show that foreign bank entry does not appear to significantly influence banking sector competition. We also suggest that there well may be a limit to the competitive influence of foreign banks over the short-term. Finally, we investigate the productivity change in these four emerging market banking systems over the period 2000-2006. We employ a parametric approach to examine banks' optimisation processes (cost minimisation and profit maximisation); and then decompose the total gross changes of variable costs and profits to measure the cost and alternative profit productivity change respectively. The results show that all these banking systems suffered a slight decrease in cost productivity (apart from India) but also enjoyed profit productivity gains over the same period. This suggests that banks in the countries under study focused more on revenue generation compared to cost minimisation over the period. We also find some evidence that banks may have also exerted their market power to improve their profit productivity.

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## List of Abbreviations

AR	=	abnormal returns
BIS	=	Bank for International Settlement
CAR	=	cumulative abnormal returns
CI	=	cost-to-income
CGFS	=	Committee on the Global Financial System
DEA	=	data envelopment analysis
EME	=	emerging market economies
EU	=	European Union
FDI	=	foreign direct investments
FE	=	fixed effects
FSFDI	=	financial sector foreign direct investment
FSP	=	financial service providers
GARCH	=	generalised autoregressive conditional heteroscedasticity
GMM	=	generalised method of moments
IMF	=	International Monetary Fund
M&A	=	merger and acquisition
NEIO	=	New Empirical Industrial Organisation
OECD	=	Organisation for Economic Cooperation and Development
OLS	=	ordinary least squares
ROE	=	return on equity
SAR	=	standardised abnormal returns
SCAR	=	standardised cumulative abnormal returns
SCP	=	structure-conduct-performance
TFP	=	total factor productivity
WTO	=	World Trade Organisation

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# CHAPTER 1: INTRODUCTION

## 1.1 General background

Traditionally, banking systems in the emerging economies were associated with stringent regulations in areas like interest rates, bank activities, geographical scope of the operations, bank entry and lack of competition and efficiency (Hawkins and Mihaljek, 2001). However, during the last two decades, emerging banking systems have undergone some dramatic changes in both external environments as well as internal organisations. These changes have been driven by deregulation of domestic financial markets undertaken by governments, advances in information technologies and various financial crises (Hawkins and Mihaljek, 2001).

There was evidence from advanced economies, notably US that deregulation was a major cause of improved competition and efficiency in banking and then led to substantial and beneficial real effects on economy in the late 1970s and 1980s (Strahan, 2002). Under such influences, deregulation has also taken place in banking systems in Latin America, Central and Eastern Europe and Asia. Generally speaking, deregulation measures included opening the banking sector to non-bank financial institutions and foreign investors, removal of interest rate ceilings and privatisation of state-owned banks<sup>1</sup>. These measures, to certain extent, intensified the competition within the emerging banking systems indicated by lowered overall operational costs as well as profitability (Claessens and Laeven, 2003; Martinez Peria and Mody, 2003). There was also an important change in the ownership and structure of the banking systems. On one hand, there was an increase of investment from private sectors in the banking systems as more new financial institutions were set up by domestic and foreign investors or some state-own banks were privatised. On the other hand, due to an increasingly competitive environment, some domestic banks experienced difficulties and became the targets of mergers and acquisitions (M&As), which, therefore, initiated the consolidation process.

Advances in information technologies have considerably improved the processing of

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<sup>1</sup> See Megginson (2005) for a review of the bank privatisation literature and a list of privatised banks.

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information, which is one of the core functions of banks (Hawkins and Mihaljek, 2001). Consequently, banks in advanced markets as well as emerging markets have changed the way how they do business. First of all, new technologies have created more efficient communication systems, which enable banks to operate in larger geographic spans. For example, foreign banks were able to enter emerging markets and oversee the operations from their home countries. Therefore, cross-border M&As or domestic expansions/consolidation were facilitated by such improvement. Secondly, new technologies have provided banks with alternative distribution channels other than traditional 'brick and mortar' branch channel. Emergences of ATMs, telephone banking and internet banking have helped banks increase their market share, cut down operation costs and generate more revenues, which further contribute to a more competitive system (Berger and Mester, 2003). Thirdly, new information technologies have accelerated the process of financial innovation. More and more sophisticated financial products such as derivatives have been provided to meet customers' new demands, which have also been increasingly used in emerging markets. Fourthly, advances in information technologies have driven cross-border M&As as foreign banks' advantage in technologies have become one of key factors why banks in emerging markets engage in a cross-border M&A transaction (Williams and Liao, 2008).

During much of the 1990s, most Asian, Latin American and East and Central European countries were directly or indirectly hit by financial crises in the region or from elsewhere. As a result, large number of banks became insolvent. One of the direct consequences of the banking crises in emerging markets has been changes in the structure of bank ownership. Governments often stepped in to intervene either by encouraging sound banks to acquire ailing banks or foreign takeovers or by nationalising banks in distress temporarily then returning them to private ownership (Hawkins and Mihaljek, 2001).

Overall, all these changes were expected to improve the competition and efficiency of emerging banking systems and contribute to economic growth. While during the financial crises, changes were expected to recapitalise the troubled banking system and stabilise the financial sector.

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## 1.2 Aims of the study

During the late 1980s and early 1990s, major banking systems in Latin America and Asia underwent large scale deregulation. However, these programmes were all ended abruptly by various financial crises. In Latin America, Mexican currency collapse of 1995 not only caused financial meltdown in Mexico, but also had contagious effects on neighbouring countries' economy. Asian financial crisis took place in 1997 and plunged five South East Asian economies (Indonesia, Malaysia, South Korea, Thailand and the Philippines) into depression. Then in 1998, Brazil, facing its own financial crisis, devalued its currency, which in turn further worsened its neighbour Argentina's economy. Two years later, after several years' poor economic performance and despite several times' financial assistance from international financial organisations, in particular IMF, Argentina experienced its severe run on the banks and social upheaval.

As a result of these crises, there has been a large number of government-led M&As and nationalisation processes as well as closing down insolvent banks during the crises that were aimed to stabilise the banking systems and the whole economy. There has also been a wave of domestic and cross-border market-driven M&As after the financial crises that considerably reduced the number of banks, which increased excessively prior to the financial crises (Hawkins and Mihaljek, 2001). However, there have been only a handful of studies that examine banking M&As in emerging markets and the results are mixed. For example, Williams and Liao (2008) use an event study to analyse cross-border M&A transactions between acquiring banks from developed countries and acquired banks in emerging markets. Generally, they find that acquiring and acquired bank shareholders both earn positive abnormal returns upon the M&A announcements and acquired bank shareholders in the emerging markets benefit more than those of acquiring banks. In contrast, Crouzille et al. (2008) apply an event study that uses a GARCH modelling framework and finds that M&A announcements tend to be associated with negative stock returns in relatively less developed banking systems. In order to enhance the extant literature, the first aim of our study is to examine whether bank M&As during and after the major financial crises (between 1998 and 2005) are successful (value-creating) within and across twelve Asian and Latin American markets. Specifically, we carry out event study analyses around the M&A announcement dates and calculate cumulative abnormal returns to bank shareholders in emerging markets. By doing so, we examine

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how banking M&As are valued by stock markets in emerging markets and how value is distributed between acquiring and acquired bank shareholders. According to studies of banking M&As in advanced markets and in accordance with expectations, acquired bank shareholders may gain more returns but there might be a transfer of wealth from acquired banks to acquiring banks. From a public policy perspective, the results may help examine whether the consolidation process benefit both sides of bank shareholders and then in turn the banking system. Moreover, we are also interested in what are determinants that positively drive value changes. Experiences from advanced markets may be useful to decide the possible determinants, but different results may be expected due to specific characteristics of emerging markets. The significant driving factors may help bank supervision authorities/market participants in the emerging markets to prove/engage in the types of M&A transactions in order to maximise the value created for shareholders.

As deregulation took place, foreign banks have played an increasingly important role in many emerging markets after restrictions on foreign bank entry were relaxed or removed. In some countries, banking systems were further opened to foreign investors after financial crises in order to obtain much needed capital (and access to international capital markets), information technologies and management expertises. Two biggest emerging markets in Asia, China and India, however, are different examples in terms of the process of foreign bank entry as both countries have only recently relaxed their foreign bank entry restrictions as part of these countries' commitments to accession of the WTO<sup>2</sup>. Therefore, it is interesting to study the foreign bank entry process in countries like Argentina and Brazil on one hand, which started such process much earlier and foreign bank presence is more dominant; and countries like China and India on the other hand, in which foreign bank entry is still at its early stage. More importantly, concerns have been raised regarding the effects of foreign bank entry on competitive conditions, in other words, whether foreign banks have improved the competition in emerging markets as banking systems in emerging markets tend to be less competitive than in advanced markets (Hawkins and Mihaljek, 2001). The existing literature generally finds that foreign bank entry and less entry and activity restrictions significantly improve market's

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<sup>2</sup> While major policy barriers have been lifted, some restrictions still remain as both countries implement the opening-up of the banking sector in a phased manner. For example, in India, before March 2009, foreign banks' acquisition of shareholdings was only permitted by India's central bank - Reserve Bank of India in selected Indian private sector banks. Acquisition of a controlling stake has to be phased in and the overall is limited to 74 percent (RBI, 2005). In China, on the other hand, since 11<sup>th</sup> December, 2006, the authorities have removed the geographical and customer restriction of RMB business on foreign banks. However, they require three years (including two profitable years) waiting period for new foreign banks to obtain an RMB license (CBRC, 2007).

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competitiveness (Claessens and Laeven, 2003; Yildirim and Philippatos, 2007). Yeyati and Micco (2007), however, find that foreign bank entry seems to have not improved competition in eight Latin American countries between 1993 and 2002. Therefore, another aim of this thesis is to re-examine this issue by using a more recent data set (between 2000 and 2006). We measure the competitive conditions of these four banking systems first by estimating the Lerner index of each bank, which measures individual bank's ability to price over marginal cost of whole banking system. Then we test the impact of foreign bank presence on market's competitive conditions. The study of this issue, therefore, will first help policymakers to evaluate the recent trend of market competition, which may have improved as a result of various deregulation measures and advances in information technologies etc. Moreover, as promoting foreign direct investment among other policy initiatives was expected to improve the competition and the majority studies have found this strong and positive relationship, we expect to draw similar conclusions. The impact may be less significant, however, for two newly opened emerging markets, China and India, compared to Argentina and Brazil due to their lower level of foreign bank presence.

Finally, we are interested to see whether overall bank performance measured by bank productivity has been improved in emerging markets in recent years. The study of bank productivity is important because productivity is a summary performance measure (Nakane and Weintraub, 2005). Therefore, productivity analysis may be relevant to market participants involved in banking M&As or bank competition authorities. Moreover, low productivity measures, to certain extent, can be used by bank supervision authorities as a monitoring instrument. Bank productivity studies are also useful as existing literature suggests that improvement in bank productivity benefits the economic growth (Levine, 1997). Academic literature regarding bank productivity in emerging banking markets mainly employs non-parametric methodologies (except for Nakane and Weintraub, 2005 that use a parametric methodology to study bank productivity in Brazil) and finds mixed results. For example, while Bhattacharyya et al. (1997) and Sathya (2001) find that there is a marginal increase in productivity in India, Kumbhakar and Sarkar (2003) and Galagedera and Edirisuriya (2005) find no evidence of significant productivity change over various sample periods. On the other hand, Kumbhakar and Wang (2007) and Koutsomanoli-Filippaki et al. (2009) both find positive productivity change in China and Central and East European countries respectively. In this study, we

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again study four major emerging markets – Argentina, Brazil, China and India between 2000 and 2006 using a parametric methodology (Berger and Mester, 1999, 2003) to measure the productivity change in their banking systems. Despite of less desirable macroeconomic environment in Argentina and Brazil in the early years of period under study, we expect that banks may, to certain extent, still enjoy positive productivity change over the seven years period due to continuous financial liberalisation and technology improvement. As far as China and India are concerned, large proportion of banking systems are still dominated by least efficient state-owned banks (Bonin and Huang, 2002; BIS, 2004), the improvement of productivity (if there is any) may not be as significant as in Argentina and Brazil. Moreover, we, probably for the first time, also study if banks exert their market power in these emerging markets to improve their cost minimisation and profit maximisation process, which may be more likely to occur in emerging markets.

### **1.3 Methodology and data**

In this study, different methodologies and datasets will be used to address policy implications and achieve research aims abovementioned. First of all, a traditional event study approach based on the ordinary least square (OLS) market model has been tested and proposed by Brown and Warner (1980, 1985) and Dodd and Warner (1983) and widely applied to study shareholder value change in various industries due to specific events. In order to examine whether banking M&As in Asian and Latin American emerging markets create value for bank shareholders, we use a market model event study (Beitel et al., 2004). However, this market model approach does not take into account the time-varying volatility of the share prices in the past, which may affect the detection of the abnormal returns of the shares during the announcement of M&As. Therefore, we use an alternative event study methodology using GARCH modelling framework proposed by Frame and Lastrapes (1998), which relaxes the constant beta assumption imposed by market model event study. Moreover, we use a multivariate cross-sectional regression model to examine the determinants of banking M&A abnormal returns in emerging markets. In terms of the dataset, we identify 84 banking M&A transactions in Asian and Latin American emerging markets between 1998 and 2005. Transactions details are collected from Thomson ONE Banker database, while bank accounting data are



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extracted from Bankscope.

The second main aim of this study is to measure the competitive conditions in four emerging markets – Argentina, Brazil, China and India, then investigate whether there is a positive impact of foreign bank presence on these banking systems' competition. We use the Lerner index to measure banking competition based on Maudos and Pérez (2003). First of all, we need to estimate marginal cost as the Lerner index measures the bank's ability to price over banking industry's marginal cost. When estimating marginal cost of banking systems, we use standard fixed effect estimator to estimate the trans-logarithmic functions as well as a dynamic panel data estimator (Arellano and Bond, 1991) in order to relax the long-term equilibrium assumption imposed by fixed effect estimator. Then we directly test the impact of foreign bank/investor shareholding on the competition. The data sample of this topic consists of 1106 bank-year observations from these four markets from 2000 to 2006. Bankscope provides data for the estimation of the Lerner Index. When analysing the impact of foreign bank entry on competition, we also use data from World Bank, IMF, The Heritage Foundation, Central Banks and individual banks' websites.

Finally, we use the same dataset from the second topic to estimate bank productivity change in Argentina, Brazil, China and India between 2000 and 2006. We follow Berger and Mester (1999, 2003) to estimate whether there are positive cost productivity and alternative profit productivity change. Then we use the Lerner Index estimated in the second topic and other market power indicators including market share and concentration ratio to test whether banks exploit their market power to improve their productivity, in particular profit productivity as banks are also becoming increasingly profit maximisation oriented (Hawkins and Mihaljek, 2001).

#### **1.4 Structure of the study**

This thesis is structured as follows:

Chapter 2 examines the consolidation progress in emerging banking systems. More specifically, we analyse the shareholder value effects of 84 banking M&A transactions in

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twelve Asian and Latin American emerging markets between 1998 and 2005. Two event study methodologies that use the OLS market model and GARCH model are applied separately in order to test whether different assumptions relating to beta alter the amount of shareholder value effects detected. Then we examine the determinants of such value change; again also to test the consistency of results derived from two event study methodologies.

In Chapter 3, we examine the impact of foreign bank entry on banking competitive conditions in Argentina, Brazil, China and India between 2000 and 2006. First of all, we use the Lerner index to measure banking sector competition. As well as using a fixed effects estimator, the generalised method of moments (GMM) dynamic panel data estimator is applied to obtain the Lerner index in order to mitigate possible misspecifications due to long-run equilibrium assumption imposed by the fixed effects estimator. We then examine the impact of foreign bank presence and other bank and country specific factors on banking competition using a dynamic panel regression model.

Chapter 4 investigates productivity change in four emerging market banking systems, namely Argentina, Brazil, China and India, over the period 2000-2006. We employ a parametric approach that follows Berger and Mester (1999, 2003) to examine banks' optimisation processes (cost minimisation and profit maximisation); and then decompose the total gross changes of variable costs and profits into change in business conditions and cost and alternative profit productivity changes respectively, which are further driven by change in best practice and inefficiency. We also investigate whether banks may have also exerted their market power to improve their productivity.

Chapter 5 concludes this thesis. We provide a summary of the main results and examine to what extent these results contribute to the existing literature. Finally, this chapter provides an overview of the main policy implications and limitations of this thesis and presents suggestions to guide further research.

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## **CHAPTER TWO: Banking Mergers and Acquisitions in Emerging Markets - Experience of Asia and Latin America**

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# **Banking Mergers and Acquisitions in Emerging Markets**

## **– Experience of Asia and Latin America**

### **Abstract**

This chapter analyses 84 banking M&A transactions in Asian and Latin American emerging markets between 1998 and 2005. Two event study methodologies that use the OLS market model and GARCH model are applied to examine the value effects of these transactions on bank shareholders. The results suggest that these transactions are moderately successful as targets' shareholders gain significant abnormal returns, whereas acquirers, on the other hand, tend not to lose value. When we take account of time-varying beta using the GARCH model approach this provides statistically similar findings to the OLS market model. However, while the different event study methodologies tend to yield the same general results in terms of shareholder value creation they differ in explaining its determinants. Future studies that examine the determinants of value creation in bank M&A's should use GARCH or similar modelling frameworks to cross-check the robustness / consistency of their findings.

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## 2.1 Introduction

Over the last decade or so, mergers and acquisitions (M&As) have taken place in various emerging markets that have had a significant impact on these banking systems. In contrast to developed countries' experiences, the consolidation trend in emerging banking markets were mainly triggered by financial crises<sup>3</sup>. Various emerging markets were affected by financial crises since the middle of the 1990s that resulted in widespread bank insolvencies. In order to tackle these problems and prevent further damage to the respective economies, governments stepped in to restructure their banking systems. Among all the rescue efforts, government-led mandatory M&As were regarded as efficient and least costly (Hawkins and Mihaljek, 2001) – either healthy banks were encouraged to take over ailing banks or small and medium-sized banks merged to form larger banks. For example, in Latin American countries such as Mexico after 1995, or Asian countries including South Korea, Indonesia, Thailand, and Malaysia after 1998, governments all played a leading role in promoting domestic M&A activities (Hawkins and Mihaljek, 2001).

In addition, governments needed extra capital to recapitalise their troubled financial institutions in the aftermath of the aforementioned crises. Also better management skills, modern technologies, as well as access to international capital markets were considered necessary to improve performance and stability of banking sectors. Therefore, restrictions on the foreign ownership of domestic banks in various emerging markets were gradually relaxed, and in some cases, completely removed, leading to foreign acquisition in many emerging banking systems (Hawkins and Mihaljek, 2001).

Banks from developed countries have also been attracted by the growth potential that emerging markets could offer. For instance, in 1999 the ratio of M3 (liquid liabilities) to GDP (a measure of financial depth and an indicator of the overall size of financial intermediary activities), was only 28% in Latin America, compared to 77% in the euro area and 71% in the US (Sebastian and Hernansanz, 2000). Moreover, as far as profitability is concerned, intermediation margins are generally higher in emerging markets than those in developed countries. Claessens et al. (2001) compare the net interest income over total assets in different countries. They find that it was on average

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<sup>3</sup> There is some evidence (e.g. Mueller, 1989) that suggests banks tend to conduct M&As when macroeconomic conditions are healthy in developed countries.

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5.76% in Latin America (as high as 9.9% in Argentina and 6.6% in Brazil) between 1988 and 1995, compared to only 2.8% for OECD countries during the same period. The relatively low value of banks in emerging markets also helped foreign banks penetrate into these markets quickly. Sebastian and Hernansanz (2000) note that it would cost US\$ 2285 million to acquire a 1% share of German deposit market in 1999. The same share in Argentina and Mexico in the same year would cost only US\$ 196 million and US\$ 205 million, respectively. Williams and Liao (2008) also suggest that Asian banks were sold to foreign acquirers during the restructuring and privatisation at relatively lower prices compared to Latin American banks.

Needless to say, foreign banks' active involvement has to be understood in a broader context (Paula, 2003). In Europe, prior to the creation of Economic Monetary Union and the introduction of the euro in 1999, European banks foresaw the forthcoming competition and consolidation within the European Union<sup>4</sup>. Banks from Germany, Spain and the Netherlands expanded into Central and Eastern Europe, Latin America, and Asia to seek more profits, diversify their risks, and overall enhance their competitiveness. At the same time, in contrast to their European counterparts, US banks did not expand overseas as rapidly. Although they had a longer history of doing business in some emerging markets, deregulation of the financial systems in the US actually motivated these banks to prioritise expansion in their own domestic markets rather than elsewhere. In Latin America, as an example, US banks have been mainly focusing on wealthy customers and pursuing an organic growth strategy (Paula, 2003).

In 2005, in Central and Eastern Europe, foreign banks controlled over 50% of the banking systems in terms of total assets. In Latin America, this figure was about 38%. Asia, on the other hand, appeared to be at the early stage in terms of the openness to foreign competition, with less than 10% of the banking assets controlled by foreign investors (Berger, 2007; IMF, 2007). Nevertheless, while foreign investments in Central and Eastern European and Latin American banking sectors have started to slow down<sup>5</sup>, Asian emerging markets continue to attract foreign direct investment inflows to their

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<sup>4</sup> Some researchers (e.g. Kregel, 2002; Berger et al., 2001), however, observe that bank M&As within the EU have not occurred on a scale as large as formally expected recently due to barriers including distance, different languages, and regulatory structures and so on that still exist and offset the potential gains from consolidation.

<sup>5</sup> In Central and Eastern Europe, financial sector foreign direct investment (FSFDI) inflows have generally slowed down recently and mainly targeted countries that have recently gained EU membership (such as Bulgaria and Romania). In Latin America, FSFDI suddenly dropped in 2002 after almost eight years of increase since the 1994 Mexican crisis (Domanski, 2005).

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banking sectors. In particular, China and India have gradually relaxed their foreign bank entry restrictions recently as part of these countries' commitments to accession of the WTO<sup>6</sup>.

Banks in Singapore and Hong Kong have expanded their business beyond their borders as well. Take the three largest Singaporean banking groups as an example (namely Overseas Chinese Banking Corporation, United Overseas Bank and the Development Bank of Singapore). Due to competitive home markets, and neighbouring countries (e.g. Malaysia, Indonesia, the Philippines and Thailand) banks' inability to serve their own economies after the Asian crisis, these institutions have made major investments to acquire other banks in the region (Molnar, 2003).

The experience of Brazil, the largest country in Latin America, is also an interesting case. In some ways, Brazil had similar experiences to other Latin American countries. After the 1995 banking crisis, the government changed legislation<sup>7</sup> to allow foreign banks to take over problematic banks (e.g. Bamerindus was acquired by HSBC, and the Spanish bank BBVA acquired Economico). However, banking consolidation within the country has also been driven by government's privatization of state-owned banks<sup>8</sup> and by the three largest domestic private banks' (Bradesco, Itaú and Unibanco) efforts to acquire small and medium-sized private banks to compete in various parts of the country (Hawkins and Mihaljek, 2001). Other foreign take-over activities, in particular, Banco Santander Central Hispano's (BSCH) US\$15 billion acquisition of Brazil's large state-owned bank Banespa in late 2000, have further intensified the consolidation process (Gelos and Roldós, 2002).

Given the widespread restructuring that has occurred in many emerging banking systems this chapter aims to contribute to the debate by studying the value effects of 84 banking M&A transactions on shareholders in twelve emerging markets (namely Argentina,

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<sup>6</sup> While major policy barriers have been lifted, some restrictions still remain as both countries implement the opening-up of the banking sector in a phased manner. For example, in India, before March 2009, foreign banks' acquisition of shareholdings was only permitted by India's central bank - Reserve Bank of India in selected Indian private sector banks. Acquisition of a controlling stake has to be phased in and the overall is limited to 74 percent (RBI, 2005). In China, on the other hand, since 11<sup>th</sup> December, 2006, the authorities have removed the geographical and customer restriction of RMB business on foreign banks. However, they require three years (including two profitable years) waiting period for new foreign banks to obtain an RMB license (CBRC, 2007).

<sup>7</sup> Legislative Intent no. 311 of 23<sup>rd</sup> August 1995 gave the President authority to permit foreign bank entry (Central Bank of Brazil).

<sup>8</sup> The programme of incentives for the restructuring of the State public financial system (PROES) was proposed in August, 1996. Under this programme, the privatization was financed by federal government (Central Bank of Brazil).

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Brazil, Chile, Columbia, Hong Kong<sup>9</sup>, Indonesia, Malaysia, Peru, Singapore, South Korea, Thailand and the Philippines) between 1998 and 2005. It is thought to be an important issue for policy makers and market participants alike from emerging markets to help them evaluate various restructuring and consolidation progresses in the banking sector (Hawkins and Mihaljek, 2001). This chapter makes a contribution to the extant literature of M&As in three main respects. Firstly, to our knowledge, it is possibly the first study to examine both domestic as well cross-border banking M&As in major emerging markets. Secondly, as well as the traditional event study methodology using the OLS market model, an alternative methodology using the GARCH approach has also been used to study abnormal returns from bank M&A announcements. The underlying reason for using both methodologies is to examine whether the use of time-varying volatility imposed by the GARCH model yields different results compared to those obtained using the OLS market model. Finally, two sets of cumulative abnormal returns from different event studies are used separately as dependent variables to examine what drives the change of shareholders' value and indirectly test whether the determinants of abnormal returns resulted from M&A announcements differ according to the event study methodologies used.

The remainder of this chapter proceeds as follows. Section 2.2 provides a literature review of both M&A studies in developed and emerging markets. Section 2.3 describes the data sample, outlines the methodologies and presents the results. Finally, Section 2.4 is the conclusion.

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<sup>9</sup> Hong Kong is a special administrative region of the People's Republic of China.



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## 2.2 Motives of banking M&As – a brief survey

There has been a substantial empirical literature that focuses on bank M&As and the bulk of this literature aims to examine the causes and consequences of the banking consolidation process<sup>10</sup>. Typically, causes of banking M&As are generally related to value maximising and non-value maximising motives (Berger et al., 1999).

### 2.2.1 Value maximising motives for bank M&As

In terms of value maximising motives, those related to efficiency gains and market power considerations are the most often mentioned in the literature.

- Operational efficiency gains

Studies have suggested that operational efficiency gains or synergy is the most important value-creating motive for banking M&As (Berger et al., 1999). One strand of literature examines efficiency improvements by comparing pre- and post-merger levels of accounting ratios or more complex frontier (cost or profit) efficiency measures. The evidence of operational efficiency gains induced by bank mergers in the US using these types of approaches is ambiguous during the 1980s and early 1990s (Berger et al., 1999), but recent studies seem to suggest some efficiency gains can be found after M&As. For example, Kwan and Wilcox (2002) study bank mergers during the 1990s in the US and find evidence of cost improvements when taking specific accounting rules into account. Knapp et al. (2006) also find significant profit gains up to five years after bank holding companies' mergers between 1987 and 1998. There is also evidence that focused deals in terms of the products merging banks offer or geography merging banks operate in tend to enhance banks' efficiency. Cornett et al. (2006) find revenue efficiency gains for these types of deals. Hannan and Pilloff (2006) find that cost efficient banks tend to acquire relatively inefficient banks, which suggests potential efficiency gains. Recent evidence from outside the US (mainly European countries) is also consistently positive. For instance, Huizinga et al. (2001) study 53 European bank M&As. between 1994 and 1998 and find cost and profit efficiency improvements. Various other studies on European banks also suggest that focused deals (Altunbas and Ibáñez, 2007) or bank-to-bank M&A

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<sup>10</sup> This topic has been documented in a number of review papers (e.g. Berger et al., 1999; Pilloff and Santomero, 1997; Amel et al., 2004; Jones and Critchfield, 2005).

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(Diaz and Azorfa, 2004) appear to out-perform other types of deals.

Another strand of the literature uses event study methodology to measure bidders/targets/or the combined entities stock market reactions to M&A announcements (Berger et al., 1999). The results from US studies in the 1990s mainly report negative returns for acquirers and combined entities (e.g. Amihud et al., 2002; DeLong, 2001; and Pilloff and Santomero, 1997). The more recent US literature finds mixed results. For example, Olson and Pagano (2005) and DeLong and DeYoung (2007) find positive abnormal returns as a result of M&A announcements and the latter note that market reactions (as well as performance improvements) tend to be associated with the number of mergers that took place prior to the announcements, suggestive of spill-over effects. In contrast, Knapp et al. (2005) find significant negative returns to shareholders.

A number of recent event studies examining the shareholder wealth effects in European bank mergers generally show positive value creation. For example, Cybo-Ottone and Murgia (2000) document significant positive increases in both acquiring and acquired bank shareholder value in their analysis of 54 relatively large European bank mergers between 1989 and 1997. Beitel et al. (2004) find that, although acquiring banks' cumulative abnormal returns are not significantly different from zero, the results for the combined entities are positive and significant. Schmutzner (2006) also finds that target shareholder gains outweigh acquirer's losses in the case of cross-border deals involving European, US and other banks, in particular when relatively cost efficient banks are acquired. Ekkayokkaya et al. (2007) use an event study approach to examine bidder returns involving European bank M&A. They find that bank/non-bank deals result in positive abnormal returns and value enhancement was greater for pre-Euro (1999) transactions.

In contrast to the majority of event studies abovementioned that use a market model to calculate expected returns, Frame and Lastrapes (1998) and Lepetit et al. (2002) use a GARCH modelling framework to control for time-varying volatility and examine the value effects of bank M&As in the US and EU respectively. Overall, their findings suggest positive value creation in both markets in the 1990s.

There appears to be a rather limited literature that focuses on the value effects of banking

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M&A in emerging markets. For example, Harade (2005) utilizes a non-parametric frontier framework (Data Envelopment Analysis-DEA) to measure the productive efficiency of Korean banks, which took part in consolidation programmes after the 1997 financial crisis. The results show that in general, mergers between domestic banks and foreign participation have improved the efficiency of the Korean banking sector. The DEA approach is also applied by Sufian (2004) to study the efficiency effects of bank M&As in Malaysia. The government's programme of consolidating its whole banking sector, including 54 banks pre-crisis, into only ten banking groups resulted in efficiency improvement for small and medium-size banks. Basu et al. (2004) find positive and significant efficiency improvement for M&A deals in Argentina between 1995 and 2000. In addition, they also find a reduction of insolvency risk. However, the results further show that while mergers and privatisation contribute to an increase in returns, bank acquisitions had a negative effect on performance. The possible explanation may be that, as noted by Basu et al. (2004), healthy banks were encouraged by the government to acquire non-viable banks that resulted in a decline in post-deal performance. Williams and Liao (2008) use an event study approach to analyse 74 cross-border M&A transactions between acquiring banks from developed countries and acquired banks in EME (emerging market economies) in Central and Eastern Europe, Latin America and Asia during 1998 and 2005. Overall, the main finding is that acquiring and acquired bank shareholders both earn positive abnormal returns upon the M&A announcements and acquired bank shareholders in the EME benefit more than those of acquiring banks. In contrast, Soussa and Wheeler (2006) find negative abnormal returns for acquiring bank shareholders from various developed markets when these banks bid for banks in emerging markets between 1990 and 2003. Finally, Crouzille et al. (2008) also apply a GARCH modelling framework to investigate the shareholder value effects of M&A announcements in South East Asia during 1993 and 2003. They find that M&A announcements tend to be associated with negative share returns during the financial crisis and in relatively less developed banking systems.

- Market power considerations

M&As can be a means for banks to increase their market power by taking over their rival banks' market share, therefore increasing local market concentration. The possible consequence of enhanced market power is price fixing (including interest rates and fees etc). On the one hand, this possibility of exerting market power to set prices may

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encourage banks to consolidate in order to increase profits. On the other hand, such actions can raise policy concerns about the adverse effects that a concentrated market can bring about. In particular, households and small businesses, who normally do not rely on national or international markets, often find that a concentrated local banking market mean higher costs of funds and lower returns on deposits (Berger and Hannan, 1989 and 1997). In general, however, the effects of market power on pricing are found to be quite small in the US (Berger and Hannan, 1997; Berger, 1995). The underlying reason may be that local markets have become more contestable recently, i.e. geographical barriers have been gradually removed due to deregulation and technology has empowered banks to offer products in a greater distance. As such it may be less likely for banks to increase market power in local markets (Berger et al., 1999). In addition, the refusal of the authorities to allow some major M&As that would have had an impact on local market competition may explain the limited effects being observed. In contrast, the findings of De Guevara et al.'s (2005) study of market power in EU banking (using the Lerner index) suggest that despite a consolidation process having taken place the market power of banks did not change.

### **2.2.2 Non-value maximising motives for bank M&As**

Other bank M&A literature focuses on non-value maximising motives such as utility maximisation and exploiting safety net subsidies or systemic risk considerations. This literature focuses (as far as we can ascertain) solely on US and European bank M&A.

- **Utility maximising motives for bank M&As**

Banks engage in M&As because managers may wish to maximise their own utility at the expense of shareholders. Managers may wish to increase bank's size by merging if their pay and benefits are linked to bank growth, or if they can enjoy a 'quiet life' where banks have greater market power to resist any pressure forcing them to improve performance (Berger and Hannan, 1998). According to Roll's hubris hypothesis (1986, 1988), managers may be over-confident in their own ability and as such they overbid or overpay for targets, which leads to value destruction or no performance improvements.

As far as we can ascertain, only studies on US bank M&As focus on these utility

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maximising motives, for example, Bliss and Rosen (2001) find that there is a relationship between CEO remuneration increase and asset growth due to mergers (or internal growth) for a sample of 32 large (assets over US\$1 billion) US banks between 1986 and 1995. Using a similar sample, Anderson et al. (2004) find that CEO post-merger compensation is positively associated with shareholders' value creation at the announcement date. Hughes et al. (2003) find that bank holding companies that have higher levels of managerial ownership tend to engage in performance destroying M&As. Hagendorff et al. (2007) also find results consistent with non-value maximization motives for US bank mergers in the 1980s and 1990s.

- Safety net subsidies and systemic risk

Banks may exploit safety net subsidies when they grow larger, irrespective of the performance implications, if they are viewed as 'Too-Big-To-Fail' (TBTF) (Kane, 2000; Stern and Feldman, 2004; Mishkin, 2006). Again, as far as we can ascertain, the only studies that examine TBTF subsidies relate to the consolidation process in the US. Some studies examine the existence of safety net subsidies of large banks. For example, Shull and Hanweck (2001) suggest that as the top 10 largest US banks paid less for funds than smaller banks and operated with lower capitalisation rates this may indicate implicit TBTF guarantees. Some other studies, on the other hand, gauge the merger premiums paid for mega-targets in M&A deals as an indicator of safety net subsidies. For example, Schmid and Walter (2006) find significant premiums paid in mega-conglomerate (over US\$100 billion) deals. Brewer and Jagtiani (2007) also find higher premiums paid when targets are larger than a critical size.

Another concern about the effects of consolidation is that it may increase systemic risk. Such risk occurs when a large financial institution become insolvent, other banks or financial firms may suffer financial losses or even insolvencies and in the end there may be system-wide panic and a macroeconomic disruption. De Nicolo and Kwast (2002) study a sample of large US banking institutions between 1988 and 1999 and find that there is an increase in the correlations of stock returns. However, they argue that systemic risk may have increased but not particularly as a result of the consolidation process. Regarding European banking, Uhde and Heimeshoff (2007) find that banking sector concentration levels lead to increased instability measured by the Z-score

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indicator of risk<sup>11</sup>, although profitability is improved at the same time. Baele et al. (2007) study the franchise values of European banks between 1989 and 2004 and find that when banks diversify more into non-interest income business, banks' stock returns become more correlated with the market potentially suggesting a heightened systemic risk.

In order to contribute to the extant bank M&A literature, in particular regarding emerging markets, we study the value effects of M&As in twelve emerging markets by using two event study approaches between 1998 and 2005 and also examine what factors explain the change of shareholders' value.

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<sup>11</sup> From an economic viewpoint, the Z-score initially measures the probability of a bank going insolvent when the value of assets becomes lower than the value of debt. Hence, a higher (lower) Z-score implies a lower (higher) probability of insolvency risk (Laeven and Levine, 2006).

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## 2.3 Methodology, data and results

### 2.3.1 Methodology

In this section, the two event study methodologies used to analyse the stock market reactions to emerging market M&A announcements are studied. First a traditional event study methodology using the market model is described. Moreover, the potential problems related to the assumption of a constant beta are discussed. An alternative approach is then introduced that uses the GARCH modelling framework in order to capture time-varying volatility of beta. Finally, a cross-sectional regression model is presented to examine the factors that may determine the shareholder value changes.

#### 2.3.1.1 Event study methodology using the market model

The traditional event study methodology based on the ordinary least squares (OLS) market model is proposed and tested in several papers (e.g. Brown and Warner 1980, 1985; Dodd and Warner 1983), and has been widely applied by researchers to examine the value effects of M&As in various industries. Beitel et al. (2004), for example, use the OLS market model event study approach to examine M&As in European banking. This study follows Beitel et al.'s methodology as follows<sup>12</sup>:

First of all, we choose an event window of 41 days in total<sup>13</sup> (20 trading days prior to and after the announcement date). Then an estimation period of 250 days is chosen<sup>14</sup>, which starts 30 trading days prior to the announcement date<sup>15</sup>. Next, an OLS regression model is used as follows to explain how company share returns are dependent on share market returns based on the past 250 share trading days<sup>16</sup>:

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<sup>12</sup> The methodology applied by Beitel et al. (2004) has few modifications compared to the original work by Brown and Warner (1980, 1985) and Dodd and Warner (1983). For example, the length of event window and estimation period is different. These changes, however, have been proven not to yield significantly different results as discussed later.

<sup>13</sup> Although almost all event studies show that CAR in the shorter event windows tend to be more significant than those in longer event windows, there is no clear-cut definition how long the event window should be to capture abnormal returns. In particular, the information leakage issue in these emerging markets remains ambiguous, it seems necessary to use an event window as wide as 41 days as suggested by Beitel et al. (2004).

<sup>14</sup> Dodd and Warner (1983) use various estimation periods (from a minimum of 24 monthly returns to 48 monthly return data), and find that the general conclusions are unchanged. Brown and Warner (1985) further reduce the length of the period to 239 days and allow at least a minimum of 30 days returns within the period. They do not find that this measure reduces the possibility of detecting daily excess returns. Beitel et al. (2004), however, use an estimation period of 250 days instead.

<sup>15</sup> Ten trading days gap between the event window and estimation period is expected to avoid any unusual returns caused by information leakage when estimating expected returns (Beitel et al., 2004).

<sup>16</sup> These estimated parameters are not adjusted in the presence of non-synchronous trading, which as suggested by

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt} \quad (1)$$

where  $R_{jt}$  is the firm's daily share  $j$ 's returns;  $R_{mt}$  is the market returns<sup>17</sup>.

Secondly, for share  $j$  on day  $t$  (during the event or within the event window), the abnormal returns (AR) are obtained by subtracting the expected share returns  $\hat{R}_{jt}$  from the observed share returns  $R_{jt}$ :

$$AR_{jt} = R_{jt} - \hat{R}_{jt} = R_{jt} - (\alpha_j + \beta_j R_{mt}) \quad (2)$$

where  $R_{jt}$  is the observed returns including any dividend payments and other rights of share  $j$  on each day  $t$  within the event window;  $\hat{R}_{jt}$  is the expected returns of share  $j$  by applying market model parameters  $\alpha_j$  and  $\beta_j$  from equation (1);  $R_{mt}$  is the observed returns of the market for event day  $t$ .

In this study, an event window  $T$  has 41 days in total ( $T = [-20,+20]$  where the event day is day 0). Within the event window, different sub-event windows e.g.  $[-1,+1]$ ,  $[-20,0]$  etc. are also analysed to see the pattern of occurrences of cumulative abnormal returns (CAR)<sup>18</sup>.

For any event window  $[-t_1,+t_2]$ , CAR is the sum of the sample means of AR:

$$CAR_{[t_1:t_2]} = \sum_{[t_1:t_2]} \frac{1}{n} \cdot \sum_{j=1}^n AR_{jt} \quad (3)$$

We estimate the share reactions of targets and bidders separately. However, when two

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Scholes and Williams (1977) and Dimson (1979) may result in misspecification of event study methodologies when using daily data and the OLS market model. Brown and Warner (1985) in their paper show that the Scholes-Williams procedures and Dimson aggregated coefficients method, which have taken non-synchronous trading into account, produce similar results to the OLS market model.

<sup>17</sup> Cybo-Ottone and Murgia (2000) do not find any significant differences between using the market index and using a specific industry index such as banking index or financial industry index. Similar comparisons have been conducted prior to the estimation in this paper and the results are consistent with their finding.

<sup>18</sup> The choice of sub-event windows is arbitrary, which could be either symmetrical centred on the announcement date like  $[-1,+1]$ , or asymmetrical, in particular, solely focus on pre-announcement period plus announcement date like  $[-20,0]$  in order to capture possible effects of information leakage.



partners in a M&A transaction are both listed, we also estimate the effects on shareholders of both partners on a combined base as suggested by Houston and Ryngaert (1994):

$$AR_{C,t} = \frac{AR_{B,t} \cdot MV_{B,t} + AR_{G,t} \cdot MV_{G,t}}{MV_{B,t} + MV_{G,t}} \quad (4)$$

The abnormal returns of a combined entity  $AR_{C,t}$  are the sum of bidder and target abnormal returns  $AR_{B,t}$  and  $AR_{G,t}$  weighted by their own market capitalisation value  $MV_{B,t}$  and  $MV_{G,t}$ , which are observed on the day prior to the first day of the event window i.e.  $t = -21$ <sup>19</sup>.

In our study, the statistical significance of both AR and CAR is tested by following the approach used by Beitel et al. (2004) in order to see whether there are any significant shareholder value effects. For example, for N banks, AR of day 0, test statistic is given as below:

$$\frac{\frac{1}{N} \sum_{i=1}^N AR_{i0}}{\frac{1}{N} \left( \sum_{i=1}^N \left[ \frac{1}{249} \sum_{t=-300}^{-51} \left( AR_{it} - \left( \sum_{t=-300}^{-51} \frac{AR_{it}}{250} \right) \right)^2 \right] \right)^{\frac{1}{2}}} \quad (5)$$

However, this standard event study methodology has been found not to take into account time-varying volatility of beta as the OLS market model assumes a constant beta according to equation (1). Consequently, the null hypothesis of no abnormal returns from the M&As may be rejected too often if betas are time-varying (see Fabozzi and Francis, 1978; Bos and Newbold, 1984). In order to solve this problem, some researchers (Frame and Lastrapes, 1998; Lepetit et al. 2002; Crouzille et al., 2008) have applied the generalised autoregressive conditional heteroscedasticity (GARCH) model (Bollerslev, 1986), which accounts for conditional heteroscedasticity in the asset return series and allows the beta to be time varying. The next section, in turn, presents the second event

<sup>19</sup> Similar to share's value, acquirer's and target's market capitalisation might also be affected by the announcement of M&A during the event. That is why we choose the last day's market capitalisation before the event window. Therefore, it acts as a benchmark in order to reflect the share value change of the combined entity (Houston and Ryngaert, 1994).

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study methodology using the GARCH model, which is also applied in this study to see if the results from the event study using the GARCH model differ from the ones from the traditional event study approach.

### 2.3.1.2 Event study methodology using the GARCH model

The second event study methodology used by this study is mainly based on the one developed by Frame and Lastrapes (1998) for US banking M&As. Instead of regressing individual bank's share returns on market returns directly, which assumes a constant beta, a joint probability density function of bank's share returns and market returns is estimated as follows:

$$Z_{it} = \begin{pmatrix} r_{it} \\ r_{mt} \end{pmatrix} \quad (6)$$

$Z_{it}$  is a vector containing bank's share return  $r_{it}$  and market returns  $r_{mt}$  on day  $t$ , which is conditional on past realisations of the process as follows:

$$Z_{it} | I_{t-1} \sim N(\mu_t, H_t) \quad (7)$$

where

$$I_{t-1} = (Z_{it-1}, Z_{it-2}, \dots), \quad \mu_t = \begin{pmatrix} \mu_{it} \\ \mu_{mt} \end{pmatrix}, \quad \text{and} \quad H_t = \begin{pmatrix} h_{iit} & h_{imt} \\ h_{imt} & h_{mmt} \end{pmatrix}$$

Then the process can be parameterised as follows:

$$r_{it} = \mu_{it} + u_{it} = a_{i0} + a_{i1}r_{it-1} + u_{it} \quad (8)$$

$$r_{mt} = \mu_{mt} + u_{mt} = a_{m0} + a_{m1}r_{mt-1} + u_{mt} \quad (9)$$

$$h_{iit} = c_{i0} + c_{i1}u_{it-1}^2 + c_{i2}h_{iit-1} \quad (10)$$

$$h_{mmt} = c_{m0} + c_{m1}u_{mt-1}^2 + c_{m2}h_{mmt-1} \quad (11)$$

$$h_{imt} = c_{im0} + c_{im1}u_{it-1}u_{mt-1} + c_{im2}h_{imt-1} \quad (12)$$

where the elements of  $Z_{it}$  i.e. bank's share return  $r_{it}$  and market returns  $r_{mt}$  are both AR(1) processes defined by Equation (8) and (9) with a bivariate GARCH process (Equation (10) and (11) define conditional variance of  $r_{it}$  and  $r_{mt}$ , and Equation (12) defines conditional covariance) (Bollerslev, 1986). The likelihood function using the algorithm of Berndt, Hall, Hall and Hausman (1974) to be maximised to estimate the parameters of the joint density function is:

$$L(\theta) = -0.5 \ln |H_t| - 0.5 u_t' H_t^{-1} u_t \quad (13)$$

By applying the parameters from the estimation, the abnormal returns (AR) on each day within the event window can be calculated as the difference between the realised return on that day and the expected returns conditional on the realised market returns at T+k and past realisation up to time T (see Appendix 2.1 for the details):

$$AR_{iT+k} = r_{iT+k} - E(r_{iT+k} | r_{mT+k}, I_T) \quad (14)$$

The cumulative abnormal returns (CAR) are the sum of the AR:

$$CAR_{iT+k} = \sum_{j=1}^k AR_{iT+j} \quad (15)$$

Finally, AR and CAR are standardised (SAR and SCAR) to control for heteroscedasticity across banks (also see Appendix 2.1 for details of the parameterisation):

$$SAR_{iT+k} = \frac{AR_{iT+k}}{\sqrt{\text{var}(AR_{iT+k} | r_{mT+k}, I_T)}} \quad (16)$$

$$SCAR_{iT+k} = \frac{CAR_{iT+k}}{\sqrt{\text{var}(CAR_{iT+k} | r_{mT+k}, I_T)}} \quad (16')$$

As Frame and Lastrapes (1998) stress in their paper, the market model imposes restrictions such as:  $a_{i1} = a_{m1} = 0$ ;  $c_{i1} = c_{m1} = c_{im1} = 0$ ; and  $c_{i2} = c_{m2} = c_{im2} = 0$ , which tend not to hold if the data present volatility clustering or excess kurtosis. This GARCH model, on the other hand, is able to control for these effects when estimating the impact of event like M&A announcements.

Finally, the null hypothesis that AR have zero mean is tested, using the t-distribution as suggested by Boehmer, Musumeci and Poulsen (1991):

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$$\frac{\bar{Y}_{T+k}}{\sqrt{\left(\frac{1}{N}\right)\left(\frac{1}{N-1}\right)\sum_{i=1}^N (Y_{iT+k} - \bar{Y}_{iT+k})^2}} \quad (17)$$

where  $\bar{Y}_{T+k}$  is the sample mean SAR or SCAR, N is the number of transactions in the sample.

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### 2.3.1.3 Determinants of banking M&A abnormal returns

Based on the two event study methodologies abovementioned, the banking M&A abnormal returns are estimated as CAR for acquirers, targets and combined entities using the traditional event study OLS market model, and as SCAR for acquirers and targets using the GARCH modelling approach.

In order to examine what drives the shareholders' value creation measured by CAR or SCAR respectively in emerging markets banking M&As, a multivariate cross-sectional regression model is used as follows.

$$\begin{aligned} \text{CAR} = & \alpha_0 + \beta_1 \text{PROF}_i + \beta_2 \text{GEOF}_i + \beta_3 \text{RSIZ}_i + \beta_4 \text{EPS}_i \\ & + \beta_5 \text{MB}_i + \beta_6 \text{CASH}_i + \beta_7 \text{RROE}_i + \beta_8 \text{RCIR}_i + \varepsilon \end{aligned} \quad (18a)$$

or

$$\begin{aligned} \text{SCAR} = & \alpha_0 + \beta_1 \text{PROF}_i + \beta_2 \text{GEOF}_i + \beta_3 \text{RSIZ}_i + \beta_4 \text{EPS}_i \\ & + \beta_5 \text{MB}_i + \beta_6 \text{CASH}_i + \beta_7 \text{RROE}_i + \beta_8 \text{RCIR}_i + \varepsilon \end{aligned} \quad (18b)$$

where CAR = CAR for targets, acquirers, or combined entities derived from the event study OLS market model; or SCAR = SCAR for the targets and the acquirers using the GARCH modelling approach;

PROF - ratio of net interest income of the target to its total operating income;

GEOF - dummy variable, that takes 1 if the deal is a domestic M&A and 0 if it is a cross-border M&A;

RSIZ - ratio of the logarithm of target's asset size to the logarithm of acquirer's asset size;

EPS - earnings per share;

MB - ratio of bank's market capitalisation to its book value;

CASH - ratio of the percentage of cash to shares;

RROE - ratio of target's return on equity (ROE) divided by acquirer's ROE;

RCIR - ratio between the target's cost-to-income ratio (CIR) and acquirer's CIR;

- PROF and GEOF - Product / Geographic focus

Evidence shows that focused or diversifying M&A transactions can influence the shareholder value of acquiring banks. For example, Cornett et al. (2000) find that

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product focus has a significant and positive effect on the acquiring banks' value creation. Also in the US, intrastate banking M&As often result in positive share price reactions and acquiring banks' share prices tend to fall upon the announcement if they are bidding for a bank in another state (see Hawawini and Swary, 1990; Cornett and De, 1991, Cornett et al., 2000). Furthermore, Houston and Ryngaert (1994 and 1997) find that a higher level of overlap of acquirer's and target's geographic span is positively associated with higher acquiring bank's returns. In a more comprehensive study that covers 280 US banking M&A transactions during the same period, DeLong (2001) uses a cluster analysis to classify banking M&A transactions as activity-focusing or activity-diversifying; and geography-focusing or geography-diversifying according to whether the locations of two banking firms' headquarters are in the same state or not. Only transactions that focus on both activity and geography create value while other types do not.

In this study, two variables suggested by Beitel, et al. (2004), PROF and GEOF are designed to classify transactions as product or geography focusing. Acquiring firms (in our study) are all listed banks, targets, on the other hand, can be any type of financial service provider<sup>20</sup>. As a consequence, we use the ratio of net interest income of the target to its total operating income to see whether the acquirer focuses on traditional core banking business when choosing M&A targets. In terms of geographic focus, a dummy variable, GEOF, that takes 1 if the deal is a domestic M&A and 0 if it is cross-border is applied. It is expected that product focusing and geography focusing transactions add value to acquirer's shareholders.

- **RSIZ - Relative size of the target**

Studies have found that the size of the target in relation to the acquiring bank has an impact on the returns, though the findings differ. James and Wier (1987) note that if the relative asset size of targets are larger then bidding banks enjoy higher returns. DeLong (2001) also finds this result in her study. While a negative relationship between the relative size of the target and the acquiring bank's value-creation has been found in other studies (Hawawini and Swary, 1990; Zollo and Leshchinskii, 2000; Houston and Ryngaert, 1994, 1997).

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<sup>20</sup> The classification of financial service providers is defined by Thomson One Banker.

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To test whether the size of the target affects the returns to the acquirer, variable RSIZ, a ratio of the logarithm of target's asset size to the logarithm of acquirer's asset size is analysed. Although the findings from previous literature in developed markets are mixed, it is assumed that it may be easier to manage and integrate a small financial firm and therefore improve its performance more rapidly.

- EPS and MB - Pre-merger share performance of the target

According to Jensen and Ruback (1983), if a company's share performs poorly, it will be more likely to be taken over and the managers will be disciplined by being replaced by acquirer's managers. Hawawini and Swary (1990) find that banking M&As involving targets with poor share performance create more value than those with targets that have a better record of share performance. DeLong (2001) also finds a negative relationship between returns from the M&As and targets' share performance compared to their peer group prior to the M&As.

Two variables that measure target's pre-merger share performance are utilised as suggested by Beitel et al. (2004). One is earning per share (EPS), and another is the ratio of its market capitalisation to book value (MB). A positive relationship between targets' returns and these two variables are expected.

- CASH - Method of payment

Myers and Majluf (1984) propose a hypothesis which posits that due to information asymmetry stock markets view the method of payment of a M&A transaction as signalling the acquiring firm share's true value, i.e. if the share is overvalued, managers would prefer to offer common stock; while if it is undervalued, cash payment would appear more reasonable. Consequently, acquiring firm's share price may decrease if a stock offer is announced as the method of payment. The opposite situation may be that acquiring firm shareholders gain from a positive reaction when managers offer cash to acquire targets. In contrast, Wansley et al. (1983) provide a different perspective on this issue. They suggest that as various methods of payment have different taxation implications, acquiring firm will have to pay more to compensate target's tax burden caused by the cash offer, which creates a tax obligation for target shareholders. The empirical findings, however, seem to support the first hypothesis as most studies find that banking M&As create more value if cash is the means of payment (e.g. Travlos,



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1987; Amihud et al. 1990; Hawawini and Swary, 1990; Houston and Ryngaert, 1994; DeLong, 2001 etc).

In our study, details about the method of payment of each transaction are collected from Thomson ONE Banker dataset (see 2.3.2 Data sample). Then the ratio of the percentage of cash (CASH) to shares is used to examine the impact on value creation. According to the majority of findings, a higher cash ratio is likely to be related to greater value creation.

- RROE and RCIR - Efficiency potential of the target

A substantial literature supports the view that acquiring banks tend to be more efficient than their targets (Berger et al. 1999). It is believed that there is a process whereby acquiring banks transfer their superior management to targets to enhance performance. Therefore, efficiency difference between acquirers and targets may explain value creation potential.

Several studies have documented that acquiring banks also obtain greater returns if they are more profitable than target banks (Hawawini and Swary, 1990; Houston and Ryngaert, 1994). Similarly, if the acquiring banks are more cost efficient than the target, they will be better off after the transaction. Pilloff (1996) observes three components of total costs of both target and acquiring banks, namely, personnel costs, fixed asset expenses and total non-interest expenses, that may be most improved after M&As. Pilloff (1996) shows that more performance improvement is found when these costs are higher for targets prior to transactions taking place.

Our study uses two variables to capture the target's efficiency potential as suggested by Beitel et al. (2004). The first one RROE is the ratio of target's return on equity (ROE) divided by acquirer's ROE, which measures potential profitability improvement. While the second, RCIR, measures the cost efficiency gap, which is the ratio between target's cost-to-income ratio (CIR) and acquirer's CIR<sup>21</sup>. The relative ROE of two banks is expected to be negatively related to acquirer's abnormal returns during the M&A. The cost efficiency difference, on the other hand, may influence value-creation in the opposite direct.

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<sup>21</sup> The cost-to-income ratio measures the costs of running a bank or other type of financial firm except interest expense and provisions for loan losses, as percentage of income generated before provisions for loan losses.

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### 2.3.2 Data sample

This study identifies 84 banking M&A transactions in Asian and Latin American emerging markets between 1998 and 2005 (see Appendix 2.2 for details). The relatively small size of the sample is the result of relative underdevelopment of the stock markets in Asia and Latin America. A large number of M&A transactions during this period can not be studied using event study as they involved non-listed banks. Consequently, it is necessary to relax the sample selection criteria as used in studies of developed banking markets, such as minimum deal values, where acquirers take full control of targets or that both acquirers and targets are listed<sup>22</sup>. We focus on deals where the acquirer in the transaction is a listed banking firm in Asian or Latin American emerging markets<sup>23</sup>, whereas the targets can be listed or unlisted and any type of financial service provider (FSP such as an insurance company, asset management firm, credit institution, brokerage or a bank<sup>24</sup>).

Thomson ONE Banker is the major data source which provides M&A transaction details, listed banking firms' daily share returns, market capitalisation and general market index data<sup>25</sup>. Accounting data (i.e. balance sheet and profit and loss account data) of all the firms (listed and non-listed banking and other financial firms), on the other hand, were extracted from Bankscope.

In the Asian sample, seven countries are chosen: Hong Kong, Indonesia, Malaysia, Singapore, South Korea, Thailand and the Philippines. Among the total 56 Asian M&A transactions, there are 19 deals where bidders and targets are both listed; 34 where only bidders are listed and three where only target banking firms are listed. In other words, as far as the listed acquiring banking firms in these transactions are concerned, 53 deals can be studied. On the other hand, for the listed acquired banking firms, there are a total of 22 deals. The Latin American sample comprises 28 deals in five Latin American countries,

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<sup>22</sup> Some studies require minimum deal value, for example, in Houston and Ryngaert's paper (1997) target banks must have at least US\$100 million of assets; sample deal value must exceed US\$400 million (Houston et al., 2001) or US\$100million (Beitel et al., 2004 and Cybo-Ottone and Murgia, 2000).

<sup>23</sup> There are eight M&A deals in the sample where one part comes from developed markets. We, however, only study emerging market's banking firms' share reactions.

<sup>24</sup> In countries such as Thailand, banks often acquired shares of non-financial service firms like manufacturing and real estate development firms. This sample excludes these M&A transactions and focuses on M&As within the financial service industry only.

<sup>25</sup> The market indices used in our study are as follows: Argentina's Merval, Brazil's BOVESPA, Chile's IGPA, Colombia's IGBC, Hong Kong's Heng Seng index, Indonesia's JSX Composite index, Korea's KOSPI, Malaysia's KLCI, the Philippines' PSE All Shares index, Singapore's Straits Times index, Thailand's SET index and NYSE index for a Peruvian bank listed in New York, US.

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which include Argentina, Brazil, Chile, Columbia, and Peru. Only three transactions have both listed partners in this sub-sample, 19 transactions for only acquirers that are listed and six where only target firms are listed. Consequently, 22 transactions can be used to analyse acquirers' shareholders value changes and 9 transactions for target firms.

Table 2.1 presents the summary statistics of the total 84 transactions. In Panel A, it can be seen that, on average, transaction value in Asian markets were higher than in Latin America except for in 2000, 2002 and 2005. In 2001, transaction value reached a peak in both sub-samples, most noticeably US\$2.58 billion in Asian markets. In terms of the number of transactions, 2000 was the busiest M&A year. It can be seen that our sample includes more domestic M&As than cross-border deals. Finally, transactions can be defined as deals between two banks or a bank with a FSP as suggested by Beitel et al. (2004). In every year and both sub-samples, more bank-bank M&A transactions were identified than bank-FSP deals.

In Panel B, the sample is further decomposed by country. In Asia, three Singaporean banks (as active acquirers) conducted as many as 20 acquisitions. In addition, some large deals that resulted in the highest average value per transaction in 2001 were also carried out by these banks (see Appendix 2.2). In Latin America, Brazilian banks substantially engaged in M&A transactions, which outnumbered any other banks in the same region. However, according to Appendix 2, compared to Singaporean banks, three of the largest Brazilian private banks (Bradesco, Itaú and Unibanco) mainly focused on their domestic market rather than other neighbouring banking systems. The reason may be that unlike the fairly competitive and concentrated Singaporean banking market the large Brazilian private sector banks were still encouraged by the government to consolidate within their national market.

Table 2.1: Summary statistics of banking M&A transactions in Asian and Latin American emerging markets

Panel A.

Year	1998	1999	2000	2001	2002	2003	2004	2005
Mean value per deal in US\$, mil.								
Asia	459.90	304.64	414.96	2588.85	103.90	666.63	298.67	42.68
Latin America	207.75	146.70	453.17	479.15	203.74	324.68	39.90	230.33
Full sample	291.80	290.28	434.07	2061.43	153.82	529.85	278.76	105.23
Number of transactions								
Asia	1	10	10	6	5	6	12	6
Latin America	2	1	10	2	5	4	1	3
Total	3	11	20	8	10	10	13	9
Domestic M&As								
Asia	0	5	8	5	2	4	6	3
Latin America	0	1	6	1	3	3	1	3
Total	0	6	14	6	5	7	7	6
Cross-border M&As								
Asia	1	5	2	1	3	2	6	3
Latin America	2	0	4	1	2	1	0	0
Total	3	5	6	2	5	3	6	3
Bank-bank M&As								
Asia	1	8	7	4	1	3	7	4
Latin America	2	1	9	2	5	4	1	1
Total	3	9	16	6	6	7	8	5
Bank-FSP <sup>a</sup> M&As								
Asia	0	2	3	2	4	3	5	2
Latin America	0	0	1	0	0	0	0	2
Total	0	2	4	2	4	3	5	4

<sup>a</sup> Financial service provider other than a bank

## Panel B. Banking M&As by country

	Hong Kong	Indonesia	Malaysia	Singapore	South Korea	Thailand	Philippines
Acquirers	4	1	16	20	6	2	5
Targets	7	8	14	6	6	7	7
<b>Total</b>	<b>11</b>	<b>9</b>	<b>30</b>	<b>26</b>	<b>12</b>	<b>9</b>	<b>12</b>
	Argentina	Brazil	Chile	Columbia	Peru		
Acquirers	1	16	2	2	1		
Targets	6	14	2	3	2		
<b>Total</b>	<b>7</b>	<b>30</b>	<b>4</b>	<b>5</b>	<b>3</b>		

Note: Two acquirers from Japan and 1 target bank from China were excluded from the Asian sub-sample. Similarly, in the Latin American sample 6 acquiring banks from Spain, US and Bermuda and 1 Portuguese target bank were not studied in this study.

Table 2.2 summarises the financial characteristics of acquiring and target firms in these banking M&A deals. First of all, acquirers are on average eight times larger than targets in terms of asset size. Acquirers (unsurprisingly) have higher equity than their targets. Secondly, acquirers' assets grew in the year prior to the transaction at about 19% whereas the average asset growth rate of targets was negative at -2.9%. Furthermore, while acquirers were on average profitable, targets on average were suffering financial losses with a -3% return on equity (ROE). Finally, with regard to cost efficiency, the acquirers had a lower average cost-to-income (CIR) ratio of 50% compared to the target's 70%. The results of the comparison, which are consistent with studies in the US and Europe (for example, Amel et al., 2004; Berger et al., 1999; Claessens et al., 2001), suggest that acquirers tend to acquire less efficient targets, which are regarded as having more significant opportunities for performance enhancement post M&A. (Poorly performing firms tend to be taken over as a means of disciplining their existing management according to Manne (1965)). It is also worth mentioning that, in general, banks and other FSPs in Asia were more efficient than their Latin American counterparts in the sample.

Table 2.2: Characteristics of banking M&A acquiring and target firms in Asia and Latin America

Characteristics	Acquirers	Targets	Ratio Target/Acquirer
Total assets <sup>a</sup> in US\$, millions:			
Whole sample mean (N=84)	60026.80	7359.09	12.26%
Asian sample mean (N=56)	38150.80	8264.63	21.66%
Latin American sample mean (N=28)	105461.58	5193.66	4.92%
Total equity <sup>a</sup> in US\$, millions:			
Whole sample mean (N=84)	3013.06	476.59	15.82%
Asian sample mean (N=56)	3211.71	515.76	16.06%
Latin American sample mean (N=28)	2555.30	396.81	15.53%
Growth of total assets <sup>b</sup> :			
Whole sample mean (N=84)	19.22%	-2.89%	-15.03%
Asian sample mean (N=56)	20.84%	0.33%	1.57%
Latin American sample mean (N=28)	16.03%	-9.15%	-57.08%
Return on equity <sup>a</sup> (ROE):			
Whole sample mean (N=84)	9.60%	-3.43%	-35.77%
Asian sample mean (N=56)	5.61%	-2.40%	-42.72%
Latin American sample mean (N=28)	17.73%	-5.40%	-30.44%
Cost-to-income <sup>a</sup> (CIR):			
Whole sample mean (N=84)	50.33%	70.07%	139.22%
Asian sample mean (N=56)	44.17%	60.29%	136.50%
Latin American sample mean (N=28)	62.00%	87.88%	141.75%

<sup>a</sup> Per 31<sup>st</sup> December of the year prior to the year of announcement

<sup>b</sup> The estimation period is the year prior to the year of announcement

The variables used in our analysis of the determinants of abnormal returns are summarised in Table 2.3. PROF and GEOF both measure the acquirer's (banking firms) focus in an M&A transaction. PROF examines whether the acquirer wants to focus on/diversify its traditional banking business measured by its target's net interest income to total operating income. Because targets in this sample are not only banking firms, on average, only about 30% of their income comes from interest based business. GEOF, on the other hand, distinguishes whether the deal focuses on the domestic or another emerging market. There are 52 domestic M&As whereas 32 deals are cross-border. As can be seen, the majority of deals in this sample are domestic. RSIZ indicates the relative size of the target to its acquirer. EPS and MB, however, are both used to examine the target's pre-merger share performance. The target firm has to be listed, so there are 31 transactions analysed in this case. In this sample, target firms generally do not seem to have very successful performance history measured by these two ratios, in particular, the average EPS is 0.03. CASH indicates the method of payment in the transaction, in other words, the proportion of the deal financed by cash. As can be seen, over 80% of payments were paid by acquiring banks in cash. Finally, RROE and RCIR compare

target's profit and cost efficiency to acquirer's respectively. Not surprisingly, targets pre-merger ROE on average are negative, which leads to a negative mean value of RROE, their costs also almost 40% higher than acquirers' according to the variable RCIR. The two aforementioned variables (again) suggest that acquirers purchase poor performing banks and other FSPs

Table 2.3: Summary of the independent variables

Definition of the variables	Mean	Median	Maximum	Minimum
PROF: Target's net interest income/Target's total operating income <sup>a</sup>	0.32	0.31	0.78	-0.68
RSIZ: Logarithm of target's total assets/Logarithm of acquirer's total assets <sup>a</sup>	0.78	0.76	1.68	0.36
EPS: Target's earnings per share (EPS) <sup>a</sup>	0.03	0.03	3.57	-3.47
MB: Target's average market cap/Target's book value <sup>b</sup>	1.34	1.33	3.86	-1.45
CASH: Payment in cash in percentage	81.53%	100%	100%	0.00%
RROE: Target's ROE/Acquirer's ROE <sup>a</sup>	-1.54	0.74	6.50	-60.67
RCIR: Target's CIR/Acquirer's CIR <sup>a</sup>	1.39	1.16	4.61	0.31
GEOF: Dummy variable:	Number of transactions		Mean value per deal US\$ Mil.	
1= domestic transaction	52		562.82	
0= cross-border transaction	32		343.12	

<sup>a</sup> Per 31<sup>st</sup> December of the year prior to the year of announcement

<sup>b</sup> The estimation period starts from 51 days prior to the announcement date and goes back a further 250 days.

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## 2.3.3 Results

### 2.3.3.1 Standard event study results

Tables 2.4 to 2.6 present the cumulative abnormal returns (CAR) from the standard event study using the OLS market model for acquirers, targets, and combined entities relating to the banking M&A transactions in Asian and Latin American emerging markets between 1998 and 2005.

The results show that, in general, acquirers' CAR's are slightly positive in most event windows, but insignificantly different from zero. Shareholders of targets, however, earn significantly positive CAR in some event windows prior to the announcement dates. Presumably, this might be caused by some information leakage. When both partners are listed, shareholders of the combined entities also tend not to lose value in four event windows out of a total of seven<sup>26</sup>, the evidence, however, is not statistically significant.

Overall, the results suggest that banking M&A in Asia and Latin America during the eight year period under study may result in some wealth creation for target shareholders. More surprisingly, there is no wealth destruction for acquirers<sup>27</sup>. These results are neither consistent with the majority of US studies, which mainly report negative returns for acquirers and the combined entities in early 1990s bank M&A studies (e.g. Amihud et al., 2002; DeLong, 2001; and Pilloff and Santomero, 1997) or more positive returns in later periods (Olson and Pagano, 2005; DeLong and DeYoung, 2007); nor are they similar to some recent EU studies which find strong evidence of value creation for both acquirer and target shareholders (e.g. Cybo-Ottone and Murgia, 2000; Campa and Hernando, 2005 and Beitel et al., 2004). Williams and Liao (2008) also report higher returns to banks in EME markets when acquired by banks from developed countries.

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<sup>26</sup> These four event windows are [-10, 0], [-1, 0], [-1, +1] and [-10, +10].

<sup>27</sup> It should be noted that the results from Latin America in this paper are likely driven by Brazilian banks as Brazil has the largest sample in Latin America.



**Table 2.4: Acquirers' CAR from an event study using market model**

Event Window	CAR in %	% positive	t-test	p-value
<b>Whole sample (N=75):</b>				
[-20 , 0 ]	0.0050	53.33%	0.49	0.6251
[-10 , 0 ]	0.0081	50.66%	1.10	0.2724
[-1 , 0 ]	0.0037	54.67%	1.18	0.2397
[ 0 ]	0.0019	53.33%	0.88	0.3810
[-1 , +1 ]	0.0035	57.33%	0.91	0.3636
[-10 , +10]	0.0039	56.00%	0.53	0.5968
[-20 , +20]	0.0000	52.00%	0.00	0.9981
<b>Asian sample (N=53):</b>				
[-20 , 0 ]	0.0065	50.94%	0.54	0.5873
[-10 , 0 ]	0.0069	44.23%	0.80	0.4271
[-1 , 0 ]	0.0013	52.83%	0.35	0.7255
[ 0 ]	-0.0001	50.94%	-0.03	0.9786
[-1 , +1 ]	0.0012	50.94%	0.26	0.7913
[-10 , +10]	0.0066	54.71%	0.55	0.5824
[-20 , +20]	0.0085	54.71%	0.51	0.6128
<b>Latin American Sample (N=22):</b>				
[-20 , 0 ]	0.0013	59.09%	0.07	0.9472
[-10 , 0 ]	0.0112	63.63%	0.81	0.4214
[-1 , 0 ]	0.0095	59.09%	1.60	0.1104
[ 0 ]	0.0068	59.09%	1.62	0.1055
[-1 , +1 ]	0.0090	68.18%	1.24	0.2164
[-10 , +10]	-0.0027	59.09%	-0.14	0.8884
[-20 , +20]	-0.0206	45.45%	-0.77	0.4446

Note: This table shows the results from a standard event study that uses the OLS market model analysing banking M&A acquiring firms' cumulative abnormal returns (CAR) in 12 emerging markets. Total 75 acquirers' CAR results are shown in the first section followed by 53 acquirers' in Asian sub-sample and 22 acquirers' in Latin American sub-sample. Tests for significance are according to Brown and Warner (1980, 1985), and show whether CAR are significantly different from zero.

**Table 2.5: Targets' CAR from an event study using market model**

Event Window	CAR in % <sup>a</sup>	% positive	t-test	p-value
Whole sample (N=31):				
[-20, 0]	0.0593 **	61.29%	2.25	0.0252
[-10, 0]	0.0451 **	61.29%	2.37	0.0186
[-1, 0]	0.0116	70.97%	1.43	0.1543
[0]	0.0139 **	58.06%	2.42	0.0161
[-1, +1]	0.0140	67.74%	1.41	0.1603
[-10, +10]	0.0341	58.06%	1.30	0.1961
[-20, +20]	0.0316	54.83%	0.86	0.3910
Asian sample (N=22):				
[-20, 0]	0.0704 **	59.09%	1.99	0.0476
[-10, 0]	0.0574 **	63.63%	2.24	0.0258
[-1, 0]	0.0040	72.72%	0.37	0.7143
[0]	0.0097	50.00%	1.26	0.2105
[-1, +1]	0.0051	63.63%	0.38	0.7031
[-10, +10]	0.0418	63.63%	1.18	0.2384
[-20, +20]	0.0401	54.54%	0.81	0.4185

Note: This table shows the results from a standard event study that uses the OLS market model analysing banking M&A target firms' cumulative abnormal returns (CAR) in 12 emerging markets. Total 31 targets' CAR results are shown in the first section followed by 22 targets' in Asian sub-sample. Latin American targets' CAR results are not shown due to the small size of the sample (only 9 target firms). Tests for significance are according to Brown and Warner (1980, 1985), and show whether CAR are significantly different from zero.

<sup>a</sup> \*=significant at the 10% level, \*\*=significant at the 5% level.

**Table 2.6: Combined entities' CAR from an event study using market model**

Event Window	CAR in %	% positive	t-test	p-value
Whole sample (N=22):				
[-20, 0]	-0.0056	50.00%	-0.36	0.7198
[-10, 0]	0.0041	45.45%	0.36	0.7156
[-1, 0]	0.0003	63.63%	0.07	0.9471
[0]	-0.0001	45.45%	-0.04	0.9685
[-1, +1]	0.0012	50.00%	0.20	0.8410
[-10, +10]	0.0072	45.45%	0.46	0.6433
[-20, +20]	-0.0350	31.82%	-1.61	0.1076

Note: This table shows the results from a standard event study that uses the OLS market model analysing cumulative abnormal returns (CAR) of the combined entities when the acquirer and the target in a transaction are both listed. Total 22 transactions' CAR results are shown. Tests for significance are according to Brown and Warner (1980, 1985), and show whether CAR are significantly different from zero.

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### 2.3.3.2 Event study using the GARCH model results

Before we use the GARCH model to estimate abnormal returns, it is necessary to conduct a two-step LM test to diagnose whether the time series our sample (each firm's returns and market index's returns) present any conditional heteroscedasticity (the details of the LM test are illustrated in the Appendix 2.3). We find that in a total of 212 time series 41.04% reject the null hypothesis at the 5% significance level implying that GARCH effects are present, which, therefore, suggests that the GARCH modelling framework seems appropriate to reflect these effects when calculating abnormal returns during M&A events.

Table 2.7 and 2.8 report standardised cumulative abnormal returns (SCAR) from event studies using the GARCH model for acquirers and targets respectively for banking M&A transactions in Asian and Latin American emerging markets between 1998 and 2005. According to Table 2.7, SCAR remains negative in most of the event windows, but still is insignificantly different from zero with the exception of significant losses of Latin American acquirers for the event window [-20, +20].

As far as the targets from these emerging markets are concerned, the results from the event study using the GARCH model also show that shareholder value benefits from the announcement of the M&A as shown in Table 2.8. In particular, in the narrower event windows (11 days, 6 days, and 1 day), SCAR are positive and significantly different from zero. Furthermore, comparatively, the absolute values of the SCAR are higher than the CAR reported in Table 2.5<sup>28</sup>.

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<sup>28</sup> In the standard event study, each share's AR are standardised by being divided by the standard deviation of its return during the estimated period, before being averaged to calculate the sample's AR. In the GARCH model event study, however, all shares' AR are averaged first then divided by the standard deviation of the whole sample past returns. In a sense, CAR from the standard methodology are also standardised, therefore, it is possible to compare SCAR with CAR directly.

**Table 2.7: Acquirers' SCAR from an event study using the GARCH model**

Event Window	SCAR in % <sup>a</sup>	% positive	t-test	p-value
<b>Whole sample (N=75):</b>				
[-20 , 0 ]	-0.0297	46.67%	-0.71	0.4778
[-5 , 0 ]	0.0074	49.33%	0.23	0.8221
[ 0 ]	0.0261	53.33%	0.49	0.6277
[-5 , +5 ]	-0.0059	48.00%	-0.16	0.8745
[-20 , +20]	-0.0499	44.00%	-0.98	0.3326
<b>Asian sample (N=53):</b>				
[-20 , 0 ]	-0.0051	50.94%	-0.09	0.9247
[-5 , 0 ]	-0.0091	45.28%	-0.25	0.8042
[ 0 ]	-0.0039	52.83%	-0.06	0.9498
[-5 , +5 ]	-0.0059	49.06%	-0.14	0.8907
[-20 , +20]	-0.0027	49.06%	-0.04	0.9667
<b>Latin American Sample (N=22):</b>				
[-20 , 0 ]	-0.0890	36.36%	-1.50	0.1490
[-5 , 0 ]	0.0470	59.09%	0.68	0.5046
[ 0 ]	0.0985	54.55%	0.91	0.3729
[-5 , +5 ]	-0.0060	45.45%	-0.08	0.9387
[-20 , +20]	-0.1636 *	31.82%	-2.04	0.0542

Note: This table shows the results from an event study that uses the GARCH model to analyse banking M&A acquiring firms' standardised cumulative abnormal returns (SCAR) in 12 emerging markets. Total 75 acquirers' SCAR results are shown in the first section followed by 53 acquirers' in Asian sub-sample and 22 acquirers' in Latin American sub-sample. Tests for significance are according to Boehmer, Musumeci and Poulsen (1991), to show whether SCAR are significantly different from zero

<sup>a</sup> \*=significant at the 10% level.

**Table 2.8: Targets' SCAR from an event study using the GARCH model**

Event Window	SCAR in % <sup>a</sup>	% positive	t-test	p-value
Whole sample (N=31):				
[-20 , 0 ]	0.1217	58.06%	1.19	0.2435
[-5 , 0 ]	0.2265 **	70.97%	2.29	0.0291
[ 0 ]	0.3116 **	61.29%	2.37	0.0241
[-5 , +5 ]	0.2050 **	67.74%	2.74	0.0102
[-20 , +20]	0.0122	51.61%	0.11	0.9114
Asian sample (N=22):				
[-20 , 0 ]	0.1217	58.06%	1.19	0.2435
[-5 , 0 ]	0.1993	63.64%	1.54	0.1376
[ 0 ]	0.1663 **	54.55%	2.37	0.0273
[-5 , +5 ]	0.2018 *	63.64%	2.03	0.0554
[-20 , +20]	0.0122	51.61%	0.11	0.9114

Note: This table shows the results from an event study that uses the GARCH model analysing banking M&A target firms' standardised cumulative abnormal returns (SCAR) in 12 emerging markets. Total 31 targets' SCAR results are shown in the first section followed by 22 targets' in Asian sub-sample. Latin American targets' SCAR results are not shown due to the small size of the sample (only 9 target firms). Tests for significance are according to Boehmer, Musumeci and Poulsen (1991), to show whether SCAR are significantly different from zero.

<sup>a</sup> \*=significant at the 10% level, \*\*=significant at the 5% level.

The SCAR from the event study using the GARCH approach do seem to offer some interesting insights. There are more negative SCAR's for the acquirers and slightly more significant SCAR's for the targets, which presumably is due to fact that the volatility of past asset returns are taken into account in the modelling framework. Nevertheless, the results in terms of wealth creation are broadly in line with the OLS market model results<sup>29</sup>.

<sup>29</sup>The GARCH modelling framework also suffers from some drawbacks, for example, it doesn't offer a solution to measuring cumulative abnormal returns of the combined entities and it is not as flexible as the standard methodology when choosing various event windows. In the standard event study, once the whole event window is decided, any sub-event windows can be chosen within this event window (41 days in this paper). According to the GARCH modelling framework, however, each event window has to be tested each time individually for the sample (for example, when the event window is [-20, +20], k=41, [-5, +5], on the other hand, implies k=11, they will be two separate estimation processes), which will inevitably increase the complication of the calculations.

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### 2.3.3.3 Determinants of banking M&A abnormal returns – a cross-sectional regression model analysis

In this section, we use regression analysis to examine the determinants of banking M&A cumulative abnormal returns (CAR) and standardized cumulative abnormal returns (SCAR) using the model outlined in equation (18). We, however, use different sets of variables when analysing the determinants of M&A value creation of acquirers and targets in order to reflect each side's different motives in a M&A transaction (e.g. product focus of a deal seems more relevant to acquirers' shareholders rather than targets') and we also focus more on the acquirers' results as acquiring banks are relatively larger and therefore their value creation process may have a greater impact on shareholders of combined entities post-merger.

Table 2.9 shows the results of seven regressions. The dependent variables are acquirers' CAR from seven event windows previously estimated using the OLS market model. As can be seen, two independent variables (PROF and GEOF) that measure whether the acquirer focuses on/diversifies its traditional banking business or markets geographically appear to be insignificantly related to the shareholder value change. The relative size of the target (RSIZ), however, exerts some significantly positive influence, in particular when using the CAR[-1, +1] event window as the dependent variable. In other words, acquiring banks gain higher returns if the target is larger compared to acquirers. This finding is consistent with James and Wier (1987) and DeLong (2001). The variable that measures the impact of method of payment on the value of acquirers (CASH) also appears to be positive and significant. Therefore, cash payment is more favoured by acquiring banks' shareholders in Asian and Latin American markets. This is in line with most developed markets' experiences (e.g. Travlos, 1987; Amihud et al. 1990; Hawawini and Swary, 1990; Houston and Ryngaert, 1994; DeLong, 2001 etc). Finally, two variables (RROE and RCIR) are used to indicate the extent to which the target's efficiency influences the value creation process, as far as the acquiring banks are concerned. Contrary to findings from developed markets (e.g. Hawawini and Swary, 1990; Houston and Ryngaert, 1994; Pilloff, 1996), acquiring banks in Asian and Latin American markets tend to gain abnormal returns if the targets are relatively more profitable measured by RROE or more cost efficient measured by RCIR. As a result, this finding may cast some doubts over the variability of some transactions in emerging

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markets, of which acquirers were encouraged by the authorities to take over poorly performing targets.

Tables 2.10a and 2.10b both focus on targets' CAR estimated using the standard OLS model event studies. Earning per share (EPS) is shown to be positively related to target firms' pre-merger share performance. Moreover, EPS seems to have more explanatory power compared to the ratio of the market capitalization to book value (MB) given the relatively higher t-values. The relative size of the target to acquirer has a positive and significant influence over targets' CAR. Therefore, when a banking M&A transaction involving a relatively large target, both acquiring and target firms tend to gain positive abnormal returns during the announcement period. Other independent variables, however, do not yield any statistically important results.

We then repeat the above approach by using the SCAR of acquirers and targets estimated by the GARCH model event studies as dependent variables while the independent variables remain the same. Table 2.11 shows the results when acquirers' SCAR from five event windows are used as the dependent variables. As can be seen, cross-border transactions measured by a dummy variable (GEOF) seem to create more value for acquirers' shareholders. The product focus variable (PROF), on the other hand, appears insignificant. The significant and positive explanatory power of the relative size of the target (RSIZ), however, disappears in these estimations. Moreover, the method of payment variable (CASH) shows more inconsistency compared to our previous results. In four out of five event windows (namely, SCAR[-20, 0], SCAR[-5, 0], SCAR[0], and SCAR[-20, +20]), CASH appears to be significantly negative, which suggests that share offerings are more favourable for acquiring banks and in turn may support the taxation explanations detailed by Wansley et al. (1983).

Finally, Tables 2.12a and 2.12b report results where EPS (earning per share) and MB (market to book ratio) separately along with other three variables are included in our two regression models with SCAR estimated from the GARCH model as the dependent variables. The results show that the relative size of target (RSIZ) is significantly positive which suggests that a relatively large target tends to bring abnormal returns to targets' shareholders, and also EPS is positively and significantly related to SCAR which suggests that a good share performance will create greater abnormal returns for targets.

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Comparing the two sets of results (CAR or SCAR as dependent variables), there are mixed results. As far as the acquiring banks are concerned, when using CAR as the dependent variable, the focus/diversification of a deal does not make an impact on shareholders' value; cash payment is a preferred payment method and acquirers tend to gain if they are comparatively more profitable and efficient compared to their targets. On the other hand, when using SCAR as the dependent variable, geographically diversified transactions (i.e. cross-border M&As in our study) and share purchase appears to bring greater abnormal returns to acquirers' shareholders. In terms of the targets' shareholders' value, there are greater abnormal returns if targets are relatively larger compared to their acquirers when using either CAR or SCAR as the dependent variables. However, there is evidence when using SCAR as the dependent variable that if the targets' pre-merger share performance is relatively good, the targets' shareholders gain greater returns as a consequence of M&As. Overall, therefore, these findings suggest that while different event study methodologies tend to yield the same general results in terms of shareholder value creation they differ in explaining its determinants.



Table 2.9: Cross-sectional regressions (N=75) using acquirers' CAR from the OLS model event studies as dependent variables

Dependent variables:		CAR[-20,0]	CAR[-10,0]	CAR[-1,0]	CAR[ 0 ]	CAR[-1,+1]	CAR[-10,+10]	CAR[-20,+20]
PROF	Product focus	-0.07436 (-1.75)	-0.04935 (-1.44)	0.00593 (0.35)	0.00306 (0.22)	0.00025 (0.01)	-0.02691 (-0.62)	-0.05144 (-0.84)
GEOF	Dummy:1-Domestic 0-Cross border	-0.02362 (-1.47)	-0.00871 (-0.67)	0.00245 (0.38)	-0.00101 (-0.19)	0.00422 (0.48)	0.00506 (0.31)	-0.01720 (-0.74)
RSIZ	Relative asset size	-0.02125 (-0.56)	0.01766 (0.58)	0.02026 (1.33)	-0.00459 (-0.37)	0.03772 (1.83)*	0.02983 (0.78)	0.01727 (0.32)
CASH	Cash ratio	0.04630 (2.08)**	0.03933 (2.19)**	0.00603 (0.67)	0.00235 (0.32)	0.00969 (0.80)	0.02238 (0.99)	0.04161 (1.29)
RROE	Relative ROE	0.00221 (2.50)**	0.00106 (1.48)	0.00050 (1.39)	0.00000 (0.00)	0.00056 (1.16)	0.00165 (1.83)	0.00431 (3.37)**
RCIR	Relative CIR	-0.00535 (-0.55)	-0.01632 (-2.06)**	-0.00189 (-0.48)	-0.00051 (-0.16)	-0.00016 (-0.03)	-0.00499 (-0.50)	-0.00505 (-0.36)
	Constant	0.03370	0.00735	-0.01749	0.00395	-0.03590	-0.02358	-0.00730
	R-sq (adjusted)	13.40%	6.90%	0.00%	0.00%	0.00%	0.00%	11.60%
	F-value	2.91**	-1.92*	0.84	0.09	0.79	0.77	2.63**

Note: This table shows the results from seven cross-sectional regressions. The dependent variables are acquiring firms' seven cumulative abnormal returns (CAR) previously estimated from the standard OLS market model event studies. Six independent variables, on the other hand, are used to indicate what factors that may explain acquiring firms' share value creation. t-values in parentheses; \*=significant at the 10% level, \*\*=significant at the 5% level

Table 2.10a: Cross-sectional regressions (N=31) using targets' CAR from the OLS model event studies as dependent variables

Dependent variables:		CAR[-20,0]	CAR[-10,0]	CAR[-1,0]	CAR[ 0 ]	CAR[-1,+1]	CAR[-10,+10]	CAR[-20,+20]
GEOF	Dummy:1-Domestic	0.05989	0.08880	0.00526	-0.01037	-0.00050	0.03735	0.01861
	0-Cross border	(0.86)	(1.57)	(0.27)	(-0.73)	(-0.02)	(0.66)	(0.19)
CASH	Cash ratio	0.11832	0.09933	0.00260	0.00595	0.00794	0.05678	0.04990
		(1.34)	(1.39)	(0.10)	(0.33)	(0.21)	(0.80)	(0.41)
RSIZ	Relative asset size	0.07100	0.06610	0.08229	0.07740	0.12386	0.06670	0.09770
		(0.56)	(0.65)	(2.31)**	(3.00)**	(2.33)**	(0.65)	(0.56)
EPS	Earning per share	0.05594	0.05609	0.00551	0.00541	0.02431	0.03603	0.04942
		(1.29)	(1.59)	(0.45)	(0.61)	(1.33)	(1.03)	(0.83)
Constant		-0.11640	-0.12280	-0.05849	-0.04848	-0.08966	-0.07906	-0.09160
R-sq (adjusted)		0.00%	6.10%	8.90%	15.30%	9.20%	0.00%	0.00%
F-value		0.86	1.49	1.73	2.35*	1.76	0.54	0.25

Note: This table shows the results from seven cross-sectional OLS regressions. The dependent variables are target firms' seven cumulative abnormal returns (CAR) previously estimated from the standard OLS market model event studies. Four independent variables, on the other hand, are used to indicate what factors that may explain target firms' share value creation. Earning per share (EPS) as one of the independent variables is estimated in this table to explain whether target firms' pre-merger share performance may contribute to positive CAR. Another alternative variable, the ratio of market capitalization to book value (MB), is estimated instead in Table 2.10b. t-values in parentheses; \*=significant at the 10% level, \*\*=significant at the 5% level

Table 2.10b: Cross-sectional regressions (N=31) using targets' CAR from the OLS model event studies as dependent variables

Dependent variables:		CAR[-20,0]	CAR[-10,0]	CAR[-1,0]	CAR[ 0 ]	CAR[-1,+1]	CAR[-10,+10]	CAR[-20,+20]
GEOF	Dummy:1-Domestic	0.06763	0.09397	0.00545	-0.01082	0.00307	0.02980	0.00940
	0-Cross border	(0.91)	(1.54)	(0.27)	(-0.72)	(0.10)	(0.50)	(0.09)
CASH	Cash ratio	0.10825	0.08670	0.00104	0.00380	0.00376	0.03804	0.02530
		(1.20)	(1.17)	(0.04)	(0.21)	(0.10)	(0.52)	(0.21)
RSIZ	Relative asset size	0.01010	0.01060	0.07751	0.07407	0.09695	0.05440	0.07840
		(0.07)	(0.09)	(2.05)**	(2.70)**	(1.69)	(0.49)	(0.42)
MB	Market value/Book value	0.03860	0.03301	0.00255	0.00111	0.01722	-0.00264	-0.00117
		(0.79)	(0.82)	(0.19)	(0.11)	(0.84)	(-0.07)	(-0.02)
Constant		-0.12650	-0.12560	-0.05786	-0.04605	-0.09460	-0.05000	-0.05490
R-sq (adjusted)		0.00%	0.00%	8.30%	14.10%	5.60%	0.00%	0.00%
F-value		0.59	0.79	1.68	2.23*	1.45	0.26	0.08

Note: This table shows the results from seven cross-sectional OLS regressions. The dependent variables are target firms' seven cumulative abnormal returns (CAR) previously estimated from the standard OLS market model event studies. Four independent variables, on the other hand, are used to indicate what factors that may explain target firms' share value creation. The ratio of market capitalization to book value (MB) as one of the independent variables is estimated in this table to explain whether target firms' pre-merger share performance may contribute to positive CAR. Another alternative variable, Earning per share (EPS), is estimated instead in Table 2.10a. t-values in parentheses; \*=significant at the 10% level, \*\*=significant at the 5% level

Table 2.11: Cross-sectional regressions (N=75) using acquirers' SCAR from the GARCH model event studies as dependent variables

Dependent variables:		SCAR[-20,0]	SCAR[-5,0]	SCAR[ 0 ]	SCAR[-5,+5]	SCAR[-20,+20]
PROF	Product focus	0.32300 (1.40)	0.07480 (0.39)	0.05700 (0.18)	0.05620 (0.25)	0.31520 (1.08)
GEOF	Dummy:1-Domestic	-0.19467	-0.05704	-0.09680	-0.10879	-0.25050
	0-Cross border	(-2.22)**	(-0.79)	(-0.82)	(-1.28)	(-2.27)**
RSIZ	Relative asset size	0.31110 (1.52)	0.01270 (0.08)	0.15050 (0.54)	0.11350 (0.57)	0.28210 (1.09)
CASH	Cash ratio	-0.32600 (-2.69)**	-0.23705 (-2.38)**	-0.29700 (-1.81)*	-0.10810 (-0.92)	-0.31350 (-2.05)**
RROE	Relative ROE	-0.00051 (-0.10)	-0.00423 (-1.07)	-0.00777 (-1.19)	-0.00081 (-0.17)	0.00156 (0.26)
RCIR	Relative CIR	-0.00507 (-0.10)	-0.01176 (-0.27)	-0.10515 (-1.46)	0.00899 (0.17)	0.04627 (0.69)
	Constant	0.02450	0.21600	-0.01380	0.03510	-0.00999
	R-sq (adjusted)	10.50%	2.10%	1.50%	0.00%	5.65%
	F-value	2.44**	1.26	1.19	0.43	1.74

Note: This table shows the results from five cross-sectional regressions. The dependent variables are acquiring firms' five standardised cumulative abnormal returns (SCAR) previously estimated from the GARCH model event studies. Six independent variables, on the other hand, are used to indicate what factors that may explain acquiring firms' share value creation. t-values in parentheses; \*=significant at the 10% level, \*\*=significant at the 5% level

Table 2.12a: Cross-sectional regressions (N=31) using targets' SCAR from the GARCH model event studies as dependent variables

Dependent variables:		SCAR[-20,0]	SCAR[-5,0]	SCAR[ 0 ]	SCAR[-5,+5]	SCAR[-20,+20]
GEOF	Dummy: 1-Domestic	-0.04340	-0.02730	-0.36860	-0.18700	-0.19820
	0-Cross border	(-0.18)	(-0.12)	(-1.21)	(-1.11)	(-0.77)
CASH	Cash ratio	0.19310	-0.03740	0.13230	-0.09990	-0.10530
		(0.63)	(-0.13)	(0.34)	(-0.47)	(-0.32)
RSIZ	Relative asset size	0.49970	0.94230	1.13770	0.79250	0.43920
		(1.14)	(2.32)**	(2.05)**	(2.60)**	(0.95)
EPS	Earning per share	0.26150	0.16570	0.06920	0.09580	0.28590
		(1.73)*	(1.19)	(0.36)	(0.91)	(1.79)*
Constant		-0.39680	-0.47190	-0.55360	-0.26070	-0.13980
R-sq (adjusted)		0.00%	8.50%	3.10%	9.70%	1.50%
F-value		0.98	1.70	1.24	1.81	1.12

Note: This table shows the results from five cross-sectional regressions. The dependent variables are target firms' five standardised cumulative abnormal returns (SCAR) previously estimated from the GARCH model event studies. Four independent variables, on the other hand, are used to indicate what factors that may explain target firms' share value creation. Earning per share (EPS) as one of the independent variables is estimated in this table to explain whether target firms' pre-merger share performance may contribute to positive SCAR. Another alternative variable, the ratio of market capitalization to book value (MB), is estimated instead in Table 2.12b. t-values in parentheses; \*=significant at the 10% level, \*\*=significant at the 5% level

Table 2.12b: Cross-sectional regressions (N=31) using targets' SCAR from the GARCH model event studies as dependent variables

Dependent variables:		SCAR[-20,0]	SCAR[-5,0]	SCAR[ 0 ]	SCAR[-5,+5]	SCAR[-20,+20]
GEOF	Dummy:1-Domestic	-0.08750	-0.00980	-0.39980	-0.20810	-0.28890
	0-Cross border	(-0.33)	(-0.04)	(-1.25)	(-1.17)	(-1.02)
CASH	Cash ratio	0.06760	-0.07250	0.08010	-0.15080	-0.28400
		(0.21)	(-0.25)	(0.21)	(-0.70)	(-0.83)
RSIZ	Relative asset size	0.38680	0.77350	1.14970	0.76180	0.40700
		(0.79)	(1.77)*	(1.96)*	(2.33)**	(0.79)
MB	Market value/Book value	0.00450	0.10240	-0.04160	-0.00930	-0.08850
		(0.03)	(0.66)	(-0.20)	(-0.08)	(-0.48)
Constant		-0.21660	-0.48630	-0.45070	-0.18060	0.17780
R-sq (adjusted)		0.00%	5.10%	2.80%	6.80%	0.00%
F-value		0.21	1.41	1.21	1.55	0.34

Note: This table shows the results from five cross-sectional OLS regressions. The dependent variables are target firms' five standardised cumulative abnormal returns (SCAR) previously estimated from the GARCH model event studies. Four independent variables, on the other hand, are used to indicate what factors that may explain target firms' share value creation. The ratio of market capitalization to book value (MB) as one of the independent variables is estimated in this table to explain whether target firms' pre-merger share performance may contribute to positive SCAR. Another alternative variable, Earning per share (EPS), is estimated instead in Table 2.12a. t-values in parentheses; \*=significant at the 10% level, \*\*=significant at the 5% level

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## 2.4 Conclusions

A substantial number of banking M&As in emerging markets have taken place since the mid-1990s triggered by factors like financial turbulence, the active involvement of banks from developed markets as well as the expansion of institutions from various mature emerging economies like Singapore and Hong Kong. In order to investigate the shareholder wealth effects of such a trend, this study uses a sample of 84 banking M&A transactions from seven Asian and five Latin American emerging markets between 1998 and 2005. We first apply a standard event study methodology using the OLS market model to measure value changes upon the announcement of banking M&As. We find little evidence that acquiring banks lose value, whereas targets' shareholders can earn significant abnormal returns from the announcement of a deal. In order to relax the restrictions of a constant beta, we repeat the event study using a GARCH modelling approach. In general, although there are more negative SCAR for the acquirers and slightly more significant SCAR for the targets compared to the CAR from the OLS market model event study, the results from using the GARCH methodology are generally similar.

Following the event study analysis, we use a regression approach to explain the determinants of abnormal returns captured by CAR from the OLS market model event study or SCAR from the GARCH model event study. If CAR from the OLS model event studies are used as dependent variables, it is found that if a transaction involves a relatively large target more value will be created for both acquirer and target shareholders. Like their developed markets counterparts, cash payment is regarded as favourable by acquirers' shareholders. Also acquirers tend to gain greater returns if they acquire more efficient targets in emerging markets. On the other hand, the model that examines the determinants of SCAR derived from the GARCH model event study suggests that acquirers' shareholders prefer not only cross-border mergers and acquisitions, but also share offers as a payment method. Moreover, the relative size and pre-merger efficiency of targets have a significant influence on shareholders' returns.

Overall, whether the time-varying volatility of betas is taken into account or not when we examine the value effects of banking M&As, the results are broadly the same – there is some evidence of value creation for target shareholders whereas acquirers experience no

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loss in value. However, when the two types of abnormal returns (those derived from the OLS event study and those obtained from the GARCH modelling framework) are used as the dependent variables to examine the factors explaining wealth effects, the results yield inconsistent findings. Generally, this suggests that the event study methodology chosen can significantly influence factors that determine value creation in bank M&As. As such, we recommend that future studies that examine the determinants of shareholder value creation resulting from bank M&As should use GARCH or similar modelling frameworks to cross-check the robustness / consistency of their findings.



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**CHAPTER THREE: The Impact of Foreign Entry on  
Competition: New Evidence from Emerging Banking Systems**

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# The Impact of Foreign Entry on Competition: New Evidence from Emerging Banking Systems

## Abstract

This study examines the impact of foreign bank entry on banking competitive conditions in Argentina, Brazil, China and India between 2000 and 2006. We use the Lerner index to measure the banking competition. As well as using a fixed effects estimator, the generalised method of moments (GMM) dynamic panel data estimator is applied to obtain the Lerner index in order to mitigate possible misspecifications due to long-run equilibrium assumption imposed by the fixed effects estimator. Our results tentatively suggest that the Lerner index estimated using the dynamic procedure is the preferred measure of competitive conditions. Using a dynamic panel regression model, we then examine the impact of foreign bank presence and other bank and country specific factors on banking competition. Overall, our results show that foreign bank entry does not appear to significantly influence banking sector competition. We also suggest that there well may be a limit to the competitive influence of foreign banks over the short-term.

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### 3.1 Introduction

Since the early 1990s, the landscape of emerging markets' banking sectors has changed dramatically. In particular, financial sector foreign direct investment mainly conducted by banks has accelerated<sup>30</sup> (BIS 2004). Since 1991, foreign bank investment in emerging markets in the form of cross-border mergers and acquisitions (M&As)<sup>31</sup> has been higher than in developed markets, both in total value and deal numbers (Focarelli, 2003). The total value alone increased from about US\$2.5 billion between 1991-1995 to about US\$51.5 billion during 1996-2000 and approximately US\$67.5 billion from 2001 to 2005<sup>32</sup> (Domanski, 2005).

Such important trends can, to a great extent, be attributed to the gradual relaxation or complete removal of foreign bank entry restrictions in the aftermath of crises in Latin American and Asian emerging markets and further privatisation in Central and Eastern Europe (Domanski, 2005). Compared to other market based reforms and financial liberalisation measures, foreign bank entry in emerging markets appears to have had far-reaching effects.

First of all, foreign bank entry can improve emerging markets' macro-economic stability. Generally speaking, banking foreign direct investment is a relatively stable mode of investment because it can be quite costly to withdraw the investments or to completely exit the host country once the foreign bank has started operations. This may not be the case, however, for indirect investment such as cross-border lending, which can be more easily reversed. Such high exit costs for foreign banks come from not only the tangible assets in the host country but also their intangible assets (such as reputation or bank's relationships with authorities and local clients etc.). Moreover, the longer foreign banks operate in the host country, the higher the exit costs can be as both tangible and intangible assets grow over time increasing such costs. Therefore, it is relatively rare to witness foreign banks abandoning their operations after they have entered a host country.

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<sup>30</sup> A Working Group established by the Bank for International Settlement's (BIS) Committee on the Global Financial System (CGFS) published a report on financial sector foreign direct investment and papers submitted by group members are dedicated to this topic in 2004.

<sup>31</sup> Due to the lack of comprehensive statistics on the scale of financial sector foreign direct investment in emerging markets, cross-border banking mergers and acquisitions (M&As) data are widely used as an indicator of such activity. Foreign banks' green-field investment data, however, are not included as this type of investment has not been expanding as rapidly as banking M&A in many emerging markets (BIS, 2004).

<sup>32</sup> This trend witnessed a sharp decline after 2001, but recovered quickly above early 1990s levels since 2003 (Domanski, 2005).

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In addition, foreign banks have, also in various cases, shown a commitment to conduct business over the long-term even when a host country's economy performs badly. For instance, Hishikawa (2003) found that banks with foreign ownership lent local currency to domestic clients as much as their domestic counterparts in Malaysia and Thailand during the 1997 South East Asian financial crisis<sup>33</sup>. Some studies have also suggested that the presence of foreign banks may limit capital flight within local financial markets, which may ease the scale of capital shortage during periods of crises (Mathieson and Roldos, 2001). Also, foreign banks have incentives to develop a sounder economic environment (for their own benefit) by helping to develop appropriate legal, accounting and other systems. Some innovative financial instruments introduced by foreign banks may also be used not only to hedge banks' own risk, but also to lower the whole system's risk if other domestic banks engage in these transactions (Domanski, 2005).

Secondly, if foreign banks choose cross-border mergers and acquisitions as the entry mode, they can transform acquired domestic banks into part of international organisations. Therefore, foreign bank entry can promote emerging market's integration into the global market. Foreign banks offer capital and their parent organisation's resources (e.g. cheaper access to international capital markets, highly trained human resources, reputation, sophisticated information technology, and innovative financial instruments etc.) when entering emerging markets in order to gain the ownership and managerial control of a domestic bank. As a result, the strategic decision-making and risk management processes of the acquired banks will be migrated to the parent organisation. As far as foreign banks are concerned, each acquired bank in emerging markets is managed as a part of an international investment portfolio. Such integration of foreign banks and domestic banks will gradually bring emerging markets closer to the global market. (Hawkins and Mihaljek, 2001; Goldberg, 2003; BIS, 2004; Domanski, 2005).

Thirdly, foreign bank entry can directly and indirectly improve the efficiency of emerging markets' financial systems. Directly, foreign banks and acquired domestic banks tend to be more efficient compared to indigenous banks. It has been documented (e.g. Claessens and Laeven, 2003; Martinez Peria and Mody, 2003) that foreign bank

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<sup>33</sup> In general, foreign banks have played an important role in domestic lending. In Latin America, the ratio of foreign banks' local claims in local currency to total foreign claims increased to 60% at the end of 2004. While the ratio in Central and Eastern European and Asian markets amounted to 35% (Domanski, 2005).

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entry is associated with a reduction in both operational expenses and profitability for the domestic banking system as foreign banks and their subsidiaries exert competitive pressure on indigenous banks. Indirectly, the efficiency of the financial market is also improved in the area of capital allocation. Traditionally, in some emerging markets, governments direct banks' lending to support the country's development projects or related parties. However, the price of this type of lending is normally not adjusted properly to reflect the risks that banks face. Foreign banks, on the other hand, may resist government' pressure and use standard risk-adjusted pricing techniques instead when allocating credit (Agenor, 2003). Therefore, they are less likely to face the non-performing loans burden over the long run that is common for domestic banks in emerging markets (BIS, 2004).

Although foreign bank entry has been proved beneficial to emerging markets' banking and financial sectors, foreign banks play considerably different roles in various markets (Clarke et al. 2002). On the one hand, some Central and Eastern European and Latin American countries have the majority of their banking sector assets controlled by foreign banks (e.g. Poland, Hungary, Czech Republic and Croatia), on the other hand, such progress is more modest in various Asian countries (e.g. Malaysia, the Philippines, Thailand and Indonesia)<sup>34</sup>, which also were affected by the financial crisis (Lardy, 2001; Laeven, 2005). On average, in 2005, more than half of total banking assets in Central and Eastern European transition countries were controlled by foreign banks. This figure was over 38 percent in Latin America and but below 10 percent in Asia (Berger, 2007; IMF, 2007).

While there are some signs of saturation in terms of foreign bank investment in Central and Eastern European and Latin American emerging markets<sup>35</sup>, it is still an on-going phenomenon in various Asian emerging markets. In particular, in two of the largest emerging economies, China and India, there has been a gradual relaxation of their foreign bank entry restrictions recently as part of these countries' commitments to accession of the WTO<sup>36</sup>. It is expected that following decades will witness more dramatic

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<sup>34</sup> For example, in Malaysia, foreign ownership in locally incorporated banks is still restricted. In Thailand and the Philippines, foreign shareholders have to reduce their shareholding after a certain period (Domanski, 2005).

<sup>35</sup> In Central and Eastern Europe, financial sector foreign direct investment (FSFDI) inflows have generally slowed down recently and mainly targeted countries that would gain EU membership (such as Bulgaria, Croatia and Romania). In Latin America, FSFDI suddenly dropped in 2002 after almost eight years of increase since the 1994 Mexican crisis (Domanski, 2005).

<sup>36</sup> While major policy barriers have been lifted, some restrictions still remain as both countries implement the

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changes in the Asian banking sectors.

Responding to these important developments, the aim of this chapter is to study the impact of foreign bank entry on four Asian and Latin American (namely Argentina, Brazil, China and India) emerging banking systems competitive conditions between 2000 and 2006. This is thought to be an important issue for emerging markets as they are normally viewed as being relatively uncompetitive and inefficient. Foreign bank entry is, however, often seen as a solution to tackle these problems (BIS, 2004). This chapter makes a contribution to the foreign bank entry and competition in four main respects. Firstly, we apply the Lerner index as an indicator to measure emerging markets' competition<sup>37</sup>, then examine whether foreign bank entry has improved or worsened competition in these emerging markets during the period studied. Secondly, a procedure known as the generalised method of moments (GMM) dynamic panel data estimator (Arellano and Bond, 1991) and fixed effects estimator are both used to estimate the Lerner index. The underlying reason for using both estimators is to examine whether the long-run equilibrium assumption imposed by the fixed effect estimator can cause misspecification and therefore yield different results as identified by Goddard and Wilson (2007). Thirdly, the existing literature that studies this issue mainly covers the time period prior to 2000 (e.g. Claessens and Laeven, 2003; Yildirim and Philippatos, 2007; Gelos and Roldós, 2002 and Yeyati and Micco, 2007). In this study, a new data set that covers the period from 2000 to 2006 is expected to offer more contemporary insights into this issue. This time period also has its own importance. As mentioned earlier, in Latin American markets, foreign banks' direct investments started to appear stagnant after 2002. Whether the impact of foreign bank presence on competition has been affected by this slow-down remains an interesting question. Finally, as far as we are aware there have been no empirical studies undertaken with respect to foreign bank entry and the impact on competitive conditions in China and India due to its early stage and the relatively small presence of foreign banks in both countries. In this study, having taken China and India's specific circumstances into account, the foreign ownership information is collected accordingly to reflect the progress of foreign bank entry and its

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opening-up of the banking sector in a phased manner. For example, in India, before March 2009, foreign banks' acquisition of shareholdings was only permitted by India's central bank - Reserve Bank of India in selected Indian private sector banks. Acquisition of a controlling stake has to be phased in and the overall limit is 74 percent (RBI, 2005). In China, on the other hand, since 11<sup>th</sup> December, 2006, China has removed the geographical and customer restriction of RMB business on foreign banks. However, the Chinese authorities require three years (including two profitable years) waiting period for new foreign banks to obtain an RMB license (CBRC, 2007).

<sup>37</sup> Extant studies (e.g. Carbó and Rodríguez, 2007; Maudos and Fernández de Guevara, 2007) that use the Lerner index to examine competition in banking markets mainly focus on developed markets.

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effects on banking system. Moreover, it is also interesting to study China and India, because according to Prasad and Ghosh (2005), unlike in many other Latin American and South East Asian markets, where foreign bank entry was mainly driven by banking consolidation after various financial crises, China and India provide unique samples as foreign bank entry coincided with the diversification of ownership of state-owned banks and the rapid growth of domestic private banks.

The remainder of this chapter proceeds as follows. In Section 3.2, a literature review regarding the causes and implications of foreign bank entry, in particular its impact on competition, is presented. Section 3.3 describes the estimation of the Lerner index, data sample, and the determinants of the Lerner index including foreign bank ownership and various control variables. The estimation results are presented in Section 3.4. Finally, Section 3.5 concludes the chapter.

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### 3.2 Foreign bank entry and its impact on competition- a brief survey

Foreign bank entry has become an important topic in both developed and emerging markets since the 1980s. In particular, in the wake of foreign bank entry in emerging markets since the middle of 1990s, many studies have been undertaken to examine its causes, consequences and implications. A better understanding of the impact of foreign bank entry is thought to be useful for policy-makers and market participants alike as it helps them to evaluate the on-going progresses of liberalisation, privatisation and consolidation in emerging banking markets.

Traditionally, foreign banks' investments abroad are seen as the result of economic integration between two countries. As non-bank foreign direct investments (FDI) and bilateral trade grow, banks need to serve their important home-country clients abroad and start to develop business networks in the host country. Many early studies have confirmed that foreign trade and foreign direct investments drive foreign banking investment<sup>38</sup> (Goldberg and Saunders 1981, Goldberg and Johnson 1990, Grosse and Goldberg 1991, Brealey and Kaplanis 1996, Yamori 1998). More recently, using a data set from two surveys of over 100 countries' national banking supervisors, Dopico and Wilcox (2001) suggest that foreign bank presence is significantly and positively related to the countries' openness of economy in areas like the level of international trade. Wezel (2004) investigates the determinants of German multinational banking groups' direct investment in emerging markets between 1994 and 2001. He finds that if the host country receives more FDI from non-bank German firms, it may tend to receive greater investments from German banks, which might provide some evidence that banks follow their clients abroad. But there is no evidence that trade between Germany and the recipient developing countries plays a significant role influencing the banking groups' investment decision-making.

Buch and DeLong (2004), nonetheless, note that cross-border banking mergers and acquisitions are relatively fewer than cross-border non-financial firm mergers and acquisitions. This phenomenon indicates that banks may face more barriers than other firms. For instance, Focarelli and Pozzolo (2000) use a sample of around 2500 banks in

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<sup>38</sup> However, Nolle and Seth (1996) suggest the connections between foreign bank entry and FDI and trade may not be as close as previously presumed because they find that foreign banks in the US allocated the majority of loans to non-home country clients between 1981 and 1992.



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29 OECD countries and state that information asymmetries and regulatory restrictions are possible barriers to foreign bank entry. Alibux (2007) uses a more recent data set and also confirms these findings.

Like any other types of firms, information asymmetries caused by distance, differences in language, culture, tax and legal systems etc. sometimes can create barriers for banks inhibiting them from investing overseas. Buch and DeLong (2004) find that between 1994 and 2001, US and European banks tended to acquire banks in their own continent (i.e. in Latin America and Central and Eastern Europe respectively) as the solution to reduce the costs caused by information asymmetries. Van Horen (2007) notes the increasing trend of banking FDI conducted by banks from developing countries and finds that about 27% of all foreign banks in developing countries are owned by a bank from another developing country, in particular from the same region. Also remarkably, Spanish banks' heavy investment in Latin America can be partially explained by their similarities in terms of language and culture stemming from Spanish colonial history in the region. On the other hand, a host country's regulatory environment, whether it is stringent regarding banks' activities in other sectors, foreign ownership etc. is found to explicitly affect the level of foreign bank direct investment (Aliber 1984, Hultman and McGee 1989, Dopico and Wilcox 2001, Weller and Scher 2001). Specifically, in emerging markets, relaxation and complete removal of foreign bank entry restrictions in the 1990s have been probably one of the most fundamental determinants of foreign bank entry, although the underlying reasons may vary<sup>39</sup>. Finally, EU banking sectors can be used as a good example to demonstrate that two important impediments (information asymmetries and regulatory restrictions) work jointly to affect foreign bank entry. Despite the fact, there has been an increased level of integration of EU banking<sup>40</sup>, the process is far behind the integration and harmonization of other financial markets, such as money, bond and equity markets (Baele et al. 2004, Manna 2004, Capiello et al. 2006). In EU banking, explicit regulatory barriers to entry have been completely abolished. However, other implicit barriers like different institutional frameworks, payment and settlement systems, and tax systems still remain. These latter factors still increase

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<sup>39</sup> Domanski (2005) notes that the removal of such restrictions was often a part of banking sector restructuring programmes in Latin America and Asia after various financial crises, which was hoped to allow in foreign capital and management to recapitalise troubled banks and improve systemic stability. In Central and European emerging markets, however, as the first round of privatisation of state-owned banks proved disappointing, opening the banking sectors to foreign investors was part of governments' efforts to further privatisation and greater integration throughout the European Union.

<sup>40</sup> Papademos (2005) notes that 14 largest cross-border banking groups within the EU accounted for almost one-third of total EU bank assets in 2005.

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information costs for cross-border M&A activities. Consequently, cross-border M&A in banking sectors, in particular in retail banking<sup>41</sup>, have not occurred at the scale previously predicted within the EU (Boot 1999, Blandon 2000, ECB 2000, Goddard et al. 2001, Berger et al. 2003, Goddard et al. 2007, Berger 2007).

Some studies suggest that banks that operate in markets with high levels of competition and low profitability (in most cases developed banking systems) may have incentives to search for investment opportunities overseas (Paula 2003), others believe that a banking sector with greater growth potential can attract more investors. Potential can be measured by a number of indicators including real economic growth, profitability, levels of taxation, overhead costs, market size, per-capita income, and relative efficiency of the domestic financial sector (Tschoegl 1987, Claessens et al. 2001, Focarelli and Pozzolo 2000, Weller and Scher 2001, Buch and DeLong 2004)<sup>42</sup>. Comparatively, emerging markets are more likely to provide the above-mentioned growth potential than developed markets, which also explains the recent wave of banks' investment from developed markets to such markets (Claessens et al. 2001).

Compared to the substantial literature on the determinants of foreign bank entry, there have only been a handful of studies that examine the impact of foreign bank entry in domestic markets, and more so in the case of emerging markets (Nier and Baumann 2003). For instance, it is commonly believed that foreign bank participation reduces banks' risks of insolvency (Vander Venet 1996, Berger 2000) and improves the stability of the banking and financial systems and therefore helps accelerate economic growth (Demirgüç-Kunt et al. 1998). Crystal et al. (2001) in their study of seven large Latin American emerging markets show that foreign banks often have higher average loan growth rates, higher average provisioning expenses, and greater loss absorption ability, which all contribute to a sounder banking system. Goldberg et al. (2000) add that foreign banks' lending in Mexico and Argentina was less volatile and witnessed noticeable growth during two crises in the 1990s due to lower volatility of credit supply. Jeon and Miller (2002) study the performance of Korean domestic and foreign banks and show that domestic banks suffered more severely than foreign banks from the Asian financial

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<sup>41</sup> Comparatively, the integration has progressed further in wholesale than in retail banking in the EU (Eppendorfer et al. 2002, Schuler and Heinemann 2002).

<sup>42</sup> Generally, these studies find that a country with higher real economic growth, larger market size, higher profitability, lower taxes, overhead costs, per-capita income and relatively inefficient financial sectors attracts more foreign investments.

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crisis. Nonetheless, other studies have noted that foreign bank entry may also increase risk at the same time due to moral hazard, i.e. by exploiting safety nets offered by regulators from either the home or host country (John et al. 1991, John et al. 2000). Also such cross-border transactions could complicate the bank supervision and monitoring processes and increase the costs of such activities (Winton 1999).

Claessens et al. (2001) use bank level data for 80 countries during 1988-1995 and find that foreign banks have higher interest margins, overhead expenses and profitability than domestic banks in developing countries and the opposite holds in developed countries<sup>43</sup>. Demirgüç-Kunt and Huizinga (1999) also find that foreign banks in emerging markets tend to outperform domestic banks. According to Mian (2003), however, private domestic banks can achieve on average the same profitability as foreign banks in emerging markets<sup>44</sup>, but state-owned domestic banks perform much worse and can adversely impact the whole domestic banking sector's performance. Others find that private domestic banks are almost as healthy as foreign banks measured by financial ratings (Crystal et al. 2001) or have similar loan portfolios and levels of non-performing loans (in Argentina and Mexico, Goldberg et al. 2000). These findings may suggest that private ownership matters rather than the origin of the ownership. Overall, foreign bank entry may have exerted pressure on the domestic banking sector and improved private domestic banks' performance in emerging markets. This leads to another important issue, namely, the effect of foreign bank entry on competitive conditions in the domestic banking system<sup>45</sup>.

Some studies offer indirect evidence that foreign bank entry can improve competition. Generally, as the results show, more restricted foreign bank entry and higher levels of banking sector concentration will significantly increase the costs of financial intermediation. As a result, a high cost environment indicated by higher interest margins

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<sup>43</sup> They suggest that in emerging markets, foreign banks enjoy high interest margins and profit due to efficiency, cheaper capital compared to their emerging markets' counterparts, but suffer from information asymmetry in their retail orientated business, which induces high overhead costs. On the other hand, in developed markets, foreign banks normally engage in wholesale markets, which are more competitive and yield relatively lower returns but also have lower overhead expenses. Moreover, foreign banks' efficiency advantage in developed markets may not be enough to compensate the disadvantage brought about by information asymmetries.

<sup>44</sup> He claims that private domestic banks are more profitable in lending as they have an advantage in lending to domestic firms that do not have publicly verifiable information. Foreign banks, on the other hand, gain more revenue from deposits due to their access to cheap capital.

<sup>45</sup> Consolidation processes in emerging banking markets have considerably increased market concentration in recent years. According to the structure-conduct-performance (SCP) view, a concentrated market may inhibit competition, when analysing a market's competitiveness, concentration is another important factor often to be considered apart from foreign bank entry (Yeyati and Micco 2007).

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and overhead expenses may be associated with banking inefficiency and weaker competitive conditions in the financial sector (Claessens et al. 2001, Demirgüç-Kunt et al. 1998, Clarke et al. 2000, Levine 2002, Martinez Peria and Mody 2003, Demirgüç-Kunt et al. 2004).

Claessens and Laeven (2003) apply the methodology developed by Panzar and Rosse (1987) to estimate 50 countries' banking sector's competitive conduct. Then, they directly test the impact of foreign bank entry on competition. They point out that foreign bank entry and less entry and activity restrictions significantly improve market's competitiveness. They also find that market concentration has no evident negative impact on competition. In a similar study, Yildirim and Philippatos (2007) examine 11 Latin American banking systems and generally find similar results, but they observe a decrease in the levels of competition in Brazil, Chile and Venezuela, which may be the result of increased concentration. According to Gelos and Roldós (2002), in a cross-country study of eight emerging European and Latin American countries, it is suggested that a negative impact of concentration on competition may exist but they may be outweighed by the positive impact brought about by the foreign bank entry. In contrast, Yeyati and Micco (2007) find that foreign bank entry seems to have not improved competition in eight Latin American countries. They also note that foreign bank presence may achieve a more stable economic growth as excessive competition may destabilise the banking sector.

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### 3.3 Methodology and data sample

In this section, the procedure for estimation of the Lerner index – an indicator of competition is first illustrated. Moreover, the potential problems associated with the estimation of this measure using the fixed effects estimator are discussed. An alternative estimator – dynamic panel data estimator in turn is introduced in order to avoid various misspecification issues. Then, a cross-bank regression model is introduced to explain the determinants of the competitiveness of four emerging banking sectors under study. In particular, we concentrate on the impact of foreign bank entry. Finally, the data sample and various variables are described.

#### 3.3.1 Methodology - estimation of the Lerner index: measure of competition

In order to directly examine the impact of foreign bank entry on banking competitive conditions in Argentina, Brazil, China and India, first of all, the competition of these four banking systems needs to be estimated. The studies that examine competitive conditions and foreign bank entry abovementioned typically use the H-statistic developed by Panzar and Rosse (1987) – a non-structural indicator of competition<sup>46</sup>. This indicator gauges the degree to which changes in the average cost of bank's inputs leads to changes in average revenues. Therefore, the market is considered more competitive if the degree of such transmission is greater (Panzar and Rosse 1987). Although there has been an extensive literature that uses this indicator in various markets, the question has been raised whether the H-statistic, or rather which indicator, can portray a market's competitive behaviour most effectively.

In a study that compares various structural and non-structural indicators of competition, Carbó et al. (2007) find that five commonly used indicators (one structural indicator – the Hirschman-Herfindahl index, and four non-structural indicators including the net

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<sup>46</sup> Traditionally, indicators (including market share, concentration ratios for the largest set of firms, or a Hirschman-Herfindahl index) that measure competitive conditions concentrate on the Structure-Conduct-Performance (SCP) paradigm. It is assumed that the competitive conditions can be inferred from a market's structural features (mainly measured by concentration) that in turn influence firm's behaviour and performance. However, recent empirical results suggest that the SCP paradigm does not hold significantly (Claessens and Laeven 2003, Yeyati and Micco 2007). Some studies, on the other hand, suggest that greater performance may be the result of better efficiency rather than market power (Berger, 1995). Moreover, various researches have found that the SCP paradigm is not able to explain the changes in competitive conditions brought about by the changes in market contestability or strategic reactions of competing oligopolies, which does not necessarily change market structure (Carbó et al. 2007).

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interest margin/total asset ratio, the Lerner index, the H-statistic and the return on assets ratio) yield conflicting results about competitive conditions within and across 14 European countries and over time (between 1995 and 2001). Therefore, these indicators are not interchangeable and the choice of indicator of competition may significantly affect the interpretation of a market's competitive conditions. It is also tentatively suggested that the Lerner index and the return on assets ratio are more preferable than other indicators because they are relatively more consistent and less affected by different country-specific factors when measuring within country competition in broader banking activity (i.e. traditional banking services as well as off-balance sheet and fee-based transactions).

Compared to the H-statistic, the Lerner index has only been recently used to determine trends in competitive conditions in European banking during the 1990s (see Fernández de Guevara and Maudos 2004, Fernández de Guevara et al. 2007, Carbó and Rodríguez, 2007, Maudos and Fernández de Guevara, 2007). In essence, the Lerner index and the H-statistic are both developed from static theory of the firm models under long-run equilibrium conditions and belong to the so-called New Empirical Industrial Organisation (NEIO) literature (Carbó et al. 2007). Instead of relating input price changes to output prices changes as the H-statistic, the Lerner index measures the mark-up of price over marginal cost as a competitive benchmark. The higher the mark-up, the greater the realised market power (Fernández de Guevara et al. 2005). In our study, in order to contribute to the existing literature of the impact of foreign bank entry on competition, the Lerner index is chosen as our indicator of competition to examine four Asian and Latin American emerging banking markets<sup>47</sup>.

The Lerner index is defined as the difference between price and marginal cost, divided by price. It measures bank's ability to set prices above marginal cost, being an inverse function of the elasticity of demand and of the number of banks (Freixas and Rochet, 1997). The values of the index vary from 0 (perfect competition) to 1 (monopoly). The empirical approach to the Lerner index in the banking sector is mainly based on Maudos and Pérez (2003) and Fernández de Guevara et al. (2001). The Lerner index is algebraically expressed as follows:

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<sup>47</sup> It is beyond the scope of this paper, however, to provide evidence that the Lerner index is more appropriate than the H-statistic or other indicators.

$$\text{Lerner}_i = \frac{p_i - MC_i}{p_i} \quad (1)$$

where the price  $p_i$  is calculated by estimating a quotient between the total revenue (interest income and other operating income) and total assets. The marginal cost of producing an additional unit of output  $TA_i$  with three inputs (labour, capital and deposits) is estimated based on the specification of a trans-logarithmic cost function as follows:

$$\begin{aligned} \ln C_i = & \alpha_0 + \alpha_1 \ln TA_i + \frac{1}{2} \alpha_2 (\ln TA_i)^2 + \alpha_3 \ln w_1 + \alpha_4 \ln w_2 + \alpha_5 \ln w_3 + \frac{1}{2} \alpha_6 (\ln w_1)^2 \\ & + \frac{1}{2} \alpha_7 (\ln w_2)^2 + \frac{1}{2} \alpha_8 (\ln w_3)^2 + \alpha_9 \ln w_1 \ln w_2 + \alpha_{10} \ln w_1 \ln w_3 + \alpha_{11} \ln w_2 \ln w_3 \\ & + \alpha_{12} \ln TA_i \ln w_1 + \alpha_{13} \ln TA_i \ln w_2 + \alpha_{14} \ln TA_i \ln w_3 + \alpha_{15} \text{Trend} + \frac{1}{2} \alpha_{16} \text{Trend}^2 \\ & + \alpha_{17} \text{Trend} \ln TA_i + \alpha_{18} \text{Trend} \ln w_1 + \alpha_{19} \text{Trend} \ln w_2 + \alpha_{20} \text{Trend} \ln w_3 + \ln u_i \quad (2) \end{aligned}$$

where  $C_i$  is the bank's total costs (financial and operating costs);  $TA_i$  is the total assets; variable Trend is used to capture the effects of technical change in the cost function over time;  $w_1$ ,  $w_2$  and  $w_3$ , the production input prices are defined as follows:

$w_1$  = price of labour: personnel costs/ total assets<sup>48</sup>

$w_2$  = price of physical capital: operating costs (except personnel costs)/ fixed assets

$w_3$  = price of deposits: financial costs (total interest paid on deposits) / total deposits

Following Maudos and Pérez (2003) and Fernández de Guevara et al. (2001), the cost function is estimated using ordinary least squares (OLS) with fixed effects<sup>49</sup>. Under this procedure, the estimation relies upon the assumption that markets are in long-run

<sup>48</sup> There is no available information on the number of bank employees in the data base – BankScope used as the source of bank data in this paper, so the average price of the labour factor is proxied as a quotient between personnel costs and total assets.

<sup>49</sup> Fixed effects are introduced in order to capture the influence of variables specific to each firm (Fernández de Guevara et al., 2001).

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equilibrium at each time when observing the data. However, this static equilibrium framework has been challenged recently. For example, Goddard and Wilson (2007) use a Monte Carlo simulation exercise and show that when estimating Panzar-Rosse H-statistics, which also imposes long-run equilibrium assumption upon the estimation, the markets may not be in equilibrium at all and the speed of adjustment may be far less than instantaneous. In contrast, a procedure known as the generalised method of moments (GMM) dynamic panel data estimator (Arellano and Bond, 1991) is designed to correct for this misspecification and capture the partial adjustment towards equilibrium.

As far as the GMM dynamic panel data estimator is concerned, a lagged dependent variable is added to the fixed effects formulation alongside the individual effects allowing for dynamics (i.e. partial adjustment towards equilibrium) in the specification of the regression model, then the formulation is first-differenced to eliminate the individual effects. As a result, however, there is a problem of correlation between the lagged first-differenced dependent variable and the first-differenced disturbance term. In order to solve this problem, instrumental variables are used instead that are uncorrelated with the disturbance term. It is, therefore, essential to ensure the validity of the instruments and assumption that the differenced disturbance term does not exhibit serial correlation in order to maintain the consistency of this estimator. Two tests proposed by Arellano and Bond (1991) are used to test these assumptions. A Sargan test of over-identifying restrictions is designated to test the validity of the instruments by analysing the sample analogue of moment conditions used in the estimation. A test for second-order serial correlation in the residuals of the estimated equation is then also conducted<sup>50</sup>.

This study applies both the OLS fixed effects estimator and the Arellano and Bond GMM dynamic panel data estimator to estimate bank marginal cost in order to see how the Lerner index can be affected by using different estimators. As usual, the restrictions of homogeneity in input prices and of symmetry are imposed. Once the cost function is estimated for each year and each bank using OLS fixed effects estimator or the GMM dynamic estimator, marginal cost can be estimated as follows:

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<sup>50</sup> The disturbance term is probably first-order serially correlated by construction. It, however, should be free from second-order serial correlation.



$$MC_i = \frac{dC_i}{dTA_i} = \frac{d \ln(C_i)}{d \ln(TA_i)} \times \frac{C_i}{TA_i} \quad (3)$$

Two sets of Lerner indices then can be calculated separately according to Equation (1) depending on whether the marginal cost is estimated by the OLS fixed effects estimator or the GMM dynamic estimator.

### 3.3.2 Methodology – cross-bank regression model

Once our Lerner index measures of competition have been obtained, we then use a relatively simple cross-bank regression model to explain the determinants of the competitiveness of four emerging banking sectors under study. In particular, we also focus on the impact of foreign bank entry. The regression model used to examine the determinants of bank competition can be illustrated as follows:

$$\begin{aligned} \text{LERNER}_{it} = & \alpha + \beta_1 \text{FOREIGN}_{it} + \beta_2 \text{MAKS}_{it} + \beta_3 \text{CR5}_{it} + \beta_4 \text{MARGDP}_{it} \\ & + \beta_5 \text{INFLA}_{it} + \beta_6 \text{PROPERTY}_{it} + \beta_7 \text{GDPPC}_{it} + \varepsilon_{it} \end{aligned} \quad (4)$$

where dependent variable LERNER is Lerner index for each bank;

FOREIGN - the percentage of each bank's shares controlled by foreign investors;

MAKS – market share variable calculated as the ratio of each bank's asset value divided by the whole banking sector assets;

CR5 – a concentration ratio calculated as the sum of market shares for the largest five banks;

MARGDP - the ratio of stock market capitalisation to GDP;

INFLA - annual inflation rate;

PROPERTY - an index of property rights from the Economic Freedom Index;

GDPPC - The logarithm of per capita GDP of each year;

Moreover, this regression model is estimated using the GMM dynamic panel data estimator as it is assumed that a market's competitive conditions may be characterised by dynamics, in other words, previous competitive conditions may to some extent affect the

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current environment. Therefore, partial adjustment towards equilibrium needs to be captured when observing the data, rather than the static long-run equilibrium assumed by the OLS fixed effects estimator.

While the competitive conditions of banking have been measured using the Lerner index, the status of foreign bank entry needs to be evaluated, which is used as the independent variable FOREIGN in Equation 4, in order to assess its impact on competition. Extant studies usually use two types of indicators of foreign bank entry: the percentage of foreign banks in terms of the number or percentage banking assets controlled by foreign banks in the whole system. In both circumstances, these are country-level indicators and foreign banks are defined as any bank that has more than 50 percent of its shares held by foreign investors (Claessens and Laeven, 2003; Yildirim and Philippatos, 2007; Yeyati and Micco, 2007).

In this research, however, competitive conditions are examined on the bases of individual banks, and a bank-level foreign ownership variable is needed. So the percentage of each bank's shares controlled by foreign investors is used instead. Moreover, in contrast with previous studies, the majority (more than 50 percent) ownership criterion is relaxed: any percentage of foreign ownership is taken into account. As mentioned earlier, in Asian emerging markets, especially in the case of China and India, the removal of restrictions on foreign bank entry started much later and more slowly than in Latin America. While there are signs that foreign bank entry has slowed in Latin America, it has been an on-going progress in Asia over the recent years, and foreign banks tend to buy minority stakes first in some relatively large domestic state-owned banks then gradually increase their stakes at a later stage<sup>51</sup>. Therefore, it is necessary to adjust the foreign ownership criterion to reflect this phenomenon. Generally speaking, it is expected that foreign bank involvement will increase banks' competitiveness. So a positive impact of foreign bank ownership on competitive conditions in the banking sector would be expected, i.e. an inverse relationship between the Lerner index and foreign ownership.

Secondly, another bank-level variable is used to test whether competition is influenced by bank market share. Bank market share (MAKS) is captured as a ratio of each bank's asset value divided by the whole banking sector assets. We seek to examine the impact of

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<sup>51</sup> For example, three out of the four largest state-owned banks in China, namely ICBC, China Construction Bank and Bank of Communication have had minority stakes purchased by foreign banks (CBRC, 2007).

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bank size on competitive conditions, as previous empirical studies have shown that larger banks can exert market power (Berger, 1995; M3r3e and Nagy, 2003; Jeon and Miller, 2005)

Competitive conditions, of course, can be influenced by various country-specific factors. As such various country variables that have been used in the previous literature are required to capture the effects of different market or country features. A market's concentration level - 5-bank concentration ratio (CR5) that is defined as the sum of market shares for the largest five banks is necessary to depict the structure of the banking market (Claessens and Laeven, 2003; Demirg3c-Kunt et al., 2004). Higher levels of concentration are suggestive of less competition according to the SCP paradigm. The ratio of stock market capitalisation to GDP (MARGDP) is used to account for the competitive pressure from the non-bank financial sector (Levine and Zervos, 1998; Yildirim and Philippatos, 2007; Demirg3c-Kunt et al., 2004). It is assumed that this ratio will have positive effects on competition since more pressure from other financial sectors will increase the competition in the banking sector. A country's general economic development and institutional framework are also controlled for. The logarithm of per capita GDP of each year during the sample period is used to depict economic development (Claessens and Laeven, 2003). An inflation rate is also included to see if a high inflation economy will hinder competitive conduct as prices of financial products will be less informative according to Claessens and Laeven (2003). As a result, this variable should be positively related to the Lerner index. Regarding the institutional framework, an index of property rights from the 2008 Index of Economic Freedom compiled by Heritage Foundation is used. A higher score of this index indicates better protection of property rights (Claessens and Laeven, 2003)<sup>52</sup>.

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<sup>52</sup> Heritage Foundation measures 10 specific factors (namely business freedom, trade freedom, fiscal freedom, government freedom, monetary freedom, investment freedom, financial freedom, property rights, freedom from corruption, labour freedom), and average them equally into a total score. Each one of the 10 freedoms is graded using a scale from 0 to 100, where 100 represents the maximum freedom. A score of 100 signifies an economic environment or set of policies that is most conducive to economic freedom. Generally, for the 2008 Index of Economic Freedom, data for the period covering the second half of 2006 through the first half of 2007 are examined. However, some factors are based on historical information. For example, the monetary policy factor is a 3-year weighted average rate of inflation from January 1, 2004, to December 31, 2006. Other factors are current for the year in which the Index is published. For example, the taxation variable for this Index considers tax rates that apply to the taxable year 2007.

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### 3.3.3 Data sample

The data sample consists of Asian and Latin American banks from Argentina, Brazil, China and India from 2000 to 2006 is obtained from the Bankscope database. Four types of banks are included: commercial banks, savings banks, cooperative banks and bank holding companies. Bank data are extracted from the consolidated accounts, if available. Otherwise they are from unconsolidated accounts, so double counting is avoided. Two selection criteria are then applied as follows: first of all, the 1<sup>st</sup> and 99<sup>th</sup> percentile of the distribution of the each variable are treated as outliers. Secondly, bank data are deleted if any input price is missing. As a result, the final sample is an unbalanced panel data sample consisting of 1106 bank-year observations. The sample composition can be found in Table 3.1.

As can be seen from Table 3.1, the largest sample of banks is from Brazil, while three other countries have similar sample sizes. The data set is not only decomposed by country and year, but also by ownership status. In other words, banks are classified as with or without foreign ownership since this study counts minority and majority control by foreign investors as the indicator of foreign ownership. As expected, the two Latin American markets have a much higher proportion of banks with shares held by foreign investors compared to China and India. By 2006, although in Argentina and Brazil the proportion of banks with foreign ownership has remained relatively stable in our sample<sup>53</sup>, it has increased in China (from 2 out of total 21 banks in 2000 to 21 out of 50 total banks in 2006) and India (from 4 out of 41 total banks in 2000 to 16 out of 50 total banks in 2006).

The results of the estimation of the Lerner index using the OLS fixed effects estimator and the GMM dynamic panel data estimator for Argentina, Brazil, China, and India between 2000 and 2006 are shown in Table 3.2. Figure 3.1-3.4 further visually illustrates the evolution of the average Lerner indices of the banking sectors from our sample markets<sup>54</sup>.

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<sup>53</sup> There is a decrease of bank numbers in Brazil during the time period in our sample. The reason may be that there was a consolidation process within its banking sector, which was mainly driven by the government's privatization of state-owned banks as well as by the three largest domestic private banks' (Bradesco, Itaú and Unibanco) efforts to acquire small and medium-sized private banks to compete in various parts of the country (Hawkins and Mihaljek, 2001).

<sup>54</sup> Results from the Sargan test all reject the over-identifying restrictions (p-values of the tests for Argentina, Brazil, China and India are 0.9995, 0.2816, 0.2803 and 1.00); Results from the serial correlation test (second order) validate

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As can be seen in Table 3.2, irrespective of the method of estimation, the Lerner indices for Argentina and Brazil rise after 2002, and 2001 for India, which suggest worsened competitive conditions, in particular for banks in Brazil; in China, on the other hand, the conditions stay relatively stable throughout the sample period, but China seems to have the least competitive bank systems compared to other three markets. Moreover, average marginal costs estimated by the OLS fixed effects estimator are consistently higher than the ones estimated by the GMM dynamic panel data estimator, which leads to lower Lerner indices compared to those estimated by the GMM estimator.

Also according to Figures 3.1 to 3.4, the two sets of Lerner indices evolve in the same pattern for all four emerging markets over 2000 and 2006. When using the OLS fixed effects estimator, the Lerner indices of these markets appear relatively low compared to those typically found in European markets<sup>55</sup>, except for China where the average value is around 0.23. When using the GMM dynamic panel data estimator, however, the Lerner indices tend to be higher than those typically found in developed markets apart from in Brazil where the average value is below 0.07 over the time period studied. Overall, it seems that different estimation procedures do affect the interpretation of a market's competitive conditions. If long-run equilibrium assumptions are not imposed, on average, banks tend to operate in a market with lower average marginal cost, and banks are more able to set prices above marginal cost. Consequently, the market appears less competitive. Therefore, the Lerner index estimated using the dynamic panel procedure tends to suggest higher levels of market power (in the countries under study) compared to those derived from traditional procedures. The assumption of dynamic behaviour and no long-run equilibrium is, we argue, more realistic, and as such we tentatively suggest that the dynamic procedure provides less biased results. Those estimates of the Lerner index in turn, will be used as our measure of competitive conditions in the banking systems under study.

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the use of instrumental variables and reject the serial correlations when using GMM dynamic panel data estimator except for Chinese bank sub-sample (p-values of the tests for Argentina, Brazil, China and India are 0.1478, 0.9142, 0.0242 and 0.1157).

<sup>55</sup> The Lerner indices of major European banking systems in the 1990s are usually below 0.16 (Angelini and Cetorelli, 2003; Fernández de Guevara et al., 2001; Maudos and Fernández de Guevara, 2004; Carbó et al., 2007; and Maudos and Pérez, 2003).

Table 3.1: Sample composition by country, year and ownership status

	2000	2001	2002	2003	2004	2005	2006
Argentina							
Bank number	65	69	72	67	67	65	59
Banks with no foreign ownership	41	44	49	45	44	41	35
Banks with foreign ownership	24	25	23	22	23	24	24
Brazil							
Bank number	96	111	115	107	99	92	86
Banks with no foreign ownership	61	72	79	74	66	64	58
Banks with foreign ownership	35	39	36	33	33	28	28
China							
Bank number	21	27	39	48	54	62	50
Banks with no foreign ownership	19	23	35	42	46	48	29
Banks with foreign ownership	2	4	4	6	8	14	21
India							
Bank number	41	44	52	58	56	55	50
Banks with no foreign ownership	37	37	45	46	37	36	34
Banks with foreign ownership	4	7	7	12	19	19	16
Total							
Bank number	223	251	278	280	276	274	245
Banks with no foreign ownership	158	176	208	207	193	189	156
Banks with foreign ownership	65	75	70	73	83	85	89

Table 3.2: Summary of average Lerner indices of 4 emerging markets 2000-2006

	2000	2001	2002	2003	2004	2005	2006
<b>Argentina</b>							
Price	0.1233	0.1560	0.2672	0.1381	0.1263	0.1383	0.1401
Marginal Cost(FE)	0.1250	0.1535	0.2505	0.1324	0.1118	0.1164	0.1251
Lerner Index(FE)	0.0365	0.0359	0.0081	0.0514	0.1375	0.1883	0.1130
Marginal Cost (GMM)	0.1028	0.1232	0.1703	0.1124	0.0993	0.1021	0.1058
Lerner Index (GMM)	0.2252	0.2494	0.1630	0.2221	0.2858	0.3351	0.2855
<b>Brazil</b>							
Price	0.2027	0.2192	0.2974	0.2185	0.2034	0.2329	0.1981
Marginal Cost(FE)	0.2006	0.2195	0.2987	0.2179	0.2013	0.2288	0.1790
Lerner Index(FE)	0.0307	0.0263	0.0143	0.0309	0.0239	0.0288	0.1031
Marginal Cost (GMM)	0.1911	0.2085	0.2823	0.2033	0.1868	0.2118	0.1702
Lerner Index (GMM)	0.0533	0.0527	0.0580	0.0738	0.0620	0.0657	0.1225
<b>China</b>							
Price	0.0471	0.0419	0.0358	0.0388	0.0421	0.0426	0.0460
Marginal Cost(FE)	0.0360	0.0319	0.0274	0.0300	0.0325	0.0330	0.0344
Lerner Index(FE)	0.2400	0.2351	0.2334	0.2314	0.2305	0.2311	0.2490
Marginal Cost (GMM)	0.0287	0.0261	0.0228	0.0251	0.0267	0.0270	0.0284
Lerner Index (GMM)	0.3739	0.3667	0.3623	0.3572	0.3644	0.3690	0.3741
<b>India</b>							
Price	0.1138	0.1116	0.1157	0.1103	0.0994	0.0880	0.0849
Marginal Cost(FE)	0.1076	0.1086	0.1097	0.1024	0.0897	0.0825	0.0797
Lerner Index(FE)	0.0544	0.0269	0.0508	0.0716	0.0999	0.0538	0.0624
Marginal Cost (GMM)	0.0967	0.0975	0.0977	0.0902	0.0785	0.0730	0.0697
Lerner Index (GMM)	0.1501	0.1254	0.1559	0.1840	0.2125	0.1622	0.1793

Note: FE - Fixed Effects Estimates; GMM - Generalised Method of Moment Estimates;

Figure 3.1: Average Lerner index of banks in Argentina from 2000-2006

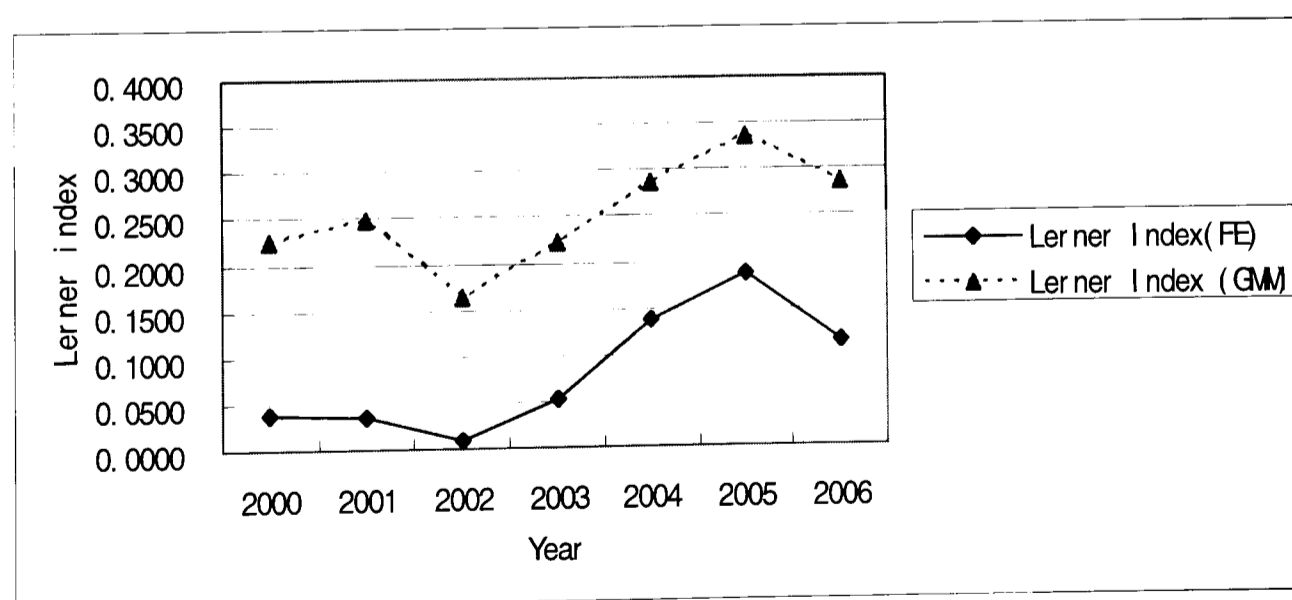


Figure 3.2: Average Lerner index of banks in Brazil from 2000-2006

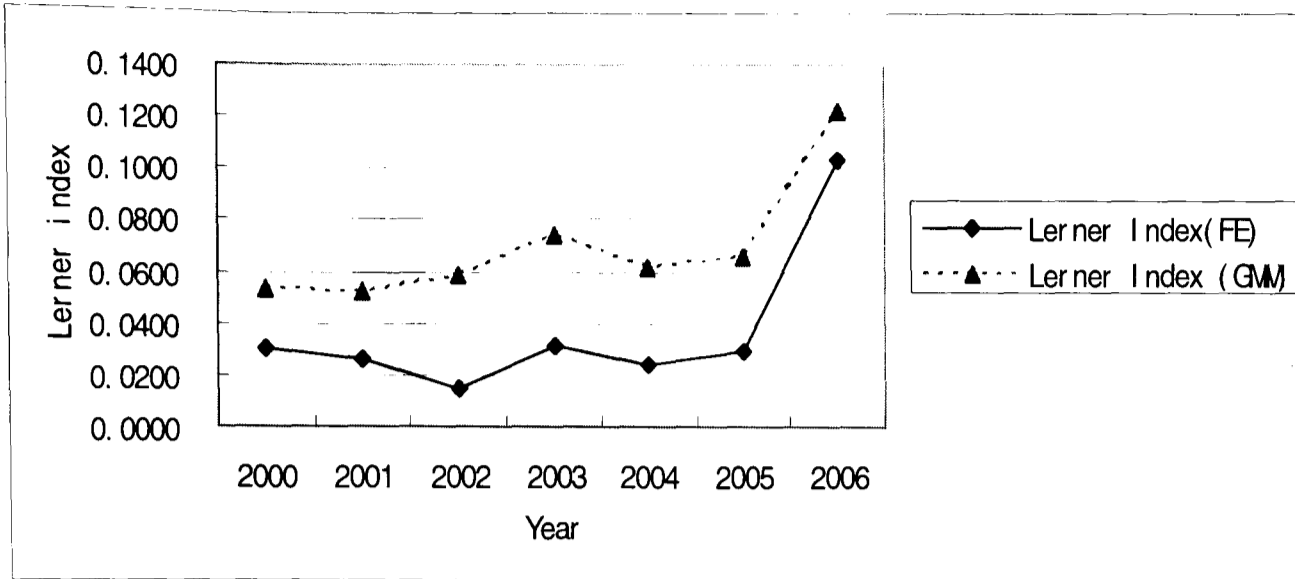


Figure 3.3: Average Lerner index of banks in China from 2000-2006

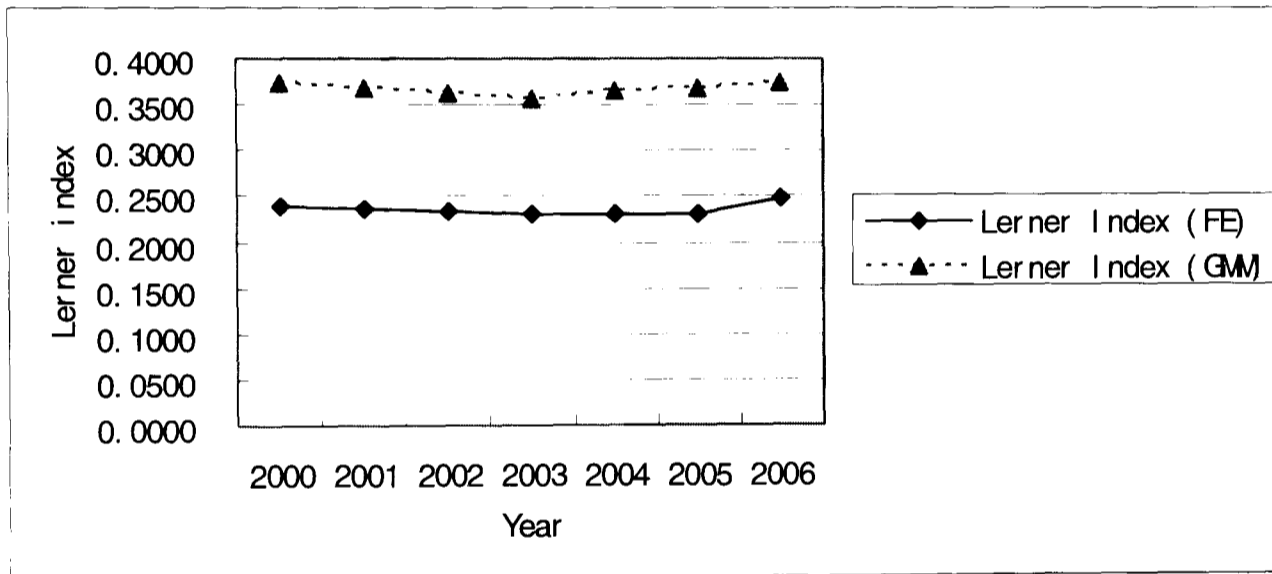
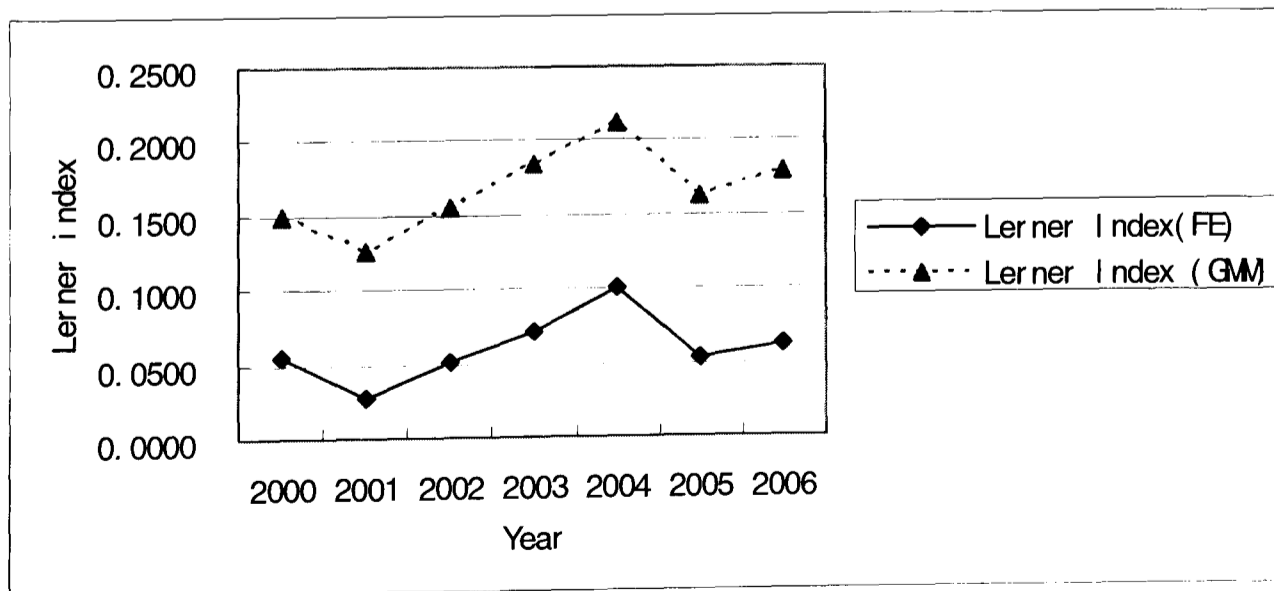


Figure 3.4: Average Lerner index of banks in India from 2000-2006





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The summary statistics for the independent variables of each country sample used in our regression analysis to examine the impact of foreign ownership on competitive conditions (as measured using dynamic panel estimates of the Lerner indices) are demonstrated in Table 3.3. The independent variables' descriptive statistics for each year, however, are further detailed in Appendix 3.1.

Table 3.3 shows that while foreign ownership, which is measured by bank's shares controlled by foreign investors, remains stable in all Latin American markets, the pace of the increase in two Asian markets, China and India, has doubled from 2000 to 2006<sup>56</sup>. In terms of bank specific control variables, Chinese banks tend to have larger market share than other banks. While, the market share in other three markets stays fairly unchanged, there is an evident decrease in China during the 7 years period. This may be, however, driven by the lack of small banks data in the first few years. The CR5 ratios, the proxy for market concentration in the banking sector, show that China has the most concentrated market in the data sample with more than 80% of the banking assets controlled by the largest five banks. Moreover, this high concentration level has not changed significantly since 2000. In terms of the development of the stock market, China and India both increased their stock markets' capitalisation considerably in 2006, which jumped from about 40% of their GDP over the past six years in our sample to 90%. The annual inflation rates use year 2000 as the base year in our study. As can be seen, two Latin American markets, Argentina and Brazil experience relatively higher inflation in their economies. China, on the other hand, has the lowest inflation rate throughout the time period under study. Four emerging markets have similar scores on their property rights protection with over 50 out of 100. Finally, Argentina and Brazil have relatively higher GDP per capita compared to China and India. India, however, is the poorest economy in our sample. In 2006, India's GDP per capita is less than half of the China's.

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<sup>56</sup> It is not shown in Table 3 that most Argentine and Brazilian banks with foreign ownership are majority owned by foreign investors or foreign banks' branches. Chinese and Indian banks, in contrast, when they have foreign ownership, it is usually via a minority stake.

Table 3.3: Summary statistics: means of posited variables, standard deviation in parentheses 2000-2006

Variable	Argentina	Brazil	China	India
FOREIGN	0.32 (0.460)	0.31 (0.452)	0.08 (0.230)	0.11 (0.287)
MAKS	0.0151 (0.029)	0.0099 (0.026)	0.0233 (0.074)	0.0197 (0.039)
CR5	0.5194 (0.033)	0.5287 (0.032)	0.8326 (0.017)	0.4996 (0.064)
MARGDP <sup>a</sup>	0.5272 (0.256)	0.4259 (0.129)	0.4589 (0.206)	0.4994 (0.224)
INFLA <sup>b</sup>	35.2 (27.62)	28.2 (20.28)	3.8 (3.30)	13.6 (8.99)
PROPERTY <sup>c</sup>	61.47 (7.870)	59.04 (1.336)	52.25 (1.661)	50.88 (2.681)
GDPPC <sup>a</sup>	8.9161 (0.091)	8.2450 (0.032)	7.1534 (0.160)	6.2650 (0.113)

Note: FOREIGN - the percentage of each bank's shares controlled by foreign investors;

MAKS - market share variable calculated as the ratio of each bank's asset value divided by the whole banking sector assets;

CR5 - a concentration ratio calculated as the sum of market shares for the largest five banks;

MARGDP - the ratio of stock market capitalisation to GDP;

INFLA - annual inflation rate;

PROPERTY - an index of property rights from the Economic Freedom Index;

GDPPC - The logarithm of per capita GDP of each year

Sources: <sup>a</sup>: World Bank World Development Indicators, Nov 2007;

<sup>b</sup>: IMF International Financial Statistics;

<sup>c</sup>: The Heritage Foundation, 2008

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### 3.4 Empirical results

The results of the examination of the impact of foreign bank entry on banking sector competitive conditions are displayed in Table 3.4. The cross-bank regression models are estimated using GMM dynamic panel estimation for the combined four banking systems and individual banking systems.

First of all, according to the results from Sargan and serial correlation tests, the application of GMM dynamic panel data estimator is valid in all five regression models. Also, the instrumental variable  $LERNER(t-1)$  is positive and significant in four out of five models, which suggests the current competitive conditions are positively affected by previous conditions and a significant degree of dynamics is presented in these cases and therefore further suggests the necessity for using a dynamic modelling approach.

As can be seen in Table 3.4, the foreign ownership variable - FOREIGN is insignificantly related to the Lerner index in any regression model. As a result, in Argentina, Brazil, China and India, foreign ownership does not appear to significantly impact on competition conduct between 2000 and 2006.

The bank level variable - MAKS, the market share of a bank in terms of total assets, on the other hand, provides mixed evidence that individual bank market share influences competitive conditions. The variable is significantly positive for Argentina, which suggests that large bank market shares may hinder competition<sup>57</sup>. The opposite holds, however, for Brazilian and Chinese banks.

Two country level variables - CR5 and GDPPC were both dropped in some country estimates (CR5 in the China estimates and GDPPC in the Argentina, Brazil and India estimates) due to co-linearity. The assets concentration variable - CR5, shows a positive and significant effect on competition for Indian banks but a negative and significant impact in our pooled sample. Therefore, we cannot find strong evidence to support the SCP paradigm that higher levels of concentration are suggestive of less competition, which is consistent with the results from Claessens and Laeven (2003). GDPPC, the

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<sup>57</sup> The independent variable MAKS is also positively significant in the pooled sample regression model. This result, however, may be mainly driven by Argentine sample

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logarithm of per capita GDP, nevertheless, is not significant in any regression model under study. As a result, there is little evidence to support the findings of Demirguc-Kunt et al. (2003) that a more developed economy tends to be related to a more competitive banking sector.

MARGDP, the ratio of stock market capitalisation to GDP, measures the competitive pressure from the non-banking financial sector as alternative financial service providers (the relative size of the stock market to the overall size of economy is used as a proxy). Table 3.4 shows that for the pooled sample and Argentina, the development of the stock market does improve competition in the banking sector suggesting that banks face significant competition from other financial sectors. Indian banking, on the other hand, seems to be less competitive when the stock market has a larger capitalisation, perhaps suggesting that bank/ non-bank relationships are more collusive than competitive (maybe due to the role of the state).

The property right protection indicator, PROPERTY, which measures a country's institutional framework, is expected to have a positive impact on competition as a more complete institutional framework will encourage competition. As a high score shows better protection, a negative sign of the coefficient of this variable should be expected. However, only for India, PROPERTY appears to have significantly opposite effects, and for China, the effects are insignificant. Two regression models for Argentina and Brazil yield positive and significant results.

The results from the variable INFLA, the inflation ratio, also contradict the general findings of a negative relationship between inflation and competition in banking (e.g. Claessens and Laeven, 2003). The hypothesis is that a high inflation economy may worsen efforts to increase competition. In fact, we generally find the opposite for the pooled, Argentinean and Indian samples, higher inflation seems to exert significantly positive effects on competition.

Overall, foreign bank entry, as measured by bank level foreign ownership, does not appear to significantly influence banking sector competition. As far as Argentina and Brazil are concerned, both have a larger foreign presence in their banking sectors, the majority of existing studies that examine Argentina and Brazil show that foreign bank

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participation does significantly and positively impact on competitive conditions in the late 1990s (e.g. Yildirim and Philippatos, 2007; Gelos and Roldós, 2002 etc.)<sup>58</sup>. However, it seems that if the positive impact exists, it can not be captured using the approach applied in this study. China and India, in contrast, both have lower levels of foreign bank presence and various restrictions on foreign bank entry remain. It may be the case that it is too early to observe the impact of foreign bank entry on competition in these two banking systems given the time period studied<sup>59</sup>.

Claessens and Laeven (2003) suggest that contestability of a market determines the competition of a market, other than the level of foreign bank presence<sup>60</sup> and relaxing foreign bank entry restrictions in emerging markets enhances contestability, but there well may be a limit to the competitive influence of foreign banks over the short-term (as in our study). Therefore, foreign ownership variables may have a relatively short-term impact on competition.

Over a long-term the impact of foreign bank entry, on the other hand, may be reflected more in individual bank's efficiency improvements, and this may exert increased competitive pressure upon domestic banks (Claessens and Laeven, 2003; Martinez Peria and Mody, 2003; Berger, 2007). As a result, the process whereby domestic banks strive to become more efficient in order to compete with foreign banks may be a long-term phenomenon not captured in the relatively short-term nature of our study. This, we suggest, is an area of research that deserves greater academic attention in the future.

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<sup>58</sup> With the exception of the study carried out by Yeyati and Micco (2007) examining eight Latin American markets. They find that foreign bank penetration is associated with weaker competition.

<sup>59</sup> According to Dobson and Kashyap (2006), direct competition between foreign banks and domestic banks in China may not increase significantly in the near future, even though major restrictions have been lifted in 2006. Foreign banks in China may focus on less developed but high margin banking business like credit cards, investment, risk management, private banking, which Chinese domestic banks have not gained advantage to compete with.

<sup>60</sup> Claessens and Laeven (2003) use two variables – Entry fit test variable and Activity restriction variable to measure the status of contestability of a banking system. These two variables are extracted from a data base established by Barth et al. (2001), which provides 107 countries' banking data prior to 2000. This paper does not capture the direct effect from the changes of contestability due to lack of data.

Table 3.4: The impact of foreign bank entry on competition in emerging markets - a dynamic approach

	Dependent variable: Lerner index (obtained by dynamic model)				
	Pooled sample	Argentina	Brazil	China	India
LERNER (t-1)	0.1253 ** (0.0121)	0.1261 ** (0.0313)	0.0557 * (0.0242)	-0.1631 (0.1630)	0.4924 ** (0.0248)
FOREIGN	-0.1539 (0.2876)	0.3991 (1.4331)	0.0621 (0.1488)	-0.0517 (0.0595)	0.0093 (0.0774)
MAKS	2.5792 * (1.0876)	59.8773 ** (16.4929)	-5.3996 ** (1.8256)	-0.0741 ** (0.0206)	-0.3758 (0.3591)
CR5	-0.2744 ** (0.0830)	5.1956 (3.8336)	-5.4524 (2.9707)		0.7216 ** (0.1040)
MARGDP	-0.8955 ** (0.1039)	-2.6449 ** (0.3535)	-1.7034 (0.8785)	-0.0122 (0.0238)	0.2811 ** (0.0661)
INFLA	-0.0057 ** (0.0014)	-0.0374 * (0.0176)	-0.0217 (0.0139)	0.0025 (0.0031)	-0.0484 ** (0.0059)
PROPERTY	0.0060 (0.0032)	0.0587 ** (0.0171)	0.1530 * (0.0733)	0.0055 (0.0030)	-0.0307 * (0.0039)
GDPPC	-0.1298 (0.1666)			0.8771 (1.2352)	
Constant	0.1451 **	0.6856 *	0.4338	-0.0875	0.2129
Number of observations	1113	295	445	151	215
Sargan test (p-value)	0.2085	0.6828	0.0919	0.7935	0.7695
Serial correlation test (p-value)	0.3229	0.4012	0.4908	0.2146	0.1951

Note: Dependent variable is the Lerner index of individual bank from Argentina, Brazil, China and India or a particular country, which is previously obtained using the GMM dynamic panel data estimator for the years 2000-2006. All regressions are estimated using GMM dynamic panel data estimator. Two variables: CR5 and GDPPC were dropped in each country sub-sample due to co-linearity. Two tests (Sargan test and Serial correlation test) results are also reported to examine the validity of the GMM estimator.

\* Significantly different from zero at 5% level

\*\* Significantly different from zero at 1% level

Standard errors in parenthesis

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### 3.5 Conclusions

This study examines the impact of foreign bank entry on banking competitive conditions in Argentina, Brazil, China and India between 2000 and 2006.

We use the Lerner index to measure the banking competition. As well as using a fixed effects estimator, the generalised method of moments (GMM) dynamic panel data estimator is applied to obtain the Lerner index in order to mitigate possible misspecifications due to long-run equilibrium assumption imposed by the fixed effects estimator. The results show that different estimators do yield noticeably different Lerner indices, in particular, the Lerner indices for Argentina, Brazil and India using the fixed effects estimator suggest greater competition than those found in studies of European banks in 1990s, although this is not the case when we use GMM dynamic estimations to derive our measure of market power. In general, if the long-run equilibrium assumption (under the fixed effects) is not imposed, on average, banks tend to operate with lower marginal costs, consequently, the market appears less competitive. Our results, therefore, tentatively suggest that the Lerner index estimated using the dynamic procedure is the preferred measure of competitive conditions. We then use this measure to see if foreign bank ownership has the impact on competitive conditions in the Argentinean, Brazilian, Chinese and Indian banking systems between 2000 and 2006.

Using a dynamic panel regression model, we examine the impact of foreign bank presence and other bank and country specific factors on banking competition. Overall, our results show that foreign bank entry, as measured by bank level foreign ownership, does not appear to significantly influence banking sector competition. As far as Argentina and Brazil are concerned, both have a larger foreign presence in their banking sectors, the majority of existing studies that examine Argentina and Brazil show that foreign bank participation does significantly and positively impact on competitive conditions in the late 1990s. However, it seems that if the positive impact exists, it can not be captured using the approach applied in this study. China and India, in contrast, both have lower levels of foreign bank presence and various restrictions on foreign bank entry remain. It may be the case that it is too early to observe the impact of foreign bank entry on competition in these two banking systems given the time period studied. Therefore, there well may be a limit to the competitive influence of foreign banks over

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the short-term (as in our study). Therefore, foreign ownership variables may have a relatively short-term impact on competition.

Over a long-term the impact of foreign bank entry, on the other hand, may be reflected more in individual bank's efficiency improvements, and this may exert increased competitive pressure upon domestic banks. As a result, the process whereby domestic banks strive to become more efficient in order to compete with foreign banks may be a long-term phenomenon not captured in the relatively short-term nature of our study. This, we suggest, is an area of research deserve greater academic attention in the future.



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## **CHAPTER FOUR: Productivity Change in Emerging Market Banking Systems**

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# Productivity Change in Emerging Market Banking Systems

## Abstract

This study investigates the productivity change in four emerging market banking systems, namely Argentina, Brazil, China and India over the period 2000-2006. We employ a parametric approach that follows Berger and Mester (1999, 2003) to examine banks' optimisation processes (cost minimisation and profit maximisation); and then decompose the total gross changes of variable costs and profits to measure the cost and alternative profit productivity change respectively. The results show that all these banking systems suffered a slight decrease in cost productivity (apart from India) but also enjoyed profit productivity gains over the same period. This suggests that banks in the countries under study focused more on revenue generation compared to cost minimisation over the period. We also find some evidence that banks may have also exerted their market power to improve their profit maximisation process.

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## 4.1 Introduction

Much of the academic literature focusing on improvements in banking productivity relates to deregulation and advances in both financial and non-financial technologies in developed banking systems, namely, the US and EU (Berg et al., 1992; Berger and Mester, 2003; Casu et al., 2004 etc.). Many banking systems in emerging markets have also embarked on the processes of restructuring and deregulation in order to create sound and efficient banking institutions, improve the stability of the financial systems (to mitigate the risks of future financial crises) and support economic growth, which form crucial parts of economic transformation to a more market-oriented economy (Koutsomanoli-Filippaki et al., 2009). These restructuring and deregulation measures in emerging markets broadly include relaxation or removal of foreign bank entry restrictions, consolidation within the banking systems, and privatisation of state-owned banks (Hawkins and Mihaljek, 2001). As a result, it may be expected that banks in these markets have also experienced changes in their productivity as suggested by evidence found in developed countries.

This chapter investigates the productivity change in four major emerging banking systems, namely Argentina, Brazil, China and India over the period 2000-2006. Productivity developments are believed to be an important issue for policymakers alike in these markets. First of all, an increase in bank productivity may result in lower prices, better services and improved allocation of capital, which in turn may further help economy grow (Casu et al., 2004). Secondly, an analysis of productivity change may assist policymakers to evaluate the impact of their financial reform programmes (Koutsomanoli-Filippaki et al., 2009). According to Casu et al. (2004), an analysis of productivity differences across countries may also help identify potential success or failures of policy initiatives. We choose two relatively large emerging banking systems from Latin America (i.e. Argentina and Brazil) and Asia (i.e. China and India) respectively<sup>61</sup>. In fact, Latin American banking systems initiated their banking reforms much earlier and in a more dramatic manner compared to their Asian counterparts (Hawkins and Mihaljek, 2001). China and India, on the other hand, have implemented policy changes in a more steady and phased manner (RBI, 2005; CBRC, 2007). Therefore, it is interesting to examine whether Latin American countries like Argentina

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<sup>61</sup> The parametric approach we apply requires relatively large bank samples, in particular in the second decomposition process.

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and Brazil have experienced more productivity changes as a result of their more dramatic reform programmes since the early 2000s compared to those in Asia.

This chapter aims to contribute to the extant literature as it is the first study (as far as we are aware) that uses a parametric approach following Berger and Mester (1999, 2003) to examine the cost and alternative profit productivity change in major emerging banking systems. Much of the contemporary literature on bank productivity in emerging banking systems apply non-parametric methodologies and focus on specific countries<sup>62</sup> (Koutsomanoli-Filippaki et al., 2009). These studies typically find that there is little improvement of banking productivity despite all the reform efforts in recent years<sup>63</sup>. Our findings, however, suggest that the improvements in terms of profit productivity are significant in these major emerging banking markets (except for Argentinean banks that experienced more modest increases) over the period under study while there is a slight decrease in cost productivity. We also find that market power does seem to positively influence banks' profit maximisation process in Argentina and India when using various market power indicators.

The remainder of this chapter proceeds as follows. Section 4.2 presents a review of the bank productivity literature. Section 4.3 first describes the parametric methodology, which estimates cost and alternative profit productivity change and further outlines the decomposition of productivity processes; we then use two regression models to investigate the impact of market power banks in these markets may have on their productivity change; we finish off this section by outlining the data sample used in this study. The results are presented in Section 4.4 and Section 4.5 concludes the chapter.

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<sup>62</sup> For example, Bhattacharyya et al. (1997), Sathya (2001), Kumbhakar and Sarkar (2003) and Galagedera and Edirisuriya (2005) study Indian banking productivity; Kumbhakar and Wang (2007) study banking productivity change in China; Leightner and Lovell (1998) investigate this issue in Thailand; Njie (2005) and Ghani and Suri (2000) examine Malaysian banking productivity; Nakane and Weintraub (2005) study Brazilian banking productivity.

<sup>63</sup> The exception is that Berger and Mester (2003) find a significant increase in profit productivity but a decline in cost productivity.

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## 4.2 Literature on productivity change in banking

Generally speaking, there are two strands of literature that study productivity change and related issues in banking. The first, and most commonly used, employs non-parametric methodologies, specifically, the Malmquist total factor productivity (TFP) index, which uses linear programming techniques to measure TFP change between two data points by calculating the ratio of the distances of each data point relative to a common technology (Shephard, 1970; Fare et al., 1994)<sup>64</sup>. This methodology has been extensively applied by many researchers. One of the earliest studies in banking is Berg et al. (1992), which examines the productivity of Norwegian banks during 1980-1989 and finds that productivity grew significantly after deregulation took place. Wheelock and Wilson (1999), on the other hand, study all US banks between 1984 and 1993. They find that productivity declined on average due to reductions in efficiency.

Recent academic literature regarding banking systems in emerging markets also typically employs non-parametric methodologies. For example, Bhattacharyya et al. (1997) examine the productivity of Indian commercial banks during 1986-1991. They find that there was a marginal increase in productivity and publicly owned banks had better productivity performance compared to private or foreign banks. Sathya (2001) conducts a similar study that covers the period 1997-1998 and finds that privately owned banks still perform worse than public sector and foreign banks measured by productivity. Kumbhakar and Sarkar (2003) examine the relationship between deregulation and TFP growth in Indian banking over 1985-1996 that covers both pre- and post-deregulation periods. They find no evidence of significant productivity change. A study covering a later period, 1995-2002, by Galagedera and Edirisuriya (2005) also do not observe any significant growth in productivity measured by Malmquist index in Indian banking. As far as Chinese banking is concerned, Kumbhakar and Wang (2007) examine 14 of the largest Chinese commercial banks and find that there was an annual 4.4% TFP growth over the period 1993-2002. More recently, Koutsomanoli-Filippaki et al. (2009) study bank efficiency and productivity change across Central and East European countries for the period 1998-2003. They find recent improvements in productivity, which were probably driven by technological change rather than efficiency change.

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<sup>64</sup> See Grosskopf (1993) and Fare et al. (1997) for a literature survey; or Ray and Desli (1997) and Mukherjee et al. (2001) for a discussion of the conceptual framework.

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The second strand of literature uses different parametric methodologies<sup>65</sup>. For example, various studies (e.g. Berger and Humphrey, 1992; Bauer et al. 1993; Humphrey, 1993; Humphrey and Pulley, 1997; Stiroh, 2000) use a variety of econometric specifications to estimate either TFP growth or technological progress in US banking during the 1980s and 1990s. In general, these studies find small improvements in cost productivity (or profit productivity) after deregulation in the banking system (1984-1988). Similar studies have also been conducted using European banking data, for example, Williams (2001) finds that deregulation appears to have improved productivity of European saving banks during 1990-1998. On the other hand, to our knowledge, there is only one parametric study by Nakane and Weintraub (2005) regarding productivity estimates in Brazilian banking systems.

All the non-parametric and parametric studies abovementioned mainly focus on cost productivity change<sup>66</sup>. Berger and Mester (1999, 2003), nevertheless, employ a parametric approach to analyse the productivity change of all US banks over the period 1984-1997 using three different optimisation concepts – cost minimisation, standard profit maximisation and alternative profit maximisation. They find that while cost productivity worsens, US banks achieve a dramatic profit productivity gain. They also argue that only analysing cost productivity change may not capture unmeasured changes in output quality over time or the profit maximisation goal of banks. In other words, while banks suffer from increased costs due to offering improved services and adopting new technologies, banks may be able to maximise profits by charging higher prices or expanding or maintaining market shares. Moreover, they also suggest that it is necessary to measure standard and alternative profit productivity change jointly in situations like when banks may exert their market power over their output prices, or there are increases over time in scale economies, or the output prices are not accurately measured (see Berger and Mester, 2003 for a detailed discussion).

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<sup>65</sup> Casu et al. (2004) use both non-parametric and parametric methodologies to measure cost productivity change in European banking between 1994 and 2000. They find that two approaches generally do not yield significantly different results in terms of identifying the components of productivity growth.

<sup>66</sup> The exception is the study by Humphrey and Pulley (1997), which estimates changes in profit using the alternative profit function over the period 1977-1988.

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### 4.3 Methodology and data sample

This section presents the methodology applied and data set studied in this study. The methodology section of this study mainly includes two parts. First of all, we use trans-logarithmic cost and alternative profit functional forms to examine the banks' optimisation processes (cost minimisation and profit maximisation); and then use the parametric methodology to decompose the total gross changes of variable costs and profits to measure the productivity change respectively. In the latter part of methodology section, we also examine the impact of market power in these markets on cost and profit productivity.

#### 4.3.1 Cost productivity change – a decomposition of the cost function

The cost minimisation concept assumes that firms minimise their variable costs subject to exogenous business conditions including quantities of outputs, prices of variable inputs, managerial inefficiency and random error (Berger and Mester, 2003). This concept is implemented using a standard cost function that relates variable costs to these exogenously given conditions. In this study, we use a standard trans-logarithmic functional form<sup>67</sup>. Our specification of the cost function is:

$$\begin{aligned} \ln C_i = & \alpha_0 + \alpha_1 \ln y_1 + \alpha_2 \ln y_2 + \beta_1 \ln w_1 + \beta_2 \ln w_2 + \beta_3 \ln w_3 + \frac{1}{2} \delta_{11} \ln y_1 \ln y_1 \\ & + \frac{1}{2} \delta_{22} \ln y_2 \ln y_2 + \frac{1}{2} \delta_{12} \ln y_1 \ln y_2 + \frac{1}{2} \gamma_{11} \ln w_1 \ln w_1 + \frac{1}{2} \gamma_{22} \ln w_2 \ln w_2 + \frac{1}{2} \gamma_{33} \ln w_3 \ln w_3 \\ & + \frac{1}{2} \gamma_{12} \ln w_1 \ln w_2 + \frac{1}{2} \gamma_{13} \ln w_1 \ln w_3 + \frac{1}{2} \gamma_{23} \ln w_2 \ln w_3 + \rho_{11} \ln y_1 \ln w_1 + \rho_{12} \ln y_1 \ln w_2 \\ & + \rho_{13} \ln y_1 \ln w_3 + \rho_{21} \ln y_2 \ln w_1 + \rho_{22} \ln y_2 \ln w_2 + \rho_{23} \ln y_2 \ln w_3 + \ln u_c \ln \varepsilon_c \end{aligned} \quad (1)$$

where  $C_i$  is the bank's variable costs (financial and operating costs); the  $y_1$  and  $y_2$  are output quantities<sup>68</sup>; the  $w_1$ ,  $w_2$  and  $w_3$  are input prices; and the standard

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<sup>67</sup> Berger and Mester (1997) find that the trans-logarithmic functional form and the Fourier-flexible functional form, which is a global approximation that includes a standard trans-logarithm plus Fourier trigonometric terms, yield statistically the same average level and dispersion of measured efficiency.

<sup>68</sup> Studies focusing on developed markets normally use information on off-balance sheet items as well as one of the variable bank outputs or fixed netput (Berger and Mester, 2003; Casu, et al., 2004). In this paper, however, off-balance sheet items are not included due to lack of relevant data. Moreover, we also argue that off-balance sheet business in emerging markets is still at very early stage, which may not have had a significant impact on production process. Therefore, we do not include a proxy for off-balance sheet items either (such as non-interest income).

symmetry and linear homogeneity restrictions apply. When defining bank outputs and inputs, this study follows a variation of the intermediation approach as originally proposed by Sealey and Lindley (1977). This is the most common approach used in the extant literature (Berger and Mester, 1997, 1999 and 2003; Akhavein et al., 1997; Casu, et al. 2004). Thus, the output quantities and input prices are defined as follows:

$y_1$  = total loans

$y_2$  = total securities<sup>69</sup>

$w_1$  = price of labour: personnel costs/ total assets<sup>70</sup>

$w_2$  = price of deposits: financial costs (total interest paid on deposits) / total deposits

$w_3$  = price of physical capital: operating costs (except personnel costs)/ fixed assets

The  $\ln u_c$  term in the equation (1) denotes an inefficiency factor that may raise costs above the best practice level and  $\ln \varepsilon_c$  denotes random error. In order to distinguish the inefficiency term from the random error term, this study uses the distribution free method (Berger, 1993) that assumes there is core inefficiency for each firm over time that is distinguished from random error. According to this method, core inefficiency is persistent over time whereas the random error tends to average out over time.

The decomposition of the cost function previously estimated takes three steps. First of all, we represent the cost of the banking industry at time  $t$  by the predicted cost of a bank with average business conditions, average inefficiency for the period and a zero random error. This gives  $\exp[f_{Ct}(\bar{X}_{Ct})] \times \exp[\ln \bar{\mu}_{Ct}]$ , where  $\bar{X}_{Ct}$  gives the average values of the business condition regressors at time  $t$  and  $\ln \bar{\mu}_{Ct}$  gives the average value of the inefficiency factor. The total gross change in cost between period  $t$  and period  $t+k$ , therefore, is measured by the ratio of the predicted costs in the two periods:

$$\Delta \text{TOTAL}_{Ct,t+k} \equiv \{ \exp[f_{Ct+k}(\bar{X}_{Ct+k})] \times \exp[\ln \bar{\mu}_{Ct+k}] \} / \{ \exp[f_{Ct}(\bar{X}_{Ct})] \times \exp[\ln \bar{\mu}_{Ct}] \} \quad (2)$$

Then  $\Delta \text{TOTAL}_C$  can be further decomposed into the gross changes in best practice,

<sup>69</sup> This category is measured as gross total assets less total loans and physical capital. Therefore, all financial assets are included.

<sup>70</sup> There is no available information on the number of bank employees in the data base – BankScope used as the source of bank data in this paper, so the cost of the labour is proxied as a quotient between personnel costs and total assets following Casu, et al. (2004).



inefficiency and business conditions:

$$\begin{aligned}
& \Delta \text{TOTAL}_{Ct,t+k} \\
& = \{ \exp[f_{Ct+k}(\bar{X}_{Ct})] / \exp[f_{Ct}(\bar{X}_{Ct})] \} && \text{(Change in best practice)} \\
& \times \{ \exp[\ln \bar{\mu}_{Ct+k}] / \exp[\ln \bar{\mu}_{Ct}] \} && \text{(Change in inefficiency)} \\
& \times \{ \exp[f_{Ct+k}(\bar{X}_{Ct+k})] / \exp[f_{Ct+k}(\bar{X}_{Ct})] \} && \text{(Change in business condition)} \\
& \equiv \Delta \text{BESTPR}_{Ct,t+k} \times \Delta \text{INEFF}_{Ct,t+k} \times \Delta \text{BUSCOND}_{Ct,t+k} && (3)
\end{aligned}$$

Thus, the total gross change in cost is decomposed into three multiplicative terms. The change in best practice,  $\Delta \text{BESTPR}_C$ , gives the change in costs due to changes in the best practice cost function  $f_C(\bullet)$ , since it holds business conditions and inefficiency constant. Similarly,  $\Delta \text{INEFF}_C$  gives the contributions from changes in inefficiency and  $\Delta \text{BUSCOND}_C$  gives the contributions from changes in business conditions. All three terms are measured as gross changes, therefore a value below one indicates falling costs and above one rising costs.

Finally, cost productivity change is the product of the change in best practice and the change in inefficiency:

$$\begin{aligned}
\Delta \text{PROD}_{Ct,t+k} & \equiv \Delta \text{BESTPR}_{Ct,t+k} \times \Delta \text{INEFF}_{Ct,t+k} \\
& = \{ \exp[f_{Ct+k}(\bar{X}_{Ct})] / \exp[f_{Ct}(\bar{X}_{Ct})] \} \times \{ \exp[\ln \bar{\mu}_{Ct+k}] / \exp[\ln \bar{\mu}_{Ct}] \} && (4)
\end{aligned}$$

We use a version of the thick frontier method to measure  $\Delta \text{BESTPR}_C$  (Berger and Humphrey, 1991). For each year, banks with residuals in the ‘best’ category in each country (i.e. 25% of banks with the lowest cost residuals) are assumed to be best practice. We then estimate the best practice cost function using OLS on the most efficient quartile of banks<sup>71</sup>.

<sup>71</sup> Due to relatively small size of the samples under study and uncertainty involved in the estimation of the thick frontier as noted by Berger and Mester (2003), the decomposition of productivity into two components should be regarded less accurate.

### 4.3.2 Profit productivity change – a decomposition of the alternative profit function

There are two profit maximisation concepts, i.e. standard and alternative profit maximisation, which assume that firms maximise their variable profits subject to exogenous business conditions. Standard profit maximisation differs from alternative profit maximisation in terms of the specification of business condition (Berger and Mester, 2003). Standard profit maximisation is implemented using a profit function that specifies output prices as part of the business conditions instead of the output quantities (total loans and total securities) specified in the cost function, while other business conditions remain the same. The alternative profit maximisation concept has the same objective as the standard profit maximisation concept, but employs the same set of business conditions as under the cost minimisation concept as illustrated in section 3.1. Due to the problem of availability of information on output prices, we, therefore, in this study only analyse the alternative profit maximisation process. Consequently, our specification of the alternative profit function is given by:

$$\begin{aligned}
 \ln(\pi_i + \theta) = & \alpha_0 + \alpha_1 \ln y_1 + \alpha_2 \ln y_2 + \beta_1 \ln w_1 + \beta_2 \ln w_2 + \beta_3 \ln w_3 + \frac{1}{2} \delta_{11} \ln y_1 \ln y_1 \\
 & + \frac{1}{2} \delta_{22} \ln y_2 \ln y_2 + \frac{1}{2} \delta_{12} \ln y_1 \ln y_2 + \frac{1}{2} \gamma_{11} \ln w_1 \ln w_1 + \frac{1}{2} \gamma_{22} \ln w_2 \ln w_2 + \frac{1}{2} \gamma_{33} \ln w_3 \ln w_3 \\
 & + \frac{1}{2} \gamma_{12} \ln w_1 \ln w_2 + \frac{1}{2} \gamma_{13} \ln w_1 \ln w_3 + \frac{1}{2} \gamma_{23} \ln w_2 \ln w_3 + \rho_{11} \ln y_1 \ln w_1 + \rho_{12} \ln y_1 \ln w_2 \\
 & + \rho_{13} \ln y_1 \ln w_3 + \rho_{21} \ln y_2 \ln w_1 + \rho_{22} \ln y_2 \ln w_2 + \rho_{23} \ln y_2 \ln w_3 + \ln u_{\alpha\pi} \ln \varepsilon_{\alpha\pi}
 \end{aligned}
 \tag{5}$$

where  $\pi_i$  is the bank's variable profits including all interest and fee income minus variable costs  $C_i$ , which is used in the cost function;  $\theta$  is a scalar added to the profits of every bank, which remain the same in a given year (as profits may be negative, so that the logarithm is taken of a positive value after adding a scalar);  $y_1$  and  $y_2$  are output quantities that are the same as the ones defined in the cost function (equation 1); and the  $w_1$ ,  $w_2$  and  $w_3$  are input prices that remain the same in all three optimisation functional forms; and the standard symmetry and linear homogeneity restrictions apply.

Analogous to the cost function, the  $\ln u_{\alpha\pi}$  term in the equation (5) denotes an inefficiency factor that is zero for best practice banks and negative for other banks, which

reduces their profits below best practice level, and  $\ln \varepsilon_{\alpha\pi}$  denotes random error with a mean of zero each year.

The decomposition of alternative profit function is similar to the cost function case with minor changes due to the addition of a scalar  $\theta$ . The total gross change in profit between period  $t$  and  $t+k$  is given by:

$$\begin{aligned} \Delta \text{TOTAL}_{\alpha\pi t, t+k} &\equiv \{ \exp[f_{\alpha\pi t+k}(\bar{X}_{\alpha\pi t+k})] \times \exp[\ln \bar{\mu}_{\alpha\pi t+k}] - \theta_{t+k} \} \\ &/ \{ \exp[f_{\alpha\pi t}(\bar{X}_{\alpha\pi t})] \times \exp[\ln \bar{\mu}_{\alpha\pi t}] - \theta_t \} \end{aligned} \quad (6)$$

Here, a value below one indicates worsened profits and a value greater than 1 indicates improvement in profits. Then  $\Delta \text{TOTAL}_{\alpha\pi}$  can be decomposed into the gross changes in best practice, inefficiency and business conditions:

$$\begin{aligned} \Delta \text{BESTPR}_{\alpha\pi t, t+k} &= \{ \exp[f_{\alpha\pi t+k}(\bar{X}_{\alpha\pi t})] - \theta_{t+k} \} / \{ \exp[f_{\alpha\pi t}(\bar{X}_{\alpha\pi t})] - \theta_t \} \\ \Delta \text{INEFF}_{\alpha\pi t, t+k} &= \left\langle \{ \exp[f_{\alpha\pi t+k}(\bar{X}_{\alpha\pi t+k})] \times \exp[\ln \bar{\mu}_{\alpha\pi t+k}] - \theta_{t+k} \} / \{ \exp[f_{\alpha\pi t}(\bar{X}_{\alpha\pi t})] \times \exp[\ln \bar{\mu}_{\alpha\pi t}] - \theta_t \} \right\rangle / \\ &\quad \left\langle \{ \exp[f_{\alpha\pi t+k}(\bar{X}_{\alpha\pi t+k})] - \theta_{t+k} \} / \{ \exp[f_{\alpha\pi t}(\bar{X}_{\alpha\pi t})] - \theta_t \} \right\rangle \\ \Delta \text{BUSCOND}_{\alpha\pi t, t+k} &= \{ \exp[f_{\alpha\pi t+k}(\bar{X}_{\alpha\pi t+k})] - \theta_{t+k} \} / \{ \exp[f_{\alpha\pi t+k}(\bar{X}_{\alpha\pi t})] - \theta_{t+k} \} \end{aligned} \quad (7)$$

Finally, similar to the thick frontier method used to estimate the best practice cost function, 25% of the banks that have the highest profit residuals are assumed as best practice profit function for that year.

### 4.3.3 The impact of market power on banking productivity change

After having outlined the three optimisation processes and their components that explain the productivity change in the US banking, Berger and Mester (2003) further investigate the impact of market power on output prices setting, which may contribute to the improved profit productivity according to their findings. We follow a similar approach and also examine the impact of market power on productivity by estimating the following simple regression models:

$$\Delta\text{PROD}_{cj} = \alpha_1 \Delta\text{LERNER}_{ij} + \alpha_2 \Delta\text{MAKS}_{ij} + \alpha_3 \Delta\text{CR5}_j + \alpha_4 \text{TREND}_j + \varepsilon_i \quad (8)$$

and

$$\Delta\text{PROD}_{\alpha\pi} = \alpha_1 \Delta\text{LERNER}_i + \alpha_2 \Delta\text{MAKS}_i + \alpha_3 \Delta\text{CR5}_i + \alpha_4 \text{TREND}_i + \varepsilon_i \quad (9)$$

where  $\Delta\text{PROD}_c$  – changes in cost productivity;  $\Delta\text{PROD}_{\alpha\pi}$  – changes in alternative profit productivity;

$\Delta\text{LERNER}$  – changes in the Lerner index for each bank;

$\Delta\text{MAKS}$  – changes of each bank's market share variable (calculated as the ratio of each bank's asset value divided by the whole banking sector assets);

$\Delta\text{CR5}$  – changes of a concentration ratio (calculated as the sum of market shares for the largest five banks);

$\text{TREND}$  is time trend variable used to capture the effects of technical change over time;

As the dependent variables  $\Delta\text{PROD}_c$  and  $\Delta\text{PROD}_{\alpha\pi}$  measure the changes in productivity instead of the 'level', we use differenced independent variables accordingly. For example, the independent variable  $\Delta\text{LERNER}$  is defined as the changes of each bank each year's Lerner index compared to its previous year (year 2000 as the base year).

Compared to the study by Berger and Mester (2003), instead of regressing output prices on market power variables, we directly test the influence of market power (measured by the Lerner index, market share and concentration ratio jointly) on cost and profit productivity change during 2000-2006. Moreover, apart from using conventional market power indicators (market share and concentration ratio) that are similar to those used in Berger and Mester (2003)<sup>72</sup>, we also use a bank level indicator - the Lerner index to measure the competition conditions in these four emerging markets. The Lerner index is defined as the difference between price and marginal cost, divided by price. This index measures bank's ability to set prices above marginal cost, being an inverse function of the elasticity of demand and of the number of banks (Freixas and Rochet, 1997). The Lerner index for each market during 2000-2006 is obtained from estimates obtained in the Chapter 3 of this thesis where we use the GMM dynamic panel data procedure (Arellano and Bond, 1991)<sup>73</sup>.

<sup>72</sup> They use a concentration variable (Herfindahl index) as well as some variables that indicate the geographic restrictions on competition and bank merger information.

<sup>73</sup> When estimating the cost function in order to yield marginal cost and then the Lerner index, we apply the Arellano and Bond GMM dynamic panel data estimator. As far as the GMM dynamic panel data estimator is concerned, a

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Compared to LERNER, MAKS is the assets market share of each bank and has been widely used in the empirical banking literature as an bank level indicator of relative market power. Previous studies have shown that banks with larger market share can exert market power (Berger, 1995; Móri and Nagy, 2003; Jeon and Miller, 2005). We also include a traditional market structure variable – the 5-bank concentration ratio (CR5) defined as the sum of the assets market shares for the largest five banks (Claessens and Laeven, 2003; Demirgüç-Kunt et al., 2004). Banks in highly concentrated markets may exploit more market power according to the SCP paradigm. The data for MAKS and CR5 are obtained from calculations of these variables presented in the Chapter 3 for these four markets under study. At last, a time TREND is used to capture the effects of technical change over time<sup>74</sup>.

#### 4.3.4 Data sample

Our data sample is mainly drawn from the Bankscope database and consists of 289 Asian and Latin American banks from Argentina (71 banks), Brazil (102 banks), China (52 banks) and India (64 banks) from 2000 to 2006. Four types of banks are included: commercial banks, savings banks, cooperative banks and bank holding companies<sup>75</sup>. Bank data are extracted from consolidated accounts, if available. Otherwise they are from unconsolidated accounts, so double counting is avoided. Three selection criteria are then applied as follows: first of all, the 1<sup>st</sup> and 99<sup>th</sup> percentile of the distribution of the each variable are treated as outliers. Secondly, bank data are deleted if any input price is missing. Thirdly, the sample only comprises continuously operating institutions in order to avoid the impact of entry and exit over the time period as suggested by Stiroh (2000).

Table 4.1 shows the summary of all variables of banks in four emerging banking systems from our pooled samples. As it can be seen, Argentinean banks have relatively the smallest balance sheets whereas Chinese banks have the largest. Brazilian banks,

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lagged dependent variable is added allowing for dynamics in the specification of the regression model, then the formulation is first-differenced to eliminate the individual effects. See Chapter 3 for detailed discussions.

<sup>74</sup> For each period, TREND takes different value, which starts from TREND=1 for the period 2000-2001; for the period 2001-2002, 2002-2003, 2003-2004, 2004-2005 and 2005-2006, TREND=2, 3, 4, 5 and 6 respectively.

<sup>75</sup> Some previous studies focus on large banks' productivity change. For example, Casu et al. examine banks with assets more than euro 450 million; Berger and Mester (2003), however, study all US commercial banks. In this paper, we study all types of banks due to small size of the sample.

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nevertheless, appear to be relatively larger than Indian banks in terms of their production processes. Moreover, Chinese banks tend to have the highest value of loans and other financial assets, which, however, does not generate equivalent size of profits. For example, Chinese banks' average value of loans is almost as much as 12 times of Brazilian banks' average loans according to Table 4.1, but the average value of profits of Chinese banks is only twice that of Brazilian banks'. Finally, Chinese and Indian banks all tend to have lower input prices compared to banks from two Latin American markets. In particular, Chinese banks have the lowest input prices of labour and deposits. Table 4.2 further illustrates the mean values of all variables from each year. Comparatively, Argentinean banks seem to have achieved the poorest profits, in particular between 2001 and 2004, with widespread losses in the industry. Other markets, on the other hand, all witness an improvement in terms of profitability; in particular Brazilian banks have the greatest improvement. Cost levels, however, have increased in all markets over the period.

Table 4.1: Summary statistics on costs, profits, output quantities and input prices (pooled data 2000-2006)

		C	$\pi$	$y_1$	$y_2$	$w_1$	$w_2$	$w_3$
Argentina	Mean	136.85	-14.06	443.63	602.28	0.0514	0.1049	3.3160
	Stdev	331.55	108.72	953.35	1210.19	0.0669	0.3616	11.3790
Brazil	Mean	1330.87	137.89	2601.53	5114.88	0.0269	1.3236	19.5035
	Stdev	3324.43	409.31	6586.99	13021.09	0.0273	0.2590	0.4680
China	Mean	1933.35	298.29	30886.75	24426.26	0.0088	0.0219	1.0148
	Stdev	5440.01	1043.14	85602.83	71117.49	0.0048	0.0120	1.9078
India	Mean	677.57	71.34	3540.16	4019.92	0.0136	0.0657	0.9947
	Stdev	1591.17	166.42	7838.30	9874.91	0.0065	0.0169	0.8723

Note: C = variable costs (US\$ mil.);  $\pi$  = variable profits (US\$ mil.);  $y_1$  = total loans (US\$ mil.);  $y_2$  = total securities (US\$ mil.);  $w_1$  = price of labour: personnel costs/ total assets;  $w_2$  = price of deposits: financial costs (total interest paid on deposits) / total deposits;  $w_3$  = price of physical capital: operating costs (except personnel costs)/ fixed assets.

Table 4.2: Average costs, profits, output quantities and input prices 2000-2006

		2000	2001	2002	2003	2004	2005	2006
C	Argentina	131.75	129.51	319.84	100.68	79.23	95.00	101.97
	Brazil	1101.55	1320.54	1731.73	1189.97	1176.64	1347.33	1448.32
	China	1599.66	1625.20	1667.34	1765.94	1906.11	2238.04	2731.12
	India	596.67	622.80	640.27	692.95	699.51	711.78	779.01
$\pi$	Argentina	0.10	-0.68	-84.69	-29.79	-4.88	6.84	14.64
	Brazil	53.50	97.42	182.48	133.32	138.37	175.59	184.56
	China	209.51	213.91	221.10	264.47	328.49	373.96	476.61
	India	51.96	49.37	56.78	73.87	98.03	82.31	87.31
$y_1$	Argentina	549.15	539.08	423.26	343.47	384.76	411.05	454.67
	Brazil	2058.72	2265.28	2375.39	2362.83	2625.30	3014.45	3508.76
	China	24371.07	25478.35	27182.15	30094.80	33162.19	35535.95	40382.73
	India	2645.36	2773.27	2880.15	3102.67	3513.85	4353.07	5512.77
$y_2$	Argentina	684.94	461.35	610.44	641.60	658.43	582.09	577.14
	Brazil	4295.29	4636.94	5085.86	4917.37	4978.01	5508.90	6381.81
	China	18195.10	19045.09	20191.56	21720.58	23557.11	31198.46	37075.94
	India	3557.93	3663.18	3721.81	3897.00	4349.14	4453.88	4496.50
$w_1$	Argentina	0.0429	0.0538	0.0682	0.0435	0.0420	0.0456	0.0638
	Brazil	0.0308	0.0281	0.0309	0.0258	0.0236	0.0256	0.0230
	China	0.0098	0.0096	0.0088	0.0087	0.0085	0.0083	0.0079
	India	0.0148	0.0147	0.0139	0.0137	0.0129	0.0126	0.0123
$w_2$	Argentina	0.0632	0.0924	0.3540	0.0821	0.0375	0.0399	0.0654
	Brazil	0.2175	0.2130	0.2877	0.1821	0.1607	0.1981	0.1704
	China	0.0268	0.0246	0.0189	0.0194	0.0186	0.0216	0.0236
	India	0.0791	0.0776	0.0767	0.0702	0.0569	0.0498	0.0494
$w_3$	Argentina	3.0371	3.1095	3.9714	1.6215	3.0251	4.7359	3.7116
	Brazil	15.6296	16.1658	27.0642	16.5107	21.1305	22.4733	17.5503
	China	0.9068	0.8637	0.7294	0.9518	1.0268	1.1762	1.4488
	India	0.7681	0.7932	0.9993	1.0021	1.0405	1.1053	1.2547

Note: C = variable costs (US\$ mil.);  $\pi$  = variable profits (US\$ mil.);  $y_1$  = total loans (US\$ mil.);  $y_2$  = total securities (US\$ mil.);  $w_1$  = price of labour: personnel costs/ total assets;  $w_2$  = price of deposits: financial costs (total interest paid on deposits) / total deposits;  $w_3$  = price of physical capital: operating costs (except personnel costs)/ fixed assets.



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## 4.4 Empirical results

In this section, we first present the results from the parametric methodology, which measures cost and alternative profit productivity change. Then we report the results from the regression models that show the impact of market power on cost and profit productivity change.

### 4.4.1 Main empirical results – cost and alternative profit productivity change

Table 4.3 and 4.4 report the total changes in costs and profits over time ( $\Delta \text{TOTAL}$ ) and the decompositions of these total changes into their  $\Delta \text{PROD}$ ,  $\Delta \text{BUSCOND}$ ,  $\Delta \text{BESTPR}$  and  $\Delta \text{INEFF}$  components for all banks in Argentina, Brazil, China and India between 2000 and 2006. The rows in the table not only show the changes over one year period, but also present annualised measures for the entire period with 2000 serving as the base year.

According to Table 4.3, the cost ( $\Delta \text{TOTAL}_c$ ) fell for Argentinean banks at an annual rate of 7.9% over the entire 2000-2006 interval, increasing in the first two years, and then decreasing sharply from 2002 to 2005. Moreover, the decomposition of the cost changes suggests that cost productivity worsened slightly over the entire period rising at an annual rate of 1.85%, while the business conditions as a whole reduced cost ( $\Delta \text{BUSCOND}_c < 1$ ). The results for Brazilian banks are somewhat similar to the results from Argentina. The cost declined by 3.8% over 2000 and 2006 but cost productivity worsened at almost the same rate. Meanwhile, business conditions do not seem to affect costs over all years. In China, the total cost of the average bank increased at an annual rate of 11%, which was mainly caused by unfavourable business conditions ( $\Delta \text{BUSCOND}_c > 1$ ). The cost productivity, on the other hand, merely declined 1% over these 7 years. Indian banks also experienced a decrease of total cost like Argentinean and Brazilian banks. However, such change was the result of improved cost productivity at a rate of 5%.

Equation (4) shows that cost productivity ( $\Delta \text{PROD}_c$ ) can be further decomposed into  $\Delta \text{BESTPR}_c$  and  $\Delta \text{INEFF}_c$ . The results show that while there is no change for Brazilian

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banks in best practice there was a minor unfavourable shift for banks in Argentina and China over the entire period (0.1% and 0.08% respectively). The opposite, however, holds for banks from India with a 6.2% increase, while best practice does not appear to affect cost productivity ( $\Delta BEST_c = 1$ ). On the other hand, inefficiency for banks from all four markets has increased slightly over the seven years' period.

Table 4.4 shows the results of decomposing gross changes in profits into various components using the alternative profit functions. In general, banks in Argentina had losses at an annual rate of 14.6% over the interval<sup>76</sup>. The profit ( $\Delta TOTAL_{\alpha\pi}$ ) increased considerably (nearly 11% annually from 2000 to 2006), for Indian banks mainly due to a favourable profit gross change between 2000 and 2001<sup>77</sup>. In terms of banks in Brazil and China, profit rose at an annual rate of about 8% over the entire period.

After decomposing gross changes in profit into changes in profit productivity ( $\Delta PROD_{\alpha\pi}$ ) and changes in business conditions ( $\Delta BUSCOND_{\alpha\pi}$ ), we can find that profit productivity appears to contribute to the gross profit change in all four banking systems. The annual increase in productivity rates range from 1% to 8.6%. Moreover, the unfavourable changes in gross profit in Argentina seem to be affected by the changes in business conditions ( $\Delta BUSCOND_{\alpha\pi} < 1$ ), which may be brought out by the poor economy during the financial crisis. Nevertheless, in the other three banking systems changes in business conditions also improve the profits.

The results of further decomposition of changes in profit productivity into changes in best practice and inefficiency in Table 4.4 show that changes in best practice tend to improve profits in all these four markets over the period. Inefficiency, on the other hand, only slightly affects the improvement of profit productivity.

Overall, all these emerging banking systems suffered a slight decrease in cost productivity except for India, but meanwhile enjoyed some profit productivity gains over the time period under study. The results, therefore, are somewhat similar to the ones from

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<sup>76</sup> Argentinean banks suffered huge losses during the financial crisis between 1999 and 2002. Only in 2005, did the banking sector overall make profits since the crisis started (BCRA, 2006).

<sup>77</sup> This favourable change could be driven by 19 Indian nationalised banks in 2001, which on average reported a 131.87 percent increase that were largely attributable to record gains from their treasury operations (RBI, 2002).

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Berger and Mester (2003)<sup>78</sup>. The possible explanation may be that banks in emerging markets have engaged in updating technologies, offering a wider range of financial services, this includes offering more ATM and internet based services, expanding the availability of debit and credit cards etc. The adoption of new technologies is likely to increase banks' costs, hence the poor cost productivity. However, banks may have strategically focused more on revenue generation by offering a wider range of products and services, increasing prices and bolstering market shares. The latter two factors could be related to banks exerting greater market power<sup>79</sup>, and next section may shed some light on this issue.

The fact that we find conflicting results comparing cost and profit productivity suggests that it is necessary to consider the latter if we are to accurately evaluate the performance of banking systems especially as cost productivity may not capture the profit maximisation goal of banks. Compared to findings on US commercial banks (Berger and Mester, 2003)<sup>80</sup>, the profit productivity improvements found in the emerging banking systems under study are also relatively large (except Argentina). However, as banks in emerging markets are generally less efficient than those in developed markets (Hawkins and Mihaljek, 2001) and positive profit productivity change does not reflect the levels of productivity, we, therefore, argue that more investment in new technologies, services and management brought about by further deregulation are still needed in the future to realise greater profit productivity improvements in these markets.

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<sup>78</sup> Berger and Mester (2003) find that profit productivity improved over the entire period from 1984 to 1997 and two subintervals while cost productivity deteriorated at the same time. In particular, during 1991-1997, profit productivity had substantial increase using standard and alternative profit approaches.

<sup>79</sup> Greater market power may be the result of substantial consolidation process in emerging banking markets since the middle of the 1990s. There are a number of factors that contribute to the consolidation. For example, there were government-led mandatory mergers and acquisitions after financial crises (Hawkins and Mihaljek, 2001), foreign banks have expanded their activities after the lifting of various entry restrictions (Berger, 2007; IMF, 2007), and major private banks have sought to expand market share, particularly in Brazil (Gelos and Roldós 2002).

<sup>80</sup> Berger and Mester (2003) find a 9% and 11% increase in standard and alternative profit productivity respectively.

Table 4.3: Measured gross changes in cost: total change, productivity change, business condition change, best practice frontier change and inefficiency change

Country	Year	$\Delta\text{TOTAL}_c$	$\Delta\text{PROD}_c$	$\Delta\text{BUSCON}_c$	$\Delta\text{BESTPR}_c$	$\Delta\text{INEFF}_c$
Argentina	2000-2001	1.0135	0.9648	1.0505	0.9367	1.0300
	2001-2002	1.1148	1.2558	0.8877	1.2119	1.0362
	2002-2003	0.8924	0.7454	1.1971	0.7284	1.0234
	2003-2004	0.8909	1.3560	0.6570	1.3210	1.0265
	2004-2005	0.9173	1.2126	0.7565	1.2001	1.0104
	2005-2006	1.0203	0.7372	1.3840	0.7321	1.0070
	2000-2006	0.9210	1.0185	0.9043	1.0010	1.0175
Brazil	2000-2001	1.0473	0.9717	1.0778	0.9502	1.0227
	2001-2002	1.0169	1.0877	0.9349	1.0702	1.0163
	2002-2003	0.8779	1.1442	0.7673	1.1356	1.0076
	2003-2004	1.0051	0.9840	1.0214	0.9657	1.0189
	2004-2005	0.9943	0.9409	1.0567	0.9336	1.0079
	2005-2006	1.0382	1.0386	0.9997	1.0266	1.0117
	2000-2006	0.9701	1.0093	0.9611	1.0000	1.0093
China	2000-2001	1.0175	0.9763	1.0422	0.9657	1.0109
	2001-2002	0.9949	0.9707	1.0249	0.9597	1.0114
	2002-2003	1.0238	0.9620	1.0643	0.9583	1.0038
	2003-2004	1.0207	1.0286	0.9923	1.0247	1.0038
	2004-2005	1.0236	1.0901	0.9390	1.0848	1.0049
	2005-2006	1.0276	1.0206	1.0068	1.0078	1.0127
	2000-2006	1.1126	1.0100	1.1016	1.0008	1.0092
India	2000-2001	1.0079	1.0438	0.9657	1.0378	1.0058
	2001-2002	0.9938	1.0936	0.9087	1.0879	1.0052
	2002-2003	0.9828	1.1174	0.8796	1.1005	1.0153
	2003-2004	0.9924	1.2568	0.7896	1.2467	1.0081
	2004-2005	0.9885	1.2010	0.8231	1.1666	1.0295
	2005-2006	1.0076	0.8441	1.1937	0.8323	1.0142
	2000-2006	0.9731	0.9493	1.0250	0.9385	1.0115

Note: a number >1 indicates an adverse shift towards higher costs; a number <1 indicates a favourable shift.

Table 4.4: Measured gross changes in profit using alternative profit function: total change, productivity change, business condition change, best practice frontier change and inefficiency change

	Year	$\Delta\text{TOTAL}_{\alpha\pi}$	$\Delta\text{PROD}_{\alpha\pi}$	$\Delta\text{BUSCOND}_{\alpha\pi}$	$\Delta\text{BESTPR}_{\alpha\pi}$	$\Delta\text{INEFF}_{\alpha\pi}$
Argentina	2000-2001	0.9982	1.0011	0.9971	0.9954	1.0057
	2001-2002	0.8039	0.9025	0.8907	0.9430	0.9571
	2002-2003	0.9942	1.0006	0.9936	1.0013	0.9993
	2003-2004	1.1092	1.0034	1.1054	1.0067	0.9967
	2004-2005	1.0963	1.0341	1.0601	1.0293	1.0047
	2005-2006	1.1714	1.0232	1.1448	1.0030	1.0201
	2000-2006	0.8536	1.0101	0.8451	1.0313	0.9794
Brazil	2000-2001	0.8862	1.0200	0.8689	1.0054	1.0145
	2001-2002	0.8475	1.0011	0.8466	1.0003	1.0008
	2002-2003	1.4491	1.2346	1.1737	1.2125	1.0182
	2003-2004	1.0010	1.0000	1.0010	1.0032	0.9968
	2004-2005	0.9994	1.0005	0.9989	1.0020	0.9985
	2005-2006	0.9985	1.0010	0.9975	1.0036	0.9974
	2000-2006	1.0871	1.0521	1.0333	1.0430	1.0087
China	2000-2001	0.9997	1.0013	0.9984	1.0034	0.9979
	2001-2002	1.0152	0.9992	1.0160	1.0007	0.9985
	2002-2003	0.9348	1.0024	0.9325	1.0113	0.9912
	2003-2004	1.0391	1.0243	1.0144	1.0430	0.9821
	2004-2005	1.0832	1.0569	1.0249	1.0326	1.0235
	2005-2006	1.0513	1.0247	1.0260	1.0593	0.9673
	2000-2006	1.0750	1.0512	1.0226	1.0421	1.0087
India	2000-2001	1.1277	1.0550	1.0689	1.0750	0.9814
	2001-2002	0.9017	0.9895	0.9112	1.0200	0.9701
	2002-2003	1.0924	1.0001	1.0923	1.1301	0.8850
	2003-2004	1.0131	1.0003	1.0128	1.0205	0.9802
	2004-2005	0.9796	0.9732	1.0066	1.0220	0.9523
	2005-2006	0.9973	1.0064	0.9910	1.0221	0.9846
	2000-2006	1.1094	1.0866	1.0210	1.1074	0.9812

Note: a number >1 indicates a favourable shift towards higher profits; a number <1 indicates an adverse shift.

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#### 4.4.2 Impact of market power on banking productivity

Table 4.5 and 4.6 show the results from two regressions that investigate the effects of market power on cost and alternative profit productivity change. In particular, we focus on whether there is a positive impact on alternative profit productivity, possibly through price setting and market share exploitation.  $\Delta\text{PROD}_c$  and  $\Delta\text{PROD}_{\alpha\pi}$  estimated in previous section are used as dependent variables respectively.

We find that market power only significantly improves cost and profit productivity in Argentina when it is measured by the Lerner index. The impact of market power, on the other hand, is insignificant in other three banking markets. When using market share as the market power indicator, however, the larger the market share Argentinean banks have, the lower cost and profit productivity they achieve. Therefore, the results suggest that large banks, in particular those expand their market share rapidly, may not be able to improve their productivity in Argentina. But Indian banks seem to have exploited their market share in order to improve their profitability. At last, when we use the CR5 ratio to measure the influence of banking sector concentration, it appears that a more concentrated banking market tends to have improved cost productivity (except Brazil) but lower profit productivity. These results may suggest that banks in these relatively concentrated emerging markets, especially for those large state-owned banks in China and India, may still not have the willingness to invest on information technology, management etc.,

Therefore, there is some evidence in these four emerging markets that market power does influence productivity change; in particular in Argentina and India, banks do appear to exert their market power to improve their profit productivity. Overall, however, the results appear somewhat inconsistent when we apply different market power variables<sup>81</sup>.

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<sup>81</sup> Our results may also indirectly suggest that various market power indicators are not interchangeable and the choice of indicator may significantly affect the interpretation of a market's competitive conditions as suggested by Carbó et al. (2007) who find that five commonly used indicators (one structural indicator – the Hirschman-Herfindahl index, and four non-structural indicators including the net interest margin/total asset ratio, the Lerner index, the H-statistic and the return on assets ratio) yield conflicting results about competitive conditions within and across 14 European countries and over time (between 1995 and 2001).

Table 4.5: Measured impact of market power on changes in cost productivity in Argentina, Brazil, China and India 2000-2006

	Argentina		Brazil		China		India
$\Delta$ LERNER	-0.0257	***	0.0033		-0.0498		-0.1849
	(0.0061)		(0.0036)		(0.0450)		(0.1157)
$\Delta$ MAKS	6.5454	**	0.0353		-0.0186		-1.9945
	(3.1635)		(0.5795)		(0.0970)		(1.2631)
$\Delta$ CR5	-0.5188		0.6309	***	-0.9277	***	-0.4051
	(0.3925)		(0.1239)		(0.0844)		(0.1140)
TREND	-0.0144		-0.0209	***	0.0238	***	-0.0170
	(0.00900)		(0.0030)		(0.0014)		(0.0061)
constant	1.0956	***	1.0958	***	0.9188	***	1.1635
							***

Note: The dependent variable is changes in cost productivity; the independent variables are all differenced: LERNER (Lerner index), MAKS (market share) of individual bank, and CR5 (5-bank concentration ratio) from Argentina, Brazil, China and India are obtained in the previous chapter for the years 2000-2006.

\*\* Significantly different from zero at 5% level

\*\*\* Significantly different from zero at 1% level

Standard errors in parenthesis

Table 4.6: Measured impact of market power on changes in alternative profit productivity in Argentina, Brazil, China and India 2000-2006

	Argentina		Brazil		China		India	
$\Delta$ LERNER	0.0028	***	0.0015		-0.0233		0.0172	
	(0.0005)		(0.0046)		(0.0217)		(0.0160)	
$\Delta$ MAKS	-0.6797	**	0.0551		-0.0075		0.6388	***
	(0.2854)		(0.7265)		(0.0467)		(0.1743)	
$\Delta$ CR5	-0.7441	***	-0.8030	***	-0.3325	***	-0.0786	***
	(0.0354)		(0.1553)		(0.0407)		(0.0157)	
TREND	0.0094	***	0.0040		0.0109	***	-0.0093	***
	(0.0008)		(0.0037)		(0.0007)		(0.0008)	
constant	0.9517	***	1.0414	***	0.9783	***	1.0394	***

Note: The dependent variable is changes in alternative profit productivity; the independent variables are all differenced: LERNER (Lerner index), MAKS (market share) of individual bank, and CR5 (5-bank concentration ratio) from Argentina, Brazil, China and India are obtained in the previous chapter for the years 2000-2006.

\*\* Significantly different from zero at 5% level

\*\*\* Significantly different from zero at 1% level

Standard errors in parenthesis



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## 4.5 Conclusions

This study investigates the productivity change in four major emerging banking markets, namely Argentina, Brazil, China and India over the period 2000-2006. We employ a parametric approach that follows Berger and Mester (1999, 2003) to examine banks' optimisation processes (cost minimisation and profit maximisation); and then decompose the total gross changes of variable costs and profits to measure the productivity change respectively.

We find that all these emerging banking systems suffered a slight decrease in cost productivity apart from in India, although they all enjoyed some profit productivity gains over the time period under study. The possible explanation for these findings may relate to the increased costs incurred by banks as they implement new technologies and broaden the array of products and services on offer. It is also likely that banks have strategically prioritized revenue expansion over cost minimization and that is why profit productivity has increased whereas cost productivity (apart from in India) has fallen. We also find some evidence that banks in emerging markets may have exerted market power to boost their profit productivity (depending on the market power indicator used).

Overall, despite the profit productivity changes in the four emerging markets under study remain significant. We still argue that further reforms may be needed to try and foster greater productivity improvements in the future.

Finally, there may be other factors explaining the changes in productivity in these banking systems that we have not empirically investigated. For instance, banks that have engaged in mergers and acquisitions may behave differently in terms of adopting new technologies and setting prices. Also, changes in the ownership features of banks may also influence productivity change. These areas we suggest could prove fruitful areas for future research.

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## CHAPTER 5: CONCLUSION

Having investigated mergers and acquisitions, foreign bank entry and productivity change in emerging markets, this chapter concludes the thesis. The first part of the chapter outlines the main contribution of the thesis and highlights the findings of each chapter and their implications. We then identify the limitations of our work and suggest areas for future research.

### 5.1 Contribution and overview of the main results

The main contribution of this thesis is that it provides an exploration of recent trends in emerging banking systems, e.g. mergers and acquisitions, foreign bank entry and the impact of these trends on bank shareholders, competitive conditions and overall bank productivity. Our study, therefore, may help policymakers and market participants to evaluate the impact of reform programmes undertaken and draw useful conclusions for future policy making and research. As far as each individual issue is concerned, the contribution and main findings of each chapter in this thesis are highlighted as follows:

In Chapter 2, we apply two event study methodologies that use the OLS market model and GARCH model to examine the value effects of 84 M&A transactions on bank shareholders in twelve emerging markets between 1998 and 2005. To our knowledge, it is the first study that examines both domestic as well cross-border banking M&As using different event study methodologies for emerging markets. The results suggest that these transactions are moderately successful as targets' shareholders gain significant abnormal returns, whereas acquirers, on the other hand, tend not to lose value. When we take account of time-varying beta using the GARCH model approach this provides statistically similar findings to the OLS market model. However, while the different event study methodologies tend to yield the same general results in terms of shareholder value creation they differ in explaining its determinants. When using CAR estimated by the OLS market model as the dependent variable, a transaction will create more value for acquirers' shareholders if the payment is paid in cash, or if an acquirer is more profitable and efficient than its acquiring bank. On the other hand, when using SCAR estimated by

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the GARCH model as the dependent variable, acquirers' shareholders gain more value if it is a cross-border transaction or they pay the targets' shareholder in share instead of cash. In terms of the targets' shareholders' value, there are greater abnormal returns if targets are relatively larger compared to their acquirers when using either CAR or SCAR as the dependent variables. However, there is evidence when using SCAR as the dependent variable that targets' shareholders receive more returns if their per-merger share performance is relatively good.

Chapter 3 examines the impact of foreign bank entry on banking competitive conditions in Argentina, Brazil, China and India between 2000 and 2006. We use the generalised method of moments (GMM) dynamic panel data estimator as well as a fixed effect estimator when estimating the Lerner index as the indicator of competitive conditions. Furthermore, the data set that covers the period from 2000 to 2006 is expected to offer contemporary insights into bank competitive behaviour in emerging banking markets. There is tentative evidence that dynamic procedure should be used to measure a banking system's competitive conditions compared to traditional static one using fixed effect estimator. Using a dynamic panel regression model, we then examine the impact of foreign bank presence and other bank and country specific factors on banking competition. Overall, our results show that foreign bank entry does not appear to significantly influence banking sector competition.

Chapter 4 examines bank productivity change in Argentina, Brazil, China and India between 2000 and 2006. This Chapter aims to contribute to the extant literature as it is the first study (as far as we are aware) that uses a parametric approach following Berger and Mester (1999, 2003) to examine the cost and alternative profit productivity change in major emerging banking systems. The results show that all these banking systems suffer a slight decrease in cost productivity (apart from India) but also enjoy profit productivity gains over the same period. This suggests that banks in the countries under study focus more on revenue generation compared to cost minimisation over the period.

## **5.2 Implications of the results**

In Chapter 2, the results show that M&As in emerging markets under study create

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significant value for targets' shareholders and modest abnormal returns to bank shareholders as whole, which, to a certain extent, may suggest that consolidation in emerging markets during and after major financial crises has enhanced performance in terms of creating value gains (that may reflect either greater operational efficiency or market power). These findings suggest that consolidation in emerging markets is likely to continue given the value enhancing (albeit modest) effects. Moreover, future studies that examine the determinants of value creation in bank M&As should use GARCH or similar modelling framework to cross-check the robustness/consistency of their findings.

In Chapter 3, we find that the competitive conditions measured by the Lerner index (irrespective of the method of estimation) worsen in Argentina and Brazil after 2002, and 2001 for India; China, on the other hand, has the least competitive banking systems compared to other sample countries and such conditions stay stable during the time period under study. Nevertheless, as far as China and India are concerned, further deregulation will take place according to their commitments to accession of the WTO, measures like gradually increasing foreign bank presence in these two economies by either taking more stakes in large state-owned banks, M&As, setting up new joint ventures with domestic banks or seeking 'green-house' growth. Therefore, these markets' competitive conditions may be affected positively as a result. Moreover, we tentatively suggest that the dynamic panel data estimator procedure provides less biased results, and we suggest that for any future study of competitive conditions measured by the Lerner index, a dynamic procedure seems more appropriate. Finally, despite the fact that we do not find any significant impact of foreign bank entry on competitive conditions in four emerging markets, it is suggested that there well may be a limit to the competitive influence of foreign banks over the short-term. Policymakers, perhaps, need to take account of this possibility in the context of liberalisation programmes.

In Chapter 4, we find conflicting results comparing cost and profit productivity which suggests that it is necessary to consider the latter if we are to accurately evaluate the performance of banking systems especially as cost productivity may not capture the profit maximisation goal of banks. Furthermore, according to Chapter 3, China and India have relatively less foreign bank presence and worse competition in their banking sectors. However, we find that banks in China and India still enjoy productivity improvement between 2000 and 2006. The possible explanations may be that banks from these two

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markets may have embarked on (to certain extent, with the assistance from their supervision authorities) improving asset quality, capital adequacy, customer services, and investment on infrastructure in order to take a better position before the banking sectors are fully opened to foreign competition. Additionally, in India, this result could also be driven by some dominant banks (domestic and foreign) mainly focusing on business in major cities, while not exerting competitive pressure on smaller banks in other parts of the country. Finally, we also find some evidence that banks may also exert their market power to improve profit maximisation. Policymakers may well have to trade off a certain degree of anti-competitive behaviour if they wish to have profit productivity improvements.

### **5.3 Limitations of the study and suggestions for the future research**

In Chapter 2, we analyse the value effects of 84 M&As in emerging markets. We draw conclusions from share reactions to M&A announcements. However, stock markets in these emerging markets are still relatively underdeveloped. The sample of our study is limited to 12 emerging markets, for an eight year period and is unlikely to be exhaustive in term of deals reported and overall sample size. Therefore, the results may not fully represent the real effects of the consolidation process. Secondly, we do not adjust our event study methodologies for non-synchronous trading as suggested by Brown and Warner (1985) that the OLS market model tends to produce similar results without taking into account this effect<sup>82</sup>. However, Leemakdej (2008) argues that shares are relatively less frequently traded in emerging markets and finds that the OLS market model is less able to detect abnormal returns of thin trading shares in Thailand compared to other non-parametric models. As a result, we suggest that the possible bias from non-synchronous trading in emerging markets needs further research. Finally, our study also does not provide unambiguous results on what are the determinants of the value creation of M&As when we use two sets of abnormal returns from different event study methodologies. Therefore, further studies are needed in this area.

In Chapter 3, we assume that foreign bank entry may only have short-term effects on competitive conditions. Over the long-term the impact of foreign bank entry, on the other

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<sup>82</sup> To our knowledge, the event study approach that uses GARCH modelling framework has not been tested whether non-synchronous trading can bias the detection of abnormal returns.

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hand, may be reflected more in individual bank's efficiency improvements, and this may exert increased competitive pressure upon domestic banks. As a result, the process whereby domestic banks strive to become more efficient in order to compete with foreign banks may be a long-term phenomenon not captured in the relatively short-term nature of our study. This, we suggest, is an area of research that deserves greater academic attention in the future.

In Chapter 4, According to Berger and Mester (2003), it is necessary to measure standard and alternative profit productivity change jointly in situations when banks may exert their market power over their output prices, or there are increases over time in scale economies, or output prices are not accurately measured (see Berger and Mester, 2003 for a detailed discussion). Therefore, future studies should seek to obtain output price data in order to study standard profit productivity change as well as alternative profit productivity change in emerging banking markets.

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## Appendices

### Appendix 2.1

#### Calculating abnormal returns using the GARCH model<sup>83</sup>

In order to estimate abnormal return, the expected return conditional on the realised market return at T+k and past realisation up to time T is needed. If the k=1, the conditional mean is:

$$E(r_{it} | r_{mt}, I_{t-1}) = (\mu_{it} - \beta_{it} \mu_{mt}) + \beta_{it} r_{mt} \quad (A4)$$

where  $\beta_{it} = h_{imt} / h_{mmt}$ , and the conditional variance is:

$$E[r_{it} - E(r_{it} | r_{mt}, I_{t-1})]^2 = h_{iit} - \left( \frac{h_{imt}^2}{h_{mmt}} \right) \quad (A5)$$

So, the k-step ahead conditional mean is:

$$E(r_{iT+k} | r_{mT+k}, I_T) = \left[ E(r_{iT+k} | I_T) - \frac{\text{cov}(r_{iT+k}, r_{mT+k} | I_T)}{\text{var}(r_{mT+k} | I_T)} * E(r_{mT+k} | I_T) \right] + \frac{\text{cov}(r_{iT+k}, r_{mT+k} | I_T)}{\text{var}(r_{mT+k} | I_T)} * r_{mT+k} \quad (A6)$$

and the k-step conditional variance is:

$$\text{var}(AR_{iT+k} | r_{mT+k}, I_T) = \text{var}(r_{iT+k} | I_T) - \frac{\text{cov}(r_{iT+k}, r_{mT+k} | I_T)^2}{\text{var}(r_{mT+k} | I_T)} \quad (A7)$$

Using parameters from Equation (8) and (9), two conditional means in A(6) can be expressed as:

$$E(r_{iT+k} | I_T) = a_{i0} (1 + a_{i1} + a_{i1}^2 + \dots + a_{i1}^{k-1}) + a_{i1} r_{iT} \quad (A8)$$

$$E(r_{mT+k} | I_T) = a_{m0} (1 + a_{m1} + a_{m1}^2 + \dots + a_{m1}^{k-1}) + a_{m1} r_{mT} \quad (A9)$$

The variance terms in Equation (A6) and (A7) are calculated in the same way, for instance from Equation (9):

<sup>83</sup> This process is suggested by Frame and Lastrapes (1998).

$$\text{var}(r_{mT+k}|I_T) = E_T [r_{mT+k} - E(r_{mT+k}|I_T)]^2 \quad (\text{A10})$$

$$r_{mT+k} - E(r_{mT+k}|I_T) = a_{m1}^{k-1} u_{mT+1} + a_{m1}^{k-2} u_{mT+2} + \dots + a_{m1} u_{mT+k-1} + u_{mT+k} \quad (\text{A11})$$

(A10) and (A11) imply

$$\text{var}(r_{mT+k}|I_T) = (a_{m1}^{k-1})^2 E_T u_{mT+1}^2 + (a_{m1}^{k-2})^2 E_T u_{mT+2}^2 + \dots + a_{m1}^2 E_T u_{mT+k-1}^2 + E_T u_{mT+k}^2 \quad (\text{A12})$$

From Equation (11)

$$h_{mmT+1} = c_{m0} + c_{m1} u_{mT}^2 + c_{m2} h_{mmT} = E_T u_{mT+1}^2 \quad (\text{A13})$$

By the law of iterated expectations,

$$E_T u_{mT+k}^2 = E_T [E_{T+k-1} u_{mT+k}^2] = E_T h_{mmT+k} \quad \text{for all } k \quad (\text{A14})$$

Therefore, (A12) can be re-written as:

$$\text{var}(r_{mT+k}|I_T) = (a_{m1}^{k-1})^2 h_{mmT+1} + (a_{m1}^{k-2})^2 E_T h_{mmT+2} + \dots + a_{m1}^2 E_T h_{mmT+k-1} + E_T h_{mmT+k} \quad (\text{A15})$$

By iterating on (A13),

$$E_T h_{mmT+k} = c_{m0} [1 + (c_{m1} + c_{m2}) + \dots + (c_{m1} + c_{m2})^{k-1}] + (c_{m1} + c_{m2})^k h_{mmT+1} \quad (\text{A16})$$

Substituting (A16) into (A15) can estimate the variance of the market return conditional on  $I_T$ .

The similar procedure is used to estimate covariance term as:

$$\begin{aligned} \text{cov}(r_{iT+k}, r_{mT+k}|I_T) &= a_{i1}^{k-1} a_{m1}^{k-1} h_{imT+1} + a_{i1}^{k-2} a_{m1}^{k-2} E_T h_{imT+2} \\ &+ \dots + E_T h_{imT+k} \end{aligned} \quad (\text{A17})$$

Finally, Equation (15) can be written as:

$$\begin{aligned} \text{CAR}_{iT+k} &= [r_{iT+1} - E(r_{iT+1}|I_T)] + \dots + [r_{iT+k} - E(r_{iT+k}|I_T)] \\ &- \beta_{iT+k} [r_{mT+1} - E(r_{mT+1}|I_T)] - \dots - \beta_{iT+k} [r_{mT+k} - E(r_{mT+k}|I_T)] \end{aligned} \quad (\text{A18})$$

Accordingly, the variance of CAR in Equation (16') can be expressed as:

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$$\begin{aligned}
\text{var}(\text{CAR}_{iT+k} | I_T) &= E_T \text{CAR}_{iT+k}^2 = (1 + a_{i1} + \dots + a_{i1}^{k-1})^2 E_T u_{iT+1}^2 \\
&+ (1 + a_{i1} + \dots + a_{i1}^{k-2})^2 E_T u_{iT+2}^2 + \dots + (1 + a_{i1})^2 E_T u_{iT+k-1}^2 + E_T u_{iT+k}^2 \\
&+ (\beta_{iT+1} + \beta_{iT+2} a_{m1} + \dots + \beta_{iT+k} a_{m1}^{k-1})^2 E_T u_{mT+1}^2 + \dots + \beta_{iT+k}^2 E_T u_{mT+k}^2 \quad (\text{A19})
\end{aligned}$$

## Appendix 2.2

### Lists of banking M&A transactions in Asian and Latin American emerging markets from 1998 to 2005

#### Asian sub-sample

##### 1. Asian sub-sample: target and acquirer both are listed firms in the M&A transaction

Announced	Target	Country	Acquirer	Country	Value US\$m
2000-1-20	Siam Industrial Credit	Thai	Siam Commercial Bank	Thai	8.00
1999-12-23	Bank of the Philippine Islands	Phil	DBS	Sin	291.90
2005-3-29	Bank NISP	Indo	OCBC Overseas Investments	Sin	75.20
2004-12-2	Bank NISP	Indo	OCBC Overseas Investments	Sin	112.40
2004-3-22	Bank NISP	Indo	OCBC	Sin	70.40
2004-2-24	Great Eastern Holdings	Sin	OCBC	Sin	1086.30
2004-7-27	Bank of Asia	Thai	UOB	Sin	100.90
2004-5-12	Bank of Asia	Thai	UOB	Sin	543.20
2004-4-6	Bank Buana Indonesia	Indo	UOB	Sin	115.00
2003-1-28	United Overseas Insurance	Sin	UOB	Sin	4.40
2002-3-20	Rashid Hussain	Ma	Utama Banking Group	Ma	190.90
2001-7-23	Rashid Hussain	Ma	Utama Banking Group	Ma	132.70
2004-6-8	Utama Merchant Bank	Ma	MIDF	Ma	7.80
2003-11-11	Utama Merchant Bank	Ma	MIDF	Ma	42.90
2000-1-10	Solidbank Corp	Phil	Metropolitan Bank & Trust	Phil	95.20
1999-11-11	Solidbank Corp	Phil	Metropolitan Bank & Trust	Phil	166.90
2005-4-27	Bank Niaga	Indo	Commerce Asset-Holdings	Ma	28.30
2002-9-12	Bank Niaga	Indo	Commerce Asset-Holdings	Ma	118.40
2004-9-10	LG Investment & Securities	S.Kor	Woori Finance Holdings Co	S.Kor	259.50

## 2. Asian sub-sample: only the acquirer is a listed firm in the M&A transaction

Announced	Target	Country	Acquirer	Country	Value US\$m
2000-11-20	FPB Bank Holding	HK	Bank of East Asia	HK	560.00
2003-12-17	Industrial Bank	China	Hang Seng Bank	HK	208.80
2003-8-21	Fortis Bank Asia HK	HK	ICBC (Asia)	HK	304.00
2003-7-5	Chekiang First Bank	HK	Wing Hang Bank	HK	615.60
2004-1-28	DBS Thai Danu Bank	Thai	Thai Military Bank	Thai	512.80
2002-4-29	DBS Group Holdings(HK)	HK	DBS Group Holdings	Sin	117.20
2001-4-11	Dao Heng Bank Group	HK	DBS Group Holdings	Sin	5679.70
1999-11-9	Far East Bank & Trust	Phil	DBS Bank	Sin	90.70
1998-12-17	Kwong On Bank	HK	DBS Bank	Sin	459.90
2001-6-12	Keppel Capital Holdings	Sin	OCBC	Sin	3753.90
2001-1-31	OCBC Finance	Sin	OCBC	Sin	28.40
2005-5-6	United Overseas Bank (Phil)	Phil	Banco de Oro Universal Bank	Phil	11.10
2005-2-3	UOB Radanasin Bank	Thai	UOB	Sin	77.10
2002-9-26	Bank UOB Indonesia	Indo	UOB	Sin	10.50
2002-3-15	Overseas Union Trust	Sin	UOB	Sin	82.50
2001-6-29	Overseas Union Bank	Sin	UOB	Sin	5463.90
1999-10-7	Radanasin Bank	Thai	UOB	Sin	382.50
2005-11-24	Affin Merchant Bank	Ma	Affin Holdings	Ma	45.00
2000-1-12	Credit Corp(Ma)	Ma	Hong Leong Bank	Ma	132.90
2000-8-30	Phileo Allied Bank(Ma)	Ma	Maybank	Ma	342.2
1999-9-17	Pacific Bank	Ma	Maybank	Ma	329.00
2000-6-26	Hock Hua Bank	Ma	Public Bank	Ma	221.70
2001-4-23	Bank Utama(Ma)	Ma	RHB Bank	Ma	474.50
2000-6-28	Perdana Merchant Bankers	Ma	Southern Bank	Ma	2.10
2000-1-6	United Merchant Finance	Ma	Southern Bank	Ma	110.50
1999-10-13	Ban Hin Lee Bank	Ma	Southern Bank	Ma	284.20
1999-7-9	Ban Hin Lee Bank	Ma	Southern Bank	Ma	98.00
2005-7-27	Prudential Bank	Phil	Bank of the Philippine Islands	Phil	19.40
1999-10-21	Far East Bank & Trust	Phil	Bank of the Philippine Islands	Phil	1216.00
2004-2-17	Adira Dinamika Multifinance	Indo	Bank Danamon	Indo	101.20
2000-12-22	H&CB	S.Kor	Kookmin Bank	S.Kor	2172.90
2003-6-19	Chohung Bank	S.Kor	Shinhan Financial Group	S.Kor	2824.10
2004-4-12	Chohung Bank	S.Kor	Shinhan Financial Group	S.Kor	291.40
2004-9-17	Good Morning Shinhan Securities	S.Kor	Shinhan Financial Group	S.Kor	188.00



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### 3. Asian sub-sample: only target is a listed firm in the M&A transaction

Announced	Target	Country	Acquirer	Country	Value US\$m
2000-12-19	Korea Exchange Bank	S.Kor	Export-Import Bank of Korea	S.Kor	330.80
1999-5-7	Dah Sing Financial	HK	Mitsui Trust & Banking	Japan	17.90
1999-5-7	Siam Commercial Bank	Thai	Sanwa Bank	Japan	135.40

Note: Asian country names are abbreviated as follows: HK (Hong Kong<sup>84</sup>), Indo (Indonesia), Ma (Malaysia), Sin (Singapore), S.Kor (South Korea), Thai (Thailand) and Phil (the Philippines)

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<sup>84</sup> Hong Kong is a special administrative region of the People's Republic of China.

## Latin American sub-sample

### 1. Latin American sub-sample: target and acquirer both are listed firms in the transaction

Announced	Target	Country	Acquirer	Country	Value US\$m
2001-8-8	Banco De A Edwards	Chile	Banco de Chile	Chile	942.90
2005-2-18	Corfinsura Corp	Colombia	Bancolombia SA	Colombia	356.90
2002-2-18	Banco de Credito del Peru	Peru	Credicorp Ltd	Bermuda	33.50

### 2. Latin American sub-sample: only the acquirer is a listed firm in the M&A transaction

Announced	Target	Country	Acquirer	Country	Value US\$m
2005-12-21	Banco do Estado do Ceara	Bra	Banco Bradesco	Bra	303.40
2005-4-18	Banco Morada	Bra	Banco Bradesco	Bra	30.70
2003-11-7	Banco Zogbi	Bra	Banco Finasa	Bra	226.90
2003-1-13	BBVA Brasil	Bra	Banco Bradesco	Bra	812.20
2002-2-20	Banco Cidade	Bra	Banco Bradesco	Bra	145.60
2002-1-14	Banco Mercantil de Sao Paulo	Bra	Banco Bradesco	Bra	542.00
2000-11-21	Banco Espirito Santo	Portugal	Banco Bradesco	Bra	72.80
2000-4-28	Boavista Inter-Atlantico	Bra	Banco Bradesco	Bra	517.70
1999-6-22	Banco do Estado da Bahia	Bra	Banco Bradesco	Bra	146.70
2002-11-29	Banco Fiat	Bra	Banco Itaú	Bra	248.40
2000-10-17	Banco do Estado do Parana	Bra	Banco Itaú	Bra	868.40
1998-5-19	Banco del Buen Ayre	Arg	Banco Itaú	Bra	225.00
1998-4-3	Banco America do Sul	Bra	Banco Sudameris Brasil	Bra	190.50
2000-12-20	Banco Financiero E Industrial De Inversiones	Bra	Unibanco	Bra	245.50
2000-7-4	Banco Bandeirantes	Bra	Unibanco	Bra	606.90
2000-2-29	Banco Credibanco	Bra	Unibanco	Bra	84.50
2003-11-19	Banco Conosur	Chi	Banco de Credito e Inversiones	Chi	100.00
2004-7-31	Banco Aliadas	Col	Banco de Occidente	Col	39.90
2002-11-15	BSCH Peru	Pe	Banco de Credito del Peru	Pe	49.20

### 3. Latin American sub-sample: only target is a listed firm in the M&A transaction

Announced	Target	Country	Acquirer	Country	Value US\$m
2000-5-23	Banco de Galicia y Buenos Aires	Arg	Grupo Financiero Galicia	Arg	950.70
2000-12-14	Banco Rio de la Plata	Arg	Merrill Lynch & Co	US	261.20
2000-2-10	Banco Rio de la Plata	Arg	BSCH	Spain	675.40
2003-1-2	BBV Banco Frances	Arg	BBVA	Spain	159.6
2001-1-9	BBV Banco Frances	Arg	BBVA	Spain	15.40
2000-9-29	BBVA Banco Ganadero	Col	BBVA	Spain	248.60

Note: Latin American country names are abbreviated as follows: Arg (Argentina), Bra (Brazil), Chi (Chile), Col (Columbia), and Pe (Peru).

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## Appendix 2.3

### A two-step LM test for diagnosing the GARCH effects of the time series<sup>85</sup>

#### 1. First step

A time series of 291 days returns of each firm's share or market index (41 days in the event window and 250 days prior to the event window) is needed for a AR(1) regression model as follows:

For the firm's share returns  $r_{it}$

$$r_{it} = \alpha_{i0} + \alpha_{i1}r_{it-1} + u_{it} \quad (\text{A20})$$

For the index returns  $r_{mt}$

$$r_{mt} = \alpha_{m0} + \alpha_{m1}r_{mt-1} + u_{mt} \quad (\text{A21})$$

A set of residuals obtained from each model are saved and denoted as  $e_t$ .

#### 2. Second step

Estimate the following auxiliary regression:

$$e_t^2 = \delta_0 + \delta_1 e_{t-1}^2 + \dots + \delta_q e_{t-q}^2 + v_t \quad (\text{A22})$$

In this case,  $q=12$  is chosen for the estimation. Therefore, the null hypothesis is that no GARCH effect can be found if:  $H_0 : \delta_1 = \delta_2 = \dots = \delta_{12} = 0$

The test statistic is  $\tau = TR^2 \sim \chi^2(12)$

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<sup>85</sup> This test is modified based on Brooks (2002).

**Appendix 3.1:**  
**Summary statistics of main independent variables by country and year**

	2000	2001	2002	2003	2004	2005	2006
<b>FOREIGN</b>							
Argentina	0.3600	0.3500	0.3100	0.3000	0.3100	0.2900	0.3200
Brazil	0.3600	0.3400	0.3000	0.2800	0.3000	0.2700	0.3000
China	0.0800	0.0800	0.0600	0.0500	0.0500	0.1000	0.1500
India	0.0700	0.1300	0.1300	0.1100	0.1400	0.1200	0.0900
Average	0.2175	0.2250	0.2000	0.1850	0.2000	0.1950	0.2150
<b>MAKS</b>							
Argentina	0.0154	0.0145	0.0139	0.0149	0.0149	0.0154	0.0169
Brazil	0.0104	0.0090	0.0087	0.0093	0.0101	0.0109	0.0116
China	0.0476	0.0370	0.0256	0.0208	0.0185	0.0161	0.0200
India	0.0244	0.0227	0.0192	0.0172	0.0179	0.0182	0.0200
Average	0.0245	0.0208	0.0169	0.0156	0.0154	0.0152	0.0171
<b>CR5</b>							
Argentina	0.5419	0.4984	0.5525	0.5647	0.5128	0.4939	0.4631
Brazil	0.5411	0.5084	0.5265	0.5154	0.4925	0.5249	0.6059
China	0.8814	0.8227	0.8159	0.8489	0.8367	0.8220	0.8236
India	0.4121	0.3902	0.5924	0.5156	0.4853	0.5129	0.5539
Average	0.5941	0.5549	0.6218	0.6112	0.5818	0.5884	0.6116
<b>MARGDP<sup>a</sup></b>							
Argentina	0.5843	0.7164	1.0137	0.3004	0.3032	0.3356	0.3725
Brazil	0.3509	0.3372	0.2447	0.4246	0.4977	0.5379	0.6658
China	0.4848	0.3955	0.3185	0.4151	0.3312	0.3480	0.9094
India	0.3217	0.2308	0.2579	0.4637	0.5574	0.6864	0.9036
Average	0.4354	0.4200	0.4587	0.4010	0.4224	0.4770	0.7128
<b>INFLA<sup>b</sup></b>							
Argentina	0.0	-1.1	24.5	41.3	47.5	61.7	79.4
Brazil	0.0	6.8	15.9	32.9	41.7	51.4	57.8
China	0.0	0.5	-0.3	0.9	4.8	6.7	8.3
India	0.0	3.7	8.2	12.4	16.6	21.5	28.6
Average	0.0	2.5	12.1	21.9	27.7	35.3	43.5
<b>PROPERTY<sup>c</sup></b>							
Argentina	74.12	70.54	64.86	55.53	53.04	54.02	57.30
Brazil	57.20	57.95	58.82	60.29	58.66	58.99	61.71
China	54.09	50.60	51.21	51.13	51.02	52.37	55.41
India	45.75	47.12	51.38	51.55	51.77	54.36	52.29
Average	57.79	56.55	56.57	54.63	53.62	54.94	56.68
<b>GDPPC<sup>a</sup></b>							
Argentina	7702.89	7288.48	6430.98	6932.45	7486.24	8094.17	8694.83
Brazil	3706.91	3701.93	3746.85	3737.39	3836.97	3958.09	4054.84
China	949.18	1020.52	1105.96	1209.00	1323.14	1448.78	1594.87
India	452.98	468.93	478.91	511.42	546.13	588.45	633.74
Average	3202.99	3119.97	2940.68	3097.57	3298.12	3522.37	3744.57

Note: FOREIGN - the percentage of each bank's shares controlled by foreign investors;

MAKS - market share variable calculated as the ratio of each bank's asset value divided by the whole banking sector assets;

CR5 - a concentration ratio calculated as the sum of market shares for the largest five banks;

MARGDP - the ratio of stock market capitalisation to GDP;

INFLA - annual inflation rate;

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PROPERTY - an index of property rights from the Economic Freedom Index;

GDPPC - The logarithm of per capita GDP of each year

Sources: <sup>a</sup>: World Bank World Development Indicators, Nov 2007;

<sup>b</sup>: IMF International Financial Statistics;

<sup>c</sup>: The Heritage Foundation, 2008