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LINKAGES BETWEEN REAL AND FINANCIAL ASPECTS OF ECONOMIC INTEGRATION IN EAST ASIA

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EXECUTIVE SUMMARY

1. Background and Objectives

The extent of financial integration of the economies of the region and its relationship with the linkage of the real side of these economies has been an important question in this project. Is money merely a veil behind which the real economy operates in response to "real" stimuli, or does finance drive real behavior? Interest in these linkages was increased by the experience of the Global Financial Crisis (GFC). Yet, there is little theoretical consensus on this issue and also there is relatively little empirical analysis.

Out of our research emerges an interest in a 'grand trade off', concern about which has also been heightened since the GFC. This is the balance between financial integration and the benefits it confers, on the one hand, and the transmission of shocks from the rest of the world and associated threats to financial stability on the other. There is an interest in the direct channels of transmission of such shocks but also the indirect effects, for example, the ways in which financial integration might intensify the direct effects of the transmissions of shocks on the real side of these economies.

Papers prepared for this project explored these questions by examining both macroeconomic indicators on the behavior of the financial and real economies and also by reviewing the microeconomics of the channels of transmission of shocks and the processes of integration.

2. Findings and Conclusions

The study begins with chapters that address the measurement of regional integration compared with the engagement of regional economies with the global economy and how this relates to the aggregate behavior of the economies. This gives a picture of the potential for welfare gains from risk sharing and also the scale of possible costs from

financial contagion in more open economies. We then turn to a consideration of the financial sector and the efficiency and performance of banking in the region. This allows a discussion of whether, in the current crisis, the banking sector was an important conduit of financial shock into real (trade and output) behavior. The final set of studies turns to the corporate sector and, using data on firms, examines what type of finance they use, what impact that has on their performance and whether foreign direct investment or ownership structures matter for productivity growth. These studies complete the analysis of both sides of the financial market (lending and borrowing) and give insight into several routes by which finance impacts on corporate behavior. Moreover, because they also include country and policy variables in their analysis it is possible to see where policy can be used to affect outcomes.

Overall the papers indicate there could be substantial gains from further financial market integration. The ability to smooth consumption and income could only grow with greater financial openness. Greater openness is likely to lead to greater regional integration. While the expectation is that integration may raise some risks, in terms of the transmission of shocks from the rest of the world, the work here points to significant scope for welfare gains. It also finds little evidence that financial contagion is a large risk.

The results of this research show that business cycles within the region are not highly correlated and, indeed, are more highly correlated with cycles outside the region. Since symmetric shocks, or symmetric response to shocks, are considered one pre-requisite for monetary union, the region does not seem to meet this criterion. At this stage, the bottom-up strategy appears to be even more important than top-down institution building, such as the creation of regional monetary unions or regional bond markets.

Alongside the results showing the underdeveloped level of risk sharing and insurance against consumption volatility, there is clear evidence of benefit from developing additional mechanisms to allow private agents to access a more diversified set of income sources. Improved openness of financial markets is one mechanism to achieve this. Creating structures from the top down, such as the efforts to develop regional bond markets, may simply be solving problems that are not of the “first-order” in this region.

Companies do not seem currently to demand greater access to bond finance. Their financing choices, while different from other regions, are not different in the way that was claimed as a rationale for building regional bond markets (that is, they are not overly bank financed). Nor do their choices seem to be distorted, in so far as that can be deduced from the finding that the drivers of corporate financing choices are broadly similar in this region to that in other groups of countries. Consumers are not yet even using the international capital markets that exist to smooth their consumption so there is little evidence that they need more such markets within the region.

The work also demonstrates that country-specific factors are generally significant in understanding the processes of integration and their consequences. These studies indicate that the country-level factors most likely to be important are those related to institutional quality. If so, work on institutional quality alongside efforts to open the financial sector might not only add to the degree of integration but also ameliorate the trade-off with the risks of transmission of significant shocks. These results point to the benefits of "bottom-up" work on integration and removing the impediments to integration.

3. Policy Recommendations

The problems that have been identified here – low levels of consumption smoothing, and business cycles that have been quite sensitive to movements outside the region – are better resolved at the economy level. If those problems were resolved and markets became more integrated as a result, then the transfers sought between economies and over time, through structures such as regional bond markets, might also be achieved.

The long-run consequences of the bottom-up approach may well be to shift the parameters of the economies of the region to provide support for new top-down institutions. But while that might be the long-run sequence, top-down institutional innovation is not the immediate priority from the work reported here.

Despite this skeptical finding about large-scale institution building related to financial markets at this stage of the region's development, there remains a rich agenda for regional cooperation.

Within the region, there are not only significant country differences in experiences, but also a wide range of experiences of various sorts of institutional structures in financial markets and their links with local corporate structures. These institutional differences are driving the observed country differences in processes and consequences. Our proposed future research program would exploit these differences in the region and identify more carefully the nature and contributions of country features. That analysis is a valuable input into the design of a capacity-building program for financial integration in this region and between this region and the rest of the world.

In terms of further work, the papers in this collection identify a number of empirical studies to clarify the questions that have emerged in the process of this research. This includes work on measures of integration, the indicators of business cycle movements, further work on the sources of corporate funding, and new indicators of bank efficiency, and others. One theme, however, is the value of identifying more carefully the specific institutional features which are contributing to the observed economy-level variations in results.

Chapter1

Linkages between Real and Financial Aspects of Economic Integration in Asia: Overview Report

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Abstract

The objective of this paper is to present an overview of the studies under ERIA Research Project "Linkages between Real and Financial Aspects of Economic Integration in Asia" conducted in FY 2009. The objective of this research is to understand the relationship between the financial side of the economy and the real activities of firm, consumers, and workers. We would like to understand the contribution of both real and financial integration to growth and to welfare, and to enquire whether increases in either or both forms build the linkage between the real and financial economy. The first part of this study begins with chapters that address the measurement of regional integration compared with the engagement with the global economy and how this influences the aggregate behavior of the economies. The second part turns to a consideration of the financial sector and the efficiency and performance of banking in the region. This allows a discussion whether, in the current crisis, the banking sector was an important channel of financial shock into real behavior. The third part turns to the corporate sector. Using data on firms, type of finance used by firms, its impact on their performance, and ownership structure influence over the productivity growth are discussed. Based on the findings, we present several policy recommendation and future research agenda for further economic integration in East Asia.

Introduction

A question which has engaged both policy makers and academic economists is how to understand the relationship between the financial side of the economy and the real activities of firms, consumers and workers. Is money merely a veil behind which the real economy operates in response to "real" stimuli, or does finance drive real behavior? Surprisingly there is not only no theoretical consensus on this point but there is relatively little direct empirical analysis. The purpose of this project has been to examine this question and to particularly focus on the policy-relevant questions that it raises. The extent of financial integration of the economies of the region and its relationship with the linkage of the real side of these economies has therefore been an important question.

Our motivation is to understand the contribution of both real and financial integration to growth and to welfare and to enquire whether increases in either or both forms build the linkage between the financial and the real economy. We also ask whether regional integration, rather than greater openness and integration with the global economy, contributes differently.

Out of our research emerges an interest in a "grand trade off", concern about which has been heightened since the global financial crisis. This is the balance between financial integration and the benefits it confers, on the one hand, and the transmission of shocks from the rest of the world and associated threats to financial stability on the other. There is an interest in the direct channels of transmission of such shocks but also the indirect effects, for example, the ways in which financial integration might intensify the direct effects of the transmissions of shocks on the real side of these economies.

Papers in this project explored these questions by examining both macroeconomic indicators on the behavior of the financial and real economies and also by reviewing the microeconomics of the channels of transmission of shocks and the processes of integration.

The project has been structured around the idea that between the financial and real sectors of the economy there is a "black box" through which unanticipated shocks, or longer-

term, predictable changes, in either sector may be transmitted from one side to the other. Because there is so little consensus on the elements or transmission mechanisms that may be inside that black box, we empirically examined several different important mechanisms.

The study begins with chapters that address the measurement of regional integration compared with the engagement of regional economies with the global economy and how this relates to the aggregate behavior of the economies. This gives a picture of the potential for welfare gains from risk sharing and also the scale of possible costs from financial contagion in more open economies. We then turn to a consideration of the financial sector and the efficiency and performance of banking in the region. This allows a discussion of whether, in the current crisis, the banking sector was an important conduit of financial shock into real (trade and output) behavior. The final set of studies turns to the corporate sector and, using data on firms, examines what type of finance they use, what impact that has on their performance and whether foreign direct investment or ownership structures matter for productivity growth. These studies complete the analysis of both sides of the financial market (lending and borrowing) and give insight into several routes by which finance impacts on corporate behavior. Moreover, because they also include country and policy variables in their analysis, it is possible to see where policy can be used to affect outcomes.

The research reported here identifies significant gains from further financial market integration. It shows that factors which are specific to particular economies are important to understand the process of and impacts of integration. The studies suggest that work on institutional quality alongside efforts to open the financial sector help offset the risks of the higher levels of transmission of shocks. Results of this type point to the benefits of a “bottom-up” approach to strategy on financial market integration at the economy level rather than larger scale and top-down institutional building at the regional level.

In terms of further work, the papers in this collection identify a number of empirical studies to clarify the questions that have emerged in the process of this research. This includes work on measures of integration, the indicators of business cycle movements,

further work on the sources of corporate funding, and new indicators of bank efficiency, and others. One theme, however, is the value of identifying more carefully the specific institutional features which are contributing to the observed economy-level variations in results. Such an analysis would also contribute to the design of capacity building programs across the region.

Macroeconomic indicators

There is a variety of ways of measuring financial integration and a contribution of this project has been to explore some of these measures and their differences. Papers by Cavoli and Rajan and Pontines and Parulian use several different lenses to illustrate the country and time pattern of changes in real and financial integration in the region.

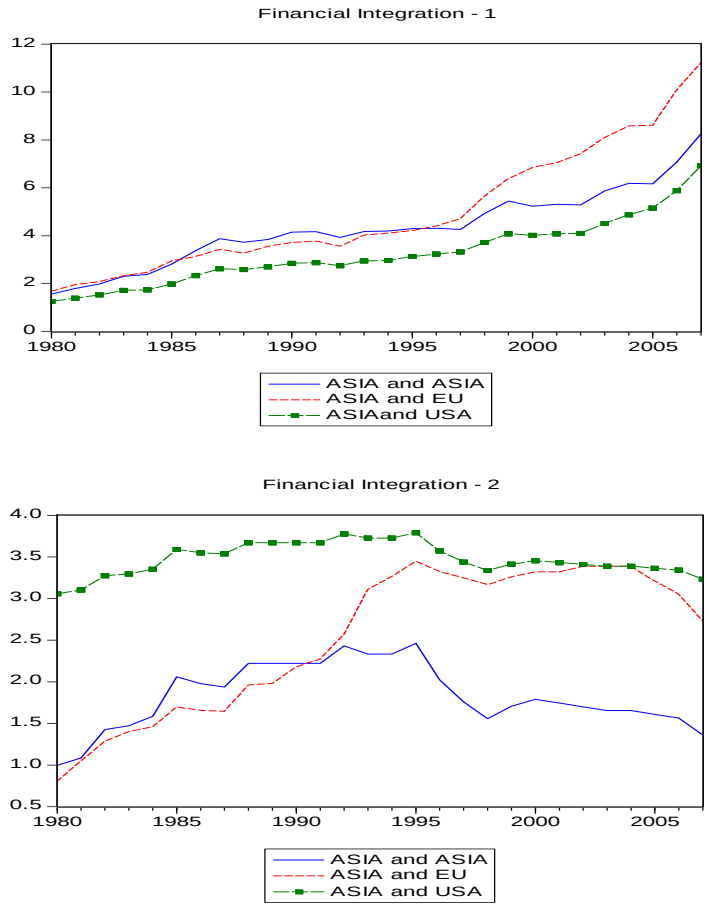
Several indicators are illustrated in Figure 1, which shows quantity-based measures of integration presented by Pontines and Parulian (who also report a price-based measure). The figure includes three graphs, one for each of their financial integration measures. The first measure is the average of the sum of stocks of total foreign assets and liabilities (derived from balance of payments data and including both (FDI) and portfolio investment) held by countries *i* and *j* scaled by their nominal GDP. The second is an average of the so-called Chinn–Ito index of financial openness and which is based on World Bank data on reported restrictions to financial transactions across pairs of countries. The third is based on the stocks of portfolio assets and liabilities between country *i* in country *j* and vice versa, scaled by each country's GDP. Each graph contains time-series plots of the cross-country pair average of the relevant financial integration measure.

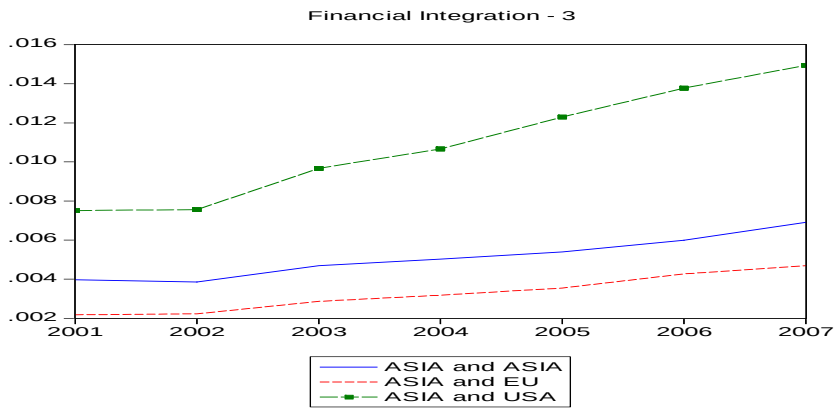
- The first figure, for the global holdings of foreign assets, clearly shows that Asia's integration with world financial markets has increased considerably over the past three decades and has moved in parallel with the globalization of finance in other regions. The main, dramatic rise occurred around the middle of the 1990s.
- This clear, persistent, upward trend in engagement with world financial markets occurred despite the reversal in Asia's openness to financial flows based on the measure of policy barriers (the Chinn–Ito measures in the second figure), that

took places sometime in the mid-1990s. From this point until the end of the period, the policy barriers measure fluctuates around an approximately constant mean, suggesting that Asia has not made much further progress in reducing formal restrictions on financial flows in recent years.

The quantity measure that indicates truly bilateral financial integration (the third figure), portrays Asia's increasing, though limited, intra-regional financial integration but also shows that the intra-regional integration falls behind that of the region's integration with the US.

Figure 1. Financial Integration over Time (Quantity-Based Measures)





Note: The correlation is estimated with a four-year rolling window.

Source: Pontines and Parulian.

Despite the apparent growth in levels of financial integration, the question remains about the relevant benchmark, and whether higher levels of integration or faster change might be possible. We return to this question, and the implications of the answer, below. However there is value in continuing to review and refine the portfolio measures of integration which are available.

Price indicators used by both Cavoli and Rajan and Pontines and Parulian, although different, indicate a similar story. Pontines and Parulian use a measure of the Euclidian distance from complete arbitrage between pairs of countries (revealed by the term structure of interest rates and by the gap between bank rates and money market rates) while Cavoli and Rajan use the distance from uncovered interest parity. All these indicators show an increase in the extent of arbitrage between individual regional economies and others in the region (i.e. increased "regional integration") before the Asian crisis, with a slowing in the pace of integration after it. However, the region's economies have increased their price arbitrage with financial markets *outside the region even more* than they have within the region.

The relationship between financial integration and real integration is explored by Cavoli and Rajan. They use innovative measures of both forms of integration (the distance from uncovered interest parity and purchasing power parity) which permit an easier

comparison of the extent of both forms and of the extent to which an economy is integrated with another economy or groups of economies.

Cavoli and Rajan find that the level of real integration exceeds that of financial integration (in their paper Cavoli and Rajan report on some other commonly used measures of integration which have observed the same result). As might be expected, Japan, Singapore and Hong Kong have integrated with global capital markets and Korea is increasingly so. The original ASEAN members are relatively more integrated with each other than with other economies in the region. Singapore and Malaysia are more integrated within the region than the other original members, and they are all more integrated than the later members.

There have been changes over time. A comparison of levels of integration within regional groups before and after the Asian Financial Crisis finds a higher level of real integration after the crisis but not for financial integration, although these effects are relatively small.

In further interesting work, Cavoli and Rajan examine the relationship between changes of levels of real and financial integration. They find some evidence that increments to financial integration precede that of real integration. This result challenges some of the preconceptions of the relationship between those two variables. However, as the authors explain, it may reflect the timing in the adjustment process, with financial markets reacting more quickly to a common shock than the real side of the economy. It is a topic for further work to identify the drivers of both financial integration and real integration and therefore their timing.

Pontines and Parulian examine the relationship between financial integration and the synchronicity of business cycles in economies in the region. As they explain, this relationship could work in either direction. Standard international business cycle models predict that greater financial integration should lead to lower synchronicity, while models of contagion suggest a positive relationship. There is no uniform result on this question in the current research literature (where cross-section studies find a positive relationship while panel data studies find a negative relationship) and little work has been done on this question in Asian economies.

Pontines and Parulian observe a rising (though not high) level of financial integration but generally no change in any particular direction in the degree of synchronicity in the cycles of the economies of interest. This simple comparison suggests that the mechanisms that transmit events through the financial system are not dominant but this question requires further testing, which Pontines and Parulian undertake, in order to be able to make a more powerful statement.

Pontines and Parulian find that, controlling for other influences on synchronicity, the relationship is negative; that is, a higher level of financial integration is associated with a decrease in business cycle synchronicity. This suggests that the business risk smoothing opportunities created by integrated financial markets dominate the contagion effects. Deeper financial integration, in other words, permits a decoupling of an economy from others with which it is integrated.

As Pontines and Parulian explain, this result is important in the current debate, where it has been alleged that the downside of greater financial integration is that it can pose risks to financial stability. This claim, they note, takes on ever increasing traction and prominence in discussions especially in light of the recent painful experience with the GFC which tends to demonstrate the role that financial linkages play in the transmission of shocks between economies. However, despite concerns in policy circles, it appears that the jury is still out on whether greater financial integration indeed increases the likelihood of crises. They refer to other recent work which shows that the availability of better risk sharing mechanisms tends to offset the risk of spillover or transmission of shocks, and thus financial integration leads to an improvement in welfare as specialization benefits are magnified and realized.

This result is consistent with the literature that argues that greater integration does not pose risks to financial stability on its own, but when a too-rapid liberalization of financial markets interacts, for instance, with certain distortions in the economy such as weak and lax supervisory regulations as well as problems of credibility and enforcements of contracts, these distortions are magnified and financial instability problems arise.

Pontines and Parulian measure the nature of the business cycle using GDP. As they also point out, there is a debate about the assessment of business cycles and an item for further

work is to examine alternative indicators. For this group of economies, many undergoing rapid structural change and evolution of their financial systems, the definition of the business cycle may not be straightforward, or at least the standard sets of measures may be more difficult to apply.

Another topic for further attention is the definition of the groups of economies to be considered in the analysis of synchronicity. The Pontines and Parulian methodology uses bilateral averages over a global sample of economies and further work is required on whether the relationships are different for degrees of integration within Asia compared to the rest of the world.

Corbett and Maulana examine a different aspect of the risk smoothing that the work of Pontines and Parulian suggests might occur. They explain the theoretical benefits of financial market integration in terms of the scope to smooth consumption but they note they do not formally analyze the possible trade-off with the greater transmission of shocks. Corbett and Maulana undertake an exercise in which they examine how much consumption and income risk sharing actually takes place in the East Asian region using identities relating output, income and consumption. This method has been used for other highly integrated economies (e.g. between US states and within Europe) but has only recently been applied to the Asian region. The research calculates how much of any change in a country's domestic income (an income "shock") is absorbed by offsetting movements in income from abroad (income risk sharing) and how much is offset by a change in national saving. Both of these changes can protect consumption from having to adjust to short-term changes in income.

Corbett and Maulana find that that the current level of consumption smoothing by the countries in the region is rather low. Most of the smoothing (23 percent) comes via the use of credit markets (i.e. from changes in national savings) while capital markets account for very little (2 percent). That implies that economies in the region do not use foreign investment income to shield (insure) themselves from domestic income variations. These results mean that a very large part of changes in GDP is not smoothed (75 percent). This kind of calculation can be extended directly (and rather mechanically) to provide estimates of welfare gains (or welfare improvements foregone) so, although they do not

do the calculation, it is straightforward to conclude that welfare could be improved by using these avenues more fully for income and for consumption smoothing.

This line of research raises the question of whether the benefits of financial integration are being fully utilized and the answer provided by Corbett and Maulana is “not yet”. This is a significant result in itself because it suggests there is room for welfare gain from greater financial openness in the region. This conclusion is reinforced by data on the “intensity” of bilateral investments between countries in the region. Using the same data as Pontines and Parulian on bilateral portfolio holdings, Corbett and Maulana show that, relative to the size of the region’s global investment markets, they do, in fact, invest quite heavily in each other. The fact that they are so small in the global markets means that none of them is using foreign investment as insurance against risk to any great extent, but the high intensity does suggest that, if they become more open to international financial markets, and if they maintain the current distribution of their portfolio holdings, they would source a considerable amount of their risk insurance from within the region.

In the context of the data reported by Pontines and Parulian concerning the lack of synchronicity in the region’s business cycles, this result of Corbett and Maulana suggests that constructing new “top-down” institutions to help smooth cycles, such as systems for monetary integration, are not a priority. Those institutions are very difficult to establish efficiently in the context of the range of country differences that are identified in this research. Instead, of more value in the immediate terms is to identify the impediments to the consumption-smoothing role that integrated capital markets might play. In other words, of more value is further work on a “bottom-up” approach to integration.

Other papers in this project which focus more on the microeconomic dimensions of integration have begun to identify some priorities in that respect.

Microeconomic transmission channels

Papers in the project reviewed the behavior of financial institutions, banks in particular, and of corporations, that is, both the lending and borrowing side, respectively. There is

also work on how the choices made by borrowers and lenders have affected their own performance.

On the lending side, Onji, Gai and Corbett are interested in the question of whether bank behavior exaggerated the shock from the rest of the world in the Global Financial Crisis. They first examine the significance of the lending channel relative to commercial paper, to see if there are signs of a credit crunch. They find some signs of such an event. They then examine balance sheets of banks in East Asia to test whether the lending fell faster for banks with (1) a high exposure to the Lehman Brothers' bankruptcy and (2) a high reliance on money market funding. In a new data set constructed for this project (an unbalanced panel of 747 banks from 10 economies around the region) they find a statistically significant correlation between loan growths in 2008 with the Lehman exposure and also with the degree of dependency to money market.

Onji, Gai and Corbett also find significant country effects; that is, the importance of the lending channel among the various transmission mechanisms appears varies economies. On the whole, most banks around the region rely on deposits as the chief source of finance so that their lending would be largely unaffected by the transmission mechanism focused on in this study. However, Korean banks in their sample rely relatively heavily on money market finance, and there is evidence consistent with the importance of the lending channel in Korea. In the analysis of the ratio of commercial papers to bank loans, they find indications of a credit crunch for Korea and Taiwan but not for Japan. Overall, the results indicate that the lending channel would have amplified the GFC shock in Asia but to a limited degree.

An important channel of finance is trade credit. This channel received a significant amount of attention in the Global Financial Crisis and there were a number of proposals for special measures related to trade finance. The role of trade finance received significant attention in the ASEAN debate on responding to the GFC. Siregar examines the role of trade finance in explaining recent slowdowns of trade activities in Indonesia, Korea and Thailand. In general, his findings confirm the vital role of trade credit in shaping export flows of these three economies during the past two decades. Nonetheless,

the impacts of trade finance on the export demand differ from one country to another. In particular, the experiences of the three countries appear to suggest that the more developed a country's financial sector then the role of trade financing is more likely to be significant. As expected, the adverse consequences of falling trade credit on export performance amplify the local impacts of a global event. This last finding highlights the importance of the crisis contagion channel from the financial sector to the real sector of an economy.

Siregar follows up his comparative work with a case study of Indonesia. The export sector of Indonesia suffered a more severe decline than during the 1997 Asian financial crisis than in the GFC. Siregar evaluates the role of export credit in explaining the performance of the export sector in Indonesia. He is particularly concerned about the role of this financing facility during the economic downturns. He finds robust evidence that the export credit contributed to the boom and bust of the export sector in Indonesia. However, the results also suggest that the size of the contribution is modest. The significance of export credit has indeed magnified the global shock, and it is short-term financing, not investment capital, which has been detrimental to the performance of the country's export sector. However, ultimately, two traditional determinants of export demand remain the most significant contributing factors – income and price factors. The slump of major trading partners' economies weakened the demand for Indonesian export goods and the country's exports were highly sensitive to the uncertainties and volatilities in the prices of major commodities in the world market.

Thangavelu and Findlay look at the determinants of bank performance. They study the determinants of efficiency of banks in the Southeast Asian countries of Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam. The study uses a new data base of nearly 600 banks from 1994 to 2008. They focus on three key areas: (1) bank-specific activities such as their off-balance sheet activities, (2) financial liberalization through foreign participation and ownership, and (3) impact of bank regulation and supervision. The results indicate that off-balance sheet activities tend to reduce bank efficiency as they measure it. Foreign participation and ownership in the financial markets tend to increase bank efficiency. Bank regulation in restricting activities on non-

interest income and authority of official supervision tend to improve the efficiency measures used in their study. Private monitoring of financial markets tends to reduce bank efficiency.

Thangavelu and Findlay use a simple quantitative measure of productive efficiency, and a topic for further work is to examine other measures. However their results stress the significance of the local policy environment for bank performance. Also significant, and highly relevant to the discussion of integration, is the contribution of foreign ownership of banks to performance as measured here.

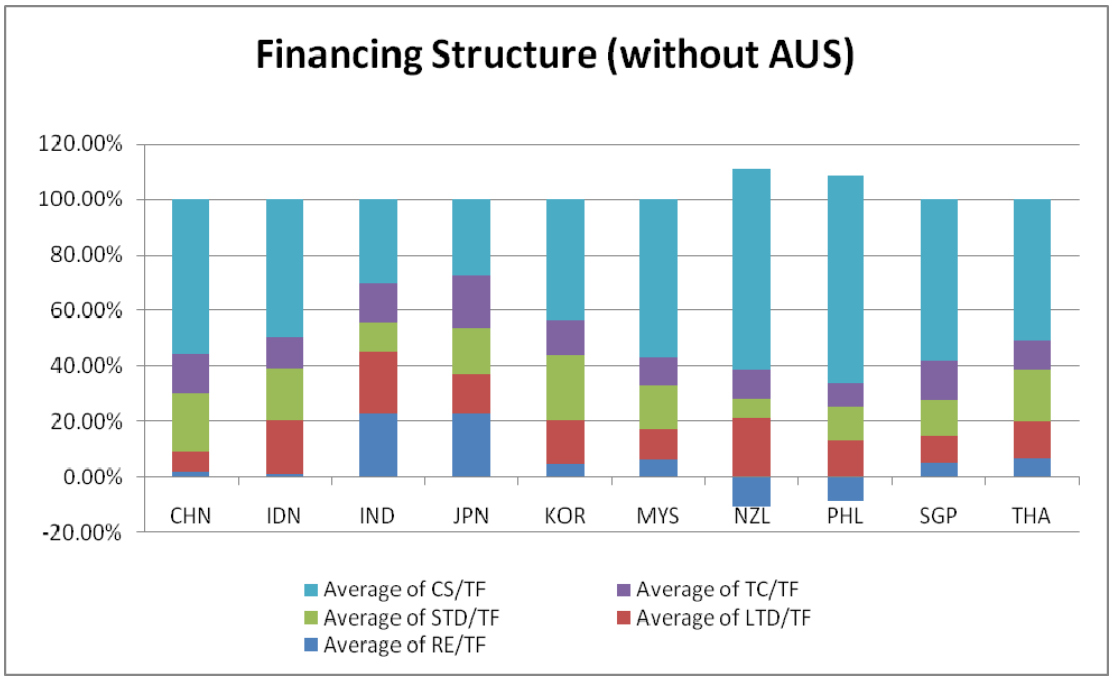
As noted earlier, a key element in explaining how financial changes affect the economy is an understanding of how they are transmitted to the corporate sector. This requires analysis of both the lending side and the borrowing side. It is not only the choices of financial institutions over the supply of credit, but also the choices of companies that determine the final outcome. Corbett provides an overview of what might be the expectations about corporate financing behavior in the light of previous work on other regions. The survey classifies existing research as being descriptive of the patterns of corporate finance or as trying to explain the drivers behind company choices of financial structure. An additional, more policy-relevant body of research, analyzes the impact of financing on real economic outcomes, such as growth or productivity. These latter studies have, in recent years, focused on whether bank-based or market-based financial systems produce better real-sector outcomes. Interestingly, the consensus is that neither system produces demonstrably better results in terms of growth or productivity. What matters is the quality of institutions and financial regulation rather than whether financing is bank or market based. This research result has yet to be fully appreciated in some policy circles, where there is still frequent discussion of one type of system over another without due attention paid to the question of quality. The paper points out the additional importance of such studies to understanding how financial shocks are transmitted to the real sector. Few empirical studies examine whether the source of finance (debt versus equity or retentions) matters for the *volatility* of outcomes, and few studies cover East Asia so there is a clear need for future research here in order to identify desirable policy improvements.

Corbett and Twite then report results of precisely the sort of analysis that Corbett's survey identifies as missing from current research. They develop a large, new database for the region based on company accounting data covering a high proportion of the listed firms in all the countries where firms regularly disclose information. Their data indicate some new and striking results. The financing patterns of Asian companies are quite different to those regularly reported for other countries.

Figure 1b from their paper (here Figure 2) illustrates two remarkable features of the financial structure of listed companies in the region. First, unlike the conventional wisdom for developed countries, retained earnings have not been the major source of finance in this region over this time period. Listed companies in East Asia rely heavily on outside sources of finance. The second feature is that, over time, the ratio of equity has risen dramatically as retained earnings have fallen. The trend is particularly noticeable after 2001. The drop in retained earnings began somewhat before the onset of the Asian financial crisis, suggesting that firms were increasingly fragile. During the crisis retained earnings dropped very steeply and, by 2001, had dropped to half their previous levels on average. For many of the countries, retentions were negative for the years immediately after the Asian crisis. Even more striking is that, from that time on, external finance came in the form of equity finance rather than debt. It appears that there was financial fragility before the crisis and that it took several years before companies were able to restructure to cover their growing losses. Once restructuring had been achieved, their access to stock market finance enabled them to use much higher proportions of equity finance than before the crisis. Whether this is a sign of financial health is a different matter: East Asian firms are now much more dependent on external (outside the company) finance than they were previously. The data cannot distinguish how much of the funding is foreign nor how much comes from other investors within the region versus elsewhere.

These are extraordinary results and are contrary to expectations based on the theories of the "pecking order of finance".

Figure 2



To some extent these data tell the story of the two financial crises. When financial markets opened up to some extent before 1998 the source of funding focused on debt. The Asian Financial Crisis brought this undone, and demonstrated that reliance on debt was not sustainable. After 1998 the sources of funding were reoriented to equity finance. The response to the GFC is not yet fully reflected in the data and is a topic for further work as the data become available. However, even in these processes, economy-level characteristics continue to be important. A topic for further work is the extent to which the burst of merger activity in reaction to the Asian crisis led to an apparent reorientation to equity rather than debt finance or retained earnings. Despite the unusual pattern in aggregate financial structure, Corbett and Twite find that choice of finance by firms is driven by broadly the same set of factors as in other countries.

The clear message from various estimations is that, in explaining the choice of financial structure, firm characteristics, industry affiliation and country characteristics all matter. This implies that it is not the behavior of Asian firms that is different but that the composition of the corporate sector, together with country characteristics that favor equity finance, must explain the pattern. A deeper understanding of this result and further

testing of the robustness of the finding is crucial for drawing policy inferences. Is it the case, for example, that policy should be focusing on strengthening the operation and supervision on stock markets to ensure that vulnerability to volatile movements in thin or illiquid markets does not unduly impact on companies. Or should policy focus on improving the quality of bank and bond markets so that a more balanced spread of financing across debt and equity could be achieved. What would be the effect of different tax regimes on the balance between debt, equity and retentions? The degree to which these policy questions matter depends to some extent on the results of the second part of Corbett and Twite's research.

Corbett and Twite turn also to the question of whether the structure of the sources of funds affects the growth of corporate investment in tangible (and in total) assets. Here, they find that country factors are much more important than financing structure in explaining performance. This finding is consistent with the emerging consensus of studies on other samples of countries. What it tells us is that measures of countries' institutional quality are more important than the sources of firms' finance or than the industrial composition of countries in determining the differences in countries' investment performance. This is a key result for policy makers since it puts the focus firmly on policy variables relating to market and regulatory quality as the source of better investment outcomes. Does this mean that financial structure does not matter for policy purposes? Not necessarily. In common with the existing literature, this study does not focus on the effect of financial structure on the volatility of real outcomes such as investment growth, nor does it exploit the possibilities in the data to examine the impact of specific episodes of financial crisis as transmitted through company financial structure. That is another area for future research and would help answer the important question of whether different financing structures provide greater robustness and reduce the vulnerability of the corporate sector even if they do not affect the longer-term, growth-inducing outcomes represented by levels of investment in tangible assets.

Thangavelu, Findlay and Chongvilaivan examine firm behavior and the effects of foreign ownership, financial constraints, and various aspects of foreign affiliates. These are all variables related to the channels of influence of integration but in this study these effects

are studied at the firm level. They use yet another new data base especially created for this project. This is data for a set of firms in Vietnam from 2002 to 2008, including data for over 5000 firms. They find that foreign ownership (which they can measure in terms of percentage of ownership, not just in terms of its presence or absence) is positively correlated with productivity. Financial constraints (e.g. low liquidity and limited access to external credit) appear to be a major threat to the productive performance of firms in the manufacturing industries in Vietnam. The evidence also points to the presence of scale efficiency and the importance of high-tech and human capital accumulations to productivity enhancement.

Final comments

Overall, the papers indicate there could be substantial gains from further financial market integration. The ability to smooth consumption and income variance could only grow with greater financial openness. With greater openness is likely to come greater regional integration. While the expectation is that this may raise some risks, in terms of the transmission of shocks from the rest of the world, the work here points to significant scope for welfare gains and little evidence that financial contagion is a large risk.

The work also demonstrates that country-specific factors are generally significant in understanding the processes of integration and their consequences. These studies indicate that the country-level factors most likely to be important are those related to institutional quality. If so, work on institutional quality alongside efforts to open the financial sector might not only add to the degree of integration but also ameliorate the trade-off with the risks of transmission of significant shocks. These results point to the benefits of "bottom-up" work on integration and removing the impediments to integration.

At this stage, this bottom-up strategy appears to be even more important than top-down institution building, such as the creation of regional monetary unions or regional bond markets. The results of this research show that business cycles within the region are not highly correlated, and, indeed are more highly correlated with cycles outside the region. Since symmetric shocks, or symmetric response to shocks, are considered one pre-requisite for monetary union, the region does not seem to meet this criterion. Alongside

the results showing the underdeveloped level of risk sharing and insurance against consumption volatility, there is clear evidence of benefit from developing additional mechanisms to allow private agents to access a more diversified set of income sources. Improved openness of financial markets is one mechanism to achieve this. Creating structures from the top down, such as the efforts to develop regional bond markets, may simply be solving problems that are not of the "first-order" in this region. Companies do not seem currently to demand greater access to bond finance. Their financing choices, while different from other regions, are not different in the way that was claimed as a rationale for building regional bond markets (that is, they are not overly bank financed). Nor do their choices seem to be distorted, in so far as that can be deduced from the finding that the drivers of corporate financing choices are broadly similar in this region to that in other groups of countries. Consumers are not yet even using the international capital markets that exist to smooth their consumption so there is little evidence that they need more such markets within the region. The problems that have been identified here – low levels of consumption smoothing, and business cycles that have been quite sensitive to movements outside the region (not yet decoupled, though the post-GFC data may change that view) – are better resolved at the economy level. If those problems were resolved and markets became more integrated as a result, then the transfers sought between economies and over time through structure such as regional bond markets might also be achieved. The long-run consequences of the bottom-up approach may well be to shift the parameters of the economies of the region to provide support for new top-down institutions. But while that might be the long-run sequence, the work reported here indicates that top-down institutional innovation is not the immediate priority.

Despite this skeptical finding about large-scale institution building related to financial markets at this stage of the region's development, there remains a rich agenda for regional cooperation.

Within the region, there are not only significant country differences in experiences to date, but also there is a wide range of experience of various sorts of institutional structures in financial markets and their links with local corporate structures. These institutional differences are driving the observed country differences in processes and consequences.

Our proposed future research program would exploit these differences in the region and identify more carefully the nature and contributions of country features. That analysis is a valuable input into the design of a capacity-building program for financial integration in this region and between this region and the rest of the world.

Chapter 2

Sequencing and Extent of Integration in Asia: The Real Financial Dimensions

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Abstract

This paper examines some of the salient issues surrounding the degree of economic integration among Asian countries with particular attention being paid to the nexus between real and financial integration. Using a novel and simple method, we derive some measures of price-based real and financial integration from the relative PPP and UIP relation. We then investigate the degree of integration between countries and groups of countries and analyze the sequence of integration – the extent to which the existence of one might cause the other. We find that, overall, integration is generally higher after the Asian crisis but the results are quite close. The original ASEAN nations – Indonesia, Malaysia, the Philippines, Singapore and Thailand – seem to be more integrated with rest of Asia than are other groups. The results of the dynamic estimations suggest that financial integration might lead real integration but not necessarily the opposite. This result may reflect the difference in the timing of adjustment of the respective markets. The paper concludes with some pertinent policy implications for the region.

Keywords: real integration, financial integration, Asia

JEL Classifications**:** F15, F36

1. Introduction

There has been a strong tendency in the literature to treat trade and monetary regionalism independently. Thus, the criteria for judging whether countries would be good partners within a customs union have focused on the size of the proposed union and the pre-union size of trade between potential partners (as indicating the likely extent of trade diversion), the degree of overlap in production (as a measure of the potential gains from specialization) and the cost differentials between prospective partners, the size of pre-union tariffs, the price elasticities of demand and supply for traded goods and services, and the scope for dynamic gains. Meanwhile, optimum currency area (OCA) criteria have focused on the degree of factor mobility between partners, size and openness, trade diversification, dissimilarity of commodity composition of production and trade baskets, macroeconomic trends and the synchronization of business cycles, the degree of labor market flexibility, the scope for regional transfers, and the strength of the financial sectors of potential members.

It is only more recently that the connections between trade and monetary integration have been examined, leading some analysts to claim, for example, that conventional OCA criteria are endogenous.[1] What are the connections and sequence between trade and financial integration? How financially integrated are the Asian economies? These are the two questions that this paper focuses on. The empirics in this paper will essentially be limited to countries that are the ASEAN plus Three economies for the period 1990–2009 subject to data availability.

As is shown in Section 5, the paper adopts a novel and very simple method of measuring real and financial market integration using the conventional parity conditions, relative PPP and UIP. To our knowledge, using the parity conditions in this manner to derive bilateral and regional integration has not been attempted in the literature. As such, we regard this as a significant addition to work on the topic of integration.

[1] Frankel and Rose (1998) suggest that intra-union trade is encouraged by reducing the risk of exchange rate changes and that this in turn increases the degree of synchronization between business cycles of countries comprising the union which is itself a criterion for an OCA. We return to this idea later.

To preview the results briefly, we find that, overall, integration is generally higher after the Asian crisis but the results are quite close. The original ASEAN nations – Indonesia, Malaysia, the Philippines, Singapore and Thailand – seem to be more integrated with rest of Asia than are other groups. This is the case for both real and financial integration and they appear to be especially well integrated with each other. We run some dynamic estimations to ascertain whether there is a possible sequence. There is evidence that financial integration might lead real integration but not necessarily the opposite. This result should be interpreted with some care as the causation might not reflect sequence, but rather the difference in timing of adjustment of the respective markets.

The paper is organized as follows. Sections 2 and 3 explore the economic and political economy issues surrounding the sequencing between trade and financial integration, respectively. Section 4 reviews some measures of integration that are commonly used in the literature.[2] Section 5 estimates the extent of financial and real integration in Asia. The final section concludes the paper.

2. Connections between Trade and Financial Integration[3]

What are the connections between trade and financial integration? First, if exchange rate stability encourages trade, the formation of an exchange rate union will help establish the conditions for a welfare-generating trade agreement. By reducing transactions and information costs, a single currency may encourage further trade among partners in a regional trade agreement (RTA). By the same token, however, an RTA may be undermined by exchange rate instability amongst members. Currency misalignment or competitive devaluations may generate a protectionist backlash, which goes against the purpose of the RTA and possibly even threatens its existence, as the recent experience of the Mercosur seems to suggest. Most recently in South America, the Mercosur trading agreement designed to encourage trade between Brazil, Argentina, Paraguay and Uruguay has been severely undermined by an uncoordinated exchange rate policy between Brazil and Argentina.[4] The devaluation of the Brazilian real in 1999

[2] Keeping in mind our empirics are limited by the data availability for emerging Asian economies.
[3] Sections 2 and 3 build upon Bird and Rajan (2006).
[4] The member countries of Mercosur also used economic integration to lock-in structural reforms which is an important political economy benefit of RTAs involving developing and transition countries.

accentuated the overvaluation of the Argentine peso and contributed to the economic crisis in Argentina, which in turn had significant negative repercussions on the Uruguayan banking system.[5] Trading partners were in effect pursuing competitive exchange rate policies and, as noted earlier, the ramifications of exchange rate changes will be much greater for close trading partners – fellow members of an RTA – than for other countries. A similar concern about competitive devaluations appears to exist in Asia.

Fernandez-Arias et al. (2002) present evidence based on 37 countries and 6 RTAs to suggest that the adverse effects of uncoordinated exchange rate policy may be more pronounced within the context of an RTA. These adverse effects can be expected to be greater the deeper the real sector integration. This is because the cross-price elasticity of demand for similar goods and services produced within the integrated region may rise (so-called "knife-edge" comparative advantage). This is particularly so if, as Fernandez-Arias et al. (2002) suggest, intra-regional FDI is especially footloose and sensitive to exchange rate changes and misalignments.

Second, the increased openness and intra-union trade encouraged by forming an RTA makes flexible exchange rates less appropriate and monetary integration more appropriate amongst partner countries.

Third, while the increased factor mobility that may be associated with forming a common market may substitute to some extent for trade amongst partner countries (as suggested by conventional trade theory), it may also substitute for exchange rate adjustment and therefore help to meet the criteria for an OCA.

Fourth, to the extent that a monetary union encourages intra-industry trade within the union, it may help to not only enhance the welfare gains from regional trade integration but also encourage the closer synchronization of business cycles that then helps retrospectively to justify the formation of the monetary union. This particular dimension of the relationship between trade and monetary regionalism has been empirically

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Concerns about the sustainability of Mercosur as only a regional trade agreement has given rise to suggestions in some policy circles that it be extended into a fully fledged regional monetary union (Fratianni, 2004; Levy Yeyati and Sturzenegger, 2000).

[5] A similar concern about competitive devaluations appears to exist in Asia.

investigated by Frankel and Rose (1998) using 30 years of data for 20 industrialized countries. They acknowledge that if RTAs or monetary unions encourage industrial specialization and inter-industry trade according to comparative advantage, this could reduce the correlation between business cycles in the member countries, which in turn could weaken the case for monetary integration since independent monetary tools, or a flexible exchange rate, may be needed to compensate for asymmetrical shocks (Krugman, 1993). It is therefore an empirical issue as to which of these effects – supply (asymmetry) or demand (symmetry) – will dominate.

Frankel and Rose (1998) claim that the empirical evidence that they examine suggests that closer economic integration has coincided with closer synchronization between business cycles – hence the argument that OCA criteria are endogenous. A study by Calderón et al. (2002) of 147 countries over the period 1960–1999 using annual data finds that the impact of trade integration among industrial country pairs on output fluctuations is 0.092, significantly higher than the impact among developing country pairs (0.019) or between industrial and developing country pairs (0.037). The authors conjecture that this is due to higher intra-industry trade (IIT) between industrial countries compared to inter-industry trade involving developing countries. More specific evidence to date for selected Asian economies suggests that the volume of intra-Asian trade does not necessarily lead to more symmetrical business cycles and could actually cause more idiosyncratic business cycles (Lee, 2004).

A number of implications follow from this analysis. If further EU enlargement encourages greater industrial specialization based on factor intensity-driven comparative advantage, it does not necessarily follow that the historical trend observed by Frankel and Rose will carry forward into the future. At the same time, however, the effects of industry-based asymmetrical shocks could be offset by the reduced incidence of demand-side shocks associated with the closer coordination of macroeconomic policy. The implication of this is that the effects of integration on the synchronization of business cycles within the integrated area are difficult to predict *a priori* and *ex ante*. Fortunately, the principal purpose of this paper is not to pursue this particular issue, but merely to observe that there will be inter-connections between trade and monetary integration, and that the direction of these connections may run both ways. Trade

integration and the formation of a common market may help to create conditions more suitable for monetary integration. Meanwhile, monetary integration may help to facilitate trade integration. It is in this context that some political actors and independent observers have been suggesting that monetary integration can take place in conjunction with or even precede trade regionalism.

3. The Political Economy of Sequencing Regional Trade and Monetary Arrangements

If the connection between regional trade agreements and regional monetary arrangements was simply that RTAs resulted in trade creation with partners and helped to establish the OCA criteria, it would be relatively easy to explain why historically RTAs tend to come first. However, the previous section identifies a much more complex and two-way relationship within which it is as easy to argue that exchange rate and even monetary union will help to maximize the benefits from RTAs. If there is this two-way relationship between trade and monetary integration, why is it that we observe a strong empirical tendency for trade agreements to come first? Why are they not preceded by exchange rate and monetary union; or why are regional trade and monetary arrangements not established simultaneously?

Conventional economic considerations on their own struggle to explain the observed trade-first strategy. One possibility is that the answer lies in the dynamics of integration, but this seems unlikely. As noted earlier, the dynamic effects of integration are difficult to pin down and quantify. In any case, there is a reasonable presumption that the dynamic effects of monetary integration on trade expansion will exceed the dynamic effects of trade integration on securing the conditions most suited for monetary union. At the very least, the dynamics do not conveniently explain the tendency for a “trade first” strategy toward integration. In terms of the economics of integration, it would be as easy to argue for a “monetary first” or a concurrent approach. So, again, why is this not what we observe?

RTAs and monetary unions are not just economic phenomena. Indeed, numerous studies emphasize the importance of political imperatives. Krugman (1996), for example, argues that many of the issues surrounding NAFTA at the time of its inception were of

little quantitative significance. From the viewpoint of the US there were never likely to be large gains in terms of increased trade or large costs in terms of unemployment amongst unskilled US workers or environmental degradation. Subsequent empirical studies appear to confirm this (Krueger, 1999). Instead, NAFTA offered the US a way of assisting Mexico at a time when it was anxious to strengthen Mexican democracy, encourage policy reform in Mexico and help Mexican economic development.

Similarly, Goodhart (1995) argues cogently that Economic and Monetary Union (EMU) in Europe reflects a political desire for closer integration. Strong and unambiguous justification is not to be found in the underlying economics. Emphasizing this point about the importance of politics, Eichengreen and Bayoumi (1999a,b) have concluded that from an economic standpoint East Asia may be as close to, or rather, as far away from being an optimum currency area (OCA) as Western Europe.[6] However, the authors go on to conclude that Asia is unlikely to move toward a European-type union anytime soon as

> there is little sign, comparable to the evidence which has existed in Europe for nearly 50 years, of a willingness to subordinate national prerogatives to some larger regional entity. There is no wider web of interlocking arrangements, as in the EU, which would be put at risk by a failure to follow through on promises of monetary and financial cooperation (Eichengreen and Bayoumi, 1999b, p. 11).[7]

If politics lies behind both trade and monetary agreements, it may be reasonable to assume that politics also helps explain the sequence in which RTAs and exchange rate and monetary unions occur. The short answer may simply be that the political rate of return to RTAs is higher than it is for monetary unions, so that it is rational for governments to pursue trade regionalism first.

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[6] This conclusion is based on an OCA index that takes into account the costs associated with asymmetric region-wide shocks as well as the benefits from stabilizing exchange rates with trading partners.

[7] In addition, substantial asymmetries in the sizes and levels and stages of economic development of the countries in Asia, on the one hand, and the *de facto* policy of strict non-intervention in one another's affairs (economic and particularly political) on the other, makes it extremely difficult to envisage the successful introduction of "tie-in" clauses to create punishment mechanisms to ensure conformity of economic policies as done in Europe.

Let us consider the options facing governments of geographically proximate states that are anxious to develop a closer relationship for political (military or security) reasons. A closer relationship can, in principle, extend to a full economic union but can be sub-divided into trade integration and monetary integration. Economic analysis suggests that there are probably small welfare benefits from trade liberalization within the context of an RTA. But the domestic political costs are probably even smaller and may indeed be outweighed by domestic political benefits. There are a number of elements to this.

First, the gainers will be those sectors of the economy that benefit from trade expansion and trade diversion. In the case of the European Union, for example, it has been the manufacturing sector that has gained from trade creation and the politically powerful agricultural sector that has gained from trade diversion (Sapir, 2000). An analytically strategic component of a customs union is the common external tariff. It is this tariff on imports from the rest of the world that generates trade diversion and the protectionism involved in RTAs (Krueger, 1999, 2000). The domestic political importance of trade diversion is revealed by the preference governments often show for RTAs as opposed to multilateral free trade. In the latter case, trade creation would be greater and trade diversion (except via non-tariff barriers) would be eliminated. In terms of basic economic analysis, the gains from multilateral trade integration would generally be higher. It is therefore the domestic politics of protectionism that tends to get in the way.

Trade policy tends to be more heavily driven by producer interests that may benefit from protectionism than by consumer interests where there would be a gain from cheaper imports, since producers represent a more coherent and better-organized political lobby. Consumers are probably ill informed about the effects of protectionism and are, in any case, poorly organized. Against this background, RTAs offer governments the closer regional relationships that they are anxious to establish at relatively little, if any, net domestic political cost. They may also offer the prospect of higher tax revenue than multilateral free trade. In this context, it is easy to see why they have been so widely pursued.[8]

[8] Of course, the suggestion that RTAs are pursued as a protectionist device is less relevant to some recent enthusiasts of regionalism like the small city state of Singapore which is already highly open to trade and

The matrix of costs and benefits is much different for monetary unions. Here there is less unanimity of view about the benefits. At least in the case of trade integration there is a consensus around the view that there will be some small benefit via trade creation. Not so in the case of monetary unions. Governments therefore encounter significant uncertainty surrounding the benefits from a fully fledged monetary union. The claim that monetary unions will exert a counter-inflationary effect also becomes less compelling in an environment in which inflation is no longer perceived as a problem.[9] Moreover, while monetary unions may offer a pro-trade benefit, they do not offer the protectionist pay-off that is a feature of many RTAs.

Lodged against the uncertain benefits from regional monetary arrangements is an array of potential political costs. First, there is the implication that exchange rate unions require enhanced labor market flexibility or intra-regional labor mobility. Establishing this risks domestic political opposition if powerful trades unions are to be confronted. Second, as the recent debt crisis in Greece, Portugal and Spain and their impact on the rest of Euroland has shown, exchange rate unions imply a need for fiscal transfers within the union and this may encounter political resistance especially amongst the probable creditor nations. Third, and perhaps most significantly, there is the whole notion of "national sovereignty" over domestic macroeconomic policy culminating, in the context of Euroland, in the abandonment of national currencies. This will carry a particularly high cost for countries that possess a strong feeling of national identity or whose monetary authorities are concerned about forsaking hard-earned credibility. Clearly, from a political perspective it is irrelevant whether there is a real loss of sovereignty or not. It is the perception that counts. In addition to the above, the political benefits from incremental regional integration may be subject to diminishing returns. What is the political value-added from the greater integration that monetary union brings? Against this background it is easy to see why governments may pursue regional trade integration but may pause before they embark on monetary integration.

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investment flows. Pursuit of trade agreements by such economies is driven by other economic considerations, though security and political reasons also play a significant role (Rajan and Sen, 2002).

[9] It was possibly the attractions of the counter-inflationary effects of an exchange rate union that encouraged the UK to join the Exchange Rate Mechanism of the European Monetary System in the early 1990s.

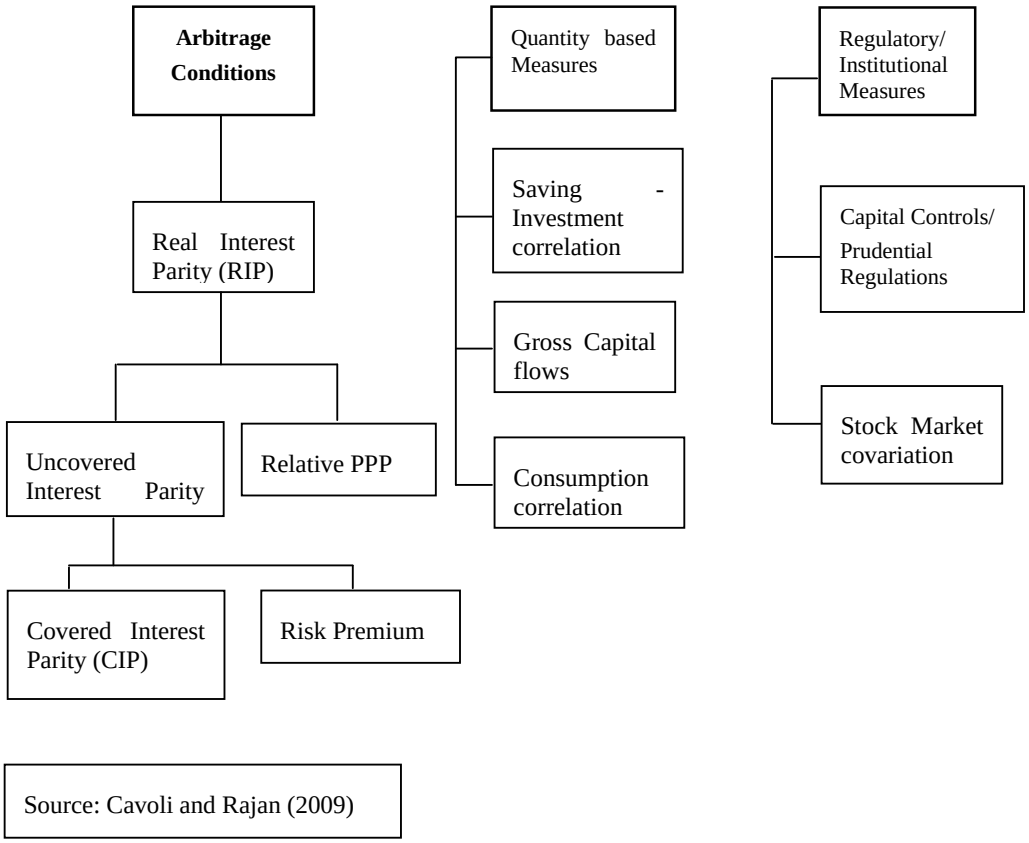
4. Price-based Measures of Financial and Real Integration

While monetary integration may be the final step in regionalism, it is important to explore the nexus between financial and real sector integration. There is an enormous literature on the measurement of financial and real integration and there exist a number of measures of integration (see Figure 1; also see Corbett, 2010). The first category refers to the price-based conditions involving mainly debt flows. These are largely embodied in the interest parity conditions, viz. the covered interest parity (CIP), the uncovered interest parity (UIP), and the real interest parity (RIP). As will be discussed, the CIP is the narrowest of measures (of capital mobility per se), the UIP being a somewhat broader measure (of financial integration), while the RIP is the broadest arbitrage measure (incorporating both financial and real integration). The second category involves quantity-based measures such as savings–investment correlations, consumption correlations, current account dynamics and gross capital flows.[10] The third category can be broadly classified as regulatory or institutional factors (such as capital controls and prudential regulations) as well as non-debt flows such as the co-movement of stock market returns. We limit our focus here to the common price-based measures (see Cavoli and Rajan, 2009, chapter 9 for a discussion of quantity measures). The aim is to formulate some stylized facts about the extent of financial integration amongst East Asian economies.

Price-based measures of financial integration or arbitrage conditions seek to equate rates of returns of comparable assets across different markets/economies. In this section we examine three common interest parity conditions, viz. CIP, UIP and RIP.[11]

[10] Gross capital flows and current account dynamics will not be covered here. See Montiel (1994) and Rajan and Siregar (2002) for the former and Obstfeld (1998) and Taylor (2002) for the latter; also see Lane and Milesi-Feretti (2001). While examination of cross-border capital flows is useful, it is probably of limited use as a measure of financial integration. For instance, a country that is highly integrated with international capital markets – in the sense of there being no significant difference in domestic and international rates of return – will experience little if any international portfolio capital flows (at least debt related flows). An interesting extension to this issue is provided in McCauley et al. (2002) and McCauley (2007), who examine the extent to which Asian bonds issued are bought by Asian counterparties. Morevoer, there is an interesting literature emerging where gravity-type models are being employed for financial flows as a way of measuring the likely direction of capital between countries (see Kim et al., 2006 and Poonpatipul et al., 2006).

Figure 1. Categorizing Measures of Financial Integration: A Simple Framework



Source: Cavoli and Rajan (2009)

[11] Another arbitrage condition is the closed interest parity condition that essentially states that the returns on identical instruments of the same currency but traded in different markets (such as onshore and offshore markets) should be equalized. Any deviation arising from this condition can be interpreted as possible evidence of the existence of capital controls in one of the two countries or the existence of other political or country risks that may prevent interest rate equalization. The measurement of the closed interest differential is difficult for developing economies as it requires that a particular asset is traded sufficiently for there to be a liquid offshore market for it (see Obstfeld, 1998 and Frankel and Okwongu, 1996).

4.1. The Covered Interest Parity (CIP) Condition

The CIP may be formally stated as follows:

$$i_t = i^*_t + f^d_{t,t+n} \quad (1)$$

where: i_t is the domestic interest rate, i^*_t is the foreign or benchmark interest rate (US rate unless otherwise stated) and $f^d_{t,t+n}$ is the forward margin (discount on the domestic currency) for n periods into the future (in logs).[12]

The CIP indicates that the difference between the current spot rate and the forward rate will equal the interest differential between similar assets measured in local currencies. Therefore, in the absence of capital account restrictions and/or transactions costs, the covered interest differential (CID) ought not to differ significantly from 0. A negative differential suggests the existence of capital controls or transactions costs that restrict capital *outflows*. Investors would certainly not tolerate a lower domestic return in the absence of capital controls (Frankel, 1991).

4.2. The Uncovered Interest Parity (UIP) Condition

The UIP may be represented as follows:

$$i_t = i^*_t + \Delta e^e_{t,t+n} \quad (2)$$

where: $\Delta e^e_{t,t+n}$ is the expected change in the log of exchange rate at time $t+n$.

The nexus between the UIP and the CIP is apparent by decomposing eq. (2) as follows:

$$i_t - i^*_t - \Delta e^e_{t,t+n} = [i_t - i^*_t - (f_{t,t+n} - e_t)] + (f_{t,t+n} - e^e t,_{t+n}) \quad (3)$$

where the first bracketed term on the right-hand side is the CIP (sometimes referred to as country or political risk premium), and the second term is the currency risk premium. If the CIP holds but the UIP is rejected, this would imply that forward rates are biased predictors of future exchange rate.

[12] Throughout this paper, the exchange rate is quoted as the domestic price of foreign currency. The forward margin can also be expressed as $(f_{t,t+n}–e_t)$ where $f_{t,t+n}$ is a forward rate and e_t is the spot rate (both in logs).

Before formally testing Equation (2), the researcher needs to find a way of measuring the expectation of the future exchange rate. One way to make the leap from theory to empirical operationalization is by using *ex-post* differentials. This may be justified by assuming that Rational Expectations (RE) holds. This assumption – that the actual or ex-post spot exchange rate equals the expected spot exchange plus an uncorrelated error term – is a practical way of overcoming the problem of non-observable expected exchange rate changes. Another approach is to use surveys of exchange rate expectations of market agents.

4.3. The Real Interest Parity (RIP) Condition

The third arbitrage condition is the RIP. This condition may be derived by first taking the following UIP equation:

$$\Delta e^{e}_{t,t+n} = i_t - i^{*}_{t} \tag{4}$$

and substituting it into an expression for relative purchasing power parity (PPP):

$$e_t = p_t - p^{*}_{t} \text{ or } \Delta e^{e}_{t,t+n} = \pi^{e}_{t,t+n} - \pi^{e*}_{t,t+n} \tag{5}$$

Combining the two with the Fisher equation, $r_t = i_t - \pi^{e}_{t,t+n}$ yields the expression for the RIP:

$$r_t = r^{*}_{t} \tag{6}$$

Clearly, for the RIP to hold the UIP, PPP and the Fisher hypothesis also need to simultaneously hold. This is no easy task given the lack of empirical success of both the UIP and PPP over the short to medium terms. Thus, the RIP is generally considered a very long run interest parity condition encompassing both real and financial linkages.

4.4. Summary of Price-Based Measures

The most popular methodology for determining the extent of financial integration is the uncovered interest parity (UIP), which was emphasized above. Indeed, as Flood and Rose (2002) have noted, “the UIP is a classic topic of international finance, a critical building block of most theoretical models” (p.252). However, it is important to keep a number of caveats in mind when interpreting the findings. First, the test for the UIP is in

fact a joint test for the CIP and the currency risk premium. We are unable to test separately for the CIP given lack of data on forward foreign exchange markets in developing East Asia. Second, the tests for the UIP generally assume that all agents form expectations rationally. Thus, the failure of the UIP to hold (in the sense that there exists large and persistent UIDs), could be because (a) the Covered Interest Parity (CIP) does not hold (imperfect capital mobility); (b) there may be large and time-varying currency risk premiums (imperfect asset substitutability (see Bhatt and Virmani, 2005); or (c) rational expectations (RE) is an inappropriate assumption for the foreign exchange markets (or that the market consists of heterogeneous agents).[13]

While the CIP is a generally preferred measure of financial integration in view of the preceding limitations of operationalizing the UIP (Frankel, 1991), as noted, there needs to be a liquid forward foreign exchange market in the currency pair under investigation. While this is not problematic for industrialized economies, it is definitely a niggling problem for developing economies. In any case, Willett et al. (2002) observe:

> [S]ubstantial deviations from covered interest parity are a good indication that capital mobility is less than perfect. [However] [f]inding that covered interest parity holds is consistent with either high or low capital mobility, and there is no good reason to presume that the magnitudes of deviations from interest parity will provide a reasonable proxy for the degree of international capital mobility. In terms of modern theory, the appropriate measure of capital mobility is the extent to which uncovered rather than covered interest parity holds (pp. 424–5).

With regard to the third price measure of financial integration, the RIP, the conditions for it to hold are quite prohibitive as both the PPP and the UIP need to simultaneously hold. However, the RIP provides a useful general condition encapsulating both trade and financial linkages, and thus should not be dismissed as being altogether irrelevant.

[13] McCallum (1994) also believes that deviations from the UIP may be due to monetary policy decisions of central banks and proposes that a monetary policy reaction function be included in an expression for the UID. Bird and Rajan (2001) offer bank-based explanations for persistent interest rate differentials in East Asia; also see Edwards and Khan (1985) and Willett et al. (2002).

The RIP is more likely to hold over longer time horizons and acts as a useful proxy for the marginal cost of capital.[14]

Whichever price measure of financial integration is used, there are two important considerations with their use. First, arbitrage conditions are probably a more appropriate way of measuring integration for certain sectors (e.g. the banking sector) rather than the whole economy (Chinn and Dooley, 1995). Second, a perennial problem with using such price measures, especially in developing economies, is what interest rate should be used, and to what extent are the available interest rates comparable across countries.

5. Empirical Estimation of Integration in East Asia

5.1. Empirical Strategy

This section will present an investigation of the relationship between real and financial market integration by examining the extent of real versus financial integration and also the dynamics of this nexus. The objective of the exercise is to ascertain whether one might possibly be a precondition to the other. The level of integration will be examined in two dimensions. The first is bilateral integration – how closely integrated each country might be with each other. The second looks at regional integration – that is, how integrated each individual country is to a grouping of other countries. These groupings are discussed further below.

In keeping with the theme developed above, integration will be measured by utilizing the parity conditions – UIP and Relative PPP (RPPP). Both measures lend themselves appropriately as ways to ascertain the degree of integration between countries and they do so in a way that is underpinned by agent behavior in both the real and asset markets. However, since we are measuring integration and not the degree to which UIP and RPPP hold, the absolute value of the uncovered interest differential (UID) and RPPP (or, by construction, the real exchange rate) differential is taken. The UID is our proxy

[14] In fact, the UIP may also be more valid over longer time horizons, i.e. over one year (see Chinn and Meredith, 2004 and Madarassy and Chinn, 2002).

measure for financial market integration and the RPPP deviation represents our measure of real integration. These are given as follows:

$$\textit{Real Integration (RI)} = ABS(\Delta e^{e}_{t,t+n} + \pi^{e*}_{t,t+n} - \pi^{e}_{t,t+n}) \quad (7)$$

$$\textit{Financial market integration (FI)} = ABS(i_t - i^{*}_{t} - \Delta e^{e}_{t,t+n}) \quad (8)$$

where the variables and notation are as described above. The *smaller the value of RI or FI, the greater the possible integration* as a smaller number implies that the asset markets and/or goods markets exhibit greater convergence. Two important caveats should be noted before proceedings.

First, there are, in this literature, many competing methods of calculating financial and real integration (Corbett, 2010). The rationale for selecting the ones described above are manifold:

a) They are simple and easy to comprehend.

b) Data are available for all countries sampled (although the sample sizes do vary).

c) They are underpinned by economic intuition about agent behavior.

The two measures can be summed and, thus are able to be compared directly. This is crucial as we are examining the relationship and the interaction between the two measures.

Second, UIP is regarded in the literature as a flawed measure but its inclusion here as an integration measure is justified on the basis of the arguments presented above, and on the following:

a) The literature rarely uses UIP as an integration measure, instead focusing on whether or not UIP holds. One of the bigger issues with whether UIP holds is usually over the sign of the UID. By taking the absolute value, this issue is mitigated to some extent.

b) Furthermore, excessive exchange rate movements are often the cause of suspicious UIDs. In this sample, the exchange rate movements are relatively small as most countries employ some degree of exchange rate fixity for local currencies.

c) In any event, some basic robustness testing was conducted comparing the absolute values of UID used in this study against some common price-based measures as calculated by the Asian Development Bank (ADB). It is found that other measures are not on the same scale as our FIs – making direct comparison with RI impossible. It is also found that, while there is some variation (this is expected as each measure will pick up on slightly different integration characteristics), there is some consistency between measures. In other words, those countries highly integrated tend in one measure tend also to be highly integrated in others (see Annex for more details).

5.2. Data and Sources

Monthly observations for the period 1990m1–2009m7 are used. All data are taken from the International Financial Statistics (IFS) CD database (August 2009) of the International Monetary Fund (IMF). Exchange rate data are taken from line RF and the cross-rates were calculated from each local currency per US dollar. The exchange rates are reported in natural logs and, as such, $\Delta e^{e}_{t,t+n}$ is calculated as (100*), the log monthly difference of the exchange rate. The interest rate data used are taken from line 60B, money market rates. These are based on interbank rates and contain sufficient volatility to form the basis of the empirical testing undertaken below. Interest rates are all divided by 12 to reflect a monthly return. Inflation data are taken from CPI series, line 64, and are calculated as the monthly change in CPI, [log CPI(t) – logCPI(t–1)]*100. Each measure, therefore, is a percentage absolute deviation from either relative PPP or UIP.

Each measure of financial and real integration is calculated for each country pair. Furthermore, each measure is calculated for each country against a regional grouping. The groupings (along with associated country acronyms) are as follows: ASEAN 1 = [Indonesia (ID), Malaysia (MA), Philippines (PH), Singapore (SG), Thailand (TH)]'. ASEAN2 = [Brunei (BR), Cambodia (CA), Laos (LA), Myanmar (MY), Vietnam (VT)]. ASEAN = ASEAN1 + ASEAN2. BIG3 = [China (CH), Japan (JP), Korea (KR)]. For example, we can measure Indonesia's integration (real and financial) with, say, Malaysia by observing the FI and RI between the two countries. We can also measure Indonesia's integration with the BIG3 by calculating her UID and RPPP Deviations

with China, with Japan and with Korea. For these calculations, we simply added each bilateral measure, so Indonesia's level of financial integration with the BIG equals the FI between Indonesia and China + FI between Indonesia and Japan + FI between Indonesia and Korea. To derive the level of integration between a particular country and the region of which it is a member, the country is left out of the member's group.

5.3. Results and Discussion

This section is divided broadly into two parts. The first examines the extent of (or level of) integration by calculating the mean RI and FI for the full sample, a pre-Asia crisis sample, and post-crisis sample. The second part utilizes the time series variation in the sample by examining the interaction between RI and FI. In this part, we investigate whether integration follows a sequence; is there sufficient evidence to suggest that real integration leads or lags financial market integration?

Table 1A presents bilateral RI for the full sample. Table 1B presents that same measure for a pre-Asia-crisis sample (1990m1–1997m5) while Table 1C presents bilateral RI for a post-crisis sample (2000m1–2009m7). Table 2A presents bilateral FI for the full sample. Table 2B(2C) present the corresponding results for the pre-(post)-crisis sample. The most obvious observation when one eyeballs all three figures is that there is not much difference between the pre and post values of integration. Furthermore, there do not seem to be overwhelming differences between RI and FI over each sample period. Some patterns do emerge: Singapore and Malaysia appear to be the countries most

Table 1A. Bilateral Real Integration, Full Sample

	BR	CA	CH	ID	IN	JP	KR	LA	MA	MY	PH	SG	TH	VT
BR	-													
CA	0.003	-												
CH	0.268	0.667	-											
ID	0.431	0.176	1.072	-										
IN	0.052	0.039	0.718	0.021	-									
JP	0.246	0.201	0.062	0.095	0.073	-								
KR	0.112	0.195	0.581	0.037	0.059	0.132	-							
LA	0.105	0.015	1.455	0.246	0.158	0.283	0.213	-						
MA	0.174	0.176	0.385	0.008	0.013	0.086	0.031	0.269	-					
MY	1.760	1.572	0.195	1.819	1.761	1.647	1.846	1.550	1.760	-				
PH	0.119	0.087	0.581	0.118	0.096	0.022	0.155	0.143	0.109	1.669	-			
SG	0.007	0.109	0.162	0.119	0.098	0.024	0.157	0.114	0.111	1.644	0.001	-		
TH	0.189	0.126	0.393	0.056	0.035	0.038	0.177	0.186	0.046	1.737	0.061	0.063	-	
VT	0.158	0.076	0.627	0.295	0.017	0.217	0.324	0.012	0.251	1.502	0.178	0.180	0.193	-

Table 1B. Bilateral Real Integration, Pre-crisis Sample

	BR	CA	CH	ID	IN	JP	KR	LA	MA	MY	PH	SG	TH	VT
BR	0													
CA	0.037	0												
CH	0.279	0.117	0											
ID	0.184	0.071	0.558	0										
IN	0.384	0.106	1.09	0.382	0									
JP	0.338	0.874	0.026	0.015	0.398	0								
KR	0.317	0.287	0.551	0.138	0.244	0.153	0							
LA	0.035	0.086	0.713	0.449	0.678	0.568	0.553	0						
MA	0.168	0.019	0.163	0.053	0.436	0.038	0.192	0.459	0					
MY	1.323	1.08	0.178	1.569	1.951	1.554	1.707	1.092	1.515	0				
PH	0.018	0.185	0.427	0.224	0.606	0.208	0.362	0.181	0.17	1.345	0			
SG	0.082	0.106	0.061	0.168	0.551	0.153	0.306	0.207	0.114	1.4	0.055	0		
TH	0.111	0.021	0.255	0.067	0.451	0.052	0.206	0.343	0.014	1.501	0.156	0.1	0	
VT	0.031	0.046	1.151	0.073	0.668	0.849	0.347	0.267	0.025	0.98	0.057	0.136	0.042	0

Table 1C. Bilateral Real Integration, Post-crisis Sample

	BR	CA	CH	ID	IN	JP	KR	LA	MA	MY	PH	SG	TH	VT
BR	0													
CA	0.092	0												
CH	0.132	0.417	0											
ID	0.332	0.007	0.798	0										
IN	0.246	0.041	0.455	0.034	0									
JP	0.236	0.321	0.251	0.313	0.279	0								
KR	0.366	0.0215	0.558	0.207	0.174	0.105	0							
LA	0.285	0.179	0.462	0.139	0.221	0.675	0.263	0						
MA	0.124	0.11	0.304	0.107	0.074	0.205	0.069	0.271	0					
MY	1.685	1.382	0.275	1.504	1.464	1.677	1.699	1.278	1.512	0				
PH	0.014	0.091	0.485	0.084	0.05	0.229	0.123	0.287	0.023	1.515	0			
SG	0.035	0.131	0.255	0.123	0.089	0.189	0.084	0.305	0.015	1.524	0.039	0		
TH	0.029	0.062	0.272	0.054	0.02	0.258	0.118	0.223	0.049	1.512	0.029	0.069	0	
VT	0.131	0.074	0.513	0.126	0.088	0.317	0.345	0.198	0.171	1.345	0.135	0.177	0.122	0

Table 2A. Bilateral Financial Integration, Full Sample

	BR	CA	CH	ID	IN	JP	KR	LA	MA	MY	PH	SG	TH	VT
BR	-													
CA	0.149	-												
CH	0.299	0.415	-											
ID	0.108	0.258	0.142	-										
IN	0.524	0.493	0.054	0.691	-									
JP	0.072	0.079	0.008	0.165	0.054	-								
KR	0.111	0.176	0.151	0.020	0.088	0.158	-							
LA	1.326	0.675	0.730	0.483	0.474	0.832	0.507	-						
MA	0.084	0.039	0.035	0.166	0.066	0.055	0.154	0.660	-					
MY	0.699	0.779	0.592	0.472	0.609	0.598	0.494	0.075	0.630	-				
PH	0.599	0.345	0.271	0.125	0.392	0.291	0.146	0.307	0.314	0.314	-			
SG	0.086	0.084	0.027	0.120	0.138	0.044	0.113	0.675	0.065	0.565	0.246	-		
TH	0.196	0.319	0.068	0.081	0.150	0.083	0.075	0.568	0.106	0.522	0.206	0.038	-	
VT	0.131	0.079	0.091	0.082	0.066	0.302	0.267	0.398	0.271	0.503	-	0.244	0.231	-

Table 2B. Bilateral Financial Integration, Pre-crisis Sample

	BR	CA	CH	ID	IN	JP	KR	LA	MA	MY	PH	SG	TH	VT
BR	0													
CA	0	0												
CH	0	0.42	0											
ID	0	0.217	0.609	0										
IN	0	0.039	0.124	0.473	0									
JP	0	0.687	0.541	0.124	0.349	0								
KR	0	0.267	0.758	0.134	0.608	0.258	0							
LA	0	1.262	1.808	1.229	1.402	1.43	1.018	0						
MA	0	0.093	0.54	0.073	0.399	0.051	0.208	1.187	0					
MY	0	0.339	0.77	0.145	0.618	0.269	0.011	0.977	0.218	0				
PH	0	0.57	0.919	0.298	0.771	0.422	0.163	0.639	0.372	0.153	0			
SG	0	0.045	0.525	0.072	0.4	0.051	0.207	1.307	0.001	0.217	0.71	0		
TH	0	0.503	0.691	0.085	0.558	0.209	0.049	1.205	0.016	0.059	0.213	0.157	0	
VT	0	0.335	0.244	0.256	0.294	1.449	0.727	1.031	0.318	0.318	0.048	0.81	0.341	0

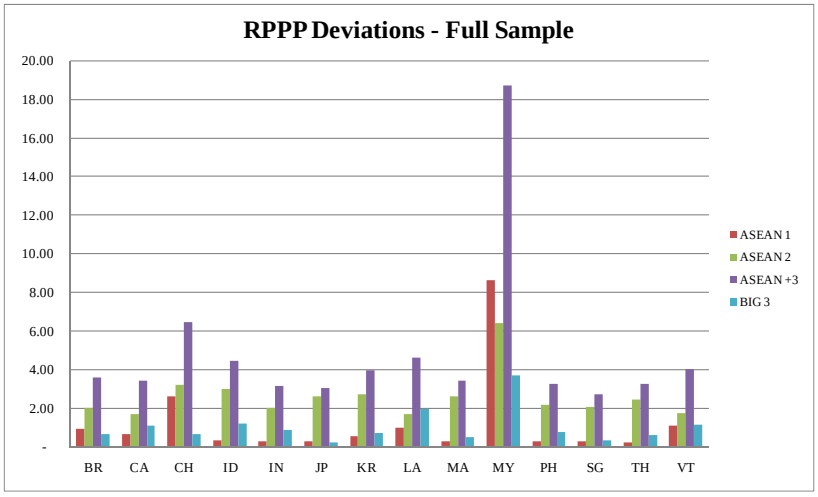
Table 2C. Bilateral Financial Integration, Post-crisis Sample

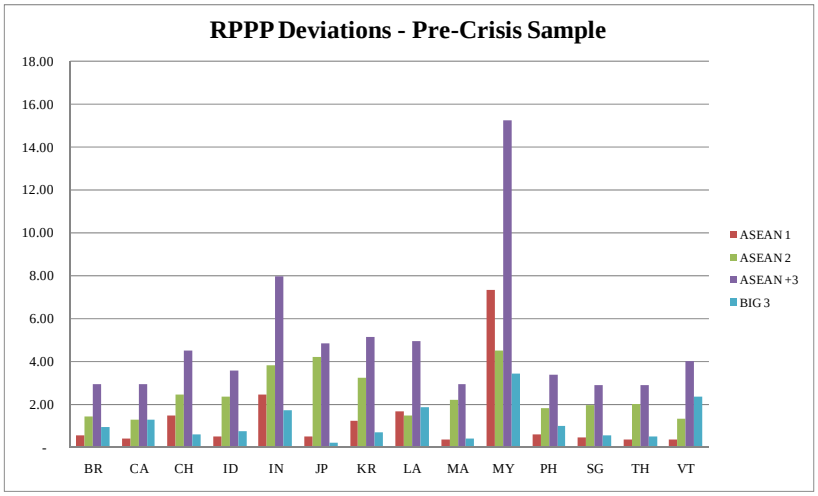
	BR	CA	CH	ID	IN	JP	KR	LA	MA	MY	PH	SG	TH	VT
BR	0													
CA	0.149	0												
CH	0.299	0.279	0											
ID	0.108	0.233	0.046	0										
IN	0.524	0.535	0.152	0.603	0									
JP	0.073	0.092	0.347	0.326	0.321	0								
KR	0.111	0.044	0.181	0.188	1.325	0.166	0							
LA	1.326	1.545	1.247	1.159	0.555	1.703	1.238	0						
MA	0.084	0.147	0.136	0.06	0.458	0.155	0.114	1.3	0					
MY	0.699	0.766	0.484	0.603	0.326	0.848	0.795	0.678	0.647	0				
PH	0.599	0.319	0.04	0.086	0.071	0.412	0.275	1.149	0.193	0.448	0			
SG	0.086	0.092	0.162	0.14	0.373	0.185	0.018	1.333	0.039	0.685	0.227	0		
TH	0.196	0.144	0.163	0.138	0.189	0.184	0.018	1.387	0.035	0.676	0.224	0.001	0	
VT	0.131	0.007	0.117	0.011	0.283	0.204	0.222	1.401	0.015	0.593	0.163	0.082	0.091	0

integrated with the others. In fact, the ASEAN 1 countries seem to return some very low numbers. The ASEAN2 countries appear to be least integrated with other countries.

Figure 2A to 2C presents the extent of bilateral RI for each country to the groupings defined above for the full sample, pre- and post-crisis samples respectively. The level of integration in the post crisis sample appears to be marginally less (larger RI and FI) than the pre crisis sample. The level of integration of Myanmar is lower than the others – as seen in Table 1. The RI to the ASEAN2 nations is lower (higher RI) than for other groupings.

Figure 2A to 2C RPPP Deviations





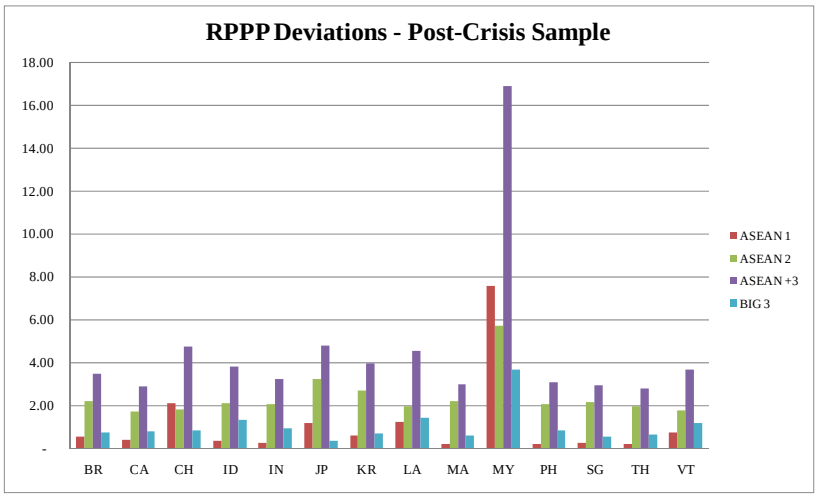
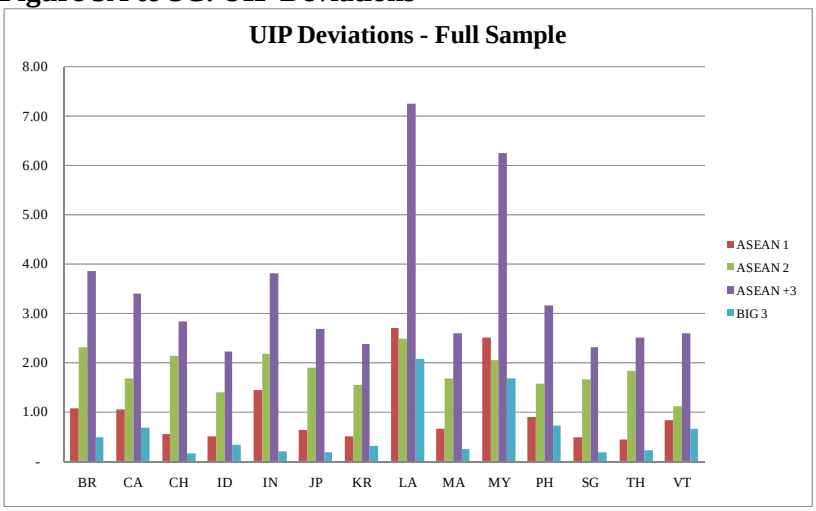
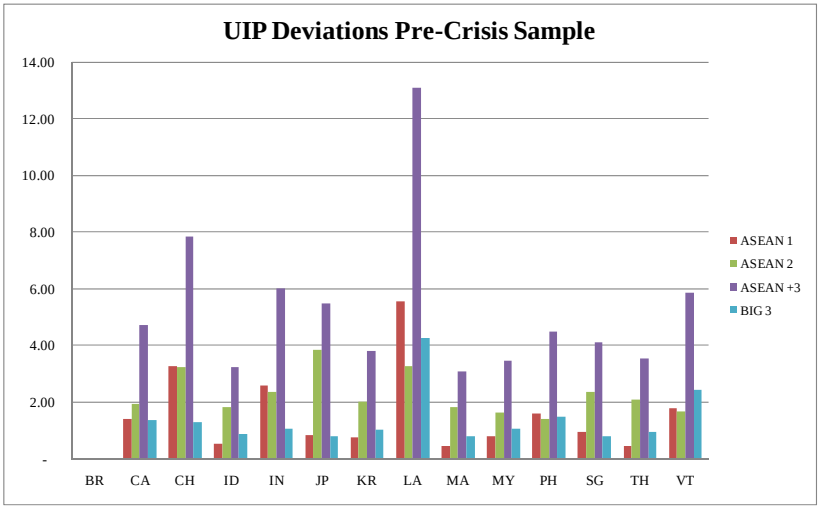


Figure 3A to 3C presents the extent of bilateral FI for each country to the groupings defined above for the full sample, pre- and post-crisis samples respectively. As with the results for RI, the differences appear minimal and the level of integration to ASEAN2 is lower than for the others.

Figure 3A to 3C. UIP Deviations





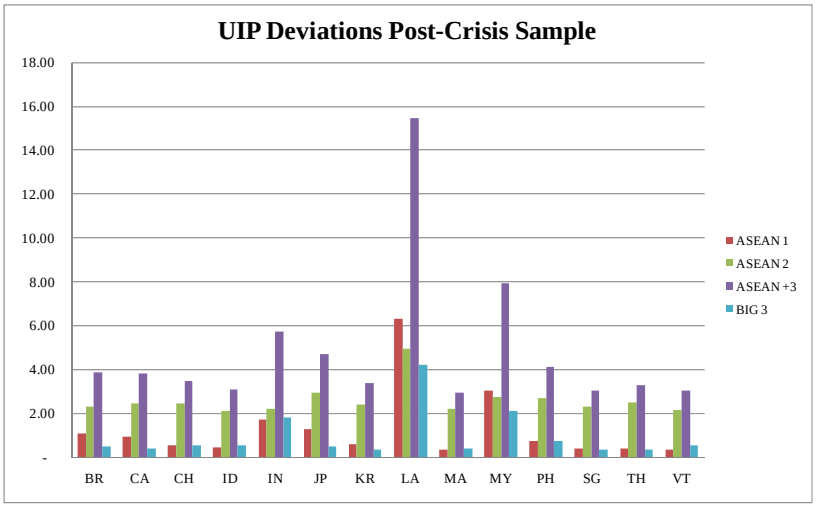
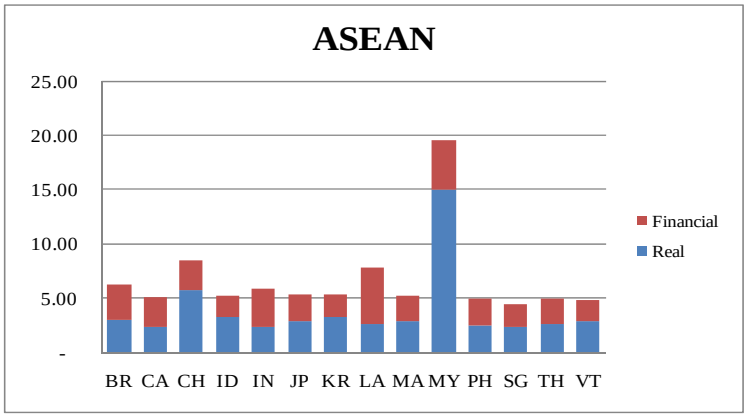
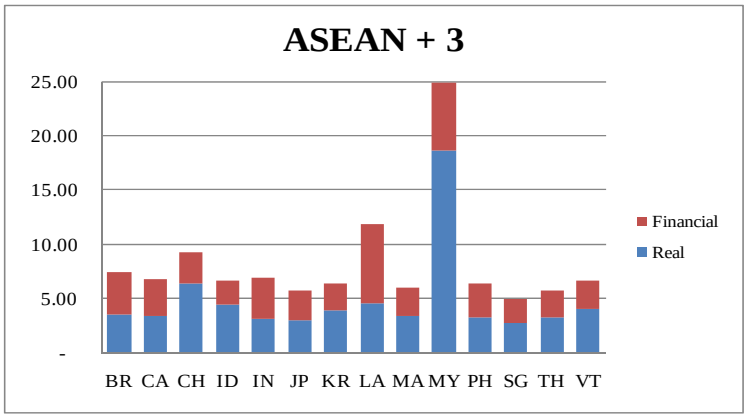


Figure 4A to 4C shows the relationship between RI and FI by presenting both together (summed) as a measure of "economic" integration. This is done for each country as measured against ASEAN, ASEAN+3 and BIG3 for the full, pre- and post-crisis sample respectively. It appears there is a lower degree of financial integration (larger FI value) post-crisis against ASEAN+3 than when compared to the pre-crisis – but the effect is quite marginal. The opposite appears to occur when the level of integration against ASEAN is observed, but it is again worth noting that the effect is slight. The extent of integration to the Big 3 countries is identifiably high.

Figure 4A. Real + Financial Integration, Full Sample





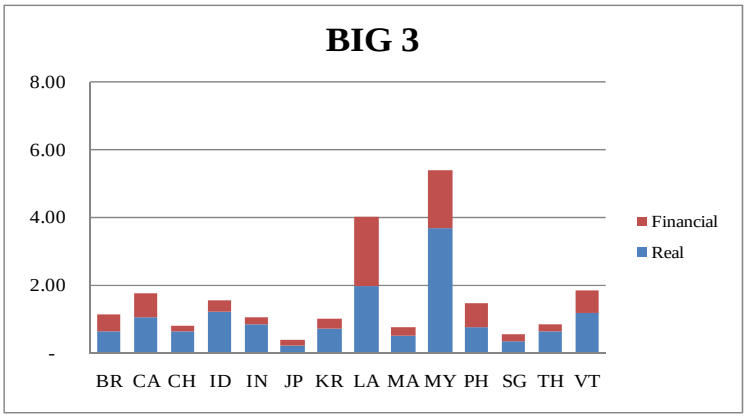
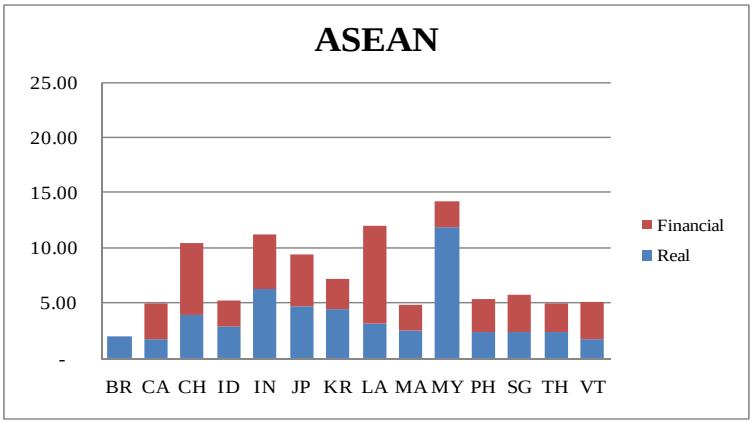
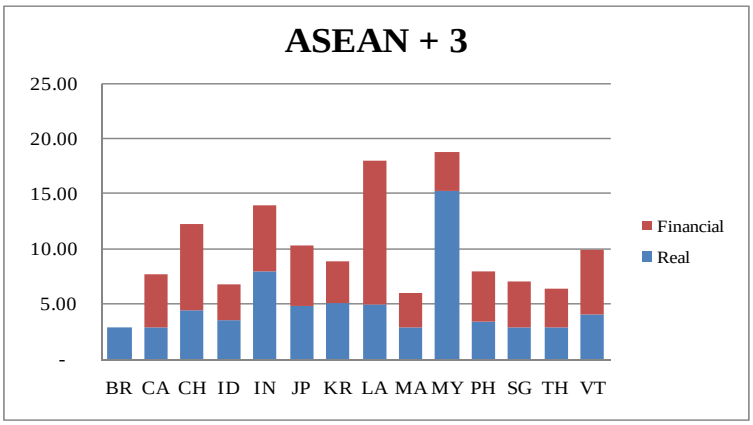


Figure 4B. Real + Financial Integration, Pre-Crisis





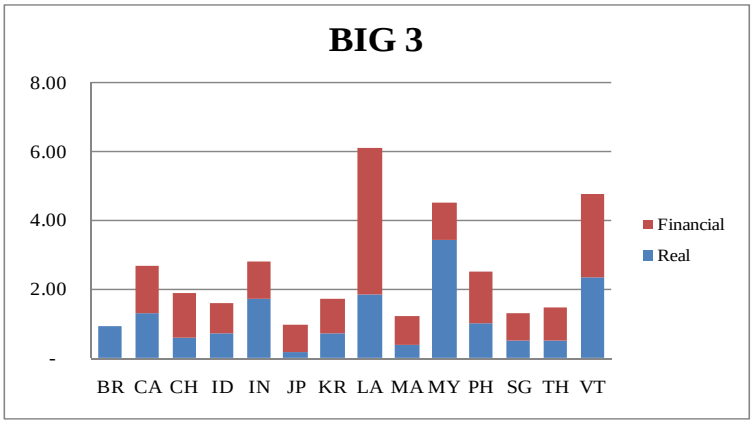


Figure 4C. Real + Financial Integration, Post-Crisis

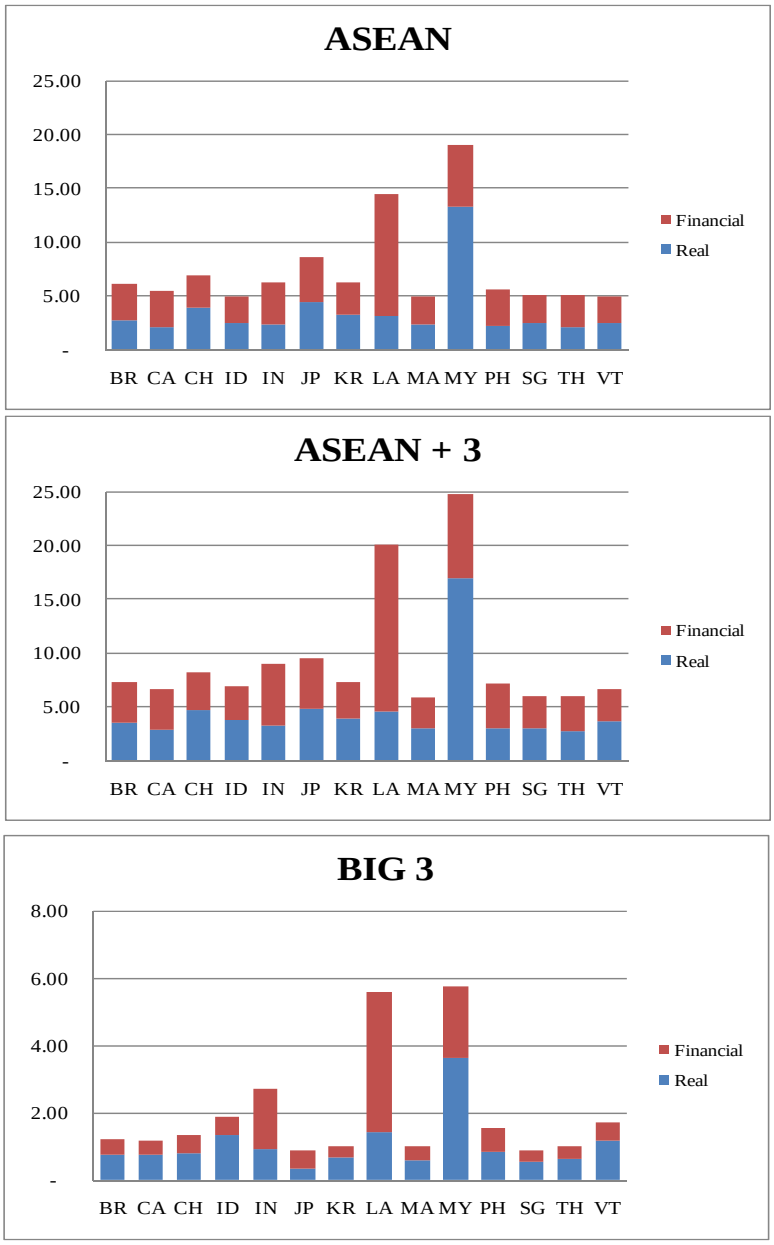
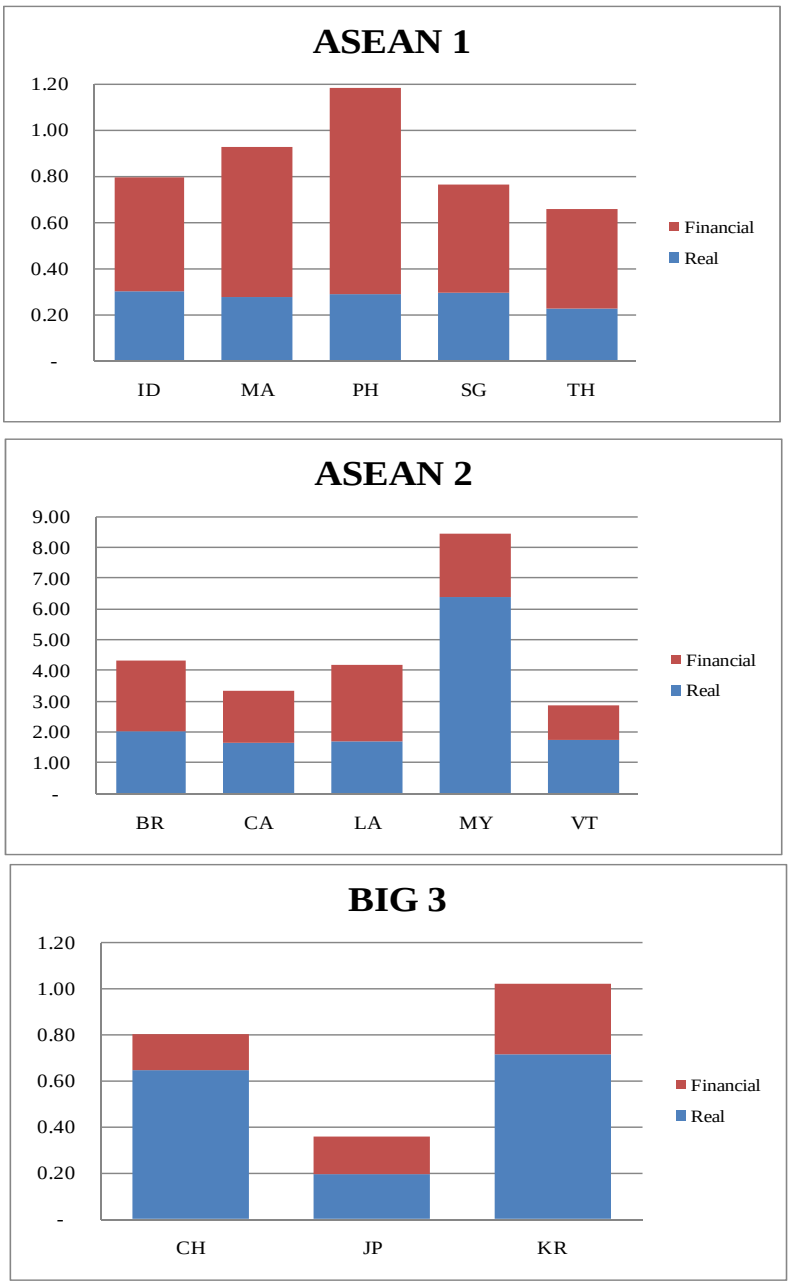


Figure 5 shows the extent of economic (RI+FI) for each member of ASEAN1, ASEAN2 and BIG3 with its own group. It is quite clear here that real integration is greater than financial integration for the post-crisis period when one examines the results for

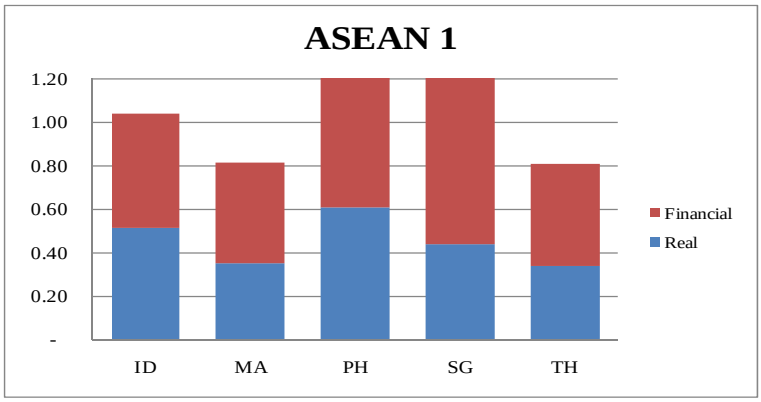
ASEAN1 and BIG3. The results are less clear-cut for ASEAN2, although the overall level of integration appears lower.[15]

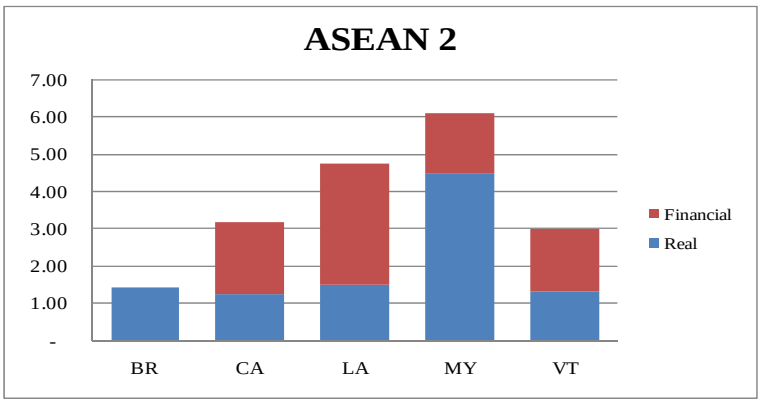
Figure 5A. Real + Financial Integration within Group, Full Sample



[15] We cannot compare the results for Brunei as data is unavailable for this sample period.

Figure 5B. Real + Financial Integration within Group, Pre-crisis Sample





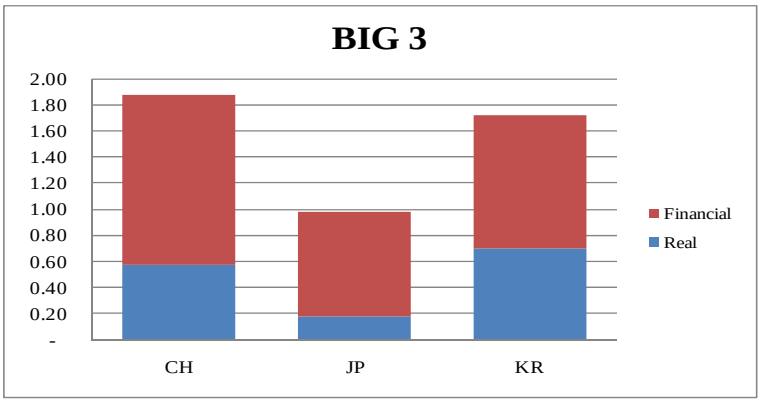


Figure 5C. Real + Financial Integration within Group, Post-crisis Sample

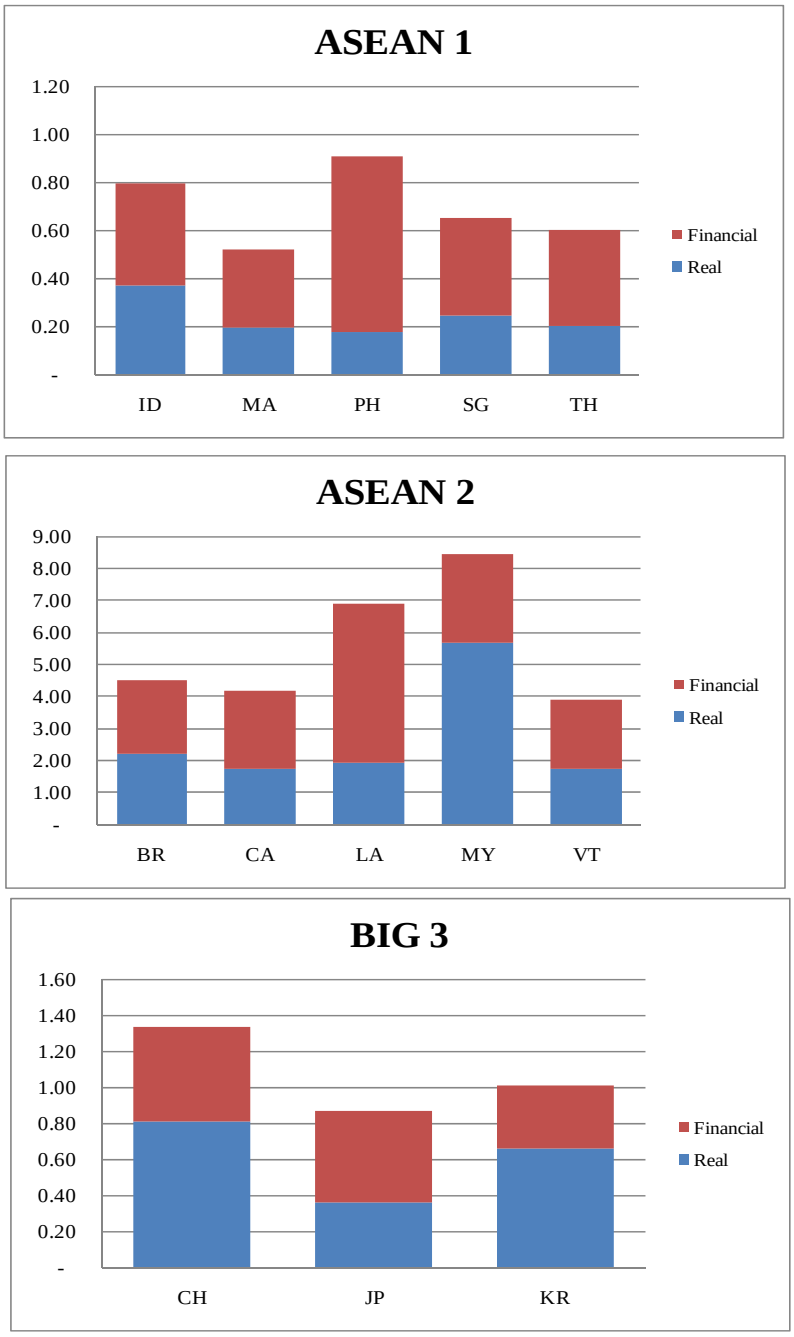


Table 3 introduces some results of the time-series properties of RI and FI by presenting some Granger Causality (GC) results. The results are presented for each country and assess the extent to which the variables interact when compared to their own group, to ASEAN and to the BIG3. A third variable, the absolute value of the (log) difference of

each exchange rate (calculated bilaterally and then added to other bilateral pairs to form the value for each grouping) is included. The intuition for this is to assess whether the possibility of sustained integration may lead to systematically lower exchange rate volatility – thus opening up the possibility of fixed exchange rate zones under OCA criteria. In other words, what can the data tell us about the possibility of an OCA and does it comply with the regional groupings?

Table 3 presents the GC results for a reduced form VAR specification for the full sample with three monthly lags. The choice of three lags is mainly because this specification returned more favorable Shwartz Bayesian Criteria (SBC) results than for other lag lengths and that a parsimonious model specification is preferred given the different sample sizes of the various groupings. It is for data considerations also that the sample is not split between pre- and post-crisis periods as some countries (mainly the ASEAN2 countries) did not present sufficient data for statistical inference.

Table 3. Granger Causality Results, 3-Lag Model

Country	Integration	Causalities. X -> Y = Ho: X Granger Causes Y. (In Probabilities)					
		Real -> ER	Fin -> ER	ER -> Real	Fin -> Real	ER -> Fin	Real -> Fin
BR	ASEAN 2	0.00	0.01	0.68	0.15	0.08	0.62
	ASEAN	0.01	0.04	0.83	0.24	0.26	0.52
	BIG 3	0.42	0.00	0.04	0.00	0.24	0.85
CA	ASEAN 2	0.96	0.57	0.44	0.52	0.36	0.41
	ASEAN	0.83	0.39	0.47	0.33	0.40	0.05
	BIG 3	0.09	0.00	0.05	0.00	0.32	0.60
LA	ASEAN 2	0.94	0.67	0.69	0.11	0.95	0.94
	ASEAN	0.09	0.77	0.98	0.10	0.41	0.79
	BIG 3	0.83	0.00	0.01	0.00	0.84	0.20
MY	ASEAN 2	0.60	0.00	0.53	0.12	0.76	0.73
	ASEAN	0.17	0.00	0.25	0.02	0.77	0.83
	BIG 3	0.20	0.00	0.39	0.00	0.02	0.01
VT	ASEAN 2	0.99	0.08	0.60	0.35	0.17	0.19
	ASEAN	0.94	0.00	0.80	0.01	0.24	0.60
	BIG 3	0.55	0.00	0.60	0.00	0.39	0.35

Country	Integration	Causalities. X -> Y = Ho: X Granger Causes Y. (In Probabilities)					
		Real -> ER	Fin -> ER	ER -> Real	Fin -> Real	ER -> Fin	Real -> Fin
ID	ASEAN 1	0.24	0.00	0.00	0.00	0.00	0.93
	ASEAN	0.20	0.00	0.05	0.02	0.31	0.56
	BIG 3	0.39	0.00	0.09	0.00	0.00	0.02
MA	ASEAN 1	0.00	0.00	0.00	0.00	0.00	0.40
	ASEAN	0.50	0.00	0.02	0.00	0.77	0.89
	BIG 3	0.17	0.00	0.75	0.00	0.27	0.50
PH	ASEAN 1	0.22	0.00	0.11	0.00	0.01	0.68
	ASEAN	0.06	0.00	0.33	0.00	0.86	0.97
	BIG 3	0.40	0.00	0.02	0.00	0.01	0.46
SG	ASEAN 1	0.32	0.00	0.00	0.00	0.00	0.40
	ASEAN	0.07	0.15	0.35	0.02	0.18	0.03
	BIG 3	0.01	0.00	0.84	0.00	0.15	0.27
TH	ASEAN 1	0.38	0.00	0.05	0.00	0.61	0.86
	ASEAN	0.44	0.00	0.17	0.00	0.97	0.99
	BIG 3	0.44	0.00	0.20	0.00	0.02	0.41

Country	Integration	Causalities. X -> Y = Ho: X Granger Causes Y. (In Probabilities)					
		Real -> ER	Fin -> ER	ER -> Real	Fin -> Real	ER -> Fin	Real -> Fin
CH	BIG 3	0.00	0.00	0.06	0.00	0.06	0.14
	ASEAN	0.64	0.01	0.14	0.00	0.53	0.82
JP	BIG 3	0.14	0.00	0.34	0.00	0.06	0.72
	ASEAN	0.00	0.00	0.33	0.00	0.39	0.26
KR	BIG 3	0.44	0.00	0.38	0.00	0.64	0.93
	ASEAN	0.28	0.00	0.85	0.01	0.07	0.18

As with the results above pertaining to the extent of financial integration, the ASEAN1 and BIG3 countries exhibit a greater propensity for integration than ASEAN2. Examining the issue of sequence, we see that, for the most part, FI Granger Causes RI much more than RI Granger Causes FI. Can we conclude categorically that FI leads RI? A nuanced response is necessary. While not in complete accordance with the recent literature on this issue (much of which is dedicated to the sequencing of real versus *monetary* integration – which is a slightly different question, and one we address with the inclusion of the exchange rate series), it is not an entirely unreasonable conclusion – it may be due to trade links being made closer due to trade financing arrangements (see Amity and Weinstein, 2009), or to the political effect of further trade facilitation. A further conclusion that may cast some doubt over the results might be that the story being told may not be one of *sequencing* but one of *timing*. Asset markets tend to adjust

more quickly than goods markets. As such, the GC results may simply be a reflection of the difference in the timing of the adjustment.[16]

Does integration have some effect on exchange rates? The answer suggests that this is possible. It is known that exchange rates in the region are subject to some management and that most appear to be exhibiting greater fixity after the crisis than during (Cavoli and Rajan, 2009). It would appear as if FI is doing much of the driving here but since these results do not hint at direction, and due to the issue of timing versus sequence, these conclusions are conjecture at best.

To augment the results from the GC tests in Table 3, we estimated a number of fixed effects autoregressive distributed lag specifications. The rationale behind this specification is that we can extend the GC analysis by incorporating the effect of contemporaneous variables by examining the direction (and not just statistical significance) of the relationships and also by controlling for fixed effects. Depending upon the fixed effects that are being controlled for, there is a possibility of being able to pick up such factors as trade agreements, investment agreements, any regional political instruments, any possible implicit exchange rate phenomena such as a basket, and possibly differences in institutions between country pairs and groups. We estimate four fixed effects models. The first controls for bilateral fixed effects; that is, the RI, FI and exchange rate measures used are bilateral. The second examines each country's integration with ASEAN and therefore controls for fixed effects specific to ASEAN. The third examines ASEAN1 and the fourth, BIG3.[17] The results are presented in Table 4. The results at first appear to confirm the GC tests above in that the model for FI is not as good in terms of its R-sqd than those for RI. But there does seem to be more support in these models for the level of FI being caused by RI. This seems to be more prominent when observing the bilateral model and the model for ASEAN1. The effect of one-

[16] To assess whether this result is due to a causality brought about by sequence, or one induced by the possibility that asset markets adjust more quickly than real ones, the test is repeated with a longer lag length to allow for the opportunity for RI to influence FI over an increased time horizon. These tests do not show materially different results than those shown in Table 3. A caveat to this analysis is that not all countries were tested at 12 lags owing to the data availability issues presented in the text.

[17] Fixed effects themselves are not reported but are available on request.

lagged FI on RI in the bilateral model looks strange and is anomalous when compared to the same coefficient in the other models.[18]

If we turn our attention once again to the effect that integration might have on exchange rates, we see that the effect is similar to that seen in the GC tests. However, the effects are not as pronounced. In the bilateral case, it is RI that appears to effect exchange changes but the magnitude of the effect is small and the signs are mixed. As such, it is very difficult to draw solid conclusions in this instance.

Table 4A. Fixed Effects Estimation

	Bilateral			**ASEAN**		
Dep Var:	**RI**	**FI**	**ER**	**RI**	**FI**	**ER**
Const	–0.02 (0.12)	–0.02 (0.57)	2.17 (0.00)	3.40 (0.05)	12.88 (0.00)	0.29 (0.61)
RI	–	0.05 (0.04)	0.21 (0.36)	–	–0.01 (0.88)	0.01 (0.81)
FI	0.01 (0.04)	–	–0.15 (0.07)	–0.01 (0.88)	–	–0.01 (0.59)
ABS(d(er))	0.00 (0.35)	–0.001 (0.07)	–	0.05 (0.81)	–0.11 (0.59)	–
RI(-1)	0.35 (0.00)	0.20 (0.00)	0.58 (0.02)	–0.00 (0.99)	–0.03 (0.68)	–0.04 (0.09)
FI(-1)	–0.95 (0.00)	0.29 (0.00)	–1.35 (0.00)	0.93 (0.00)	0.37 (0.07)	0.86 (0.00)
ABS(d(er))(-1)	–0.001 (0.001)	–0.00 (0.79)	0.26 (0.00)	–0.07 (0.75)	0.37 (0.09)	0.26 (0.00)
RI(-2)	0.14 (0.00)	0.05 (0.03)	–1.11 (0.00)	–0.11 (0.10)	0.19 (0.003)	0.01 (0.56)
FI(-2)	0.38 (0.00)	0.16 (0.00)	0.39 (0.12)	0.02 (0.92)	–0.53 (0.01)	–0.11 (0.09)
ABS(d(er))(-2)	0.001 (0.001)	0.003 (0.001)	0.25 (0.00)	0.28 (0.19)	–0.03 (0.89)	–0.04 (0.55)
RI(-3)	0.01 (0.01)	0.02 (0.01)	0.63 (0.00)	–0.20 (0.05)	0.09 (0.36)	–0.001 (0.97)
FI(-3)	0.17 (0.00)	–0.04 (0.14)	–0.27 (0.25)	0.03 (0.87)	–0.28 (0.18)	–0.06 (0.36)
ABS(d(er))(-3)	–0.00 (0.16)	0.004 (0.00)	0.18 (0.00)	–0.03 (0.80)	–0.30 (0.01)	0.01 (0.72)
Adj R-sq	0.88	0.09	0.44	0.48	0.25	0.89
DW	2.00	2.01	2.08	2.06	1.84	1.98
x-sec/Obs	78/13157	78/13157	78/13157	13/234	13/234	13/234

[18] These models use an unbalanced panel. By balancing the panel in this case, the coefficient becomes more negative. This suggests that the effect is probably driven by one (or more) of the ASEAN2 countries where there is less data.

Table 4B. Fixed Effects Estimation

	ASEAN1			BIG3		
Dep Var:	**RI**	**FI**	**ER**	**RI**	**FI**	**ER**
Const	0.85 (0.00)	2.07 (0.00)	0.45 (0.04)	0.67 (0.00)	1.72 (0.00)	–0.27 (0.00)
RI	–	0.26 (0.00)	0.04 ().26)	–	0.15 (0.04)	0.49 (0.00)
FI	0.04 (0.00)	–	–0.01 (0.39)	0.01 (0.04)	–	–0.01 (0.22)
ABS(d(er))	0.01 (0.26)	–0.02 (0.39)	–	0.58 (0.00)	–0.10 (0.22)	–
RI(-1)	0.24 (0.00)	–0.13 (0.01)	–0.01 (0.75)	0.14 (0.00)	0.28 (0.00)	–0.04 (0.04)
FI(-1)	0.88 (0.00)	0.19 (0.00)	0.90 (0.00)	0.32 (0.00)	0.28 (0.00)	0.52 (0.00)
ABS(d(er))(-1)	0.01 (0.48)	0.03 (0.30)	0.25 (0.00)	0.01 (0.54)	–0.18 (0.03)	0.12 (0.00)
RI(-2)	–0.02 (0.24)	0.18 (0.00)	–0.04 (0.26)	–0.01 (0.38)	–0.02 (0.79)	–0.04 (0.04)
FI(-2)	–0.20 (0.00)	0.13 (0.02)	–0.25 (0.00)	–0.11 (0.00)	–0.06 (0.39)	–0.09 (0.00)
ABS(d(er))(-2)	–0.004 (0.72)	0.06 (0.02)	0.54 (0.00)	–0.04 (0.08)	0.55 (0.00)	0.17 (0.00)
RI(-3)	0.02 (0.12)	0.17 (0.00)	0.07 (0.00)	0.05 (0.01)	0.23 (0.001)	–0.06 (0.03)
FI(-3)	0.002 (0.91)	–0.09 (0.07)	–0.45 (0.00)	0.05 (0.02)	–0.38 (0.00)	–0.10 (0.00)
ABS(d(er))(-3)	–0.01 (0.29)	–0.02 (0.36)	–0.09 (0.00)	–0.04 (0.01)	–0.10 (0.14)	0.03 (0.03)
Adj R-sq	0.90	0.38	0.78	0.94	0.29	0.95
DW	1.99	2.04	1.93	1.99	2.02	1.98
x-sec/Obs	13/2518	13/2518	13/2518	13/2527	13/2527	13/2527

Note: Figures in parentheses are probabilities.

6. Conclusion

The analysis in this paper suggests that the path toward regional integration and its "trade first" orientation is the outcome of a combination of politics and economics. However, the politics dominate. There is increasing evidence from an economic perspective that trade and monetary integration are closely connected. Indeed, it is plausible that monetary integration encourages trade and that trade integration leads to the closer synchronization of business cycles and produces other economic spillovers

that facilitate monetary integration.[19] This implies a complex set of positive causal interconnections between trade and monetary integration. Overall, while it is unclear why a trade-first strategy should be favored on the basis of economic considerations alone, it becomes much easier to understand the preferred approach when political considerations are added.

The literature review and empirical analysis undertaken in this paper suggest there is no obvious indication of intensified financial market integration in the East Asian region on the whole. Nonetheless, the evidence reveals a close correspondence between measures of financial integration and the extent of the development of financial markets in general in that, at a bilateral and regional level, those countries with greater financial integration (lower FI) tend to have more diversified deeper, larger financial markets.[20] The three East Asian financial centers, and the high-income economies of Hong Kong,[21] Japan and Singapore, are fairly highly integrated with global capital markets. The recent pace of liberalization in Korea post-crisis is also intensifying the country's extent of international financial integration. The lower middle-income Southeast Asian countries – Thailand and Indonesia and the Philippines – are relatively less financially integrated, but still more integrated, in general, when compared to the less-developed ASEAN countries of Brunei, Cambodia, Laos, Myanmar and Vietnam.

Our analysis of the extent and sequence of real versus financial market integration finds that, overall, integration is generally higher after the Asian crisis, but the results are quite close. The original ASEAN nations – Indonesia, Malaysia, the Philippines, Singapore and Thailand – seem to be more integrated with the rest of Asia than are other groups. This is the case for both real and financial integration and they appear to be especially well integrated with each other. The dynamic tests conducted above suggest that there is evidence that financial integration might lead to real integration but not necessarily the opposite. This is true of both the Granger Causality and also of the fixed effects results where country characteristics are to some extent controlled for.

[19] See Eichengreen and Taylor (2003) for a critique of this argument. They find that the political context matters far more in determining if and when closer trade integration leads to enhanced monetary integration.
[20] There is sizable literature on this topic. One of the most recent papers is Chinn and Ito (2005).
[21] This is not examined in the empirical section in this work.

These results ought to be interpreted with some care as the causation might not reflect sequence, but rather the difference in timing of adjustment of the respective markets

While these countries continue with their ongoing liberalization efforts, one would expect their effective degree of financial integration to intensify over time. It has, however, been argued that these liberalization attempts may lead to enhanced *regional* rather than *global* integration (Eichengreen and Park, 2003 and Park and Bae, 2002). While this a real possibility,[22] policy makers in East Asia have taken the view that there are positive externalities from cooperating to strengthen their individual financial sectors, to develop regional financial markets, and, in particular, to diversify their financial structures away from bank-based systems to bond markets. Motivated by this, a number of financial cooperation initiatives are underway in East Asia, including the Asian Bond Fund (ABF) established by the 11 members of the Executives' Meeting of East Asia-Pacific Central Bank (EMEAP) and the Asian Bond Market Initiative (ABMI) by the Asian Plus Three (APT) economies. The more successful are these early initiatives, and the deeper and broader they become over time, the greater the likelihood that the region's financial systems will become more closely intra-regionally integrated.

[22] However, see McCauley et al. (2002) for a counter argument.

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Annex

Discussion of Comparison between FI and Some Existing Measures of Financial Market Integration

In an attempt to ascertain whether FI captures sufficient information to adequately measure financial market integration, it was subjected to comparison tests against some commonly used measures. The measures were taken from the ADB website at www.aric.adb.org. We took the available data for money market differentials, money market correlations, and equity returns correlations and mapped these against the comparable data for FI. Thirty-six currency pairs were taken.

We are mindful that, as mentioned in Section 4 above, there are many different ways of measuring financial integration, and that each measure will capture different facets of integration. As such, it is unreasonable to expect that the measures will match exactly. That said, we found that, by ranking the country pairs for each measure from lowest to highest (integration), there were, at a general level, some similarities. We plotted the series and extrapolated a linear trend for each. We found that the slope of the trend is in the same direction as FI for the money market differences and for the equity correlations (the money market correlation line was virtually horizontal).

After ranking the measures, we split the sample into thirds. We found that 75 percent of the sample that appeared in one quartile for the measure of FI also appeared in the same quartile for at least one of the other measures, and 33 percent appeared for at least two of the other measures.

Neither of these tests are scientific, but we can show that, in many cases, those country pairs that returned a high level of integration under FI also showed a high level of integration (as captured by comparatively low money market differentials, and high money market and equity correlations) in the other measures.

Chapter 3

Consumption Risk Sharing and Its Implications for Financial Integration: The Case of Nine East Asian Countries

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Abstract

Using three easily measured variables – growth in aggregate output, change in net factor income and change in national saving – this paper estimates the degree of consumption smoothing by a group, East Asia. Using the Penn World Tables data for nine East Asian countries, we provide evidence that about 22 percent of shocks to GDP are smoothed via a credit market channel while the international capital market is almost insignificant. Furthermore, we find that around 75 percent of shocks to GDP remain unsmoothed. Portfolio investment intensity calculations suggest that, of this already small degree of smoothing achieved by access to international capital markets, a disproportionately small share is coming from within the region for many countries, although some countries are achieving a more balanced geographical spread of their portfolio investments. Given these results, we argue that countries in the region may benefit from having more open financial systems, which they could use as means of increasing the consumption risk sharing.

Keywords: Risk sharing; Financial Integration; East Asia.

JEL Classifications: E32, F33.

1. Introduction

The case for financial integration in East Asia has been made strongly by some policy makers in the region, although, as demonstrated here and elsewhere, progress has been limited. Some argue that financial integration could bolster the region's economic growth and reduce its exposure to global shocks, but such arguments have no firm theoretical basis.[1]. This paper examines one element of the case for gains from financial integration that does have a theoretical basis to see what empirical evidence tells us about the benefits within East Asia. We focus on the connection between the financial system and the element of the real economy most closely connected with welfare, that is, consumption.

Theoretical studies argue that one of the benefits of financial integration is the ability for consumers' or citizens' in a country to achieve consumption smoothing. There may be other welfare improvements from financial integration that come from different channels (such as access to greater capital for investment and embodied technology transfer) but most literature focuses on the welfare gains from consumption smoothing. On the other hand, financial integration also creates some costs for the participating countries. The fear of exposing domestic markets to external shocks, and the higher possibility of financial contagion, are among them but, as shown in other studies in this volume, the evidence is not strong for this effect. We do not consider these costs in this paper but look only for evidence of existing or potential welfare gains.

Consumption smoothing can be achieved when consumers can insure their income against various shocks in the economy or can decouple their consumption from the shocks to their income. In an open economy setting this can be achieved by one country holding other countries' assets and selling these, or using the income stream from them, to buffer the effect when their country experiences a negative shock. The literature identifies this phenomena as "consumption risk sharing". When there is a high degree of consumption risk sharing, countries smooth their consumption by offsetting their

[1] For a discussion on the benefits and costs of financial integration in Asia, see Corbett (2010).

country-specific output shocks via several mechanisms. Two of the most common are capital and credit market channels. In the first channel, each member would offset their individual shocks through cross-ownership of productive assets between countries, which would be facilitated by developed capital markets. In the second channel, countries smooth their consumption via lending and borrowing activities in the international credit market to offset income shocks. Any shocks to GDP that are not dampened by these two channels are classified as "unsmoothed".

There is a considerable literature on consumption risk sharing but we follow the framework in two particular studies. Asdrubali et al. (1996) estimate the consumption risk sharing between states in the US. Kim et al. (2006) adapt Asdrubali et al. to estimate the degree of consumption risk sharing in the East Asian region.

Asdrubali et al. (1996) use regional data from the United States (US), an example of a successful monetary union, to estimate the risk-sharing channels. Using data from 1963 to 1990 they analyze three main channels for risk sharing between states in the US: capital market, credit market and fiscal transfer channels. They find that only 25 percent of shocks to states' output is not smoothed. Contrary to Kim et al., they find that the capital market is the most important channel for consumption risk sharing between states. This channel is used particularly by states that experience persistent shocks to their output. Even though they find that perfect insurance is not achieved, they argue that states in the US have achieved a considerable level of risk sharing.

Kim et al. (2006) use a data series from the Penn World Table between 1971 and 2000 to estimate the degree of consumption risk sharing. They analyze two channels for consumption risk sharing among 10 East Asian countries: Indonesia, Malaysia, the Philippines, Thailand, Singapore, Korea, Taiwan, China, Hong Kong and Japan. In the absence of any federal system, there is no mechanism for fiscal transfers so this does not feature in their study. They find that only 20 percent of the shocks to GDP are smoothed within the region. Within this 20 percent, the credit market is the most important mechanism, dominating the capital market in absorbing the shocks. This means that countries use borrowing and lending in international credit markets more than they use investment strategies to shield their consumption from income shocks. Since most

(though not all) of the countries in the region are high savings countries (with matching external current account surpluses) this implies that they build up a buffer of savings when income shocks are positive (and lend them abroad) and borrow (or draw down savings) when shocks are negative. In addition, the authors calculate the potential welfare gain that each country could attain if it had complete risk sharing. They conclude that the East Asian region has not yet achieved a significant level of consumption risk sharing compared to OECD countries. They draw the implication from this that the region does not yet have the degree of risk sharing necessary for the formation of a common currency area, although this judgment about levels is somewhat arbitrary.

The main objective of this paper is to extend and improve the estimates of the degree of consumption risk sharing in East Asian countries. To this end, we estimate the extent, on average, of each channel of consumption risk sharing in nine East Asian countries. One contribution of this paper is that we are able to use updated data and extend the data to 2003, which enables a clearer view of the period after the Asian financial crisis of 1997. The improved data change the picture of the respective roles of different channels (see Appendix Table 1 for comparison with earlier studies). We also offer an extended interpretation of the estimated low level of consumption risk sharing, and begin to examine the extent to which risk sharing is truly regional, rather than the result of each countries' engagement with international capital markets globally, based on the patterns of mutual asset holding within the region.

The structure of the paper is as follow. Section 2 discusses the conceptual framework that we employ. Section 3 explains the methodology while Section 4 describes the data and gives some summary statistics. Section 5 discusses results and Section 6 presents conclusions and directions for future research.

2. Conceptual Frameworks

The idea of welfare gain from the ability to smooth consumption between time periods is well established in economic theory. If consumers have a preference for constant consumption across time periods (a result that emerges from commonly used consumer

preference functions) while their income is variable across time (i.e. subject to random shocks), they will benefit from the ability to move income through time, via saving and investment strategies, to achieve smoother consumption. In an international context Obstfeld and Rogoff (1996) show how access to international markets can enable countries to achieve this objective. Based on these observations it has been argued that both deeper financial markets and greater "financial integration" among economies would enable those economies to achieve improved welfare by giving them access to capital markets that could achieve consumption smoothing. Corbett (2010) notes that one "approach to the welfare effects of financial integration (see, for example, Backus et al., 1992; Cole and Obstfeld, 1991, Imbs, 2006; Lee and Shin, 2008; Tesar, 1995, van Wincoop, 1994, 1999) derives from the idea that "under complete markets, the social planner equates the marginal utilities of consumption across countries … isoelastic preferences then imply that consumption plans be perfectly correlated" (Imbs: 299). Put more loosely "welfare gains are measured by the degree of consumption risk shared through financial integration" (Lee and Shin, 2008: 2)". This also can be used to imply that "those countries with low levels of consumption risk sharing have most to gain from greater integration" (Corbett, 2010).

As mentioned in the Introduction, there are two mechanisms by which risk sharing can occur among countries. The first is the capital market, through which citizens or the government of a country can own claims to output produced in other countries. This implies that the consumption of a particular country depends on the world income rather than on their own individual income. To illustrate, suppose there is a Malaysian mutual fund that invests all of its wealth by buying other countries' assets. We expect the revenue of the firm will be closely related with the movements of other countries' income. This implies that the Malaysian firm will be insulated from some of the negative shocks that occur to the Malaysian economy through ownership of other countries' assets; that is, they have a form of insurance. This form of risk sharing is also known as income insurance. The extent to which income insurance is used can be captured by the difference between a country's aggregate output, as measured by GDP, and its aggregate income, as measured by GNP.

The second mechanism is the credit markets. Through credit markets, citizens or the government of a country can smooth consumption by borrowing and lending internationally or within their own country. This form of risk sharing is also known as consumption insurance. This form of consumption smoothing is directed by agent's intertemporal decisions. For given international borrowing and lending, the aggregate amount of saving in a country is measured by the difference between aggregate income (GNP) and total consumption (Cons).

3. Methodologies

The focus of this paper is the estimation of the risk-sharing model. To supplement the interpretation of the results we also calculate regional investment intensity indexes. This section of the paper discusses the framework of the risk-sharing model, that is, the modified variance decomposition technique. This technique allows us to quantify the proportion of shocks to GDP that are smoothed through international factor income flows, that is, through savings behavior, and the amount of shocks that are not smoothed. In the second section we discuss the estimation strategy for the risk-sharing model. We then turn to a discussion of an investment intensity index that we use to illustrate how much of the risk sharing actually takes place within East Asian.

3.1. Decomposing Cross-sectional Variance in Aggregate Output

Asdrubali et al. (1996) used modified variance decomposition techniques to break down channels of risk sharing. We (and Kim et al.) use this technique with some modifications. Because Asdrubali et al. use data for individual states within a federal system they avoid any heterogeneity arising at the country level, for example, citizenship and type of government. We therefore have to account for this complication in our estimation strategy. Their framework also assumes that GDP is exogenous and we test this assumption indirectly by testing whether two lags of growth in consumption could be strong instrument variables for growth in GDP. Based on our over-identifying restriction test, we found that these two variables are weak instruments for the growth rate in GDP.

To explain the method we start with the following identity,

$$GDP^i = (GDP^i/GNP^i)\,(GDP^i/Cons^i), \quad (1)$$

where i is an index of countries.

To obtain a simple measure from (1), we take logs and differences on both sides

$$\Delta\log(GDPi) = \Delta\log(GDPi) - \Delta\log(GNPi) + \Delta\log(GNPi) - \Delta\log(Consi) + \Delta\log(Consi). \quad (2)$$

Multiply both sides by $\Delta\log(GDP^i)$ and take expectations. We obtain the following decomposition of cross-sectional variance in GDP:

$$\begin{aligned} Var\{\Delta\log(GDPi)\} &= cov\{\Delta\log(GDPi);\ \Delta\log(GDPi) - \Delta\log(GNPi)\} \quad (3)\\ &+ cov\{\Delta\log(GDPi);\ \Delta\log(GNPi) - \Delta\log(Consi)\}\\ &+ cov\{\Delta\log(GDPi);\ \Delta\log(Consi)\}. \end{aligned}$$

Divide both sides by $var\{\Delta\log(GDPi)\}$ to get

$$\begin{aligned} 1 &= cov\{\Delta\log(GDPi);\ \Delta\log(GDPi) - \Delta\log(GNPi)\}/var\{\Delta\log(GDPi)\} \quad (4)\\ &+ cov\{\Delta\log(GDPi);\ \Delta\log(GNPi) - \Delta\log(Consi)\}/var\{\Delta\log(GDPi)\}\\ &+ cov\{\Delta\log(GDPi);\ \Delta\log(Consi))\}/var\{\Delta\log(GDPi)\}. \end{aligned}$$

Note that the first term in the right-hand side of (4) is the ordinary least square (OLS) formula of the slope in the a bivariate regression of $\Delta\log(GDPi) - \Delta\log(GNPi)$ on $\Delta\log(GDPi)$, the second term is the slope in a bivariate regression of $\Delta\log(GNPi) - \Delta\log(Consi)$ on $\Delta\log(GDPi)$, and the last term is the OLS formula for the slope of a regression of $\Delta\log(Consi)$ on $\Delta\log(GDPi)$. We define βk, βc and βu as the corresponding parameters from the OLS regression and rewrite (4) to get,

$$1 = \beta k + \beta c + \beta u \quad (5)$$

3.2. Estimation of the Risk-sharing model

In the last section we showed how the framework developed by Asdrubali et al. (1996) could be used to quantify the extent of risk sharing via the various channels and how it

corresponds to the slope of several simple OLS regressions. Thus, we can estimate the following system of equations (where all variables are in constant per capita terms).

$$\Delta \log(GDPi,t) - \Delta \log(GNPi,t) = dk,t + \beta k \, \Delta \log(GDPi) + eik,t \quad (6)$$

$$\Delta \log(GNPi,t) - \Delta \log(Consi,t) = dc,t + \beta c \, \Delta \log(GDPi) + eic,t$$

$$\Delta \log(Consi,t) = du,t + \beta u \, \Delta \log(GDPi) + eiu,t$$

where d:;t are time-varying fixed effects. The time-varying fixed effects capture year-specific impacts on the growth rate of aggregate output of the nine East Asian countries. Thus the β coefficients could be interpreted as the weighted average of the year-by-year cross-sectional regressions.[2]

In Equation 6 we have the identical independent variable for all the equations, that is, growth in GDP. Given that the constant represents a time-varying fixed effect, the change in the independent variable captures the change in aggregate output after accounting for any year-specific component affecting all countries' growth of GDP. In other words, a change in the growth rate of GDP in the equation represents country-specific shocks to GDP.

The variable $\Delta \log(GDPi) - \Delta \log(GNPi)$ represents change in net factor income of a country while $\Delta \log(GNPi) - \Delta \log(Consi)$ captures the difference between growth in aggregate income and aggregate consumption and can be used to proxy for national savings. The variable $\Delta \log(Consi)$ measures growth in total consumption.

Using this system of equations, we measure how shocks to GDP affect the other three variables: net factor income payment, total consumption, and national savings. Since we use panel data estimation with time-varying fixed effects, our estimator yields consistent estimates even if there are unobserved shocks that affect all countries (c.f. Wooldridge, 2002; Wooldridge, 2008).

Using the conceptual frameworks that we developed earlier, the interpretation of the

[2]See Asdrubali et al. (1996) for more careful statement of this argument.

sign and magnitude of the parameters in (5) (which is equivalent to (7) as in Sörensen and Yosha (1998)) is as follows. If the region has full risk sharing, then cov{ Δ log(GDPi), Δ log(Consi)} = 0 and hence $\beta u = 0$. However, if risk sharing is not achieved, the consumption level in country i changes positively with individual shocks to country i's output, and we have $\beta u > 0$. Sörensen and Yosha (1998) point out that if we run a regression of consumption on output using cross-sectional data and we also control for fluctuations in regional consumption, we have a test of full risk sharing. Asdrubali et al. (1996), Kim et al. (2006) and Yehoue (2005) use essentially the same approach to quantify the channels of risk sharing.

If full risk sharing is achieved via the international capital market channel, then

cov{ Δ log(GNPi), Δ log(GDPi)} = 0 and hence,

cov{ Δ log(GDPi), Δ log(GDPi) – Δ log(GNPi)} = var{ Δ log(GDPi)} implying that $\beta k = 1$.[3]

The intuition here comes from the fact that the difference between GNP and GDP is the amount of income from abroad. If there is zero covariance between these two, then when the growth rate of one changes the other does not change. Thus, a shock to the growth of domestic income would not cause a similar (or even opposite shock) to national income, including foreign sources of interest and investment income. In this sense, the foreign sources of income must be providing a buffer from the shock to domestic income

On the other hand, suppose that full risk sharing is not achieved via the international capital market channel, but is achieved through the combination of this channel and the credit market channel. This would cause condition (5) to become $1 = \beta k + \beta c$.

By construction (and intuitively) coefficient βu represents the share of shocks to GDP that remains unsmoothed and coefficients βk and βc represent the shares of shocks to GDP that are dampened by changes in net factor income and changes in national

[3] See footnote 19 of Sörensen and Yosha (1998).

savings. If full risk sharing is not achieved, βu, which shows the extent of the unsmoothed part, will be positive. We cannot anticipate any particular sign for βk and βc if we allow the possibility of "dis-smoothing", i.e. increasing the volatility of consumption beyond that of income.[4]

The model in (6) consists of three linear regressions for N countries over T periods.[5] Our objective is to find an appropriate estimator that can cope with this degree of complexity. We treat the system of equations in (6) as a Seemingly Unrelated Regression (SUR) system (Wooldridge, 2002). While we assume that the error terms of each equation have nice properties – zero mean, constant variance and no serial correlation – we do test whether the errors in one equation are correlated with the errors in any other equation within each country. We employ the Breusch–Pagan Test (BP test) for Error Independence to check this.

The conclusion from this test will determine our optimal estimator for (6). If the BP test concludes that the errors are independent, then we use OLS as our estimator for the system. On the other hand, if the errors between equations are not independent then the optimal estimator for the βs is a GLS estimator or Feasible GLS (FGLS) in the operationalized version.[6] Wooldridge (2002) establishes the circumstances in which OLS estimator and FGLS yield identical results for SUR systems. Case one: OLS and FGLS are identical when the errors are independent. Or, in other words, we do not observe any correlation between equations for specific countries. Case two: both estimators are identical when regressors of each equation in the system are identical. Obviously, the specification in (6) falls into the latter case, since we have $\Delta \log(GDPi)$ as the regressor for each equation. Another advantage of using FGLS is the fact that we

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[4] Importantly, βc does not measure which countries smooth consumption optimally via savings. It measures the marginal share of shocks to GDP smoothed via savings (Sörensen and Yosha (1998).). Nor does $\beta u > 0$ indicate that, given the uninsured shocks to income, consumption is not intertemporally smoothed optimally. On the other hand, it measures the amount of deviation of regional consumption patterns from the full risk sharing allocation.

[5] The main references used for the discussion in this section are Greene (2003), Cameron and Trivedi (2008) and Wooldridge (2002).

[6] Cameron and Trivedi (2008) show that there exists a more robust estimator than FGLS to estimate a system such as (7), which is the Iterated FGLS (IFGLS) but it is beyond the scope of this study to proceed using this estimator.

could do joint hypothesis tests of the β's across equations. By using OLS, we can only do hypothesis testing within each equation separately. As shown in the results in Section 5, the results of the BP test require the use of SUR estimation techniques rather than simple OLS.

In addition, OLS assumes that the variance matrix of the vector of error is non-singular. System (6) clearly does not satisfy the singularity condition due to the additive constraint in (5). To overcome the singularity issue in our SUR system, we use the re-parameterization "trick" proposed by Wooldridge (2002). In this "trick" we exploit condition (5), βu =1–βk–βc, and substitute it into one of the equations, which is βu (6). As a result we can estimate all equations jointly.

This is shown as follows:

$$\Delta \log(Consi,t) = du,t + (1-\beta k-\beta c)\,\Delta \log(GDPi,t) + eiu,t \quad (7)$$

Rearranging

$$\Delta \log(Consi,t) - \Delta \log(GDPi,t) = du,t + (\beta k+\beta c)\,\Delta \log(GDPi,t) + eiu,t \quad (8)$$

We then replace the last equation in (7) with (9).

4. Data Descriptions and Summary Statistics

4.1. Data

This paper utilizes Penn World Table version 6.2 (hereafter PWTv62) collected from the Centre for International Comparisons of Production, Income and Prices at the University of Pennsylvania (Heston et al., 2006). This version of PWT used the data in 30 OECD countries as a benchmark and 2002 as the base year. The data were compiled using several different methodologies to ensure all their series can be used in international comparison studies. Our study focuses on nine East Asian countries: Indonesia, Malaysia, Singapore, Thailand, the Philippines, Korea, Japan, China and Hong Kong over the period 1971 to 2003.

The variables we take from the Penn data are, first, Real Gross Domestic Product (GDP).

This variable acts as a proxy for aggregate output. For consistency, PWT produced their GDP series by employing aggregation techniques that take into account price and currency differences between countries.

The second variable is total consumption. PWT does not directly provide this data but does provide estimates for the shares of consumptions by the private and government sector in real GDP. We used this measure to calculate total consumption by multiplying the share of each of these components in real GDP and summing them.

GNP data are not provided directly in PWT, but it does provide the ratio of GNP to GDP. We are, therefore, able to estimate the GNP figure.[7]

4.2. Summary Statistics

Table 1 compares summary statistics for several variables in three different periods. The first variable is the average economic growth, as measured by growth in GDP per capita. On average, the nine East Asian countries had 9.2 percent growth before 1997, the year the Asian Financial Crisis started. Growth remained on average above 7 percent for the years after 1997. The relative small difference in the GDP growth between pre- and post-crisis indicates that the crisis only affected some East Asian countries. On the other hand, the crisis caused an increase in volatility of the economies of the nine East Asian countries, as measured by standard deviations. The volatility of growth of output increased from 4.7 percent in the pre-crisis period to 5.2 percent in periods that include the crisis. The patterns were similar in the other three variables, except for the growth in net factor income, which stayed unchanged.

Table 1. Summary Statistics for Several Variables

	1971–2003		**1971–2000**		**1971–1996**	
Variable	Mean	Std.	Mean	Std. Dev	Mean	Std. Dev

[7] The PWT data extracted the ratio of GNP to GDP from World Bank and UN archives. Since no data are provided for Taiwan we dropped Taiwan from our sample (making the study slightly different in coverage from Kim et al.).

	Dev					
Δ log(GDP)	0.079	0.052	0.083	0.052	0.092	0.047
Δ log(GNP)	0.079	0.053	0.083	0.052	0.091	0.047
Δ log(Cons)	0.078	0.047	0.081	0.048	0.088	0.041
Δ log(GDPi)– Δ log(GNP)	0.000	0.012	0.000	0.012	0.000	0.012
Δ log(GNPi)– Δ log(Cons)	0.002	0.031	0.002	0.03	0.003	0.03

Source: PWTv62.

Table 1 shows that growth of consumption is lower than growth of output and income in all three different periods. This is a rough indicator of saving process in these countries. Table 1 also suggests that credit market is the channel that was dominant in absorbing the shocks to GDP. This last claim needs further justification and in the following section we try to evaluate it using the proposed econometric framework.

5. Results and Discussions

5.1. Risk-Sharing Model

In this section we examine the degree of risk sharing at the aggregate level and for various groupings of East Asian countries (following the groupings used by Kim et al.). This provides us with a simple sensitivity analysis of the consumption risk sharing in East Asian countries. The first group is ASEAN 5, which consists of Indonesia, Malaysia, the Philippines, Singapore and Thailand. The next group is Northeast Asia (NEA), which groups China, Korea and Japan. The last one is developed countries, which consists of Korea, Japan, Hong Kong and Singapore. The last part of this section discusses the effect of including the US in the group for which consumption risk sharing is estimated in several different periods. These groups are as follows.

We present the results of the unit root test for all variables in Table 2. Using the Wooldridge (2008) procedures to check for unit roots we find that some of the series, in some countries, can be identified to have unit roots. This weakly indicates that our study may be subject to spurious regression.

Table 2. Unit Root Test Results

Variables	AUS	CHN	HK	IDN	JPN	KOR	MAL	PHI	SGP	THA	USA
Δlog(GDP)	Yes	No	No	No	No	No	No	Yes	No	No	No
Δlog(GNP)	No	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes
$\Delta\log(GDP^i)$–Δlog(GNP)	No	No	No	No	No	No	No	No	No	No	No
$\Delta\log(GNP^i)$–Δlog(Cons)	No	No	No	No	No	No	No	No	No	No	No

Source: Authors' calculation

We explained above that the choice of an appropriate estimator depends on the independence of the errors between equations. Using procedures suggested by Cameron and Trivedi (2008) to perform the BP test for independence of the errors, we estimate system (6) using the SUR estimator (employing the "trick" from Wooldridge (2002) to impose the summing constraint) to estimate the consumption risk-sharing pattern in nine East Asian countries for the period 1971–2003. Then we calculate the corresponding BP statistic.

We present the estimates in (9) below for the whole East Asian group, where the numbers in the parenthesis below each coefficient are standard errors. We also attach the value of the BP stat for this system.

$$\Delta \log(GDPi,t) - \Delta \log(GNPi,t) = -0.0019 + 0.0235\,\Delta \log(GDPi,t) + eik,t \quad (9)$$

$$(0.00138)\ (0.0138)$$

$$\Delta \log(GNPi,t) - \Delta \log(Consi,t) = -0.0164 + 0.2245\,\Delta \log(GDPi,t) + eic,t$$

$$(0.00322)\ (0.0321)$$

$$\Delta \log(Consi,t) = 0.0184 + 0.7519\,\Delta \log(GDPi,t) + eiu,t$$

$$(0.00293)\ (0.0292$$

$$\text{BP Stat} = 283.557 \text{ p-value } (0.000)$$

Based on the conclusion of the BP statistic, we find sufficient evidence to reject the null hypothesis of no correlation between equations in this SUR system. This result justifies

the decision to use the SUR estimator to estimate system (6).

Our interpretations of the estimation result of (9) are as follows. Only 2.3 percent of shocks to the GDP of nine East Asian countries in the period 1971–2003 is smoothed by the change in net factor income payment. This number, however, is not statistically different from zero, which suggests that the role of the international capital market in consumption risk sharing is virtually nonexistent. From the second equation in (9), we find that 22.45 percent of shocks to GDP is smoothed via savings-related activities and this number is statistically significantly different from zero. Therefore we observe a relatively larger role for the credit market channel in absorbing shocks to the GDP of the nine East Asian countries. From the last equation, we see that the amount of deviation of East Asian regional consumption patterns from full risk-sharing allocation is about 75.19 percent and this number is significantly different from zero. This number can also be interpreted as the amount of shocks to the GDP that remains unsmoothed.

Table (3) reports the results for risk-sharing patterns estimated on several different groups of countries in East Asia and against developed countries as a benchmark. Columns 5 and 6 present the BP and F statistics. The F statistic in Table (3) tests the null hypothesis of the insignificance of both capital and credit market channels in absorbing shocks to the GDP. From the p-value, we have sufficient evidence to reject the hypothesis that capital and credit markets are not significant in absorbing shocks to GDP. Based on the p-value of the BP statistic, we find that within the countries the errors are correlated between equations and this conclusion, again, supports the use of the SUR estimator to estimate (6) for various groupings. The conclusion of these tests is consistent for all sub groups.

For the ASEAN 5 countries, about 26 percent of shocks to GDP are smoothed through lending and borrowing activities (the credit channel). Surprisingly, this figure is not significantly different from the role of the same channel in developed countries. The role of credit markets in ASEAN 5 in 1971–2003 is similar to EC8[8] countries during 1981–1990.

[8] Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, the UK.

Table 3. Risk-sharing Pattern in Various Sub-Groups for 1971–2003

Sub-Groups	Capital Market	Credit Market	Unsmoothed	BP Stat	F Stat
ASEAN 5	2.8	25.50	71.7	157.409	27.16
	(2.0)	(4.2)	(3.8)	(0.00)	(0.00)
NEA	0.10	23.56	74.54	104.614	11.10
	(1.9)	(5.7)	(5.9)	(0.00)	(0.00)
ASEAN 5 + NEA	2.07	24.81	73.12	252.470	39.13
	(1.49)	(3.38)	(3.06)	(0.00)	(0.00)
Developed	2.09	25.97	71.94	146.769	26.60
	(2.07)	(4.94)	(4.2)	(0.00)	(0.00)

Source: PWTv62.

Standard Errors in parenthesis.

The numbers below the BP stat and F Stat are p-value.

Our own calculation for the nine East Asian countries for the period 1981–1990 showed that the marginal amount of shocks to GDP absorbed by saving behavior was approximately 28 percent, while Kim et al. found 23 percent for the same period. From this comparison, we see that East Asian countries' risk-sharing pattern was similar to European countries during the 1980s (Sörensen and Yosha, 1998). For other groups, such as ASEAN 5 plus NEA, and NEA alone, the role of the credit market is about 24 percent on average and is similar to our finding in the preceding paragraph on the aggregate risk-sharing pattern in the nine East Asian countries.

Considering the capital market channel, we can see there is a substantial difference between the role of capital markets in NEA countries and in the other three groups. The capital market channel in NEA accounts for only 0.1 percent and this figure is lower than that for the other groups of countries. As in our earlier findings, we conclude that the percentage of smoothing being carried out by the change in net factor income is statistically not different from zero. Our finding in this regard is consistent with Kim et al. (2006), who also find a very small role for the capital market channel for the same groups of countries. The finding in NEA countries can be explained to some extent by the China factor. Before 2001, the year that China acceded to the WTO, China could arguably be classified as a closed economy (Unit, 2003), which meant that the exchange of productive assets between China and other countries was likely to be insignificant.

Assuming this situation remained until 2000, a year before China's WTO membership, this may have affected the overall pattern of the capital market channel in NEA countries.

One result that remains puzzling is the finding on the fraction of shocks being smoothed in the ASEAN 5 compared with the developed countries group. Our calculation shows that the former outperforms the latter group and is not consistent with the finding in most studies of the consumption risk-sharing pattern. These studies find that the fraction of shocks to GDP that are being smoothed is higher in developed countries (Kim et al., 2006; Yehoue, 2005). It may be that growing economic cooperation between the ASEAN 5 group since early 1970 provides an explanation. This formal cooperation between ASEAN 5 countries is marked by the formation of the ASEAN organization in 1967, whose charter states that one of the goals of this organization is to promote economic cooperation between members. However, later evidence on patterns of mutual portfolio investment does not provide strong support for this argument and the evidence remains puzzling.

We now investigate whether the same pattern is also observed in three different periods: 1971–2003, 1971–2000 and 1971–1996 (for this exercise we also include the US in the group of countries to be estimated, but this does not affect the results as can be seen from the column for 1971–1996, which is not different from the earlier results for the East Asian 9 group).[9] Table 4 shows that the unsmoothed part of GDP shocks seems to have increased after the Asian crisis (i.e. between 1996 and 2000) and had not returned to the earlier levels by 2003. This would be consistent with an inability to access international markets for a period after the crisis and/or an unwillingness to open capital markets during that time. It also reflects the fact that the shocks to GDP were very large at this time. Across the three periods, the contribution of the international capital market to consumption risk sharing is consistently very small.

[9] Introducing the US into the framework (which we did for comparability with Kim et al.) does not alter the overall pattern of consumption risk sharing that we found in the earlier sections. For example, in period 1971–1996, we see that the cross-country factor income flow amounted to only 3 percent. This number is not statistically significantly different from zero.

Table 4. Consumption Smoothing and Risk Sharing (%): East Asian Countries and the US

Periods	Capital Market	Credit Market	Unsmoothed	BP Stat
1971-2003	2.43	22.17	75.40	348.287
	(1.22)	(2.87)	(1.77)	(0.00)
1971-2000	1.74	21.13	77.13	313.728
	(1.22)	(5.7)	(5.9)	(0.00)
1971-1996	3.13	26.79	70.08	275.824
	(1.46)	(3.52)	(3.22)	(0.00)

Source: Authors' calculations; Standard Errors in parenthesis; the numbers below the BP stat and F stat are p-values.

This finding is, however, not unique to the region. It is consistent with Kim et al. (2006) and Sörensen and Yosha (1998) who find the same pattern in European and OECD countries. The insignificance of this channel may be explained by the "home bias puzzle" (French and Poterba, 1991). The "home bias puzzle" is a situation in which citizens in one country prefer to invest their money in their domestic capital market rather than in other countries' capital markets. This is presumed to reflect either some perceived risk or some unobserved barriers to cross-border investment. It is argued that one reason that this happens is the absence of a supranational legal authority (Obstfeld and Rogoff, 1996) which would enforce contracts between countries. In addition to this "home bias puzzle", the absence of common capital markets in East Asia may also contribute in part. However, as noted, since the region is not very different from other groups of countries, this cannot be a major explanation.

We are also interested in country differences in the use of consumption smoothing and the use of different channels. We use a different strategy to estimate the country variation. We introduce country dummy variables, setting one country (Japan) as the benchmark case. We interact the dummy with the growth rate of output and then estimate system (6) by including these two new variables. To illustrate, to estimate China's country variation, we estimate system (6) but include a dummy for China and the interaction of this dummy with the growth rate of output. It can be seen in Table (5) that China was mostly unsmoothed, with around 97 percent of the total shocks to GDP going unsmoothed. While a large share of income shocks go unsmoothed for all

countries in the group, there is heterogeneity of patterns, ranging from a low share of 56.7 percent unsmoothed in Singapore to 97.4 percent in China. The pattern is interesting in that it does not show only high-income countries engaging in income and consumption smoothing. The Philippines, with high levels of overseas earnings being sent home, seems to achieve a relatively higher degree of smoothing than some other countries.

Table 5. Estimate of Country Variations, 1971–2003

Countries	Capital Market	Credit Market	Unsmoothed
Benchmark: All countries excluding Japan			
China	–0.55	22.66	97.43
Hong Kong	4.44	3.04	91.2
Indonesia	1.96	4.36	78.63
Korea	–0.61	19.4	64.73
Malaysia	1.88	35.91	77.03
Philippine	4.01	21.1	62.67
Singapore	4.89	33.33	56.72
Thailand	–0.64	38.2	75.96

These results need further study. An initial attempt to expand the analysis using quarterly data for each country separately (Appendix Table 2) suggests that there may be interesting variations across time and countries.

6. Cross-Border Portfolio Investment

It would be misleading to present results such as those in this paper as revealing the extent of regional consumption smoothing if this is taken to mean the extent to which countries in the region are able to share their income risks with each other and to provide insurance within the region. Other studies using the method we have employed in this paper have sometimes presented their results in these terms (for example, Kim et al) although in fact the estimation that we and they have done simply uses a particular group of countries to estimate the average risk sharing or consumption smoothing behavior for the members of that group. Because we use data on each country's GDP, GNP and Consumption we can only calculate their access to total sources of

international income and to the total amount of savings (whether held domestically or abroad) that they accumulate. The data do not tell us how much of any country's international interest and investment income, or borrowing and lending, come from any geographical area. Therefore, we are not, in fact, saying anything about the intra-regional extent of consumption smoothing and risk sharing. Some of the existing literature has not been careful about this point and has implied that the result could be used to deduce something about the role of regional integration in providing consumption smoothing. This is not correct.

That question remains of interest. It would be useful, for analysis and for policy, to know whether increased access to each other's capital markets within the region (i.e. greater regional financial integration) would allow greater consumption smoothing to take place but, to date, there is no method to do that. The question that is informed by the type of analysis carried out here is only to what extent is access to global capital and credit markets being used to provide consumption smoothing by the countries in the region.

We can, however, use other evidence to see to what extent countries are investing in productive assets of other countries within the region. This may help us infer something about the extent to which consumption smoothing could be, or is already, provided within the region. If most of the region's economies are holding most of their foreign assets and liabilities within the region then it is reasonable to suppose that the consumption and income smoothing functions are mainly being provided within the region. If most of the foreign assets are held outside the region then it would be global (extra-regional) markets that are providing the insurance function.

This section of the paper provides some evidence on this question.

6.1. Data

We exploited the Coordinated Portfolio Investment Survey (CPIS) published by IMF to calculate an Investment Intensity Index. This data is a unique tool in capturing the world totals and the geographical distribution of the holdings of portfolio assets. Hence, by analyzing this data we could infer some pattern in capital flows between countries. By

doing this, we want to give some feel on how risk sharing might actually be taking place between countries within the region. We used the total of portfolio investment asset without further disaggregating into more detailed type of assets and present two years of data, 2001 and 2007, to give a snapshot of changes.

Table 6 shows the geographic breakdown of total portfolio investment assets. In 2001 most East Asian countries held significant amounts of US assets. For example, Indonesian investors invested approximately US$248 million in the US market. The figure was even higher for other countries (Japan, Korea, Hong Kong, the Philippines and Thailand). Only Singapore held portfolio assets in a geographically balanced way, with the amount of money invested in the US market relatively similar to the amount held in East Asian markets.

Table 6 also shows which foreign countries own domestic assets. In Malaysia, for example, almost US$6 million of their assets were held by Singapore in 2001 while Hong Kong and Japanese investors held only about US$4.9 million of Malaysian assets. Similarly, Singaporean investors held a significant amount of Japanese assets. These two examples show that Singapore was actively holding East Asian countries' assets. We could infer from this pattern that Singapore used both intra-regional and extra-regional markets about equally to achieve the risk-sharing result estimated earlier in the paper.

Table 6. Geographic Breakdown of Total Portfolio Investment Assets, 2001 (in million US$)

Recipients	Investor									
	EAST ASIA								NON-EAST ASIA	
	HK	IND	JPN	KOR	MAL	PHI	SGP	THL	AUS	USA
Australia	18,575.00	54.90	19,179.60	52.42	21.67	9.98	7,743.11	9.00	–	55,182.65
China, P.R.	8,416.00	0.03	1,669.24	157.42	7.97	–	1,446.99	4.00	–	3,003.88
Hong Kong SAR of China	–	107.43	6,116.28	406.24	75.14	25.03	4,746.66	125.00	2,185.37	32,047.17
Indonesia	–	–	157.63	75.10	51.34	3.00	867.12	15.00	14.30	1,840.82
Japan	9,248.00	3.17	–	176.33	22.26	5.47	10,550.10	1.00	4,615.31	197,839.43
Korea, Republic of	5,100.00	0.08	5,834.95	–	11.13	6.54	3,215.82	–	429.41	34,474.50
Malaysia	2,421.00	2.11	2,538.18	452.41	–	8.96	6,886.15	–	56.17	4,258.11
Philippines	1,239.00		1,559.87	109.94	101.82	–	1,181.42	1.00	8.17	4,015.21
Singapore	2,685.00	39.82	2,132.59	152.24	471.16	61.64	–	106.00	778.67	22,817.61
Thailand	1,147.00	0.01	1,037.92	179.31	35.98	0.80	2,361.14	–	21.45	2,698.28
United States	39,253.00	248.95	490,200.13	3,763.86	208.33	1,844.21	18,011.01	292.00	44,446.20	–

Source: CIPS, IMF.

Table 7 reveals that in 2007 the pattern of total portfolio investment assets differs significantly. It is still true that most East Asian countries' investors invested their money in developed capital markets such as the USA, Hong Kong and Japan. Philippine investors, for example, invested approximately US$2 billion in the US market. This was higher than the amount they invested in all other East Asian countries' markets. Singaporeans, on the other hand, again invested their money in a geographically balanced way between East Asian countries' markets and the US market.

By 2007, we find that China has attracted more funds than in 2001. Almost all countries in East Asia have started to hold Chinese assets in a significant manner, excluding Indonesia and Malaysia. Hong Kong assets have also attracted many investors from the region. This may in part be explained by the more developed financial system in Hong Kong. Most East Asian investors, however, were still investing a relatively large sum in the USA market so we could infer that these investors were using US assets as a means to smooth their consumption.

Table 7. Geographic Breakdown of Total Portfolio Investment Assets, 2007 (in million US$)

Recipients	Investor									
	EAST ASIA								NON-EAST ASIA	
	HK	IND	JPN	KOR	MAL	PHI	SGP	THL	AUS	USA
Australia	42,436.00	15.97	65,931.22	2,948.54	363.22	359.74	24,119.34	4,157.05	–	222,570.00
China, P.R.	165,710.00	0.05	15,500.71	11,054.59	106.46	53.13	10,554.24	48.61	–	97,240.00
Hong Kong SAR of China	–	62.15	18,351.22	29,723.93	1,902.31	155.12	19,991.40	152.32	6,063.64	121,276.00
Indonesia	761.00	–	1,433.22	742.03	323.30	48.60	9,332.22	20.36	305.92	18,349.00
Japan	20,826.00	20.36	–	4,881.48	219.87	83.24	8,417.08	63.00	25,003.94	582,342.00
Korea, Republic of	20,233.00	5.37	13,762.89	–	961.14	169.71	20,276.93	525.55	3,905.49	139,555.00
Malaysia	5,875.00	4.00	3,228.55	934.11	–	271.91	25,537.63	48.11	523.67	25,209.00
Philippines	1,104.00	2.28	1,952.49	103.02	80.75	–	1,870.97	3.43	–	14,461.00
Singapore	8,774.00	187.99	11,314.22	1,579.39	2,250.72	500.79	–	565.70	2,766.46	64,710.00
Thailand	1,593.00	23.39	1,771.37	429.66	128.84	35.15	4,495.27	–	–	16,842.00
United States	70,387.00	262.21	813,311.39	52,745.76	1,408.14	2,368.53	40,188.80	1,362.28	182,311.35	–

Source: CIPS, IMF.

6.1 Investment Intensity Index

It is helpful to put the size of these intra-regional investments into context. One way to do this is to use intensity indices. Intensity indices can indicate whether bilateral holdings of assets are large or small in terms of the investing country's total holdings of foreign assets and the recipient country's size in the world. The indices parallel the idea of intensity indices used in international trade and indicate whether the asset holding by a particular country in another country is a large share of the investor country's holdings relative to the size of the host country. For example, if country *i* holds 10 percent of its total overseas assets in country *j* and country *j* accounts for 10 percent of the world's foreign-held assets, then the intensity of *i*'s holdings in *j* would be 1. Numbers larger than 1 indicate that holdings by *j* in *i* are disproportionately large relative to *i*'s role as a host to foreign portfolio investment.

The formula for the intensity index[10] that we use is given below

$$\mathrm{I}_{ij} = \frac{A_{ij}}{A_i} \Big/ \frac{L_j}{L_w}$$

where A*ij* is the asset holding by country i in country *j*, A*i* is the total foreign asset holding by country *i*, L*j* is the total of assets held by foreigners in country *j*, and L*w* is the global total of foreign assets.

Intensity Index Results

Here we present investment intensity indices as a means to identify the relative engagement of countries in East Asia with their neighbors. Our goal is again to identify where countries may be doing their risk sharing by showing where they have a disproportionately high share of their foreign portfolios.

Table 8 shows, somewhat surprisingly, that even in 2001 some countries in the region were intensively invested within the region, relative to the small size of those markets in

[10] It is possible to construct intensity indices from both the outgoing and the incoming country side. We have only shown the intensity indexes for the investor country.

the global market. Hong Kong, Singapore and Malaysia were striking in this regard and held disproportionately low investments in the US (below 1). The pattern, however, varies considerably across countries. By contrast, investors in Korea, Japan, Indonesia and the Philippines held more than a proportionate amount of their assets in the US and other developed financial markets such as Hong Kong and Singapore. Indonesia, Japan and the Philippines in particular held proportionately low shares in other economies in the region. Thus the pattern in 2001 would have been consistent with Japan, Indonesia and the Philippines finding their income smoothing from developed-country markets inside and outside the region, while Hong Kong, Singapore, Malaysia and Korea might also have been gaining foreign income from other regional markets.

By 2007 the pattern of exchange of assets was relatively different, as shown in Table 9. Only Japan, Korea and the Philippines remained intensively invested in the US while other countries in the region, even lower-income countries such as Indonesia, for example, had started to reallocate their funds away from the US market to neighboring countries' financial markets. In 2001, Indonesia's intensity index as an investor in the US market was approximately 1.42 whereas in 2007 the figure dropped to 0.65. In general it appears that many countries in the region had moved to a more geographically balanced allocation of their portfolio holdings in proportion to the growth of the size of the countries in global markets. Both Tables 8 and 9 reveal Japan's continued lack of portfolio investment in the developing countries of the region. Again, without wanting to exaggerate the information content of these indexes for the risk-sharing story, it appears that several countries in the region may be able to achieve their income smoothing fairly equally from within and outside the region (remembering that the overall extent of income smoothing from international capital markets remains negligible).

Table 8. Intensity Index of Total Portfolio Investment Assets, 2001 (in million US$)

Recipients	Investor									
	EAST ASIA								NON-EAST ASIA	
	HK	IND	JPN	KOR	MAL	PHI	SGP	THL	AUS	USA
Australia	6.76	5.73	1.11	0.49	0.71	0.35	5.50	0.82	–	1.79
China, P.R.	25.68	0.02	0.81	12.29	2.19	–	8.63	3.04	–	0.82
Hong Kong SAR of China	–	19.69	0.62	6.65	4.33	1.54	5.93	19.92	3.62	1.83
Indonesia	–	–	0.28	21.42	51.61	3.22	18.88	41.66	0.41	1.83
Japan	1.05	0.10	–	0.51	0.23	0.06	2.35	0.03	1.36	2.01
Korea, Republic of	4.11	0.02	0.75	–	0.81	0.51	5.06	–	0.90	2.48
Malaysia	6.63	1.66	1.11	31.69	–	2.36	36.82	–	0.40	1.04
Philippines	6.02	–	1.21	13.67	44.62	–	11.21	1.21	0.10	1.74
Singapore	3.27	13.92	0.41	4.75	51.82	7.24	–	32.21	2.46	2.48
Thailand	5.90	0.01	0.85	23.62	16.70	0.40	23.74	–	0.29	1.24
United States	0.78	1.42	1.56	1.92	0.37	3.54	0.70	1.45	2.30	–

Source: CIPS, IMF.

Table 9. Intensity Index of Total Portfolio Investment Assets, 2007 (in million US$)

Recipients	Investor									
	EAST ASIA								NON-EAST ASIA	
	HK	IND	JPN	KOR	MAL	PHI	SGP	THL	AUS	USA
Australia	2.99	0.41	1.43	1.02	1.54	3.02	4.07	15.50	–	1.70
China, P.R.	20.26	0.00	0.58	6.63	0.78	0.78	3.09	0.31	–	1.29
Hong Kong SAR of China	–	3.28	0.82	21.06	16.53	2.67	6.91	1.17	1.76	1.90
Indonesia	0.66	–	0.39	3.18	16.98	5.06	19.50	0.94	0.54	1.73
Japan	0.72	0.26	–	0.82	0.45	0.34	0.69	0.11	1.73	2.17
Korea, Republic of	2.78	0.27	0.58	–	7.94	2.78	6.67	3.82	1.08	2.07
Malaysia	2.93	0.73	0.50	2.28	–	16.18	30.47	1.27	0.53	1.36
Philippines	1.39	1.05	0.76	0.64	6.14	–	5.66	0.23	–	1.98
Singapore	2.57	20.16	1.02	2.27	39.73	17.54	–	8.79	1.63	2.05
Thailand	1.58	8.46	0.54	2.09	7.67	4.15	10.65	–	–	1.80
United States	0.48	0.65	1.71	1.76	0.58	1.92	0.65	0.49	2.50	–

7. Concluding Remarks and Future Research

This paper employed the variance decomposition technique developed by Asdrubali et al. (1996) to investigate the extent of consumption risk sharing that was achieved by nine East Asian countries between 1971 and 2003. We provided evidence that, for these nine countries, about 22 percent of shocks to GDP are smoothed via the credit market channel while factor income flows (i.e. income received from the international capital markets) have not been used to smooth income shocks. We further found that around 75 percent of shocks to GDP remains unsmoothed (implying that consumption flows were generally not shielded from occasional shocks to income). These findings are consistent across sub-groups of countries although it appears that the ASEAN 5 group smoothed slightly more of their GDP shocks than did Northeast Asia.

The general picture is that the nine East Asian countries are still not well integrated into international capital markets and have a relatively low portion of change in net factor income from abroad and a relatively small ability to adjust national savings to protect consumption. The implication is that there would be significant welfare gains from improvements to mechanisms to achieve consumption smoothing and that these would benefit all countries in the region.

While the analysis cannot directly address the question of whether closer regional financial integration would provide these welfare gains, the analysis of investment intensity indexes is suggestive. Investors in the region have moved more toward a balanced geographic spread of their investments but some countries' investors remain heavily skewed toward the developed global financial markets. Many countries in the region still invest at disproportionately low levels within the region, with 26 of 81 bilateral assets holdings below 1 in 2007. Given the number of bilateral portfolio holdings that are below an intensity index of one, there is the possibility of increases in intra-regional investment flows both from the growth of the financial markets and from further rebalancing toward a more even geographic spread of investments by regional investors. These will not themselves, however, provide more consumption risk sharing as long as the size of international investment income remains low. The policy message is therefore that further opening of financial markets, and development of the capacity

for investors to hold foreign assets as a hedge against local income shocks, both within and outside the region, would improve welfare derived from consumption smoothing.

We should note several limitations of this type of analysis. First, we assumed that GDP was exogenous to the access to external income sources and to the extent of savings. This assumption may not be a realistic (see for example Nelson and Plosser, 1982).

In addition, in discussing the pattern of external investment, our investment intensity indices are derived from the CPIS data. These give an incomplete picture of the cross-country holdings of assets and do not account for foreign direct investment, which is likely to be a much larger element in foreign-derived income. We therefore have only a very indirect measure of the role of regional consumption risk sharing.

There are a number of possible extensions to this research. Finer grained data (quarterly data) over longer time periods would give a better picture of the pattern of consumption risk sharing across countries and over time. The use of VAR techniques would supplement our understanding of how country-specific income shocks are absorbed. Getting behind the pattern of consumption smoothing is essential to understand what drives the results. One way to do this would be to derive the extent to which countries have unsmoothed shocks and then to use panel data regressions on country characteristics (including some policy variables) to explain what helps or hinders the ability to smooth consumption. We might be able to include intensity indexes of regional investment compared with extra-regional investment to see whether closer engagement within the region helps in this regard.

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Appendix

Table 1. Comparison of Alternative Analysis of Risk-sharing Channels

Channel	Periods	Kim et al. (2006)	System (6)	System (6)
Capital Market	1971–2000	0.6	0.4	1.6
		(0.8)	(1.0)	(1.4)
	1971–1996	2.1	2.2	3.4
		(0.9)	(1.2)	(1.7)
	1991–2000	–2.4	–2.7	0.7
		(1.2)	(2.1)	(3.9)
Capital Market	1971–2000	19.4	23.0	21.5
		(3.9)	(3.5)	(3.4)
	1971–1996	18.9	28.0	28.0
		(4.2)	(4.2)	(4.0)
	1991–2000	11.6	18.0	9.9
		(6.0)	(5.9)	(6.5)
Unsmoothed	1971–2000	79.6	76.6	76.9
		(4.0)	(3.5)	(3.2)
	1971–1996	78.7	69.8	68.6
		(4.2)	(4.1)	(3.7)
	1991–2000	92.1	84.7	89.4
		(6.1)	(5.5)	(5.2)
Source		PWT	PWTv61	PWTv62
Estimator		SUR	SUR	SUR
Number of Countries		10	9	9

The numbers below the BP stat and F stat are p-values

Table 2. Estimate of Risk-sharing Channels Using Quarterly Data

Country	Capital Market	Credit Market	Unsmoothed	Period	Conclusion
Japan	–0.00169	–0.0055	1.007*	1969:1–2009:3	Uninsured
Indonesia	–0.011	1.09*	–0.087	1997:1–2009:3	Fully insured
Malay	0.0865	0.0167	0.8967*	2000:1–2008:4	9 % unsmoothed
Thailand	–0.161*	1.001*	0.15*	1993:1–2009:3	Fully insured
Korea	0.011*	1.02*	–0.341	1969:1–2009:2	Fully Insured
Hong Kong	0.109	0.625*	0.264*	1999:1–2009:2	73% insured
Philippines	0.01	0.07	0.91*	1981:1–2006:3	90% unsmoothed

* Statistically significant

Data Source: IFS, IMF.

Chapter 4

Business Cycle Synchronization and Financial Integration in the Asia–Pacific Region

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Abstract

This paper explores the factors that drive business cycle synchronization (BCS) in the Asia–Pacific region. Three main factors that figure prominently in the literature, viz., trade intensity, similarity of industrial structure and financial integration, are analyzed, with emphasis on the impact of financial integration on BCS. We employ a dynamic panel GMM approach in our estimation in order to control for biases associated with simultaneity and unobserved country-pair specific effects. Our results agree with theoretical predictions from the benchmark international business cycle models – greater financial integration leads to divergent BCS. This strongly suggests that controlling for biases associated with simultaneity and unobserved country-pair heterogeneity using a panel-based IV estimator is crucial in unraveling the contrasting evidence found in the empirical literature. Once such biases are accounted for, the prediction by theory regarding the inverse relationship between financial integration and BCS becomes apparent.

Keywords: financial integration, business cycle synchronization, Asia–Pacific countries, dynamic panel GMM, international business cycle models

JEL Classifications: C23, E32, E44, F36

Introduction

In the past decade, the buzzword amongst policymakers, observers and academics has been “globalization”. Arising from the strong growth of trade, finance, transportation and communication, the impression has been that the world has increasingly become “borderless” or to operate in sync as a single global market. Fast forward to the past year or so and, against the backdrop of the global financial turmoil, a different theme has emerged – decoupling. The term emanates from the observation that despite weakening economic conditions in the US and a number of industrial countries, economic conditions in emerging-market countries have been surprisingly strong and resilient. This perception challenges conventional wisdom that when the US economy sneezes, the rest of the world economy, especially emerging-market countries, catches a cold.

Initially one could think that greater trade and financial linkages would lead to tighter business cycles instead of being divergent or asynchronous. A perfunctory inspection of the data would indeed suggest so (Lane and Milesi-Ferretti, 2004, 2007). However, theoretical predictions suggest that trade and financial linkages can influence business cycle synchronization (henceforth BCS) either way. For example, standard international business cycle theories predict that greater financial integration should lead to a lower degree of BCS, whereas models of financial contagion, such as Allen and Gale (2000) show how international financial integration can lead to financial panic and thus to synchronized business cycles. The question therefore is an empirical one, but the current empirical literature does not help as it fails to find a robust and systematic relationship. Pure cross-sectional studies, for instance, find a significantly positive relationship between financial integration and BCS, e.g. Imbs (2004, 2006). However, recent studies using panel data show a strong negative effect, e.g. Cerqueira and Martins (2009) and Kalemli-Ozcan et al. (2009), and thus are in conformity with the basic ideas of standard international business cycle theories.

This paper contributes to the empirical literature in a number of ways. First, we take the pragmatic approach of using quantity- and price-based indicators of financial integration to ensure robustness in our results. This is important as the lack of mandatory reporting of actual bilateral information on FDI and portfolio investment data, which limits many

previous studies (including ours), makes this a sensible and logical strategy.[1] Second, in view of the data limitation just mentioned, we exploit the availability for a number of years of survey-based data on portfolio investment from the Coordinated Portfolio Investment Survey (CPIS) gathered by the IMF. To the best of our knowledge no study employs this dataset to ascertain the direction of the BCS–finance link in a panel context. Third, as we are using panel data, we adopt a panel-based GMM approach in our estimation. We believe that this technique gives us two important advantages compared to previous approaches, namely, controlling for biases associated with simultaneity, and unobserved country-pair specific effects. Finally, we examine the impact of trade and financial linkages on BCS across a broad cross-section of Asian and Pacific countries. The evidence is mostly for OECD or industrial countries, and little empirical work has been done in this part of the world. Previous empirical works by Park and Shin (2009) and Shin and Sohn (2006) find either a negligible or an insignificant effect of financial integration on BCS.[2]

Our results agree with the benchmark standard international business cycle models. This strongly suggests that controlling for biases associated with simultaneity, let alone unobserved country-pair heterogeneity, using a panel-based IV estimator is crucial in unraveling the contrasting evidence found in the empirical literature. In a pure cross-sectional instrumental-variable regression any unobserved time-invariant country-pair specific effects would be part of the error term, leading to biased estimates of the coefficients, and as such previous studies that examine the direction of the BCS–finance link using pure cross-sectional data are afflicted by this problem. Once biases associated with simultaneity and unobserved country-pair specific factors are accounted for, the theoretical prediction regarding the inverse relationship between financial linkages and BCS becomes apparent in the results.

The rest of the paper is structured as follows. The next section reviews the literature on the relationship between financial integration and BCS. Section 3 describes the data and

[1] Exceptions to this limitation are Kalemli-Ozcan et al. (2009), who use BIS proprietary data on OECD countries, and Garcia-Herrero and Ruiz (2008), who use a novel dataset on bilateral flows between Spain and a large number of countries taken from the Spanish Balance of Payments.

[2] An exception is by Lee and Azali (2010), who look at a smaller sub-section of countries than we examine in this paper and who emphasize OCA criteria.

the measures used for each of the variables. Section 4 describes the estimation strategy. Section 5 presents the empirical results. Section 6 offers some policy implications emanating from the results, and Section 7 concludes.

2. Literature Background

Financial integration has been argued to affect business cycle synchronization but as to whether it should lead to tighter or synchronized business cycles is unclear. Standard international macro theories predict that greater financial integration should lead to a lower degree of business cycle synchronization. As shown by Backus et al. (1992) and Baxter and Crucini (1995), in a two-country general equilibrium model with complete financial markets, a country hit by a positive productivity shock receives capital from the other country, resulting in a negative output correlation between the two. Similarly, Backus et al. (1994) document that complete markets result in negatively correlated GDP because an economy hit by a positive technology shock will attract capital flows away from the no-shock economy.

Heathcote and Perri (2001, 2003, 2004) also find results that are in line with the above mentioned studies through a model in which international financial market integration occurs endogenously in response to less-correlated shocks. They argue that increasing globalization in financial markets is the key for less international co-movement. A combination of less-correlated shocks coupled with the resulting deepening of international asset markets can account for the less-correlated international real business cycle. Likewise, international specialization theories along the lines of Obstfeld (1994) yield a similar prediction.

However, surprisingly, the empirical evidence is still mixed as to the relationship between financial integration and business cycle correlation. In a pure cross-sectional context, studies find a significantly positive relationship between financial integration and BCS. Using a system of simultaneous equations, Imbs (2004) finds evidence that economic regions with strong financial links are significantly more synchronized. Employing the same approach but using the 2001 Coordinated Portfolio Investment Survey (CPIS) gathered by the IMF, Imbs (2006) finds similar results. Kose et al. (2003) using a cross-country sample of 76 countries – 21 industrial and 55 developing –

find evidence that financially open developing economies have synchronized cycles with the core rich G7 countries over the period 1960–1999. Davis (2009) also finds a positive relationship between international credit and BCS over a cross-country sample of 58 countries from 1991 to 2004. Jansen and Stokman (2004) investigate the relationship between FDI and BCS over the period 1982–1991 using data from Canada, France, Germany, the Netherlands, the UK and the US, and find that the rapid expansion of FDI can be related to the phenomenon of more synchronized business cycles. Finally, Kose et al. (2008a) and Kose et al. (2008b) find the same results with a dynamic latent factor model.

A notable exception that documents a negative relationship between financial integration and BCS in a pure-cross section context is by Garcia-Herrero and Ruiz (2008). Using actual bilateral financial flows from Spain these authors estimate a system of simultaneous equations and find that greater financial integration leads to divergent BCS. Bordo and Heibling (2003) also find a long-run increase in cycle synchronization, but conclude that little of it can be ascribed to a proxy of financial integration using the removal of capital control.

Although one can reconcile these studies that find a positive relationship between financial integration and BCS based on models of financial contagion, such as Allen and Gale (2000), which show how international financial integration can lead to financial panic and thus to synchronized business cycles, these studies conflict with the benchmark international business cycle models discussed above.

Opposed to cross-country studies that consistently find a positive effect of financial integration on BCS, some recent studies using panel data show a robust negative effect, and thus are in conformity with the basic ideas of standard theories. For instance, using panel three-stage least squares estimation for 15 OECD countries from 1984 to 2003, Xing and Abbott (2007) find that economic regions with strong financial links are significantly less synchronized. Using GMM methods for 20 OECD countries from 1970 to 2002 Cerqueira and Martins (2009) also find a negative and significant effect of financial integration on BCS. Using data for eight Asian countries – ASEAN5 (Indonesia, Malaysia, the Philippines, Singapore and Thailand), plus three additional members of East Asia (China, Japan and Korea) – Lee and Azali (2009) also find a

similar significantly negative effect. Finally, Kalemli-Ozcan et al. (2009), using a rich panel data structure on banks' international bilateral exposure over the past three decades across 20 developed countries, show that once country-pair and time-fixed effects are controlled for, a higher degree of cross-border financial integration leads to less synchronized, more divergent business cycles.

A notable exception that documents a positive relationship between financial linkages and BCS using panel data is by Schiavo (2008). Using a system of simultaneous equations for 190 developed country pairs over the period 1991–2002, the study shows that financial integration is associated with less-divergent business cycles. Inklaar et al. (2007), using a sample of 21 OECD countries over the period 1970–2003, find that the financial integration measures suggested by Imbs (2004) are not robustly related to BCS.

3. Data and Measurement

In order to examine empirically the effect of financial linkages as well as the effect of two other channels – trade linkages and similarity in industrial structure – on BCS, we estimate the following equation:

$$\rho_{ij,t} = \alpha_0 + \alpha_1 \rho_{ij,t-1} + \beta_1 T_{ij,t} + \beta_2 S_{ij,t} + \beta_3 F_{ij,t} + \upsilon_{ij,t}\,, \tag{1}$$

where i,j represents country pair i and j; $\rho_{ij,t}$ denotes the business cycle correlation or synchronization (BCS) between countries i and j; $\rho_{ij,t-1}$ is the lagged BCS between countries i and j; $T_{ij,t}$ is a measure of bilateral trade intensity; $S_{ij,t}$ is an index of the similarity of the industrial structure between countries i and j; and $F_{ij,t}$ is a measure of financial integration between countries i and j. In Equation 1 we assume that $\nu_{ij,t}$ contains the following two effects: (i) the unobserved time-invariant country-pair specific effect, $\eta_{ij,}$, and (ii) a stochastic error term $\varepsilon_{ij,t}$, varying across time and cross-section.

We adopt a panel approach over the period 1980–2007. To acquire a meaningful measure of business cycle correlation as well as to purge any possible cyclical effects on

the variables, the 28 years have been split into subperiods of four years each.[3] Our strategy of investigation assumes that countries in the Asia–Pacific region integrate within the region as well as with two major economic blocs – the United States and the EU-14. The EU bloc includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the UK. The Asian–Pacific bloc comprises China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Taiwan, Thailand, Australia and New Zealand.

The business cycle correlations refer to the Pearson correlation of cyclical component of annual real GDP expressed in US dollars between countries *i* and *j* over the relevant subperiods. The cyclical components of GDP are computed in two ways after taking the natural logarithms of real GDP: (i) using the Hodrick–Prescott (HP) filter, and (ii) the Baxter–King (BK) band-pass filter.[4]

Two different measures of bilateral trade intensity will be considered. The first is a standard measure used in many recent studies, for instance, Clark and van Wincoop (2001), Frankel and Rose (1997, 1998) and Imbs (2004) among others, and is calculated as:

$$T^1_{i,j} = \frac{1}{T}\sum_t \frac{X_{ij,t} + M_{ij,t}}{Y_{i,t} + Y_{j,t}} \tag{2}$$

where $X_{ij,t}$ denotes total merchandise exports from country *i* to *j* in year *t*, $M_{ij,t}$ denotes imports to *i* from *j*, and Y_{i} denotes nominal GDP in country *i*. An alternative measure, proposed by Clark and van Wincoop (2001) based on the model in Deardoff (1998), and employed by Imbs (2004, 2006) among others, can be constructed as:

$$T^2_{i,j} = \frac{1}{2}\frac{1}{T}\sum_t \frac{(X_{ij,t} + M_{ij,t})Y^W_t}{Y_{i,t} \times Y_{j,t}} \tag{3}$$

where Y^W_t is world GDP. T^2 differs from T^1 in that it is independent of country size and depends only on trade barriers. In the empirics, we take the natural logarithm of both

[3] 1980-1983, 1984-1987, 1988-1991, 1992-1995, 1996-1999, 2000-2003 and 2004-2007.

[4] We do not broach the literature on the appropriate measure of synchronizations of business cycles, noting only that most studies employ simple bilateral correlation coefficients in order to measure the strength and direction of the association between the cyclical components of the annual real GDP of two countries.

measures of bilateral trade intensity. We interpret that the *higher* the values of T^1 and T^2 the greater the trade intensity between countries *i* and *j.* In terms of Equation (1), the sign of β_1 can be positive or negative as theory predicts that closer bilateral trade could result in synchronized (positive) or asynchronous (negative) business cycles.

There are no standard measures of similarity in industrial structures (Imbs, 2004). We use two measures of similarity in industrial structures for comparability with existing research. The first, a measure akin to a Herfindahl index of concentration, is employed in Clark and van Wincoop (2001), Imbs (2004, 2006) and Krugman (1991), among others, and is measured as:

$$S_{i,j}^1 = \frac{1}{T}\sum_t \sum_n^N \left| S_{ni} - S_{nj} \right|, \tag{4}$$

where S_{ni} and S_{nj} denote the GDP shares for industry *n* in countries *i* and *j,* respectively. If two countries had identical industrial structures, that is, the industry shares in GDP were the same for countries *i* and *j*, then the index would be 0. On the other hand, when two countries have completely disjointed or different industrial structures, the index reaches a maximum value of 2. Therefore, *lower* values of S^1 imply more similarity in industrial structure between countries *i* and *j.*

Our second measure of similarity of industrial structure, suggested by Shea (1996) and used by Imbs (2001, 2003) and Baxter and Kouparitsas (2005) is the correlation of industry shares:

$$S_{i,j}^2 = \frac{1}{T}\sum_t \frac{\sum_n^N S_{ni} S_{nj}}{\sqrt{\sum_n^N S_{ni}^2}\sqrt{\sum_n^N S_{nj}^2}} \tag{5}$$

If $S_{ni} = S_{nj}$, that is, GDP shares of each industry are the same in countries *i* and *j*, S^2 is equal to 1. In other words, *lower* values of S^2 imply less similarity in industrial structure between countries *i* and *j.* We also take the natural logarithms of both measures of similarity of industrial structure in our empirics. Theory clearly predicts that similar production patterns between countries should lead to synchronized business cycles, and

as such the sign of β_2 changes depending on the measure used for similarity of industrial structure in Equation (1). That is, S^1 implies $\beta_2 < 0$, while S^2 implies $\beta_2 > 0$.

Bilateral financial integration can be difficult to measure effectively. On this basis, our measures of financial integration encompass quantity- and price-based measures to ensure robustness. We first discuss our quantity-based measures of financial integration and then turn to our price-based measures. Our quantity-based measure of financial integration is constructed in three ways. The first measure uses the recently updated dataset of Lane and Milesi-Ferretti (2007) and, following Cerqueira and Martins (2009), is calculated as the average of the sum of stocks of assets and liabilities of foreign direct investment (FDI) and portfolio investment between countries *i* and *j* scaled by nominal GDP:[5]

$$F^1_{ij,t} = \frac{1}{T}\sum_t \left(\frac{A_{i,t} + L_{i,t}}{Y_{i,t}} + \frac{A_{j,t} + L_{j,t}}{Y_{j,t}} \right), \tag{6}$$

where *Ai,t* and *Li,t* are total assets and liabilities of country *i*, at time *t*. We can interpret F^1 as a measure of the extent of openness between pairs of countries to global financial markets, and as such we think of *higher* values of F^1 when pairs of countries are more financially integrated with world financial markets. An alternative measure of financial openness, which builds on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) and is thus based on information on controls on financial flows, is the index-based measure recently put together by Chinn and Ito (2008). To construct a bilateral measure, the average of the sum of the indices between countries *i* and *j* is calculated as:

$$F^2_{ij,t} = \frac{1}{T}\sum_t (ITO_{i,t} + ITO_{j,t}), \tag{7}$$

where $ITO_{i,t}$ and $ITO_{j,t}$ denote the Chinn–Ito indices for countries *i* and *j*, respectively. Likewise, F^2 takes higher values when pairs of countries have officially lower restrictions on financial flows.

[5] Also using the Lane and Milesi-Ferretti dataset, Imbs (2004) constructs his own alternative measure of bilateral financial integration by using the difference between the stocks of assets and liabilities (net foreign asset) between countries *i* and *j*.

Finally, one of this paper's contributions is to use in a panel context the Coordinated Portfolio Investment Survey (CPIS) gathered by the IMF that provides direct observations on bilateral asset holdings from 2001 until 2007.[6] At the outset, however, one should also recognize that the data have their own limitations. Problems of under-reporting (Lane and Milesi-Ferretti, 2004), non-inclusion of foreign direct investment (FDI), and the absence of some countries in the collection in view of the non-mandatory nature of the reporting, are some of the concerns that plague these dataset (Imbs, 2006).[7] Nonetheless, given our awareness of the problems inherent in the dataset, which is borne out of the lack of data sources based on mandatory reporting of bilateral information on FDI and portfolio investment, our third quantity-based measure of financial integration is computed, as in Garcia-Herrero and Ruiz (2008):

$$F_{ij,t}^{3} = \frac{I_{ij,t} + I_{ji,t}}{Y_{i,t} + Y_{j,t}}, \tag{8}$$

where $I_{ij,t}$ represents financial flows from country i to country j at time t. Similar to F^1 and F^2, F^3 takes higher values when pairs of countries are more financially integrated.

In order to measure financial integration through a price-based indicator, we follow Schiavo (2008) in defining financial integration as the Euclidean distance between the spread among long- and short-term interest rates as well as the spread among long-term bank lending rates, respectively:

$$F_{ij,t}^{LS} = \sqrt{(loir_i - loir_j)^2 + (sir_i - sir_j)^2} \tag{9}$$

$$F_{ij,t}^{LL} = \sqrt{(loir_i - loir_j)^2 + (blir_i - blir_j)^2}, \tag{10}$$

where $loir_i$, sir_i, $blir_i$ are the long- and short-term and bank lending rates in country i. The underlying argument behind both measures is that it utilizes the notion that interest rate equalization can be expressed in the form of distance from the law of one price starting from long- and short-term interest rates (F^{LS}) or from long-term bank lending rates (F^{LL}). The appeal of both measures is that these rates span "orthogonal" markets

[6] Imbs (2006) uses the 2001 CPIS survey data, which effectively makes it a pure cross-sectional study.
[7] For instance, two of the 13 Asia–Pacific countries that are examined in this paper, namely, China and Taiwan, are both absent from the collection.

and therefore give a multi-faceted or complete picture of closer financial integration rather than focusing only on a single rate, which may produce a distorted picture (Schiavo, 2008). Being a measure of distance from the law of one price, *higher* values of F^{LS} and F^{LL} imply less financial integration between countries *i* and *j*.

As discussed in Section 2 above, standard international business cycles theories show that greater financial integration leads to divergent business cycles and as such the sign of β_3 changes, depending also on the measure used for financial integration in Equation (1). That is, F^1, F^2 and F^3 all imply $\beta_3 < 0$, while F^{LS} and F^{LL} both imply $\beta_3 > 0$.[8]

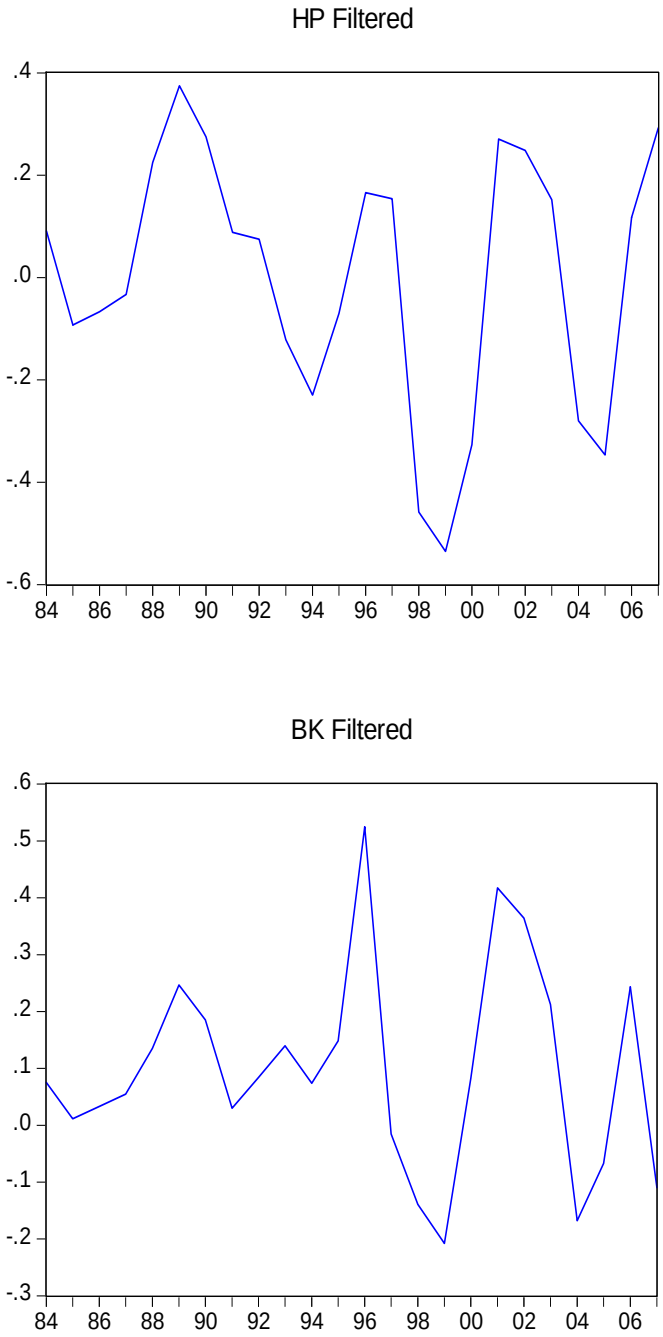
3.1. Some Stylized Trends

As a preliminary step, this section presents a graphical evolution of our measures of BCS as well as the measures of financial integration that we employ later in our analysis. We begin by examining the stylized trends in our BCS measures over the period considered in our analysis.

Figure 1 presents the business cycle synchronization between the Asia–Pacific economies and the EU-14. The figure has two graphs, one for each of detrending techniques used – the Hodrick–Prescott (HP) filter and the Baxter–King (BK) band-pass filter. Each graph contains time-series plots of the average BCS for all possible pairs of Asian and EU-14 countries at a point in time. The average BCS level varies over time between –0.5 to 0.5, but there are no obvious trends. To be sure, the Asian financial crisis of 1997–1998 made the business cycle asynchronous between these two regions as well as during the mid-2000s. However, by the end of the period of interest, there is a divergence in outcome on whether Asian business cycles became more (HP filter) or less (BK filter) correlated with the EU-14 countries.

[8] Obviously, in relation to cross-country empirical studies that find a positive relationship between financial integration and BCS, the sign of β_3 is the reverse of the above. That is, $\beta_3 > 0$ for F^1, F^2 and F^3, and $\beta_3 < 0$ for the case of F^{LS} and F^{LL}.

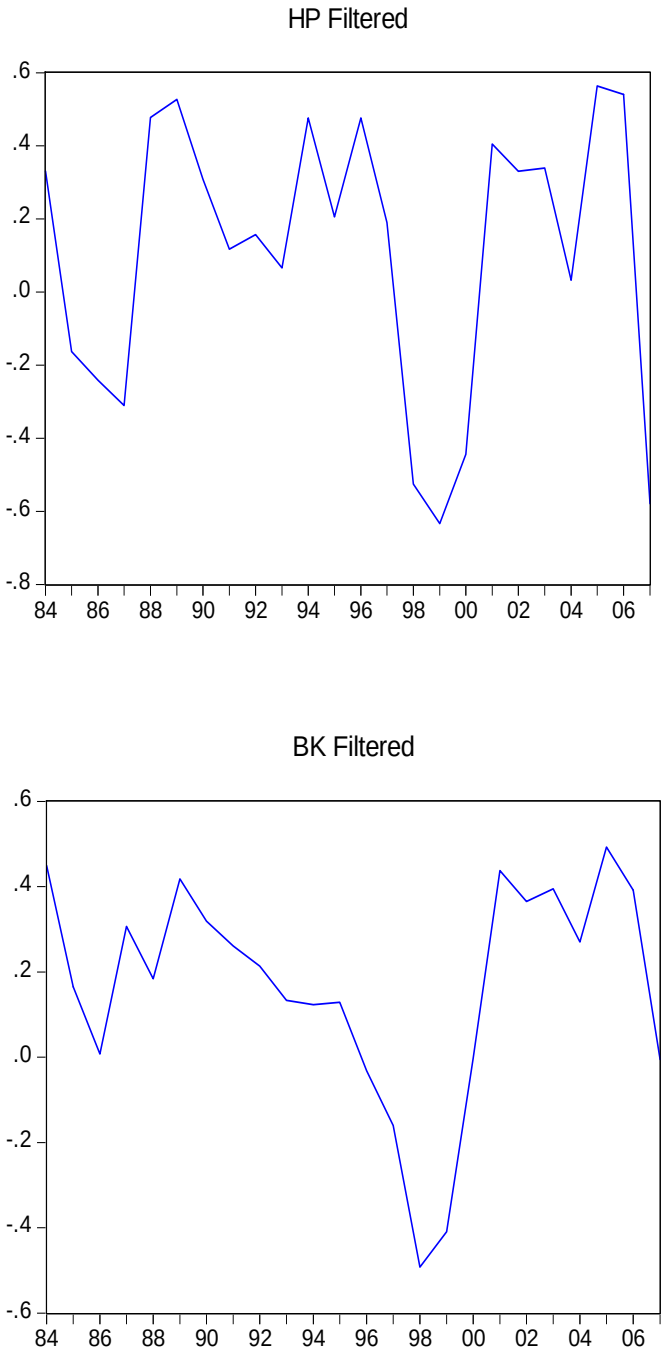
Figure 1. Asia–EU Business Cycle Correlation across Time



Note: The correlation is estimated with a four-year rolling window.

Source: Authors' calculations.

Figure 2. Asia–US Business Cycle Correlation across Time



Note: The correlation is estimated with a four-year rolling window.

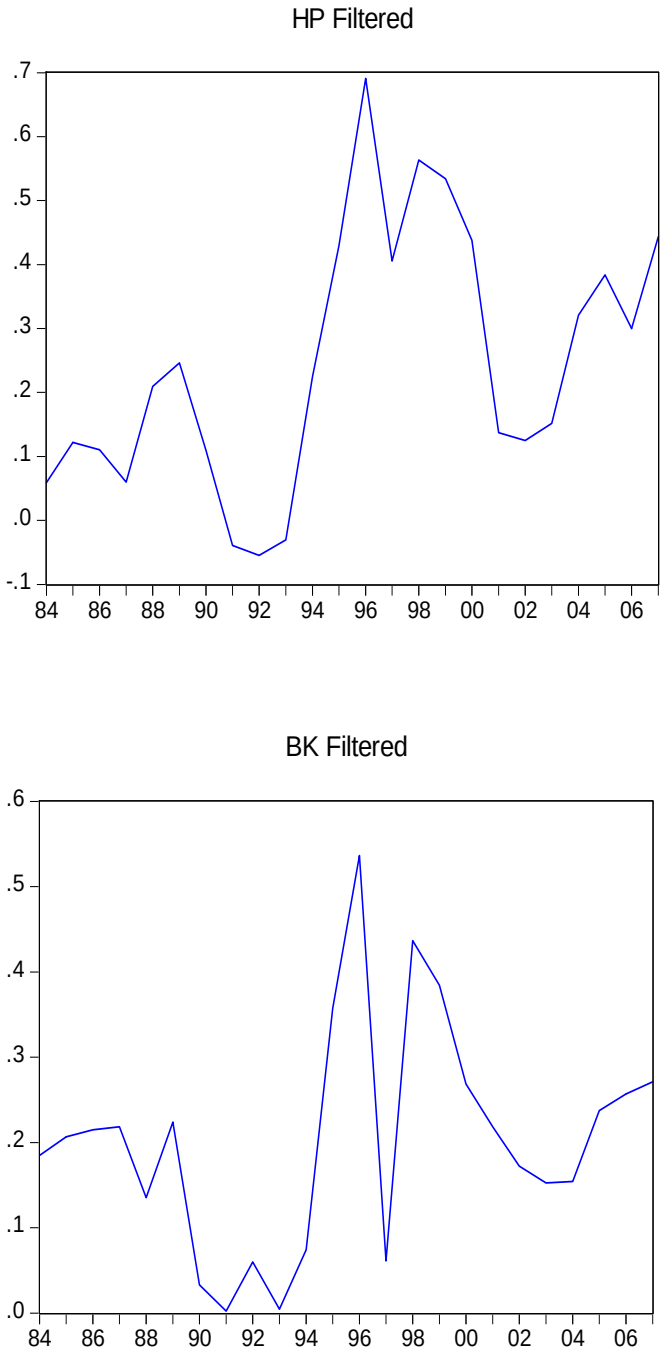
Source: Authors' calculations.

Figure 2 is an analogue that considers the BCS of the Asia–Pacific economies to the United States. In the aftermath of the steep decline in BCS levels around the time of the Asian financial crisis, BCS levels typically hovered around 0.4 or so in the 2000s. However, as portrayed in the figure, there is a tendency between business cycles across the Asia–Pacific countries and the United States in 2007 to be *less* correlated.

Finally, Figure 3 is an analogue that considers the intra-Asia–Pacific countries' BCS levels over time. The single most striking observation of Figure 3 is the marked contrast in average BCS levels in this figure as compared, in particular, with the average BCS levels presented in Figure 2. This suggests a shrinking relationship between the business cycles of the Asia–Pacific countries and with major countries outside of it, most especially the United States, whereas, at the intra-regional level, decoupling does not seem to be a phenomenon over time.

Obviously, the above analysis has its limitations, and thus should be taken as indicative only on whether business cycles in the Asia–Pacific economies are moving asynchronously or are "decoupled" over time with the two major economic blocs considered in the analysis. For one, the analysis is unconditional – no other factors have been taken into account as possibly affecting BCS. This will be the focus of our attention in the subsequent sections, but before that we take a brief look at the trends of our financial integration measures over time.

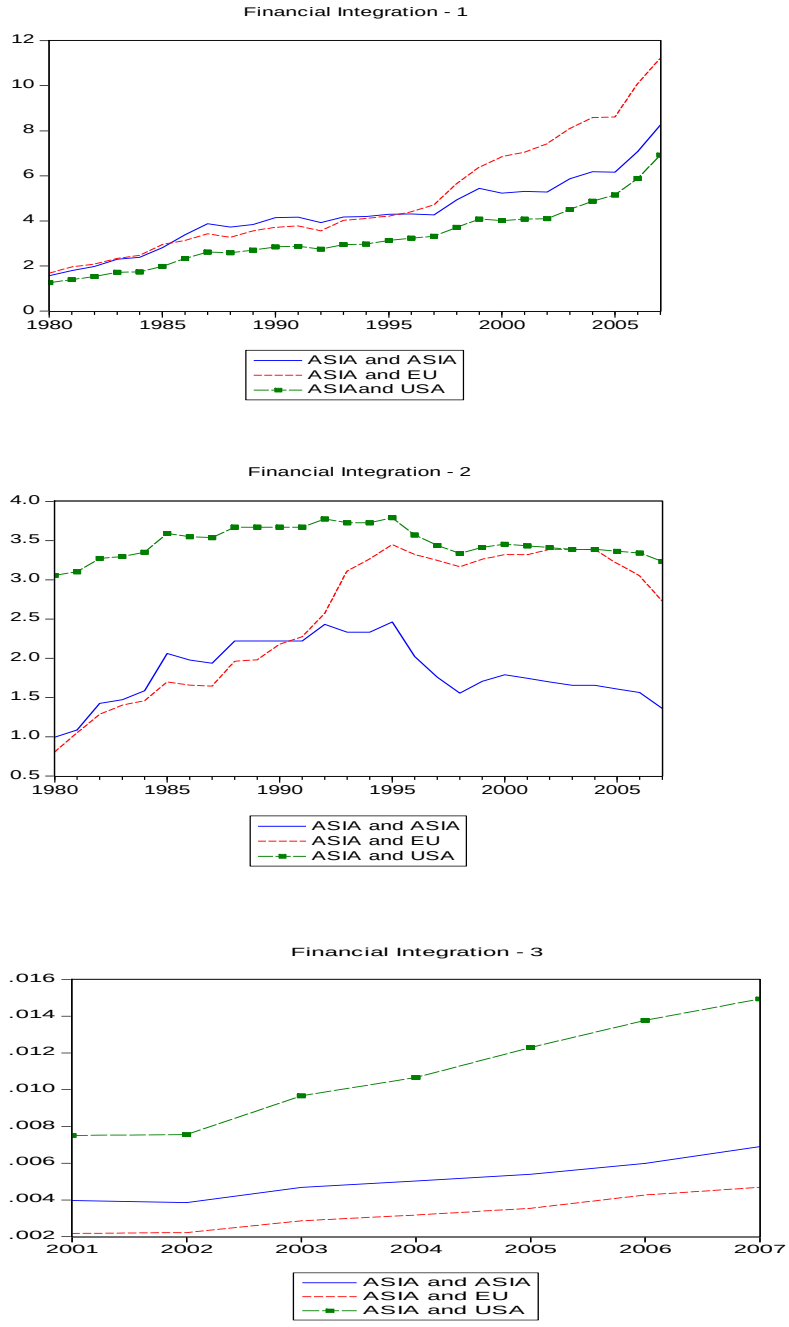
Figure 3. Asia–Asia Business Cycle Correlation across Time



Note: The correlation is estimated with a four-year rolling window.

Source: Authors' calculations.

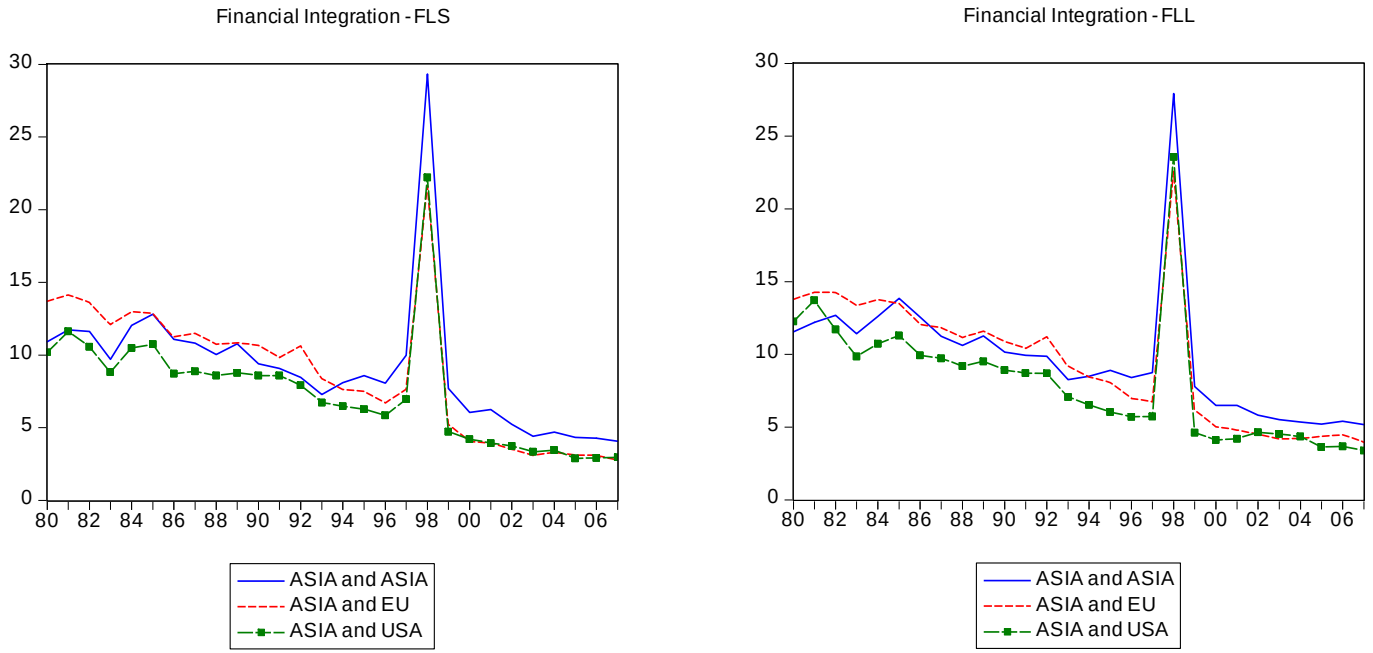
Figure 4. Financial Integration over Time (Quantity-Based)



Note: The correlation is estimated with a four-year rolling window.

Source: Authors' calculations.

Figure 5. Financial Integration over Time (Price-Based)



Note: The correlation is estimated with a four-year rolling window.

Source: Authors' calculations.

Figures 4 and 5 give a graphical depiction of the evolution over time of our quantity-based and price-based measures of bilateral financial integration, respectively. Figure 4 has three graphs, one for each of our bilateral financial integration measures (F^1, F^2 and F^3). Each graph contains time-series plots of the cross-country-pair average of the relevant financial integration measure.[9] Figure 4 clearly shows that, according to our first measure of financial integration, Asia's integration with world financial markets has increased considerably over the past three decades. Indeed, a more detailed inspection of this particular plot of F^1 indicates that the dramatic rise occurred around the middle of the 1990s. Whereas there is a clear and persistent upward trend in F^1, there is a reversal in Asia's openness to financial flows sometime in the mid-1990s according to our second bilateral measure (F^2). From this point until the end of the period considered, our second measure seems to fluctuate around an approximately constant mean, which intuitively suggests that Asia has not made much further progress in reducing formal restrictions on financial flows in recent years. With regards to our last quantity measure of bilateral financial integration (F^3), in consistency with Kim and Lee (2008), its evolution portrays Asia's increasing though limited intra-regional financial integration as it falls behind that of its integration with the US.

Finally, Figure 5 presents a graphical depiction of our price-based measures of financial integration. Clearly, with the exception of the period around the time of the 1997–1998 Asian crises, cross-country dispersion or "distance" from the law of one price is declining over time, but remains sizable, and is, likewise, suggestive of Asia's greater integration with the EU-14 and the US than within the region.

Supplementary results to the above discussions are provided by the unconditional correlations of the respective bilateral variables in Table 1.[10] While most of our quantity-based indicators of financial integration tend to show a very weak (almost zero) negative relationship with our two BCS measures, this stands in contrast to the unconditional correlation results between most of our price-based indicators and our

[9] Notice that the time-scale axis for the graph containing the F^3 measure is not in synch with the other two measures. Recall from our previous discussion that the F^3 measure is constructed using the CPIS data which are only available for 1997 and then from 2001 to 2007.

[10] The unconditional correlations for the smaller sample period of 2001–2007 when using the CPIS data in constructing the third quantity-based indicator of financial integration, i.e. F^3, is presented separately in Table A1 in the Appendix.

two BCS measures – a weak positive relationship. Furthermore, the low correlation (< 0.5) among our measures of the explanatory variables in Equation (1) suggests that multicollinearity is not an issue here.[11]

Table 1. Correlation Matrix of the Variables

	ρHP	ρBK	T1	T2	S1	S2	F1	F2	FLS	FLL
ρHP	1.0000									
ρBK	0.5875	1.0000								
T1	0.2151	0.1400	1.0000							
T2	0.1729	0.1443	0.8751	1.0000						
S1	0.0088	0.0149	0.0758	0.0919	1.0000					
S2	–0.0124	–0.0034	–0.0559	0.0025	–0.8465	1.0000				
F1	0.0353	–0.0247	0.3404	0.4223	0.0220	0.0176	1.0000			
F2	–0.0922	–0.0178	0.1568	0.1767	–0.2702	0.2273	0.5305	1.0000		
FLS	–0.0766	0.0055	–0.1953	–0.1139	0.1301	–0.0989	–0.3032	–0.2335	1.0000	
FLL	–0.0741	–0.0028	–0.2033	–0.1395	0.1444	–0.1252	–0.3157	–0.2038	0.8611	1.0000

Note: All variables are in logarithmic form with the exceptions of ρ^{HP}, ρ^{BK}, F^2, F^{LS} and F^{LL}.

Source: Authors' calculations.

4. Methodology

4.1. Dynamic Panel GMM Technique[12]

In a pure cross-sectional regression any unobserved time-invariant country-pair specific effects would be part of the error term, leading to biased estimate of the coefficients. Previous studies of the direction of the BCS–finance link using pure cross-sectional data are afflicted by this problem. A panel context, however, allows us to control for these unobserved time-invariant country-pair specific effects and, as a result, the problem of biased coefficient estimates are either reduced or eliminated. This is important as there is growing evidence in the literature that cultural biases and differences, for instance, have a substantial impact on a variety of financial flows – portfolio and direct investment (Ekinci et al., 2008; Guiso et al., 2009) as well as on foreign bank lending (Giannetti and Yafeh, 2008; Mian, 2006). In addition, the GMM estimator does not require any particular distributions of the error term. This veers away from the

[11] It should be noted at this point that the high correlation between T^1 and T^2, S^1 and S^2 and F^1 and F^2 in Table 2 does not pose any multicollinearity problems in the estimation of Equation (1) as two respective measures of, for instance, trade intensity, are entered separately as explanatory variables in Equation (1).

[12] The discussion that follows draws in part on Calderon and Chong (2001), Chong and Gradstein (2007) and Levine et al. (2000).

complicated inference introduced by using a Pearson correlation coefficient (bounded at –1 and 1) to measure BCS as the error term is unlikely going to be normally distributed.

In order to estimate our model (Equation 1) consistently and efficiently, we use a generalized method of moments (GMM) estimator for dynamic panel data models that was introduced by Holtz-Eakin et al. (1990) and Arellano and Bond (1991), and further developed in a series of papers including Arellano and Bover (1995) and Blundell and Bond (1998). This estimator encompasses a regression equation in both differences and levels, each one with its specific set of instrumental variables. Consider the following regression equation for BCS:

$$y_{ij,t} = \alpha y_{ij,t-1} + \beta X_{ij,t} + \eta_{ij} + \varepsilon_{ij,t}\,, \tag{11}$$

where y is the business cycle correlation measure, X represents the set of explanatory variables apart from the lagged business cycle correlation measure, η is an unobserved, time-invariant country-pair specific effect, ε is the error term, and the subscripts i, j and t represent country pairs and time period, respectively.

We eliminate country-pair specific effects (η_{ij}) by taking first differences of Equation (11):

$$y_{ij,t} - y_{ij,t-1} = \alpha(y_{ij,t-1} - y_{ij,t-2}) + \beta(X_{ij,t} - X_{ij,t-1}) + (\varepsilon_{ij,t} - \varepsilon_{ij,t-1}) \tag{12}$$

The use of own suitable lagged levels of $y_{ij,t}$ as instruments is required to deal with the problem that by differencing the lagged dependent variable ($y_{ij,t-1} - y_{ij,t-2}$) is correlated with the error term, $\varepsilon_{ij,t} - \varepsilon_{ij,t-1}$. The same strategy is applied to form instruments for other explanatory variables that are allowed to be endogenous in the sense that they can be affected by current and past realizations of business cycle correlations. This feature enables us to avoid simultaneity bias due to the endogeneity of our financial linkages variables. Strictly speaking, under the assumption that (i) the explanatory variables, X, are weakly exogenous (no correlation with future realizations of the error term), and (ii) the error term, ε, is not serially correlated, the dynamic panel GMM estimator exploits the following moment conditions:

$$E[y_{ij,t-s} \cdot (\varepsilon_{ij,t} - \varepsilon_{ij,t-1})] = 0 \qquad \text{for} \qquad s \geq 2;\ t = 3, \ldots, T \tag{13}$$

$$E[X_{ij,t-s} \cdot (\varepsilon_{ij,t} - \varepsilon_{ij,t-1})] = 0 \qquad \text{for} \qquad s \geq 2;\ t = 3, \ldots, T. \tag{14}$$

The resulting GMM estimator based on these conditions is known as the *difference*-GMM estimator. There is, however, an issue with the *difference*-GMM estimator. If lagged dependent variables and explanatory variables are persistent over time, the lagged levels likely represent weak instruments for the first-differenced variables. This causes finite sample bias and low accuracy, which leads to the need to complement the regression in first differences with a regression in levels. The instruments for the regression in first differences are the same as above. The instruments for the regression in levels, in turn, are the lagged *differences* of the same corresponding variables, under the assumption that although there may be correlation between the levels of the right-hand side variables and the country-pair specific effect in Equation (11), none exists between the differences of these variables and the country-pair specific effect.

The additional moment conditions for the regression in levels are:

$$E[y_{ij,t-s} - y_{ij,t-s-1}) \cdot (\eta_{ij} + \varepsilon_{ij,t})] = 0 \text{ for } s = 1 \tag{15}$$

$$E[X_{ij,t-s} - X_{ij,t-s-1}) \cdot (\eta_{ij} + \varepsilon_{ij,t})] = 0 \text{ for } s = 1. \tag{16}$$

The consistency of the GMM estimator depends on whether lagged values of the explanatory variables are valid instruments in the regression. To address this issue, we consider two specification tests: the first is the Hansen test of over-identifying restrictions, which tests the overall validity of the instruments. Failure to reject the null hypothesis supports the model. The second test examines the hypothesis that the error term is not serially correlated. We test whether the differenced error term, that is, the residual of the regression in differences, is second-order serially correlated.[13] If the test fails to reject the null hypothesis of absence second-order serial correlation, we conclude that the original error term is serially uncorrelated and use the corresponding moment conditions.

[13] Second-order serial correlation of the differenced residual indicates that the original error term is serially correlated and follows a moving-average process at least of order one.

5. Estimation Results

Table 2 presents the dynamic panel GMM estimation results using business cycle correlation or synchronization as the dependent variable. The table has six columns. The first column refers to the explanatory variables used in the estimation of a particular specification of the dynamic panel GMM. The second to fourth columns contain the coefficient estimates of the explanatory variables, that is, measures of trade, similarity of industrial structure, and financial, respectively, along with the p-values in square brackets; estimates that are significantly different from zero at the 0.10, 0.05 and 0.01 are marked by one, two and three asterisks, respectively. The last two columns contain the specification tests results. The table also contains two panels. The upper panel contains the results using the Hodrick–Prescott filter; the lower panel contains the estimates using the Baxter–King band-pass filter. Each panel has four sets of results, and each set is delineated based on the measure of financial integration (*F*) used as the explanatory variable in the GMM estimation. In turn, each set contains four rows of results that pertain to all possible permutations of *F* with the other explanatory variables *T* (bilateral trade) and similarity of industrial structure (*S*).

We begin by examining the specification test results. The Hansen test of overidentifying restrictions in all cases does not reject the null hypothesis that the instruments are not correlated with the error process. In addition, tests of serial correlation fail to reject the null that the error term, expressed in first differences, is not second-order serially correlated in all cases. This supports using lags of the explanatory variables as instruments.[14]

[14] In addition, apart from using "internal" instruments , i.e. lags of the explanatory variables, we also included the pair-wise sum of the recently updated exchange rate regime classification of Reinhart et al.(2010), the pair-wise sum of GDP per capita, and the absolute value of differences in GDP per capita as "external" instruments in the GMM estimations.

Table 2. Dynamic Panel GMM estimations of Business Cycle Synchronizations (Crisis Years Included)

Variables	Trade ($T_{ij,t}$)	Specialization ($S_{ij,t}$)	Finance ($F_{ij,t}$)	Hansen test (p–value)	AB test for AR(2) (p-value)
		Hodrick–Prescott Detrended			
T^1, S^1, F^1	1.153 [0.00]***	–0.448 [0.04]**	–0.446 [0.01]**	0.38	0.29
T^2, S^1, F^1	0.448 [0.01]**	0.633 [0.01]**	–0.443 [0.00]***	0.78	0.26
T^1, S^2, F^1	0.654 [0.00]***	1.27 [0.03]**	–0.415 [0.00]***	0.61	0.08
T^2, S^2, F^1	0.534 [0.01]**	–1.85 [0.03]**	–0.494 [0.00]***	0.87	0.17
T^1, S^1, F^2	0.448 [0.00]***	–0.439 [0.00]***	–0.109 [0.00]***	0.14	0.66
T^2, S^1, F^2	1.516 [0.05]**	2.361 [0.12]	–0.902 [0.03]**	0.78	0.84
T^1, S^2, F^2	0.609 [0.00]***	2.780 [0.00]***	–0.139 [0.00]***	0.81	0.76
T^2, S^2, F^2	0.349 [0.02]**	2.68 [0.00]***	–0.458 [0.00]***	0.35	0.40
T^1, S^1, F^{LS}	1.397 [0.01]**	–0.832 [0.02]**	0.121 [0.05]*	0.89	0.26
T^2, S^1, F^{LS}	0.660 [0.01]**	–0.101 [0.42]	0.089 [0.04]**	0.16	0.33
T^1, S^2, F^{LS}	1.070 [0.00]**	3.088 [0.04]**	0.078 [0.05]*	0.41	0.64
T^2, S^2, F^{LS}	1.195 [0.02]**	6.098 [0.07]*	0.060 [0.03]**	0.29	0.62
T^1, S^1, F^{LL}	1.547 [0.04]**	–1.031 [0.02]**	0.149 [0.07]*	0.72	0.42
T^2, S^1, F^{LL}	0.478 [0.04]**	–0.299 [0.02]**	0.128 [0.00]***	0.27	0.12
T^1, S^2, F^{LL}	1.163 [0.01]**	3.469 [0.04]**	0.088 [0.07]*	0.37	0.67
T^2, S^2, F^{LL}	0.892 [0.02]**	–2.192 [0.27]	0.128 [0.02]**	0.14	0.71
		Baxter–King Detrended			
T^1, S^1, F^1	0.307 [0.01]**	–0.311 [0.00]***	–0.302 [0.00]***	0.92	0.63
T^2, S^1, F^1	0.228 [0.00]***	–0.287 [0.00]***	–0.208 [0.00]***	0.75	0.51
T^1, S^2, F^1	0.282 [0.01]**	1.571 [0.00]***	–0.280 [0.00]***	0.86	0.56
T^2, S^2, F^1	0.226 [0.00]***	1.491 [0.00]***	–0.195 [0.00]***	0.71	0.51
T^1, S^1, F^2	0.003 [0.98]	–0.223 [0.30]	–0.081 [0.01]**	0.87	0.25
T^2, S^1, F^2	0.037 [0.02]**	–0.189 [0.28]	–0.052 [0.00]***	0.53	0.12
T^1, S^2, F^2	0.071 [0.51]	0.620 [0.21]	–0.094 [0.01]**	0.96	0.31
T^2, S^2, F^2	0.040 [0.02]**	0.453 [0.25]	–0.058 [0.00]***	0.48	0.08
T^1, S^1, F^{LS}	0.523 [0.09]*	–0.038 [0.72]	0.063 [0.00]***	0.29	0.11
T^2, S^1, F^{LS}	0.208 [0.02]**	–0.644 [0.00]***	0.063 [0.00]***	0.20	0.97
T^1, S^2, F^{LS}	0.836 [0.02]**	0.304 [0.72]	0.058 [0.01]**	0.56	0.11
T^2, S^2, F^{LS}	0.208 [0.01]**	1.846 [0.00]***	0.022 [0.01]**	0.20	0.20
T^1, S^1, F^{LL}	0.222 [0.22]	–0.055 [0.53]	0.046 [0.02]**	0.20	0.72
T^2, S^1, F^{LL}	0.214 [0.01]**	–0.691 [0.00]***	0.068 [0.00]***	0.29	0.59
T^1, S^2, F^{LL}	0.496 [0.08]*	0.040 [0.95]	0.051 [0.02]**	0.30	0.23
T^2, S^2, F^{LL}	0.194 [0.01]**	2.028 [0.00]***	0.022 [0.01]**	0.19	0.10

Notes: Numbers in square brackets are p-values. Significance levels: *10%, **5%, ***1%.

The GMM estimations include lags of the dependent variable as well as time-dummies.

The estimates of the impact of bilateral trade intensity on BCS are strongly positive (more trade between two countries induces higher BCS). Of the 32 coefficients (= 2

detrending technique × 2 measures of bilateral trade linkages × 2 measures of similarity of industrial structure × 4 measures of financial integration,[15] two are significant at the 10% level, 21 are significantly so at the 5% level, and six at the 1% level. Of these statistically significant coefficients, these coefficients range from 0.04 (using T^2 as one of the regressors in the GMM estimation) to 1.547 (using T^1 as one of the regressors), and this means that an increase by our relevant measure of bilateral trade intensity by one standard deviation implies that BCS starting from its mean would increase from 0.025 (= 1.547*0.016) to 0.254 (= 0.04*6.35). On average, this represents moving the correlation of output by about 22% of one standard deviation, quite an economically significant effect.

Concerning similarity of industrial structure, most estimated coefficients are significant, although once we control for endogeneity some of the estimated coefficients have incorrect signs (we should expect that $S^1 < 0$, $S^2 > 0$; more similar countries have higher BCS). Of the 32 coefficients, 28 have correct signs; of these 28 coefficients, one is significant at the 10% level, seven are significant at the 5% level, and 11 at the 1% level.

Finally, we found in our estimation results that the higher is the financial linkages between countries (higher F^1 and F^2, lower F^{LS} and F^{LL}) the less synchronization of business cycles. This finding is strikingly consistent across all estimated coefficients, all of which are statistically significant at conventional significance levels. These estimated coefficients range from –0.902 to –0.052 (both using F^2 as one of the regressors), and from 0.022 to 0.149 (both using F^{LL} as regressor).[16] This means that an increase by one standard deviation by our relevant measure of financial linkages implies that BCS starting from its mean would be reduced from 0.786 to 0.045 (using F^2 as one of the regressors), while BCS increases from 0.123 to 0.836 (using F^{LL} as regressor). In turn, this represents moving the correlation of output from 20% to 60% of one standard deviation, again quite an economically significant effect.

[15] Note that there are five measures of financial integration used in this paper. The results using the fifth measure are presented in a separate table.

[16] We recognize that we are dealing with quantity- and price-based indicators of financial integration, and as such we separate the economic interpretation of the size coefficients based on this distinction.

Table 3 is an analogue to Table 2, but excludes the crisis years of 1997–1998 from the GMM estimation. Although some of the estimated coefficients lost their statistical significance, the general features and story of the results are still strikingly similar to its Table 2 analogue. Table 4 is also an analogue to Table 2 that considers our final indicator of financial integration (which is also our third quantity-based indicator of financial integration) using the 2001 to 2007 CPIS data.[17] Though two as well as four of the eight estimated coefficients of the indicators for financial and bilateral trade linkages, respectively, are statistically indistinguishable from zero, this additional sensitivity test does not undermine the initial findings: both specification tests are fulfilled; a slightly weaker although consistent result indicates that more trade between two countries induces higher BCS; there are some indications that more similar countries have higher BCS; and; finally, increased financial linkages between countries leads to divergent BCS.

[17] In order to create the measure of BCS, i.e. the correlation between cyclical output in countries *i* and *j*, we follow Rose (2009) by using 20 quarterly observations (five years) preceding through time τ.

Table 3. Dynamic Panel GMM estimations of Business Cycle Synchronizations (Crisis Years Excluded)

Variables	Trade ($T_{ij,t}$)	Specialization ($S_{ij,t}$)	Finance ($F_{ij,t}$)	Hansen test (p-value)	AB test for AR(2) (p-value)
		Hodrick–Prescott Detrended			
T^1, S^1, F^1	1.092 [0.00]***	–0.048 [0.76]	–0.435 [0.01]**	0.39	0.42
T^2, S^1, F^1	0.494 [0.01]**	0.636 [0.01]**	–0.573[0.00]***	0.74	0.36
T^1, S^2, F^1	0.638 [0.00]***	1.082 [0.03]**	–0.468 [0.00]***	0.42	0.80
T^2, S^2, F^1	0.623 [0.01]**	–2.078 [0.02]**	–0.662 [0.00]***	0.91	0.19
T^1, S^1, F^2	0.430 [0.00]***	–0.119 [0.19]	–0.114 [0.00]***	0.17	0.82
T^2, S^1, F^2	0.954 [0.02]**	0.802 [0.39]	–0.202 [0.51]	0.35	0.14
T^1, S^2, F^2	0.408 [0.00]***	0.865 [0.10]	–0.109 [0.00]***	0.66	0.86
T^2, S^2, F^2	0.300 [0.06]**	3.069 [0.00]***	–0.448 [0.00]***	0.22	0.98
T^1, S^1, F^{LS}	1.150 [0.01]**	–0.061 [0.73]	0.101 [0.05]**	0.88	0.88
T^2, S^1, F^{LS}	1.398 [0.03]**	–2.877 [0.00]***	0.011 [0.89]	0.10	0.40
T^1, S^2, F^{LS}	0.699 [0.00]***	0.296 [0.66]	0.063 [0.04]**	0.38	0.67
T^2, S^2, F^{LS}	0.150 [0.86]	17.583 [0.00]***	0.142 [0.10]	0.15	0.92
T^1, S^1, F^{LL}	1.218 [0.03]**	–0.133 [0.45]	0.115 [0.06]*	0.66	0.67
T^2, S^1, F^{LL}	1.011 [0.03]**	–1.179 [0.10]	0.011 [0.89]	0.25	0.77
T^1, S^2, F^{LL}	0.701 [0.01]**	0.640 [0.38]	0.066 [0.04]**	0.39	0.84
T^2, S^2, F^{LL}	0.883 [0.09]*	9.417 [0.02]***	0.106 [0.24]	0.36	0.72
		Baxter–King Detrended			
T^1, S^1, F^1	0.172 [0.01]**	–0.101 [0.06]*	–0.271 [0.00]***	0.43	0.85
T^2, S^1, F^1	0.190 [0.00]***	–0.103 [0.04]**	–0.222 [0.00]***	0.32	0.93
T^1, S^2, F^1	0.202 [0.01]**	0.535 [0.09]*	–0.278 [0.00]***	0.42	0.78
T^2, S^2, F^1	0.194 [0.00]***	0.591 [0.05]*	–0.216 [0.00]***	0.28	0.96
T^1, S^1, F^2	0.021 [0.85]	–0.291 [0.08]*	–0.082 [0.00]***	0.58	0.22
T^2, S^1, F^2	0.042 [0.01]**	–0.620 [0.01]**	–0.154 [0.00]***	0.96	0.13
T^1, S^2, F^2	0.086 [0.40]	0.967 [0.04]**	–0.123 [0.00]***	0.97	0.89
T^2, S^2, F^2	0.046 [0.01]**	1.391 [0.01]**	–0.176 [0.00]***	0.94	0.33
T^1, S^1, F^{LS}	0.524 [0.09]*	–0.157 [0.17]	0.084 [0.01]**	0.60	0.85
T^2, S^1, F^{LS}	0.003 [0.99]	–0.108 [0.05]*	0.048 [0.00]***	0.39	0.29
T^1, S^2, F^{LS}	0.975 [0.02]**	1.224 [0.17]	0.095 [0.00]***	0.34	0.83
T^2, S^2, F^{LS}	0.025 [0.86]	0.580 [0.12]	0.063 [0.02]**	0.48	0.59
T^1, S^1, F^{LL}	0.160 [0.37]	–0.118 [0.17]	0.055 [0.03]**	0.13	0.46
T^2, S^1, F^{LL}	0.083 [0.67]	–0.108 [0.08]*	0.048 [0.00]***	0.19	0.14
T^1, S^2, F^{LL}	0.591 [0.10]	0.636 [0.37]	0.061 [0.04]**	0.13	0.94
T^2, S^2, F^{LL}	0.006 [0.96]	0.703 [0.07]*	0.068 [0.01]**	0.52	0.93

Notes Numbers in square brackets are p-values. Significance levels: *10%, **5%, ***1%.

The GMM estimations include lags of the dependent variable as well as time-dummies.

Table 4. Dynamic Panel GMM estimations of Business Cycle Synchronizations (Using CPIS Data)

Variables	Trade ($T_{ij,t}$)	Specialization ($S_{ij,t}$)	Finance ($F_{ij,t}$)	Hansen test (p-value)	AB test for AR(2) (p-value)
		Hodrick–Prescott Detrended			
T^1, S^1, F^3	0.051 [0.04]**	–0.042 [0.17]	–0.050 [0.09]*	0.53	0.31
T^2, S^1, F^3	0.089 [0.05]*	–0.058 [0.29]	–0.058 [0.27]	0.77	0.28
T^1, S^2, F^3	0.010 [0.81]	0.552 [0.09]*	–0.054 [0.05]**	0.86	0.32
T^2, S^2, F^3	0.062 [0.09]*	0.128 [0.73]	–0.019 [0.66]	0.30	0.23
		Baxter–King Detrended			
T^1, S^1, F^3	1.141 [0.03]**	–0.427 [0.01]***	–0.348 [0.03]**	0.23	0.20
T^2, S^1, F^3	1.066 [0.52]	–7.641 [0.02]**	–0.339 [0.09]*	0.41	0.36
T^1, S^2, F^3	1.722 [0.30]	–1.089 [0.94]	–0.581 [0.05]*	0.24	0.83
T^2, S^2, F^3	0.063 [0.93]	–5.743 [0.62]	–0.458 [0.04]**	0.16	0.34

Notes: Numbers in square brackets are p-values. Significance levels: *10%, **5%, ***1%.

The GMM estimations include lags of the dependent variable as well as time-dummies.

Source: Authors' calculations.

6. Policy Implications

The implications of the above results for Asian policy making are important and far reaching. Given that Asia's integration within itself and with countries outside the region has advanced steadily in recent years, the finding of an inverse relationship between bilateral financial linkages and BCS might indicate that financial integration makes it easier for these countries to transfer financial assets, which should help Asian countries diversify themselves against country-specific risks, and thus enable their decoupling (Flood et al, 2009; Garcia-Herrero and Ruiz, 2008). This is consistent with the basic argument underlying the theory of international risk sharing, as further financial integration offers better opportunities for risk diversification.

In view of the benefits of increasing financial integration by affording better risk sharing opportunities, the importance in actuality of developing and strengthening capital markets through which agents can diversify their portfolio via cross-border ownership of assets is essential and cannot be over-emphasized. Moving forward, reforms aimed at improving the capability of agents to adjust the size of their asset portfolio (savings rate), e.g. pension-fund schemes, in response to shocks as well as to

being more receptive of cross-border M&As can further enhance risk-sharing opportunities between countries (Kalemli-Ozcan et al., 2004).

On the other hand, it is alleged that the downside of greater financial integration is that it can pose risks to financial stability. This claim takes on ever-increasing traction and prominence in discussions, especially in light of the recent painful experience with the global financial crisis, which tends to demonstrate the role that financial linkages play in the transmission of shocks between economies. However, despite concerns in policy circles, it appears that the jury is still out on whether greater financial integration increases the likelihood of crises. For instance, in a recent study Fecht et al. (2008) show that the availability of better risk-sharing mechanisms tend to offset the risk of spillover or transmission of shocks, and thus financial integration leads to an improvement in welfare as specialization benefits are magnified and realized.[18] Furthermore, a few studies argue that greater integration poses no risk to financial stability on its own, but when too-rapid a liberalization of financial markets *interact*, for instance, with certain distortions in the economy such as weak and lax supervisory regulations as well as problems of credibility and enforcements of contracts, these distortions get magnified and financial instability problems arise (Fecht et al., 2008).[19]

Nonetheless, as financial integration deepens and international capital flows become more intense the enduring and considerable challenge for policy makers is to be able to counter balance the benefits and alleged risk of greater financial integration. This trade-off will vary across economies as it will be a function of the level of financial market development of individual countries in the region. Thus, the appropriate policy approach to enable countries to reap the benefits of the opportunities that come with further financial integration, e.g. international risk sharing, and at the same time contain the alleged inherent risk of greater financial integration, will likely differ across countries in the region (BIS, 2009).

[18] See also Bonfiglioli and Mendicino (2004) and Glick et al. (2006). For contrasting evidence, see for instance, Demirguc-Kunt and Detragiache (2001) and Hartmann et al. (2005).
[19] See, for instance, Ishii and Habermeier (2002).

7. Conclusion

This paper examines empirically the effect of three factors, viz., financial and trade linkages as well as similarity of industrial structure on BCS in the Asia–Pacific region. We adopt a panel approach and employ dynamic panel GMM estimation in order to unpack endogeneity problems as well as to control for country-pair specific unobservable time-invariant factors. Our modeling strategy assumes that the Asia–Pacific countries integrate not just from within the region, but also with major countries outside the region. As also documented in the paper, this strategy conforms with the stylized fact that Asia's integration within itself and countries outside the region have increased considerably over the past three decades. Furthermore, as opposed to previous studies, our measures of financial integration encompass both quantity- and price-based indicators to ensure robustness in our results. The main results are as follows: some indications that more similar countries have higher BCS; consistent support to the evidence that shows that more trade between two countries induces higher BCS as well as that increased financial linkages between countries leads to divergent BCS.

While the first two findings are in line with Imbs (2004, 2006), the third is contrary to his and other studies that use pure-cross sectional data to examine the direction of the finance–BCS link. Our third finding conforms with the basic ideas of benchmark international business cycle models. What perhaps drives the conflicting evidence found by pure cross-sectional studies from that of the theoretical benchmarks is that, apart from being able to control for simultaneity, one also needs to account for the role of country-pair specific unobservable time-invariant factors. Similar to our approach that used panel IV techniques, recent studies such as Cerqueira and Martins (2009) and Kalemli-Ozcan et al. (2009) have controlled for such influences. These works are now considered to be fundamental and basic in any study that tries to ascertain the link between BCS and finance. Once biases associated with simultaneity and unobserved country-pair specific factors are accounted for, the prediction by theory regarding the inverse relationship between financial linkages and BCS become apparent in the results.

In terms of future work, it would be useful to disentangle the possible differing effects that different types of financial integration have on synchronicity of business cycles. This would allow a close examination of whether the rapid expansion of equity and FDI

positions may make the economy more susceptible to external economic influences, and thus lead to more synchronized business cycles. It would also be desirable to explore the regional dimension of the linkage between financial integration and BCS, and to ascertain whether our results “hold out” across various country configurations in the region. Finally, it would also be interesting to make use of an event-study approach to capture explicitly the period of the financial turmoil associated with the Asian financial crisis of 1997–1998 as well as with the global financial crisis of 2008–2009, and, accordingly, to pin down the extent of the transmission of financial crisis to business cycles, while controlling for the significant factors that drive BCS.

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Table A1. Correlation Matrix of Variables Using CPIS Data

	ρ^{HP}	ρ^{BK}	T^1	T^2	S^1	S^2	F^3
ρ^{HP}	1.0000						
ρ^{BK}	0.5791	1.0000					
T^1	0.2003	0.2168	1.0000				
T^2	0.1860	0.2275	0.8967	1.0000			
S^1	–0.0302	–0.0039	0.1332	0.2298	1.0000		
S^2	0.0726	0.1187	–0.0680	–0.1098	–0.8072	1.0000	
F^3	0.1956	0.1867	0.4128	0.2937	–0.1105	0.1435	1.0000

Note: All variables are in logarithmic form with the exceptions of ρ^{HP} and ρ^{BK}.

Source: Authors' calculations.

Chapter 5

Corporate Financial Structure in East Asia: What Do We Know?

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Abstract

This paper surveys studies in corporate financial structure, focusing on studies that include East Asia. The paper looks at three clusters of research on i) the structure of corporate finance, ii) explaining the company choices of financial structure, and iii) the impact of financing on real economic outcomes such as growth or productivity. The paper concludes that, although such studies are fundamental to understanding how financial shocks are transmitted to the real sector few studies cover East Asia. Some data are available that can be used to extend studies in the region but there is also a need to extend data sources and to supplement existing data which could provide a useful base for work in this area. This paper proposes a further extensive survey involving ERIA's RNIM to identify macro- and industry-level data and recommends linking with ERIA's microdata studies stream to build more comprehensive company databases.

***Keywords*:** Company finance, corporate finance, corporate governance, corporate investment, financial statistics, firm, firm level

***JEL Classifications*:** G320, G380, G390, O330, O160 K000

I. Introduction

There is a very large literature on corporate financial structure, including studies by finance specialists, economists, lawyers and corporate governance specialists, and on the link between financial structure and growth. It is not the intention of this paper to provide a comprehensive survey of that literature (for a survey, see Beck (2009), Beck et al., Chapter 5 in Demirguc-Kunt and Levine (2001) and Carlin and Mayer (2003), and for a critical perspective, Trew (2006)).

While there is an emerging consensus that financial systems become more developed and more "market-oriented" as countries become richer and that there is a link between overall financial development and growth, there is no *consistent* evidence that a particular *type* of financial structure (e.g. bank-based versus market-based systems) makes a difference. However, the latter conclusion, and variations on the question of the impact of financial structure, remains a fertile field for research and one that is subject to continuous challenge.

The sheer volume of work on the subject of whether and how financial structure affects growth testifies to the enduring importance of the question. Curiously, in view of the recent history of financial markets, there is much less work on the link between financial structure and the volatility of economic outcomes. Arner (2007) is an exception in the field of legal studies, but there are relatively few economic studies. At the top level of policy questions relating to finance these two must be the most important. Directly researchable questions necessarily break these big questions into smaller and more manageable pieces, resulting in a proliferation of literature that goes in many directions and cannot always be clearly related to other studies.

The purpose of this paper is not, therefore, to survey the whole field but to focus on studies of the East Asian region (where they exist), and on the types of data and approach used in the different areas of research. The objective is to identify gaps in the research field and to identify what data are available to support further research. In doing this, we hope also to identify types of data that could be collected or made more easily useable and to make concrete policy recommendations about data collection that

would be an appropriate task for ERIA.

To provide some structure for the survey and because data needs and usage depend on what question is being asked, the paper looks at three clusters of research that are broadly related and describes a representative research approach in each area, the types of data used by existing studies, and outlines some key conclusions. The three groups are i) studies describing the structure of finance, ii) studies that explain financing choices, and iii) studies of the impact of financing on real outcomes. Where studies covering East Asia are available, attention is given to whether East Asian results are similar to results for other countries or groups of countries. The paper concludes by linking the existing research with key policy questions in the region and setting out the data needs and research approaches that would help answer those questions.

Section 1

Financial Structure and Sources of Finance

One broad theme of research has been aimed at simply describing how the corporate sector has been financed. These studies are positive, not normative, and do not have immediate policy relevance but form an important part of our understanding of the financial systems in different countries.

As the World Bank team best known for collecting data on financial structures (Demirguc-Kunt and co-authors) note in describing The Financial Structure Database, now available at the World Bank website,[1] there was an absence of cross-country data on financial structures before they began compiling the data. The database now provides macro, aggregate data on indicators that measure the size, activity, and efficiency of financial intermediaries and markets. These are supplemented by other datasets on deposit insurance around the world, bank regulation and supervision, episodes of systemic and borderline financial crises and bank concentration. The Financial Structure Database itself has country coverage that varies for each variable, depending on underlying data availability. Several of the countries in the East Asian Summit group are

[1] http://go.worldbank.org/X23UD9QUX0

well covered. These data allow much better descriptions of the institutional and market structure of financial systems and have become a well-used source of variables for certain types of studies described below. They do not, however, give any picture of how the corporate (borrowing sector) is financed and focus only on descriptions from the lending side of the financial markets.

Studies that describe how the corporate sector is financed therefore provide a different picture of financial structure, one that focuses on the borrowing side and that might, arguably, give a better picture of how the financial system connects with real business activity.

One approach to this descriptive exercise is based on the method described in Mayer (1988, 1990) using companies' sources of financing. An example is found in Corbett and Jenkinson (1996) and the methodology is described in more detail in the working paper version of the latter paper (Corbett and Jenkinson, 1994). That methodology involves constructing aggregate flows of funds for different countries over extended periods using National Accounting Statistics (the underlying date is provided by companies, financial institutions and securities markets). Estimates of the proportion of the corporate sector's aggregate investment financed from different sources are derived by categorizing flows of funds under various headings, such as retained earnings, bank loans, trade credit, bonds and new equity, and averaging them over several years. The methodology provides more-or-less internationally comparable estimates of the financing of physical investment by the non-financial corporate sectors of different countries over particular periods. The Appendix to this paper gives the details of how this was done in the original work for Germany, Japan, the US and the UK in Corbett and Jenkinson (1994). As can be seen there, even in advanced OECD countries there is considerable difference in the definition of the corporate sector and in the definition of financial instruments used. This requires some care when making international comparisons

The reason that the "net flows approach" is the appropriate basis for measurement at the aggregate level is that it correctly answers questions concerning the flows that have taken place across the boundaries between different sectors. It can, therefore, answer questions about flows between the banking and corporate sectors or between bond

markets and the corporate sector over particular time periods. It cannot answer questions about what goes on within sectors or within time periods (there has been some criticism of details of this approach for these reasons, but that is not relevant to the current discussion).

The approach using aggregate flow of funds data appeared to establish some patterns across many countries and time periods that challenged some received wisdom about sources of financing. The results suggested that retained earnings were the main source of financing for new investment (that is, the flow of new investment in a period) and that the next most important source of finance was debt. Myers' (2001) survey of the field opens with a statement to the effect that most investment by US non-financial firms has been financed from internal cash flows. External equity raising seemed to be a small part of finance for investment. These results were consistent with "pecking order theories" of finance but did not accord with expected differences across countries because of the diminished importance of bank financing in many countries considered to be "bank-dominated" or bank-centered. The method was also applied to other countries (Cobham and Serre (2000) for France, Cobham et al. (1999) for Italy, Singh various years for developing countries). Unpublished studies were done for Thailand and Korea. The implications might be considered likely to be significant in East Asia but no consistent study has been done for the region.

1.1. East Asia

Two studies after the Asian financial crisis attempt a similar exercise for samples including some East Asian countries. Glen and Singh (2003) shows that liabilities fund a much lower share of growth in assets for developing than for developed countries and argues that emerging market corporate sectors use both more internal sources and more external equity than developed economy firms. His interpretation is that stock markets are indeed an important source of finance for firm expansion in emerging markets, contrary to their role in developed markets. He notes, however, considerable variation between countries in the emerging markets group compared with developed countries.

In the same volume, Ratha et al. (2003) argue a different view, that emerging market firms, particularly in East Asia, were excessively debt financed (had high leverage) and,

although they have reduced their debt financing significantly post-crisis, they are still excessively dependent on external finance because of their low profit rates (and resulting low retained earnings).

One source of the difference in these views of the sources of finance in regional emerging economies is the type of data used as well as in the interpretation of it. Singh uses company accounting data from the Osiris database while Ratha et al. use a combination of macro data on financial flows and equity outstanding, with company accounting data drawn from Worldscope.

Even for other developed countries (beyond the big four) there are difficulties about using National Income Accounts Flow of Funds data. Cobham et al. (1999) notes that comparable data are not even available for Italy. Ratha et al. make a strong plea for better data in the Asian region, noting that "the flow-of-funds data compiled for the United States ... are a model of top-down data. Few developing countries, however, produce such complete accounts" (p. 450). This matters for a number of reasons. While similar information can be created from company accounts, these suffer from selection bias (covering only listed, large companies), they may have time lags, and they may be based on different national accounting definitions, making reliable cross-country comparisons difficult. As Ratha et al. (2003) note,

> The absence of comprehensive, timely data is more than a hindrance for researchers: it also is a concern for market participants and policymakers. With financial markets prone to sharp adjustments and given the easy availability of derivatives ... it is increasingly important for market participants to be aware of the extent of exposure of the corporate sector as a whole. If the entire sector is over-exposed, individual companies are likely to have trouble rolling over their debt in times of market stress. (p. 450)

If those remarks were true before the GFC they are even more so now.

The broad purpose of most of the work in this area of describing financial structure is aimed at establishing what sources of data are most reliable and what patterns emerge across different countries in the way companies finance their investments in assets. The data are not explanatory but are descriptive. Some papers in this tradition speculate

about explanations of cross-country differences but do not provide formal tests. Studies of this type may use either national income accounts or company accounting data, may present either sources and uses (flow) data or stock data (e.g. leverage ratios) and may present results at the country level or at the industry level. A number of studies include developing countries but data limitations mean that there is no substantial body of results for the region.

Section 2

Explaining Financial Choices

Another strand of literature is related more closely to conventional corporate finance concerns and asks how to explain the choice of financial structure that firms make. While originally growing out of the Modigliani–Miller tradition (looking for evidence that tax and bankruptcy costs explain non-random financing choices), the literature has evolved to ask increasingly complex questions about determinants of financial structure. The literature now has a strong policy element since it asks which institutional features at country level have an impact on financing choices. Many of the institutions that are examined are amenable to policy change.

Representative examples of this type of study include Fan et al. (2008) and the literature reviewed there (Rajan and Zingales (1995) and Myers (2001) describe much of the standard work) and several studies by Demirguc-Kunt and co-authors (2001; 2002).

The original question that these studies asked was what firm characteristics determined the choice of capital or financing structure. The dependent variable could be either capital structure ratios, such as leverage, or maturity choices, or could equally be financing structure choices based on source and uses (flow data) such as new equity issues, new debt issues, etc. A range of firm characteristics might be considered but gradually interest focused on characteristics beyond the confines of the firm and studies looked at whether industry and country characteristics matter. Following the series of papers by La Porta and colleagues in the late 1990s many authors now look at the effect of legal institutions.

These studies normally use company accounting data since they require firm

characteristics as a key part of their apparatus, although some studies have considered the financial structure of different industries. The underlying theory behind the empirical work is summarized by Myers (2001). There is not yet a firmly established consensus view about what drives company choices. There is broad support for a role for taxes and bankruptcy costs, as in the original MM formula. Beyond this, several firm characteristics are known to have some effect: asset tangibility, profitability, and the market-to-book ratio. Asset maturity can be included to describe the extent to which companies have to finance long-term assets. In developed-country data it is desirable to include effective tax rates, operating risk and R&D expenditure but in studies using developing country data these variables are often missing. Results in Fan et al. (2008) show that the choice of leverage (use of debt) is positively related to asset tangibility and firm size and negatively related to profitability and the market-to-book ratio. These results, from a sample of 39 countries including a cross-section of developing countries, are consistent with evidence on US firms and more recent international evidence (Rajan and Zingales, 1995). Examining the choice of maturity (how much long-term debt is used in total debt), typical results are that more long-term debt is used by firms with greater asset tangibility, larger size, higher profits and higher market-to-book ratios. Asset maturity is unrelated to debt maturity.

2.1. Industry and Country Characteristics

Recent papers (since Rajan and Zingales, 1995) have extended the list of factors that affect financing choices to include both industry and country variables. It has become clear that different industries are typically financed in different ways (with different mix of debt vs equity and different maturity of financing) so these effects need to be accounted for. In addition, the literature linking financial structures to growth (reviewed below) introduced a number of country characteristics that might also be relevant in considering the financial choices that firms make. Fan et al. (2008), Carlin and Mayer (2003) and several papers by the World Bank group (Demirguc-Kunt and colleagues) add in country characteristics and, increasingly, interact these with either firm or industry characteristics.

The results show that country characteristics matter a good deal in explaining leverage

choices and that firm characteristics have different effects in different countries. The results on industry characteristics are less clear with some studies (Carlin and Mayer, 2003) finding strong industry characteristic effects while some do not (Fan et al., 2008).

These results are important for the current paper's purpose since they mean that having good detailed studies of country characteristics in the East Asian region will add value to our understanding of how firms are financed. Country differences matter and some of them (such as the relative development of different parts of the capital markets, tax policy, investor protection laws and so on) can be affected by policy.

The Carlin–Mayer approach would have considerable interest in the region but requires industry-level financial information that may not be easily available in the region. As noted elsewhere, firm-level data are available for large, listed companies in the major countries in the region with functioning stock markets.

Section 3

Does Financing Matter: Finance and Growth

The question of the link between countries' financial structure and development and their growth has been, as noted above and by Demirguc-Kunt and Levine (2001), a focus of attention since the work of Goldsmith (1969) . Linking the developments in methodology from the corporate financial structure literature with an interest in economic growth and performance has resulted in several recent studies looking for an effect of financial structure on growth either at the firm level, industry level or at the country level (in the case of Carlin–Mayer, the dependent variable is investment growth in industry *i* in country *j*).

Firm level studies typically use cross-sectional data from different countries to look for an impact on firm performance from the firm's financial structure and industry and country characteristics. This allows us to say something about whether the financial choices that firms or industries make (which are, in turn, driven by some industry and country characteristics) have effects on the amount and/or type of investment they can carry out. Further, it allows us to take account of the impact of the industry

characteristics in which the firm is embedded and of the effect of many institutional and policy settings at the country level. These studies are at an early stage (mainly from 2000) and are only beginning to include developing countries and to take account of the significant differences between developed and developing countries (see Carlin and Mayer (2003) for a discussion of the problems of including developing and developed countries in the same samples).

The emerging evidence suggests that the quality of financial systems (captured by accounting standards in Rajan and Zingales, 1998) affects the growth of firms dependent on external finance, and that either the size or the structure of the banking system also affects growth (Cetorelli and Gambera, 2001, cited in Carlin and Mayer, 2003, find evidence that concentrated banking systems are associated with higher growth). Papers from the World Bank group authors (Demirguc-Kunt and co-authors) argue strongly that the overall level of financial development and the efficiency of the legal system affect investment growth, but that financial structure (i.e. bank dominance vs market dominance) does not matter.

Carlin and Mayer (2003) show that these results can be more complex. They interact industry characteristics with country characteristics to show that certain country institutional features matter more for industries with certain characteristics. For example, accounting disclosure standards are associated with faster growth of industries that are equity and skill dependent while concentration of the banking system is associated with slower growth and lower R&D expenditure in this type of industry. Their research focuses on three particular country characteristics (information disclosure, concentration of banking systems, and concentration of firm ownership) since these are linked to three separate theoretical models of capital structure. They report a strong relationship between good information disclosure, fragmentation of banking systems, concentration of ownership and the growth of equity-financed and skill-intensive industries. Different factors matter for different types of industries. They note also the differences between developed and developing economies not only because of the differences in their financial systems but also because they support different industries. They therefore attempt to account for levels of development by considering differences between low-income countries and others and find evidence that their results are sensitive to stages of

economic development. Again, this argues for the value of studies within the region that are carefully constructed to be comparable to existing studies so that we can discover where general research based on cross-country evidence is applicable to the region and where it is not.

These results, while approaching the question of the link between finance and the real sector in a different way from those of Demirguc-Kunt and Maksimovic (2002), are consistent with them. Demirguc-Kunt and Maksimovic find that the development of the legal system is associated with a higher proportion of firms relying on external finance. Stock markets and banking systems affect the proportion of externally financed firms differently but the relative development of stock markets to banking sectors does not matter.

As reported in Corbett and Twite in this volume, the evidence is that country characteristics matter more than financial characteristics in explaining the growth of investment by firms.

Conclusions

A number of the research questions addressed by the literature briefly surveyed here are particularly important in the East Asian region. Fundamental to the pattern of development in the region and to the progress of closer integration is an understanding of which institutional and industry characteristics have an impact on the financial structure of the corporate sector, and whether differences in financial structures matter for real economic outcomes such as growth, productivity, investment and volatility. This survey indicates that few studies look at the individual countries of East Asia and that relatively few of these include either ASEAN or the full sample of the East Asian Summit group of countries. This makes it difficult to know whether the behavior observed across large groups of countries is also observed within the region and whether there are specific policy targets that could be improved. To carry out such studies we need better data.

We need a detailed look at the availability of National Income Accounts-type Flow of Funds data. This requires country-by-country knowledge since there may be collections of such data available even if they are not included in the formal National Income

Accounts. To supplement and support the analysis of that data we also need good company accounting data that go beyond the narrow sample of large, listed companies that are included in Worldscope, Datastream and similar databases. So further work is needed to identify whether ministries of finance, central banks or securities market regulators, or local stock exchanges may have wider company accounting databases. Finally, a great deal can be done by studying financial structure at the industry level. Data are available in Japan, showing the sources and uses of funds at industry level. Some data are available for the OECD, although not with the same level of detail as Japan, and it would be useful to find out whether similar information is available around the region. A first attempt at a survey is included in Appendix B of this paper.

It is proposed that ERIA's Research Institute Network be invited to help do a survey of what types of data covering company financial information are available in the region so that recommendations for systematic collection and sharing of data can be achieved. There may be scope for joint activity to collect and maintain data between ERIA, universities and institutes in the member economies and government agencies to create a resource for important policy research leading to evidence-based policy reform.

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Appendix A. Corbett–Jenkinson, 1994, Methodology Using Flow of Funds Data

Table A.1. Examples of Sources of Aggregate Flow of Funds Data

US	Federal Reserve System, *Flow of Funds Accounts*, "Sector Statements of Saving and Investment"
UK	Central Statistical Office, *Financial Statistics*
JAPAN	Economic Planning Agency, *National Income Accounts*
GERMANY	Deutsche Bundesbank, *Capital Finance Accounts of the Deutsche Bundesbank*
ALL COUNTRIES	OECD, *Financial Accounts*

Table A2. Definitions of the Non-financial Enterprise Sector in Flow of Funds Statistics

Country	Public enterprises	Unincorporated enterprises and partnerships	Consolidation (netting) of intra-sectoral transactions*
US	Excludes	Includes (our data excludes farm sector)	No (but equities are consolidated)
UK	Excludes[a]	Excludes	Usually yes[b]
JAPAN	Excludes[c]	Excludes	Usually yes, but depends on items[d]
GERMANY	Includes[e]	Includes	Usually yes[f]

Notes:

*SNA definitions recommend recording transactions on a gross basis where possible but recognizes that a minimum degree of netting of transactions is more likely to be practical. The minimum degree of netting is to subtract dispositions from acquisitions of each class of asset and to offset redemptions of each class of liability against new incurrences of that liability. Higher degrees of netting may also occur (e.g. (i) transactions of a given category of financial assets against the same category of liabilities – equivalent to our netting procedure in Table 2 – or (ii) transactions of one category of financial assets against liabilities of another category) but the disadvantage is that "significant differences in behaviour between the transactions of a class will be obscured." UN, *System of National Accounts* (1968), p. 136.

(a) For the UK, figures for private enterprises only were used. Privatizations therefore result in changes in the sector as previously public enterprises are included.

(b) OECD notes state that "Intersectoral transactions are, as far as possible, consolidated." This implies relatively higher degree of consolidation in the UK than other countries as no separate items are listed as non-consolidated.

(c) Our figures for Japan are based on EPA, *National Income Accounts* and exclude virtually all public enterprises. The sector definition in this source is more consistent than the OECD one, which is based on Bank of Japan sources. The latter include some public enterprises but not all. Gas and electricity companies, legally classified as private companies, are included in our definition of the sector. As a result of privatization, Nippon Telegraph and Telephone Company and the Tobacco and Salt Public Corporation were included after 1985 and Japan National Railways after 1987.

(d) In principle, intra-sector transactions are consolidated in Japan but where it is useful to show non-consolidated data this is done. Non-consolidated items are: short- and long-term securities, equities, bills bought and sold, trade credit.

(e) Germany also includes legally dependent pension funds under the control of enterprises in the enterprise sector. In other countries where these are administered by outside companies (e.g. by trust departments of banks) they are included in the financial sector.

(f) Financial transactions in Germany are "largely consolidated figures, as the financial relationships within a sector are normally set off against each other". Exceptions are equities and claims and liabilities evidenced by securities.

Table A3.1. US Definitions – Gross Sources

Sources	Definition	Notes
Internal sources	Total internal funds plus inventory valuation adjustment	Standard definition but numbers in the original US source differ from those reported by OECD
Bank finance	Mortgages, bank loans, loans from foreign sources, bankers' acceptances, non-bank finance loans, US government loans	Book value
Bonds	Tax-exempt bonds and corporate bonds	Book value. Equals figures reported by OECD
New equity	Net new equity	Market value. Consolidated figures so intra-corporate sector disappear.
Trade credit	Trade debt and consumer credit (latter on uses side)	
Capital transfers	Not available, no distinction between current and capital transfers in the data	
Other	Includes commercial paper, foreign direct investment in US	Contrast with UK where net commercial paper is included in bank finance.

Table A3.2. UK Definitions – Gross Sources

Sources	Definition	Notes
Internal sources	Saving (after payment of taxes, dividends and interest) including depreciation less amounts set aside for tax liabilities	
Bank finance	Borrowing from banks including commercial bills; other loans and mortgages (on the uses side, instalment credit by retailers), loans by non-bank financial institutions, net commercial paper, shares of retail coops.	
Bonds	Debentures and preference shares	No separate uses figures for this category are shown (see notes under “net sources”).
New equity	Ordinary shares and other capital issues (e.g. management buyouts, ESOPS, issues abroad of UK securities)	
Trade credit	Domestic and foreign trade credit received from government and public enterprises	Very incomplete coverage. Does not record intra-sector trade credit or credit received or extended to households.
Capital transfers	Standard SNA definition	
Other	Other overseas investment	Commercial bills and commercial paper are included under bank finance

Table A3.3. Japanese Definitions – Gross Sources (consolidated except where noted)

Sources	Definition	Notes
Internal sources	Savings of the non-financial private enterprise sector (after interest, dividends and tax payments) plus depreciation	Depreciation for the non-financial enterprise sector is not separately reported and had to be calculated from the National Income Accounts
Bank finance	"Market loans". Includes bank loans, loans from government financial institutions and is assumed to include bills bought and sold ("TEGATA" BILLS DISCOUNTED AT BANKS).	"Tegata" (bills) figures are non-consolidated so both sales and purchases by companies are included. After 1987 includes commercial paper (new instrument)
Bonds	Corporate bonds issued domestically and abroad	Non-consolidated
New equity	Shares	Non-consolidated
Trade credit	Receivables and payables plus deferred payments	Non-consolidated but reporting conventions mean that negative numbers may appear in both sources and uses (e.g. when trade credit advanced falls year-on-year the creditor companies' uses are negative and the debtor companies' sources are also negative)
Capital transfers	No data available	
Other	Short-term securities, some government loans, foreign direct and portfolio investment (excluding foreign bond issues)	

Table A3.4. German Definitions – Gross Sources

Sources	Definition	Notes
Internal sources	Retained earnings plus depreciation plus pension funds	
Bank finance	Short-term and long-term bank loans	Includes insurance loans
Bonds	Bonds	Includes money market paper
New equity	Shares	
Trade credit	Domestic trade credit not separately shown	Includes only foreign trade credit.
Capital transfers		Includes the internally generated funds of government-owned enterprises as well as subsidies to industry.
Other		Excludes foreign trade credit. Includes flows of funds between non-financial enterprises and housing, which in Germany is a distinct enterprise sector.

Chapter 6

Capital Structure of Firms and Real-Financial Linkages in East Asia*

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Abstract

This paper describes the pattern of corporate financing choices in East Asian listed firms, analyzes the main drivers of debt, equity and maturity choices, and examines the effect of financing choices on the growth of firms' investment in tangible assets. The paper makes new contributions by creating a large database of financial data from the balance sheets of listed companies in East Asia; by considering the combined effects of firm factors, industry characteristics and country features in explaining firms' financial choices; and by introducing a measure of financial openness into country characteristics to allow policy lessons to be drawn about financial opening. East Asian firms have a distinctive financial pattern, depending heavily on external equity finance, and their choice of financial structure is determined by their own characteristics, their industry affiliation and their country characteristics. The growth of investment in tangible assets, however, is driven only by country characteristics such as legal, institutional and financial market structures. The paper suggests further work to derive the effect of more detailed country-level policy variables and the interactions between financial market structures and policies to develop concrete policy advice.

* We are grateful to Yifei (Lance) Wang for his excellent research assistance.

Keywords: company finance, corporate finance, corporate governance, corporate investment, financial statistics, firm, firm level, East Asia, financial systems

JEL Classifications: G320 ,G380, G390, O330, O160, K000,

Introduction

Companies raise finance to undertake economic activities in a variety of different ways. Some depend heavily on bank loans while others use their own stores of funds, amassed from retained earnings, with little recourse to outside earnings. While economic theory may try to develop a general explanation of how firms will finance themselves (or, as in Modigliani-Miller, argue that financial structure is irrelevant so there will be no presumption of a systematic pattern in company financing structures) data show that there is a variety of patterns for company finance and that patterns vary over time and place. However, some systematic patterns can be discerned.

An attempt to uncover such patterns within the East Asian region is, in itself, of interest because few, if any, studies do this. There are, furthermore, additional important policy questions that can be informed by such a study. The theme of this volume, the linkages between the real and financial sectors of the economy, requires an analysis of several links in a chain. On one side is the financial system itself where it is important to understand the structure of banks and other financial institutions and how they are financed, what business model they use, and where their vulnerabilities and inefficiencies lie. Surrounding those institutions is a structure of financial (capital) markets that are themselves worthy of study since failures, inefficiencies or absences of those markets, also impact on the provision of finance. Many studies of financial systems stop there but if we are interested in the link between the real behavior of the economy and how it responds to financial pressures and shocks, then one important element of the black box between the real and financial sides of the economy is the structure of corporate financing. To use the example above, if there is a banking crisis the firm that relies heavily on bank finance may behave differently to the firm that uses its own finance. In the absence of any crisis, when financial systems are working well, the firm that restricts itself to using only its own finance will probably not grow as rapidly as one that accesses other sources of funding. If we lack knowledge about the way the corporate sector is financed it may be more difficult to understand how the economy will respond to changes in the financial system.

The companion paper (Corbett, Chapter 4) in this volume has shown that the literature on corporate finance is large and addresses, separately, both microeconomic questions

(usually with a positive focus and little policy relevance) and macroeconomic (both positive and normative in the literature on growth and finance).

This paper picks up the challenge identified there and analyzes the drivers of corporate financing choices in East Asia and gives a preliminary analysis of the effect of financing choices on firms' growth. While the paper uses standard analytical methods, it makes a number of new contributions, including:

- Creating a large database of financial data from the balance sheets of listed companies in East Asia. Few such databases have been compiled. The data cover the pre- and post-Asian crisis period, allowing a clear picture of the changes through time.
- Considering the combined effects of firm factors, industry characteristics and country features in explaining firms' financial choices and the growth of firms.
- Introducing a measure of financial openness into the country characteristics to allow policy lessons to be drawn about financial opening. Few, if any, studies that use microdata to explain the link between financial structure and growth pay attention to the openness or integration of countries' financial systems.

There is still much work to do to refine the results and to draw correct policy inferences from them. However, the work that has gone in to creating this database and demonstrating the uses to which it can be put is a very significant step toward improving understanding of what will make a robust and efficient corporate financial structure in the region.

This paper is structured as follows. Section 2 sets out the detailed research questions. Section 3 describes the data. Section 4 gives a descriptive overview of the data and identifies some intriguing features that are distinctive to the East Asian region and highlights significant changes before and after the Asian crisis. Section 5 sets out the results from analysis of the drivers of the choice of financial structure (the use of debt versus other types of finance and the choice of debt maturity). Section 6 describes the results of analysis of the impact of finance on the growth of firms' investment in assets and identifies the key country characteristics that matter. Section 7 sets out conclusions and opportunities for future research.

2. The Research Questions

This paper addresses a number of distinct but interrelated questions. We are first concerned to see what the structure of finance is like within the region and whether we can explain the choice of debt, the choice of maturity, the use of trade credit and the extent to which earnings are retained. By using a fairly standard model we are able to make some comparisons with the results of other samples of countries reported in other literature. These interests dictate two research questions: (i) what are the choices firms make about the extent of debt financing in the countries we are examining and what determines it; (ii) what are the debt maturity choices of firms and their choices on the retention of earnings and the use of trade credit and what determines them.

The second part of the paper considers what effect financing choices have on the growth of investment in two categories of investment: fixed and current assets. This research agenda addresses the question of whether different financial structure (i.e. choice of financing or sources of funds) has an impact on the real behavior of firms as demonstrated by their investment decisions.

3. Data

We use firm-level data from COMPUSTAT Global Database of the Wharton Research Data Services from 1990 to 2009 (the data were collected at 2009/12). We include data for Australia, China, Indonesia, India, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand. We were unable to get data for Vietnam, Laos, Cambodia, Brunei Darussalam or Myanmar and so these countries are not included in the analysis but would be of considerable interest for future research.

Table 1 shows the sample size which is considerable in total and for most countries.

Some cleaning of the data was required and we dropped companies that had negative retained earnings and zero or negative shareholders' equity. Because we are using listed company data we are not able to draw conclusions about the whole corporate sector and unlisted SMEs and non-listed firms such as family firms are not covered (as noted in the companion paper in this volume (Corbett, Chapter 4)). Definitions of our financial variables are given in the Appendix.

Table 1. Sample Size

	Number of Companies	Total Company Years
AUS	1,818	12,856
CHN	1,645	8,538
IDN	265	2,549
IND	1,392	6,217
JPN	3,201	39,803
KOR	917	5,234
MYS	967	9,089
NZL	139	1,077
PHL	151	1,429
SGP	658	5,243
THA	453	4,077
Total	11,606	96,112

4. Empirical Puzzles

Figures 1–2 show patterns in the aggregate data in the use of debt finance in the region. The figures show both sample averages and period averages for individual countries, since there is a presumption that financing patterns differ across countries in both the use of external finance and the composition of that finance. Appendix 2 gives the variation over time in the patterns for individual countries but the discussion in the paper is limited to the averages.

The figures show the sample averages, aggregate time pattern and country time patterns for the ratios of key financing variables: long-term debt as a share of total financing (LTD/TF); short-term debt as a share of total financing (STD/TF); trade credit as a share of total financing (TC/TF); retained earnings as a share of total financing (RE/TF); and common stock as a share of total financing (CS/TF). Total debt (used later in the regressions) is simply the sum of long-term and short-term debt. These figures therefore show the proportions of each type of finance in the total finance raised by firms.

The noticeable features in Figure 1 are the low equity finance ratios in Japan, Korea and India. These countries also display higher ratios of total debt than of equity (stock market) finance so that they conform to the conventional view of “debt-financed” Asian economies. However, the other country data call this stereotype into question. Several

countries in the region show much higher use of equity finance than of debt, thus, clearly, country differences matter.

Figure 2 illustrates two striking features of the financial structure of listed companies in the region. First, it has not been true that retained earnings have been the major source of finance in this region over this time period. Unlike the conventional wisdom reported in the companion paper (Corbett, Chapter 4), it appears that listed companies in East Asia and Australia/NZ rely heavily on outside sources of finance. The second feature is that, over time, the ratio of equity has risen dramatically as retained earnings have fallen. The trend is particularly noticeable after 2001 and the timing of other changes is also suggestive. The drop in retained earnings began somewhat before the onset of the Asian financial crisis, suggesting that firms were increasingly fragile. During the crisis, retained earnings dropped very steeply and, by 2001, had become negative in Australia and dropped to half their previous levels in the rest of the sample, on average. The individual country results in the Appendix show that for many of the countries, retentions were negative for the years immediately after the Asian crisis. Even more striking is that, from that time on, the external finance came in the form of equity finance rather than debt. It appears that there was financial fragility before the crisis and that it took several years before companies were able to restructure to cover their growing losses. Once restructuring had been achieved, their access to stock market finance enabled them to use much higher proportions of equity finance than before the crisis. Whether this is a sign of financial health is a different matter: East Asian firms are now much more dependent on external (outside the company) finance than they were previously. We have no data on the origin of funding so we cannot distinguish how much is foreign nor how much comes from other investors in the region versus elsewhere.

Figure 1a. Full Period (1990–2008) Country Averages

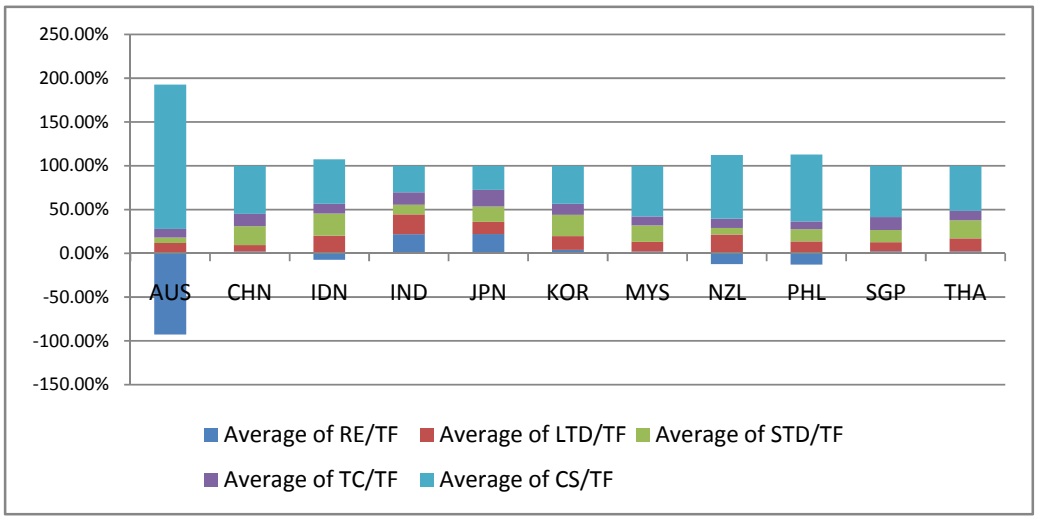


Figure 1b.

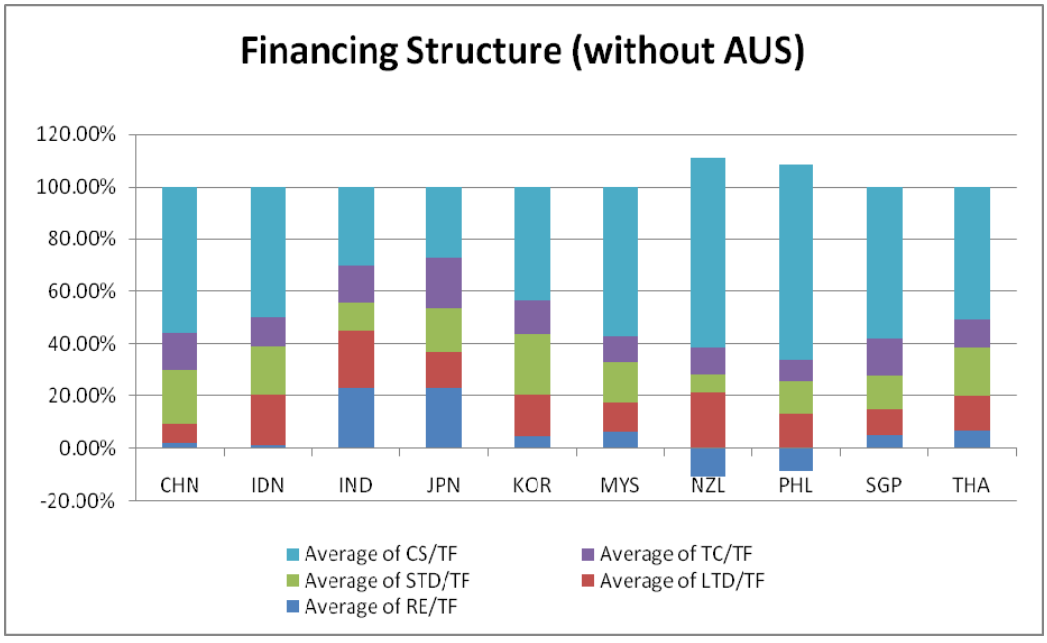


Figure 2a. Financing Structure Annual Averages (with Australia)

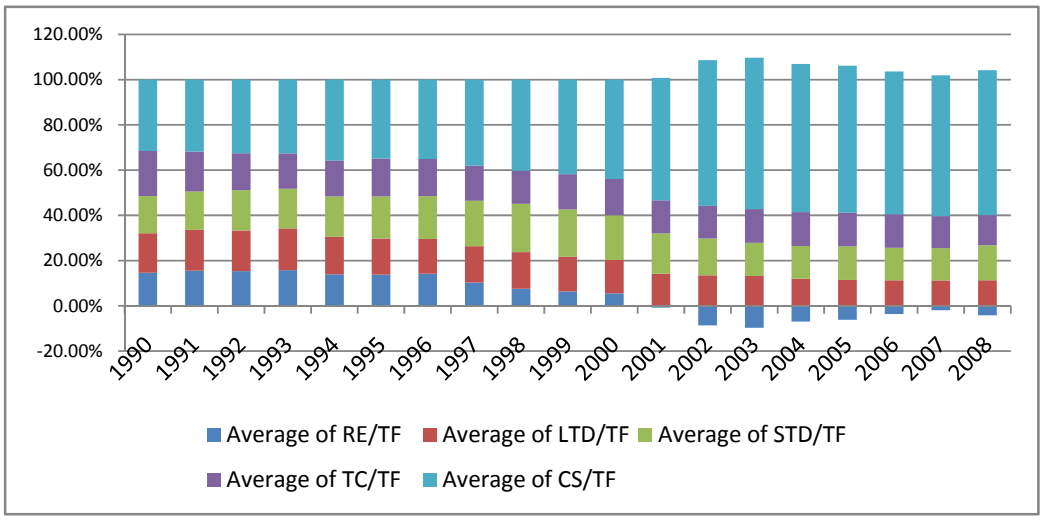
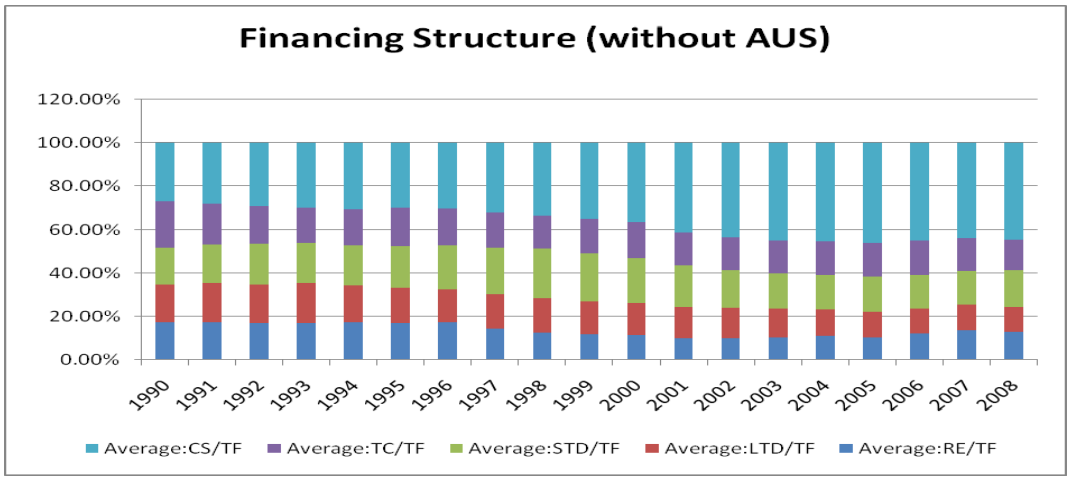


Figure 2b. Financing Structure (without Australia)



Figures 3–5 reinforce the empirical puzzle in terms of the financial flows data. These data show the change in firms' financing structure and give a picture of the sources of funds used to finance business activities. Again, there is significant country variation. Rapidly growing countries show higher growth of financing sources than slow growing ones (Japan, Korea and the Philippines). India, Japan and Korea show quite different patterns from the rest of the group, with small amounts of new equity finance. All other countries show the significant use of stock market finance that is consistent with the position demonstrated above for the outstanding balances of different types of finance. Over time, Figure 5 again shows the dramatic effect of the Asian financial crisis on the

sources of finance used by companies and the long period of restructuring from 1998 to 2004 where debt was reduced and equity financing increased. The decreasing use of retained earnings and the increasing use of stock market financing since 2004 is very remarkable.

Figure 3. Average Financing Flows for Sample Period 1990–2008

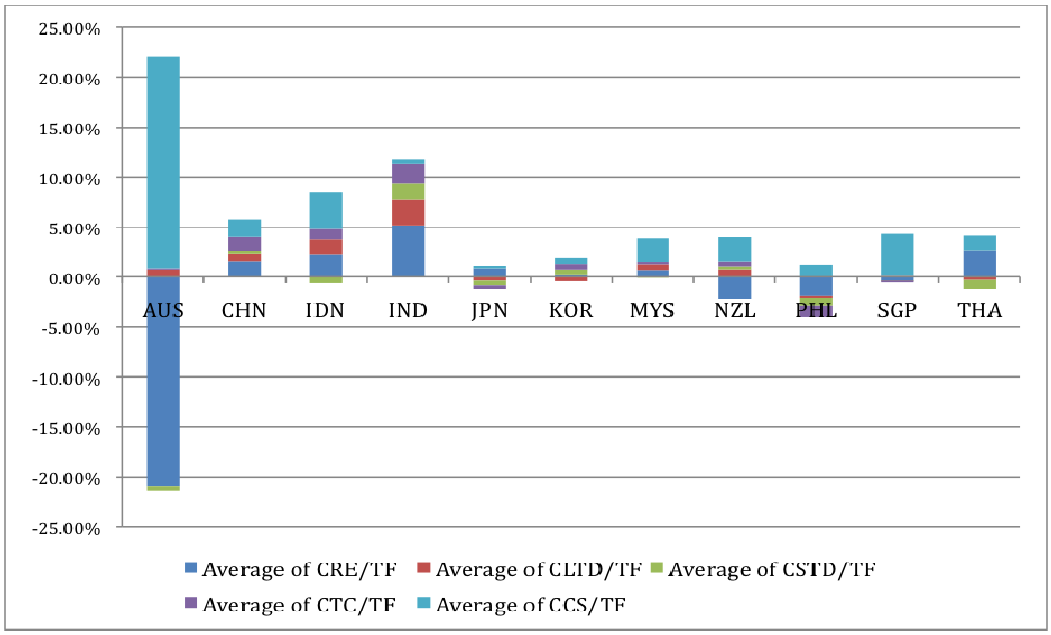


Figure 4. Average Financing Flows for Sample Period 1990–2008 (without Australia)

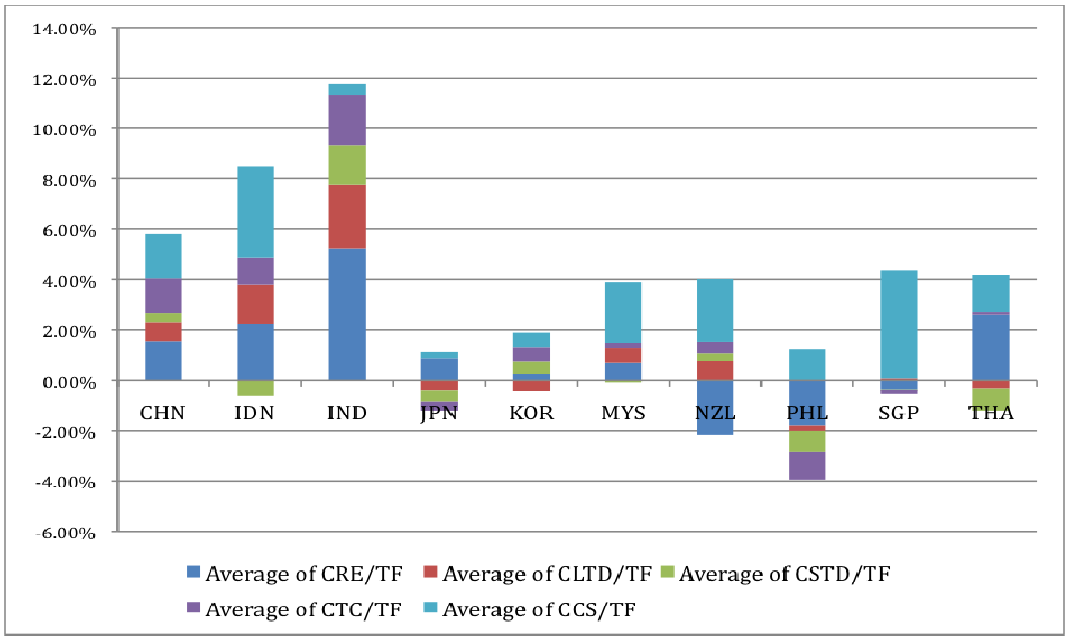
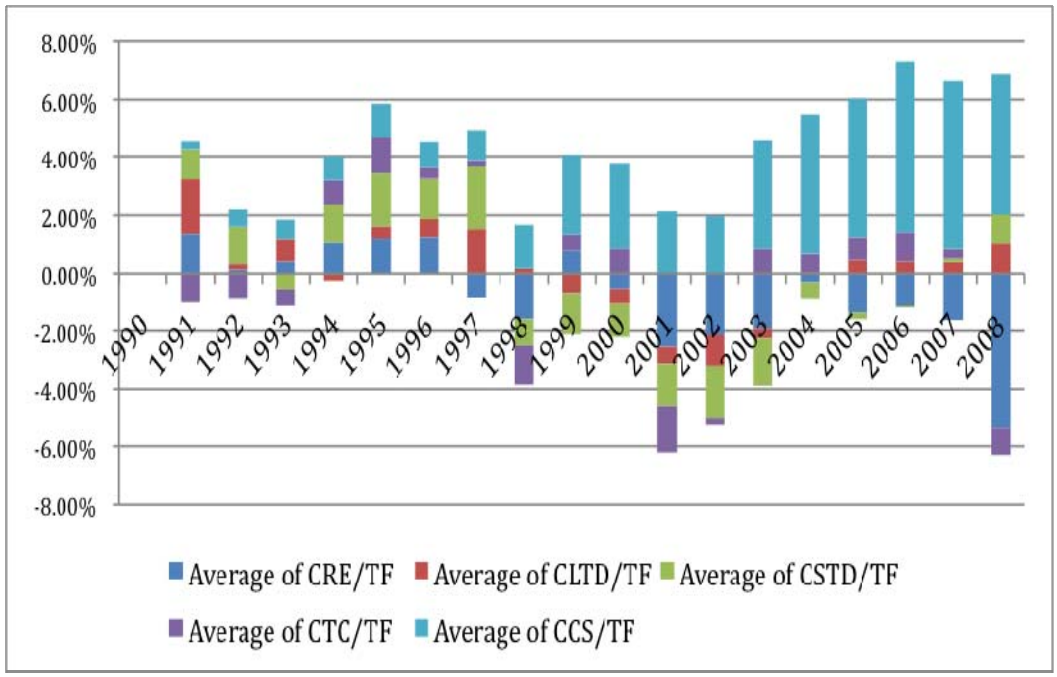


Figure 5. Annual Average Financing Flows for All Countries in Sample



5. Explaining Financial Structure

We turn now to the question of what variables explain the observed patterns in the choice of financial structure. We run six regressions on the pooled cross-sections for all countries over the period. Each regression aims to explain the choice of one of the dependent variables:

(i) total debt(excluding trade credit)/total assets (td_ta);
(ii) total debt(including trade credit)/total assets (td_tc_ta);
(iii) retained earnings/shareholder equity (re_shf);
(iv) long-term debt/total assets (ltd_ta);
(v) short-term debt/total assets (std_ta);
(vi) trade credit/total assets (tc_ta)

In each case we regress the financing choice measure on a set of firm-level variables plus a set of industry dummies plus various country characteristics.

Firm-level Variables

As further described in the Appendix, the explanatory variables at the firm level are asset tangibility (fixed assets over total assets), profitability (net income over total assets), firm size (natural logarithm of total assets), the market-to-book ratio (market value of equity over book value of equity) and a dividend payment dummy (dummy equals one if the firm pays a dividend in a given year and zero otherwise).

The justification for this choice of variables is that they are close to the standard firm effects that have been found to be significant in many previous studies of financial structure. Asset tangibility indicates the availability of collateral with which firms can raise external finance, in particular debt. Profitability has been found to be a strong determinant of financial structure and, in general, firms with high profitability tend to have lower debt ratios (and external finance generally) since they have more internal sources of finance and are not finance constrained. Where tax systems favor corporate income over personal there is an incentive for firms to retain earnings. Pecking order theories of finance, whether driven by information asymmetries or other causes, also suggest that retained profits will be used before other sources of finance. Firm size and

the market-to-book ratio capture both the growth opportunities for firms and the observation that larger firms have greater access to external finance for a variety of reasons, from better disclosure to better governance. We expect that firms that pay a dividend have additional sources of financing (both internal and external) and are less financially constrained.

Country Variables

The country variables cover several institutional features: the legal system (common law versus civil law dummy), a corruption index, a tax compliance variable, a business startup cost index, a variable to capture the development of the banking system (Bank deposits/GDP), and an indicator of whether the banking system is state-owned. We also include variables for the stage of development of the economy (an indicator for the level of income) and for the degree of openness of the financial system. Finally, we include indicators showing the degree of development of the debt markets: an indicator of whether there is an explicit bankruptcy code and an index of the extent to which the tax system favors debt. It would be possible, and in further work we hope, to include indicators of the transparency of the accounting system and to break down the indicator of openness to look in more detail at the policy implications of different elements of capital market liberalization. We also plan to consider further the structure on the lenders' side of the market, including the barriers to entry in banking and financial services that may restrict the financial choices open to firms.

The justification for these variable is as follows: 1) common law systems are argued to provide better investor and property rights' protection, making external finance, particularly debt finance, less costly; 2) more corruption means less ability to protect property and to enforce non-defined contracts, giving an advantage to formally specified contracts and resulting in more debt and less investment; 3) higher tax compliance indicates a higher-quality system of regulation and property protection; 4) the fewer days required for contract enforcement, the more efficient is the legal system assumed to be, with the expectation that firms will have access to more debt (and that more investment would be carried out); 5) higher business startup costs give more protection for entrenched businesses, allowing them to access more debt, although the overall

investment impact is unclear. Turning to variables reflecting the level of development of the banking system and the debt markets we have 7) the larger the banking system the more debt we expect firms to use, particularly short-term debt, which is the typical form of bank debt, and the higher we expect their investment to be; 8) where a deposit insurance scheme exists we also expect more debt because of the preferences of lenders, and in this case we expect more long-term debt since banks with protection are more willing to lend long even with short maturity deposits, and we would expect more investment. Where we have 9) state ownership of banks, we have possible conflicting effects since state ownership may simply be associated with bigger and fewer banks predisposed to more short-term debt. State banks may, however, also be more likely to engage in crony or related lending, resulting in more long-term debt to favored clients and thus the overall investment impact is unclear.

A second set of country variables indicates the level of development, openness and sophistication of the capital markets since these all affect the availability of finance, which is, in turn, likely to affect firms' choice of finance. The index of openness is of particular interest in the context of the region's somewhat hesitant commitment to opening capital markets after the Asian crisis. Its theoretical effect is unclear. While we would expect openness to lead to more investment growth there is no obvious theoretical presumption about the impact on the choice of debt versus equity or retentions. It would be presumed to make more funds of both types available. The developed economy dummy would likely lead to more use of equity since developed capital markets should have less asymmetric information and more disclosure (which we do not measure directly in this set of regressions). The effect on the growth of investment is unclear as growth opportunities may be higher in developing economies rather than mature, developed ones. The sophistication of the debt market is indicated by the bankruptcy code index with the expectation that an explicit bankruptcy code (insolvency reorganization index) provides more protection of creditors, allowing use of more debt and more long-term debt. The tax benefit to debt (Miller ratio) variable should have a straightforward effect where a larger tax benefit to debt would result in more debt being used. We do not consider policy implications from this variable and it

is included here as a control to clarify the effects of other policy and institutional variables but there would be possibilities for future research on tax effects.

5.1. Results

A simple exercise suggests that we should expect that all variables contribute to the explanation of financial structure rather than any subset. Appendix 3 Table 1 shows that regressions with all the variables have greater explanatory power than those with only subsets of the variables. This is a much less rigorous test than an approach using the general-to-specific method, or than using Akaike Information Criteria (AIC) tests, but gives a rough guess as to the effects of additional variables. The overall picture is consistent with the detailed results reported below. The strong message from both sets of results is that, in explaining financial structure choices, all elements (firm characteristics, industry affiliation and country characteristics) matter.

Tables 2–7 give the results for the regressions explaining the choice of each of the financial structure variables.

Firm characteristics

Taking firm characteristics effects first, the key results for the choice of debt are that higher tangible assets, size and market-to-book are associated with higher levels of total debt. Financially constrained firms (dividend dummy) use less total debt.

Looking at debt maturity we find higher tangible assets, size and market-to-book are associated with more long-term debt and that financially constrained firms (dividend dummy) use less long-term debt. Larger size is also associated with more short-term debt (presumed to be bank debt) while financially constrained firms (dividend dummy) use less short-term debt.

Firms that choose higher levels of trade credit have lower tangible assets (i.e. less collateral to offer for bank debt), larger size and higher market-to-book ratios. While the latter may seem counter-intuitive, it is a feature of trade credit that flows are usually from smaller firms to larger. That is, small businesses are forced to offer credit terms to their larger customers.

We find more profitable firms and dividend-paying firms have higher levels of retained earnings.

These results are all broadly consistent with other studies, suggesting that, while firm characteristics matter for East Asian firms' choice of financial structure, there is nothing unusual about their effects. Firms in the region make financing choices in similar ways to firms elsewhere.

Industry-level results show that Communication, Entertainment, Insurance, Mining and Services are associated with less total debt. Electric, Gas & Sanitary Services, Banks and Transport are associated with more long-term debt while Entertainment, Insurance, Mining, and Tobacco are associated with less long-term debt.

The Automotive industry and Banks are associated with more short-term debt while Chemical, Communication, Electronics, Electric, Gas & Sanitary Services, Entertainment, Hotels, Mining, Newspaper, Retail, Services, Tobacco, and Transport are associated with less short-term debt.

Automotive, Chemical, Construction, Food & Beverages, Manufacturing, Metal fabrication, Paper & Pulp, Retail, Transport and Wholesale use more trade credit.

Insurance and Mining are associated with higher levels of retained earnings.

For the present purposes we have not made any particular use of this information and these variables function mainly as controls to ensure that industry effects are accounted for before attributing significance to other variables. Other studies have used a variety of approaches to account for the fact that different countries have a different industrial mix and this may impact on the way country variables affect financing (see, for example, Carlin and Mayer, 2003). This would be an interesting future question for research.

Country effects

In explaining the choice of total debt, the results indicate that being a common law country, having higher corruption, a larger banking sector, higher state ownership of banks and being a developed economy are associated with higher levels of total debt. These results are consistent with previous studies although the sign on state ownership

of banks was unclear in theory. Unexpectedly, the existence of an explicit bankruptcy code is associated with lower levels of total debt although it was expected to provide better protection for debt holders and to facilitate the use of debt.

The ability to use more long-term debt is associated with common law, lower corruption and an open economy. The latter result is an interesting one to note for future research. Unexpectedly, the existence of an explicit bankruptcy code and higher tax compliance are associated with lower levels of long-term debt.

For the use of short-term debt (which is generally bank debt but is also less risky for lenders than long-term debt) we find that higher corruption, a closed economy, longer duration (less efficient) contract enforcement, being a developed economy, having higher state ownership of banks and higher tax compliance are associated with higher levels of short-term debt. Common law is associated with lower levels of short-term debt, consistent with greater protection of debt holders' rights. The mix of results indicates that short-term debt is used both in developed countries with reasonable enforcement of obligations (as shown by tax compliance) where banks may be willing to provide loans, and in countries where uncertainty about debt holders' protection means that short, rather than long, debt has to be used.

Common law, lower corruption, less tax compliance, lower startup costs, larger banking sector and a more open economy are associated with higher levels of trade credit, suggesting that this is a form of finance that requires reasonably high levels of property rights protection to be used (presumably because it is sometimes informal and would not be easy to pursue).

For the choice of how much earnings to retain, higher corruption, higher tax compliance, higher state ownership of banks are associated with higher levels of retained earnings. Unexpectedly, higher tax benefit to debt is associated with higher levels of retained earnings.

These results are still somewhat preliminary but demonstrate the potential for more detailed analysis of what improvements to financial systems would be associated with changes to the financing choices made by firms. In particular, the fact that financial openness has a significant impact warrants a much more detailed examination. The

strong message that can be taken from the data is that country variables influence financing choices by firms, even after firm characteristics and industry effects have been taken into account. This is reassuring since it is consistent with the results of other studies for large samples of developed and developing countries and it gives scope for policy variables of particular interest in the region to be examined. It also should allow an analysis of what may cause changes in the financial structure of firms that, as noted above, have been very significant in the recent period.

6. Explaining the Impact of Sources of Finance

Tables 8–9 give the results for regressions explaining the change in investment in tangible assets (property, plant and equipment) and in current assets.

Since the focus of interest here is on how financing sources may impact on the investment activity of firms we have included in our explanatory variables several measures of the sources of finance. While our variable definitions (Appendix table) show the sources of finance as a share of total finance, the regression results were better. As these simply uses the change in the amounts of the sources of finance, the results reported in Tables 8 and 9 use changes in the levels of finance (change is defined as t – t-1 for each variable).

The R-squared for these investment equations is low but the results are broadly consistent with other studies so they may still be taken as informative. Essentially the results confirm that financial structure variables matter little for the amount of investment that firms carry out. Indeed, the only variables that have significant impact are country characteristics. These results remain puzzling in the finance literature but they are consistently replicated in the literature across a number of different specifications of real activity by firms and with different samples of countries and firms. We may therefore conclude that East Asia is not different in this respect. This does not mean that there is nothing to be learned from these results. On the contrary, they give considerable (future) scope for considering which country characteristics matter, for focusing on particular policy and regulatory characteristics and for further examining the interactions between country characteristics and firm and industry structure within countries. It would also be desirable to do more rigorous testing of which insignificant

variables can be removed and what the effect is on the remaining results (general-to-specific strategy).

Taking the detail of the results in Tables 8 and 9 it is clear that the sources of financing do not influence firm fixed investment. For investment in current assets there is some evidence that lower levels of short-term debt financing are associated with higher current asset investment.

As expected, different industries have different investment behavior. Electronics, Electric, Gas & Sanitary Services, Manufacturing, Metal fabrication, Paper & Pulp and Retail are associated with higher fixed asset investment while there is no industry effect on current asset investment.

The interesting results are at the country level. The main significant effects are in this group of variables. In addition to the variables in earlier regressions, we add a shareholder rights index (where better protection is expected to make investors more able to enforce contracts and should lead to both more use of equity and more investment) and a creditor rights index (where better protection should lead to more debt and more investment). Overall, lower corruption, lower startup costs (i.e. less entrenched business), more tax compliance, higher state ownership of banks, a more open financial system and stronger shareholder rights are associated with higher fixed asset investment. Unexpectedly, common law, a developed economy, a larger banking system, an explicit bankruptcy code and weaker creditor rights are associated with less fixed asset investment

Lower corruption, lower startup costs and higher creditor rights are associated with higher current asset investment.

7. Conclusions and Future Research

- East Asian firms have a distinctive and striking financial structure. They rely to a considerable degree on external finance rather than retained earnings, and much of that finance comes from stock markets.

- Only Japan, Korea and India conform to the stereotype of debt-financed corporate structure.
- In the aftermath of the Asian financial crisis, there was a dramatic change in the financial structure of firms and their sources of finance. The transition to the new structure took several years to achieve.
- For firms' financial structure choices (i.e. debt levels, equity levels, maturity structure and retained earnings) firm-level, industry-level and country-level variables all matter.
- Thus, firm financing choices are not common across countries even though firm characteristics do matter.
- This is consistent with other literature that finds that country variables matter for financial structure but it is the first demonstration for the East Asian economies alone.
- The use of debt is greater when a country has common (rather than civil) law, has higher corruption, a larger banking sector, higher state ownership of banks and is a developed economy.
- There is no perceptible effect of shareholders' or debt holders' rights.
- Openness of the financial system has no effect on the overall choice of debt ratio but does increase the use of long-term debt (reducing short term).
- Firms' sources of finance (i.e. the structure of their fund raising) have no influence on the change in investment in either long- or short-term assets.
- Only country-level variables have an effect (consistent with other research).
- The main variables supporting the creation of assets are lower corruption, lower start-up costs for new business, higher state ownership of banks (China effect?) and an open financial system.
- Stronger shareholders' rights also have a significant effect.

Future Research

The current research has compiled a very large database of company accounting data that demonstrate what can be done even with the limitations of currently available data. There is clearly enormous scope for more research that can inform an understanding of

how the financial system is structured, how it connects with the corporate sector's real activities, and what elements of policy and institutional structure make a difference. To develop specific policy recommendations we suggest the following further research.

- A closer look at individual country results to see how countries have changed over time and what has determined those changes. This would be better achieved by using fixed-effects panel data estimation methods.
- Separation of individual elements of the financial openness measures and the inclusion of regional integration measures to consider the effects of financial liberalization and integration on the financial structure and behavior of firms.
- The inclusion of better measures of financial market development.
- Other measures of different types of investment such as R&D, which is a crucial element in growth and productivity.
- Closer examination of structural breaks around times of crisis to see whether finance sources and structure impact on investment more at certain times and under certain circumstances.

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Results Tables

Table 2. Total Debt/Total Finance

Variable	Coef.	t	P
tangible	.2147967	5.65	0.000
profit	–.0019585	–0.99	0.320
size	.0235452	7.18	0.000
m_b	5.89e–06	3.56	0.000
div_dum	–.073453	–3.99	0.000
law	.0510641	2.34	0.019
corrupt	.0186969	4.31	0.000
enforce_du~t	.0002817	2.07	0.039
taxevas	.016249	1.32	0.186
startup_co~t	–.0263369	–0.41	0.681
bankdeposi~p	.0218991	2.20	0.028
deposit_in~e	–.0168976	–0.90	0.370
bankstate	.061523	3.63	0.000
openness	–.0018508	–0.21	0.830
income	.0554457	3.59	0.000
reorg	–.0369542	–1.61	0.108
miller	.0621813	1.51	0.131
_Iindust_8	–.0938547	–3.53	0.000
_Iindust_9	.2482043	7.42	0.000
_Iindust_10	–.0874373	–4.67	0.000
_Iindust_16	–.156324	–4.12	0.000
_Iindust_21	–.1854775	–4.20	0.000
_cons	–.2053378	–2.78	0.006

Number of Obs = 91918; R-squared = 0.2292; Root MSE = 0.1713 Notes: Only Industry dummies with a P of .001 or less have been included in the tables.

Table 3. Total Debt Plus Trade Credit/Total Finance

Variable	Coef.	t	P
tangible	.0409238	4.01	0.000
profit	–.0020694	–1.08	0.282
size	.0271438	7.25	0.000
m_b	6.65e–06	3.90	0.000
div_dum	–.0765193	–3.42	0.001
law	.0784962	2.57	0.010
corrupt	.0125895	2.49	0.013
enforce_du~t	.0001911	0.98	0.329
taxevas	–.0166862	–1.19	0.235
startup_co~t	–.1109728	–1.32	0.186
bankdeposi~p	.0486097	4.48	0.000
deposit_in~e	–.0185104	–1.08	0.279
bankstate	.0704777	5.01	0.000
openness	.0060221	0.58	0.560
income	.0563452	3.17	0.002
reorg	–.0500276	–1.98	0.048
miller	.0837131	1.50	0.134
_Iindust_8	–.1004735	–3.28	0.001
_Iindust_9	.2495399	10.73	0.000
_Iindust_16	–.1658329	–4.33	0.000
_Iindust_21	–.2082075	–5.09	0.000
_Iindust_23	.1074116	7.56	0.000
_cons	.0638888	0.57	0.572

Number of Obs = 91916, R-squared = 0.2364, Root MSE = 0.1902

Table 4. Retained Earnings/Shareholders Equity

Variable	Coef.	t	P
tangible	–.7023238	–0.13	0.896
profit	2.242583	2.69	0.007
size	1.061307	1.67	0.095
m_b	–.0109832	–0.79	0.429
div_dum	3.72845	2.69	0.007
law	1.476316	0.37	0.711
corrupt	1.574422	3.15	0.002
enforce_du~t	–.0008221	–0.05	0.958
taxevas	7.824188	4.61	0.000
startup_co~t	–3.398072	–0.26	0.792
bankdeposi~p	–2.544971	–1.22	0.224
deposit_in~e	1.719604	0.93	0.352
bankstate	10.60071	7.48	0.000
openness	.9458251	0.79	0.427
income	.0846882	0.06	0.955
reorg	–2.16044	–0.75	0.454
miller	13.28458	2.00	0.045
_cons	–55.24883	–5.66	0.000

Number of Obs = 91944, R-squared = 0.0038, Root MSE = 129.7856

Table 5. Long-term Debt/Total Finance

Variable	Coef.	t	P
tangible	.1851676	6.67	0.000
profit	–.0008804	–1.34	0.181
size	.0209732	7.59	0.000
m_b	6.21e–06	5.34	0.000
div_dum	–.0347795	–6.13	0.000
law	.1460649	5.61	0.000
corrupt	–.0042395	–2.55	0.011
enforce_du~t	–.0002936	–1.44	0.149
taxevas	–.0501534	–4.47	0.000
startup_co~t	–.0984596	–1.71	0.088
bankdeposi~p	.0143888	1.19	0.232
deposit_in~e	–.0089322	–0.64	0.522
bankstate	–.0181173	–0.80	0.424
openness	.0146491	2.96	0.003
income	.0022558	0.15	0.879
reorg	–.0365448	–1.87	0.061
miller	.0461133	1.00	0.315
_Iindust_7	.0614651	5.67	0.000
_Iindust_9	.1998528	6.66	0.000
_cons	.0508133	0.91	0.362

Number of Obs = 91934, R-squared = 0.2973, Root MSE = 0.1101

Table 6. Short-term Debt/Total Finance

Variable	Coef.	t	P
tangible	.0298037	1.51	0.132
profit	–.0010838	–0.81	0.416
size	.0025538	2.28	0.023
m_b	–3.16e–07	–0.42	0.677
div_dum	–.038722	–2.81	0.005
law	–.0948951	–4.58	0.000
corrupt	.0229242	4.58	0.000
enforce_du~t	.0005754	6.45	0.000
taxevas	.0663039	6.00	0.000
startup_co~t	.0722868	1.93	0.054
bankdeposi~p	.0076561	0.55	0.586
deposit_in~e	–.0080042	–0.57	0.571
bankstate	.0796828	5.01	0.000
openness	–.0165479	–3.09	0.002
income	.0533869	2.85	0.004
reorg	–.0003924	–0.03	0.980
miller	.0161676	0.26	0.794
_Iindust_4	–.0880793	–4.52	0.000
_Iindust_7	–.0794157	–5.41	0.000
_Iindust_8	–.055409	–3.69	0.000
_Iindust_13	–.0679676	–4.26	0.000
_Iindust_16	–.0890191	–4.35	0.000
_Iindust_17	–.0560176	–3.74	0.000
_Iindust_20	–.0630637	–4.93	0.000
_Iindust_21	–.0908602	–3.67	0.000
_cons	–.2559502	–3.49	0.000

Number of Obs = 91933, R-squared = 0.1409, Root MSE = 0.1236

Table 7. Trade Credit/Total Finance

Variable	Coef.	t	P
tangible	–.1736383	–4.65	0.000
profit	–.0001351	–0.54	0.587
size	.0035974	4.02	0.000
m_b	7.60e–07	2.52	0.012
div_dum	–.0030248	–0.68	0.496
law	.0274353	2.75	0.006
corrupt	–.0061018	–4.10	0.000
enforce_du~t	–.0000899	–1.23	0.220
taxevas	–.0329664	–8.04	0.000
startup_co~t	–.0843965	–2.73	0.006
bankdeposi~p	.0267527	4.02	0.000
deposit_in~e	–.0016499	–0.16	0.875
bankstate	.0089752	0.94	0.347
openness	.0078736	2.20	0.028
income	.0009315	0.18	0.859
reorg	–.0129973	–1.61	0.108
miller	.0218234	1.13	0.260
_Iindust_5	.0803013	7.74	0.000
_Iindust_14	.0413365	3.71	0.000
_Iindust_19	.0578412	5.07	0.000
_Iindust_23	.1271955	4.99	0.000
_cons	.268934	5.96	0.000

Number of Obs = 91973, R–squared = 0.3203, Root MSE = 0.0900

Table 8. Investment in Property, Plant & Equipment

Variable	Coef.	t	P
chg_ltd	–4.96e–08	–0.16	0.870
chg_std	9.69e–08	0.65	0.515
chg_tc	3.81e–07	0.84	0.398
chg_re	1.21e–07	1.65	0.099
law	–5.247312	–2.67	0.008
corrupt	–.5419505	–5.21	0.000
enforce_du~t	–.0251875	–4.10	0.000
taxevas	1.224491	3.49	0.000
startup_co~t	–15.70504	–5.39	0.000
bankdeposi~p	–2.476196	–2.92	0.004
deposit_in~e	–.1899943	–0.30	0.766
bankstate	3.684801	3.45	0.001
openness	.0106528	0.06	0.954
income	–5.82652	–5.38	0.000
reorg	–2.906417	–2.58	0.010
miller	–7.308702	–1.99	0.047
creditor_r~s	–2.03561	–7.06	0.000
share_rights	3.502545	5.00	0.000
_Iindust_6	.6546698	3.35	0.001
_Iindust_7	1.054598	3.21	0.001
_Iindust_14	.6743884	3.83	0.000
_cons	3.709195	3.06	0.002

Number of Obs = 64515, R-squared = 0.0007, Root MSE = 53.4648. Note: change in retained earnings, change in long-term debt; change in short-term debt and change in trade credit are defined as t – t-1

Table 9. Investment in Current Assets

Variable	Coef.	t	P
chg_ltd	5.18e–08	0.20	0.845
chg_std	–4.68e–07	–2.06	0.040
chg_tc	5.96e–07	0.94	0.349
chg_re	–7.01e–08	–0.53	0.595
law	–11.56963	–0.76	0.448
corrupt	–2.469467	–1.86	0.064
enforce_du~t	–.0224026	–2.14	0.033
taxevas	–1.717838	–1.90	0.058
startup_co~t	–22.59532	–1.16	0.244
bankdeposi~p	1.530191	0.79	0.430
deposit_in~e	.0892354	0.12	0.904
bankstate	11.44514	0.93	0.353
openness	.1455602	0.27	0.786
income	–14.21094	–1.48	0.140
reorg	–4.026255	–0.74	0.462
miller	–9.066622	–0.62	0.538
creditor_r~s	1.089851	1.96	0.050
share_rights	6.678921	1.07	0.283
_cons	6.240801	0.76	0.447

Number of Obs = 66246, R-squared = 0.0006, Root MSE = 89.8051

Appendix 1

Variable Definitions

A1.1. Independent Variables

1. Leverage in period t (a) or Leverage (a)

Definition: total debt/market value

Where total debt is defined as the book value of current and long-term interest bearing debt, market value is defined as the market value of common equity plus book value of preferred stock plus total debt.

Calculating Formula:

$$Leverage\ (a)_t = \frac{DLC_t + DLTT_t}{CSHO_{t,last\ trading\ day} \times PRCCD_{t,last\ trading\ day} + PSTK_t + DLC_t + DLTT_t}$$

2. Leverage in period t (b) or Leverage (b)

Definition: total debt/market value

Where total debt defined as the book value of current and long-term interest bearing debt plus trade credit, market value is defined as the market value of common equity plus book value of preferred stock plus total debt.

Calculating Formula:

$$Leverage\ (b)_t = \frac{DLC_t + DLTT_t + AP_t}{CSHO_{t,last\ trading\ day} \times PRCCD_{t,last\ trading\ day} + PSTK_t + DLC_t + DLTT_t + AP_t}$$

3. Debt maturity in period t (a) or DM (a)

Definition: long-term debt/total debt *total debt defined as the book value of current and long-term interest-bearing debt.

Calculating Formula: $DM(a)_t = \frac{DLTT_t}{DLC_t + DLTT_t}$

4. Debt maturity in period t (b) or DM (b)

Definition: long-term debt/total debt *total debt defined as the book value of current and long-term interest-bearing debt plus trade credit.

Calculating Formula: $DM(b)_t = \frac{DLTT_t}{DLC_t + DLTT_t + AP_t}$

5. Shareholder Equity Ratio in period t or SEMR

Definition: shareholders equity/total assets

Calculating Formula: $EMR_t = \frac{SEQ_t}{AT_t}$

6. Long-Term Debt Maturity Ratio in period t or LTMR

Definition: long-term debt/total assets.

Calculating Formula: $LTMR_t = \frac{DLTT_t}{AT_t}$

7. Short-Term Debt Maturity Ratio in period t or STMR

Definition: short-term debt/total assets.

Calculating Formula: $STMR_t = \frac{DLC_t}{AT_t}$

8. Trade Credits Maturity Ratio in period t or TCMR

Definition: trade credits/total assets.

Calculating Formula: $TCMR_t = \frac{AP_t}{AT_t}$

9. Proportions of fixed investment in period t (a) or PFI (a)

Definition: change in fixed assets/total investable funds.

Where total investable funds defined as change in current liabilities plus change in long-term liabilities plus change in issued equity plus cash flow from operations.

Calculating Formula: $PFI(a)_t = \frac{(AT_t - ACT_t) - (AT_{t-1} - ACT_{t-1})}{OANCF_t + (LT_t - LT_{t-1}) + (CSTK_t - CSTK_{t-1})}$

10. Proportions of fixed investment in period t (b) or PFI (b)

Definition: change in gross PP&E/total investable funds.

Where total investable funds defined as change in current liabilities plus change in long-term liabilities plus change in issued equity plus cash flow from operations.

Calculating Formula: $PFI(b)_t = \frac{PPEGT_t - PPEGT_{t-1}}{OANCF_t + (LT_t - LT_{t-1}) + (CSTK_t - CSTK_{t-1})}$

11. Proportions of current investment in period t or PCI

Definition: change in current assets/total investable funds.

Where total investable funds defined as change in current liabilities plus change in long-term liabilities plus change in issued equity plus cash flow from operations.

Calculating Formula: $PCI_t = \frac{(ACT_t - ACT_{t-1})}{OANCF_t + (LT_t - LT_{t-1}) + (CSTK_t - CSTK_{t-1})}$

12. FINCF/OANCF Ratio in period t or FOR

Definition: net financing cash flow/net operating cash flow.

Calculating Formula: $FOR_t = \frac{FINCF_t}{OANCF_t}$

13. Retained Earnings Ratio in period t or RER

Definition: change in retained earnings / (change in long-term debt + change in common stock capital).

Calculating Formula: $RER_t = \frac{RE_t - RE_{t-1}}{(DLTT_t - DLTT_{t-1}) + (CSTK_t - CSTK_{t-1})}$

14. FINCF/OANCF Ratio in period t or FOR

Definition: net financing cash flow/net operating cash flow.

Calculating Formula: $FOR_t = \frac{FINCF_t}{OANCF_t}$

15. RE/TF Ratio in period t or RE/TF

Definition: retained earnings/total financing.

Where total financing defined as shareholders equity plus total debts plus trade credit.

Calculating Formula: $RE/TF_t = \frac{RE_t}{SEQ_t + DLTT_t + DLC_t + AP_t}$

16. LTD/TF Ratio in period t or LTD/TF

Definition: long-term debts/total financing.

Where total financing defined as shareholders equity plus total debts plus trade credit.

Calculating Formula: $LTD/TF_t = \frac{DLTT_t}{SEQ_t + DLTT_t + DLC_t + AP_t}$

17. STD/TF Ratio in period t or STD/TF

Definition: short-term debt/total financing.

Where total financing defined as shareholders equity plus total debts plus trade credit.

Calculating Formula: $STD/TF_t = \frac{DLC_t}{SEQ_t+DLTT_t+DLC_t+AP_t}$

18. TC/TF Ratio in period t or TC/TF

Definition: trade credit/total financing.

Where total financing defined as shareholders equity plus total debts plus trade credit.

Calculating Formula: $AP/TF_t = \frac{AP_t}{SEQ_t+DLTT_t+DLC_t+AP_t}$

19. CS/TF Ratio in period t or CS/TF

Definition: the residual value of total financing, representing the equity capital proportion in financing.

Where total financing defined as shareholders equity plus total debts plus trade credit.

Calculating Formula: $CS/TF_t = 1 - RE/TF_t - LTD/TF_t - STD/TF_t - TC/TF_t$

20. CRE/TF Ratio in period t or CRE/TF

Definition: change in retained earning/total financing.

Where total financing defined as shareholders equity plus total debts plus trade credit.

Calculating Formula: $CRE/TF_t = \frac{RE_t-RE_{t-1}}{SEQ_t+DLTT_t+DLC_t+AP_t}$

21. CLTD/TF Ratio in period t or CLTD/TF

Definition: change in long term debt/total financing.

Where total financing defined as shareholders equity plus total debts plus trade credit.

Calculating Formula: $CLTD/TF_t = \frac{DLTT_t-DLTT_{t-1}}{SEQ_t+DLTT_t+DLC_t+AP_t}$

22. CSTD/TF Ratio in period t or CSTD/TF

Definition: change in short term debt/total financing.

Where total financing defined as shareholders equity plus total debts plus trade credit.

Calculating Formula: $CSTD/TF_t = \frac{DLC_t-DLC_{t-1}}{SEQ_t+DLTT_t+DLC_t+AP_t}$

23. CTC/TF Ratio in period t or CTC/TF

Definition: change in trade credit/total financing.

Where total financing defined as shareholders equity plus total debts plus trade credit.

Calculating Formula: $CTC/TF_t = \frac{AP_t - AP_{t-1}}{SEQ_t + DLTT_t + DLC_t + AP_t}$

24. CCS/TF Ratio in period t or CCS/TF

Definition: change in long term debt/total financing.

Where total financing defined as shareholders equity plus total debts plus trade credit.

Calculating Formula: $CCS/TF_t = \frac{CSTK_t - CSTK_{t-1}}{SEQ_t + DLTT_t + DLC_t + AP_t}$

Data Item List:

ACT	ACT – Current Assets – Total
AP	AP – Accounts Payable – Trade
AT	AT – Assets – Total
CEQ	CEQ – Common/Ordinary Equity – Total
CSHO	CSHO – Common Shares Outstanding
CSHR	CSHR – Common/Ordinary Shareholders
CSTK	CSTK – Common/Ordinary Stock (Capital)
DLC	DLC – Debt in Current Liabilities – Total
DLTT	DLTT – Long-Term Debt – Total
FINCF	FINCF – Financing Activities – Net Cash Flow
LCT	LCT – Current Liabilities – Total
LT	LT – Liabilities – Total
OANCF	OANCF – Operating Activities – Net Cash Flow
PPEGT	Property, Plant and Equipment – Total (Gross)
PSTK	PSTK – Preferred/Preference Stock (Capital) – Total
SEQ	SEQ – Stockholders' Equity – Total
RE	Retained Earnings
PRCCD	Closing Price Daily

Table A1.2. Industry Dummies Definitions

	Industry	**SIC**
1	Agriculture, Forestry & Fishing	1+2+7+8+9
2	Automotive	55+75
3	Chemical	28+29
4	Communication	48
5	Construction	15+16+17
6	Electronics	36+38
7	Electric, Gas & Sanitary Services	46+49
8	Entertainment	78+79+84
9	Banks	60
10	Insurance	64
11	Brokers, real estate & other	62+65+67
12	Food & beverage	20
13	Hotels	70
14	Manufacturing	22+23+24+25+30+31+32+35+37+39
15	Metal fabrication	33+34
16	Mining	10+12+13+14
17	Newspapers	27
18	Paper & pulp	26
19	Retail	52+53+54+56+57+58+59
20	Services	43+72+73+76+80+81+82+83+86+87+88+89
21	Tobacco	21
22	Transport	40+41+42+44+45+47
23	Wholesale	50+51
24	Other	91+92+93+94+95+96+97+99

Table A1.3. Definitions and Data Sources of Country-level Variables

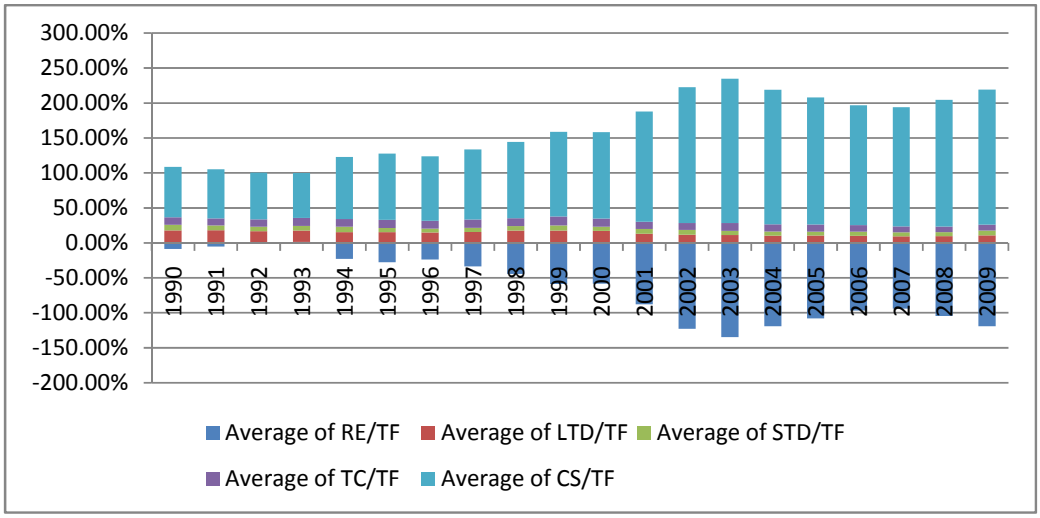
Variable	Description	Source
Common law	A 0 or 1 dummy variable indicating whether a country adopts the common law system.	Treisman (2000)
Corruption index	An index ranging from 0 to 10, with larger value indicating more severe corruption.	Corruption Perception Index, Transparency International
Creditor rights	An index aggregating creditor rights – restrictions for a debtor to file for reorganization; secured creditors are able to seize their collateral after the reorganization petition is approved; secured creditors are paid first out of the proceeds of liquidating a bankrupt firm; management does not retain administration of its property pending the resolution of the reorganization. The index ranges from 0 (weak creditor rights) to 4 (strong creditor rights).	Djankov, McLiesh, Shleifer (2007)
Shareholder rights	Aggregate index of shareholder rights. The index is formed by summing: (1) vote by mail; (2) shares not deposited; (3) cumulative voting; (4) oppressed minority; (5) pre-emptive rights; and (6) capital to call a meeting.	Djankov, La Porta, Lopez-de-Silanes, Shleifer (2008)
Contact enforcement	Estimated duration, in calendar days, between the moment of issuance of judgment and the moment the creditor obtains payment.	Djankov, La Porta, Lopez-de-Silanes, Shleifer (2003)
Tax evasion	Executives' assessment of how important tax evasion is in their country (the lower the measure the more rampant is tax evasion)	Djankov, Ganser, McLiesh, Ramalho, Shleifer (2009)
Business startup cost	The cost of obtaining legal status to operate a firm as a share of per capita GDP.	Djankov, La Porta, Lopez-de-Silanes, Shleifer (2003)
Deposits	A proxy for the degree of financial intermediation of a country, measured as the country's deposits (liquid liability) over GDP.	International Financial Statistics, International Monetary Fund
Deposit insurance	Dummy variable equal to 1 if bank deposits are insured by government.	Demirguc-Kunt, Karacaovali, Laeven (2005)
State control	An index measuring the proportion of a country's banks that are state controlled, where a bank is defined to be state	Caprio, Laeven, Levine (2005)

	controlled if the state's voting rights exceed 10 percent.	
Openness	An index that measures the extent of openness in capital account transactions. Higher values represent more open economies.	Chinn, Ito (2008)
Developed economy	A 0 or 1 dummy variable indicating whether the country is classified as developed according to the World Bank classification based on countries' gross national income levels.	World Development Indicators, World Bank
Bankruptcy code	A proxy for the existence of an explicit bankruptcy code, measured as a dummy variable equal to 1 if an insolvent firm is most likely to undergo a reorganization proceeding.	Djankov, Hart, McLiesh, Shleifer (2008)
Tax	Estimate of the Miller tax ratio equal to (1 – [(after all tax value of $dividends)/(after all tax value of $interest)]) calculated using statutory tax rates.	Price Waterhouse Coopers, Doing Business

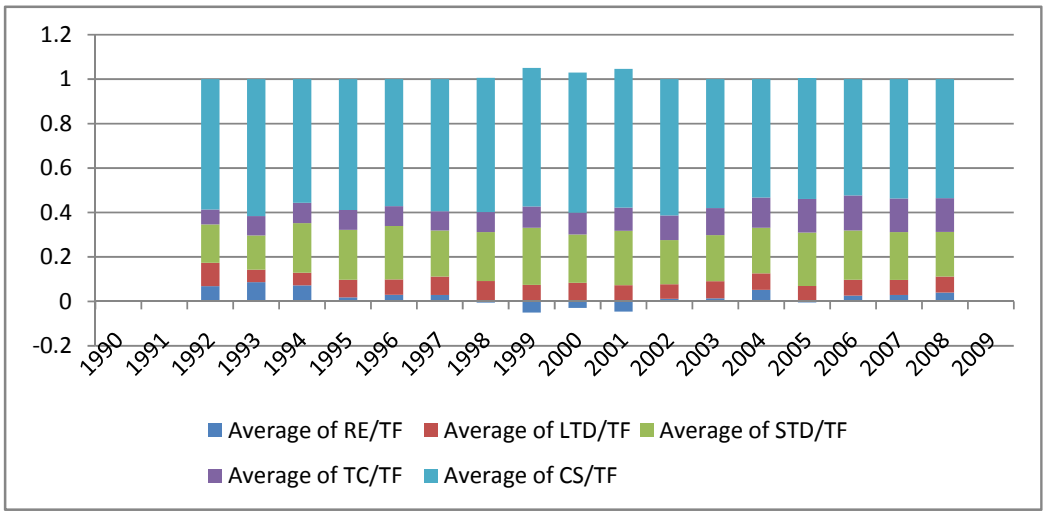
Appendix 2

Figures A2.1 – A2.13. Financial Structure: Individual Country Results

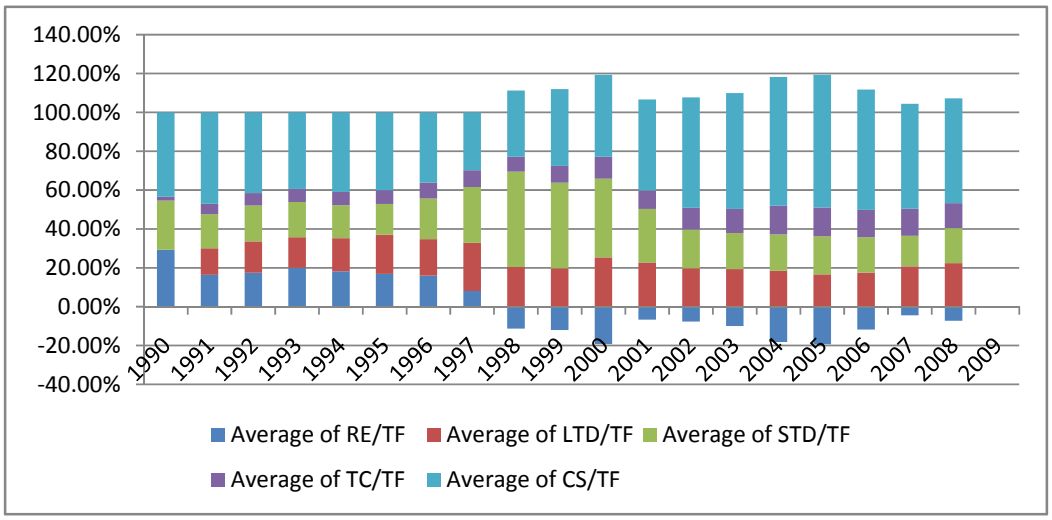
Australia



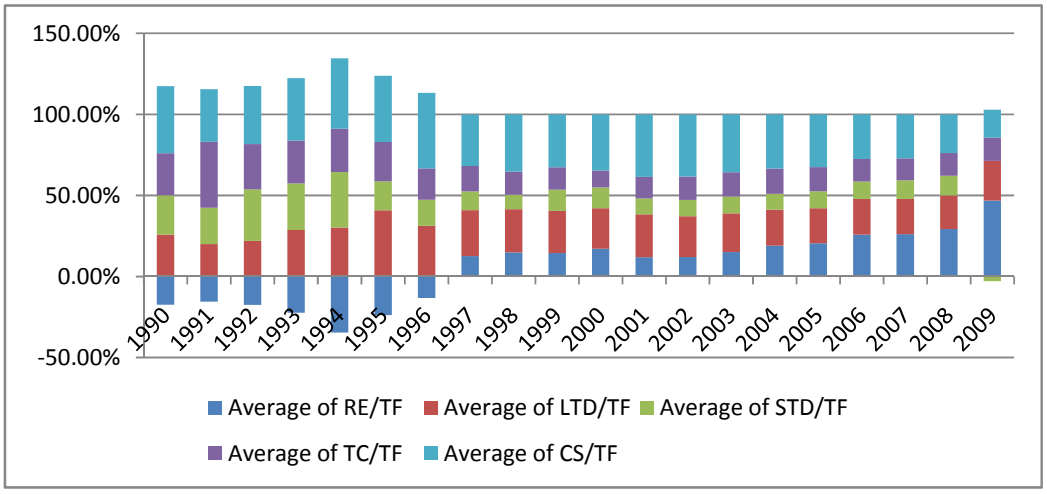
China



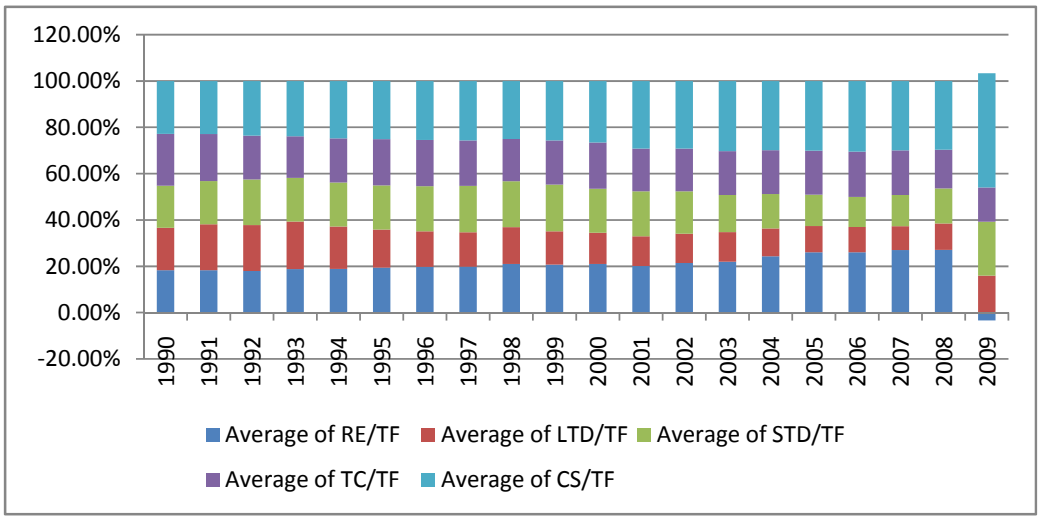
Indonesia



India



Japan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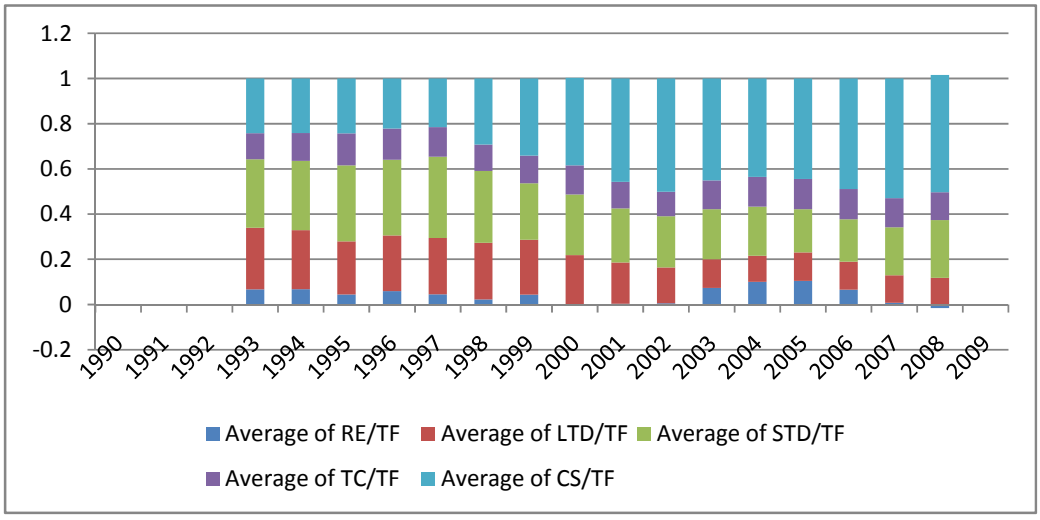
Average of RE/TF
Average of LTD/TF
Average of STD/TF
Average of TC/TF
Average of CS/TF

Korea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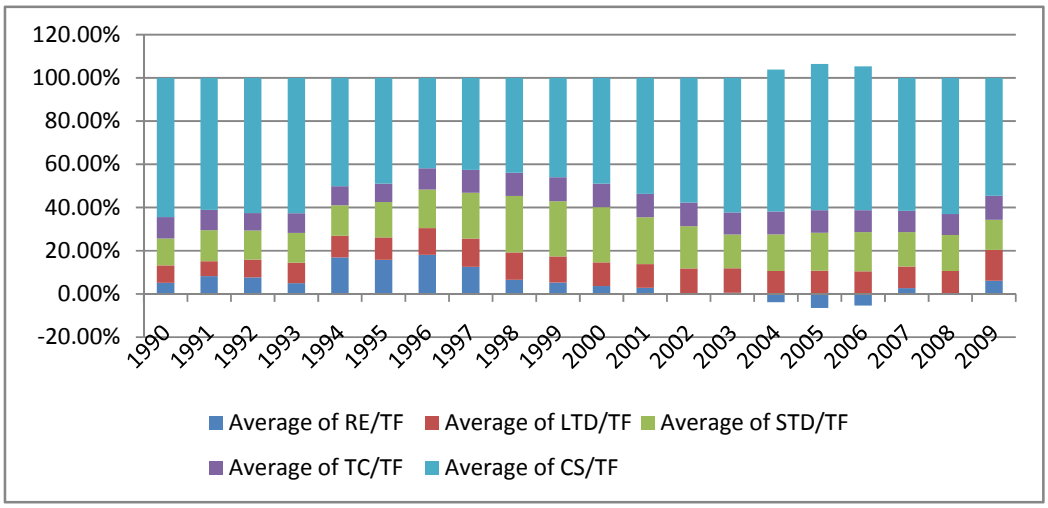
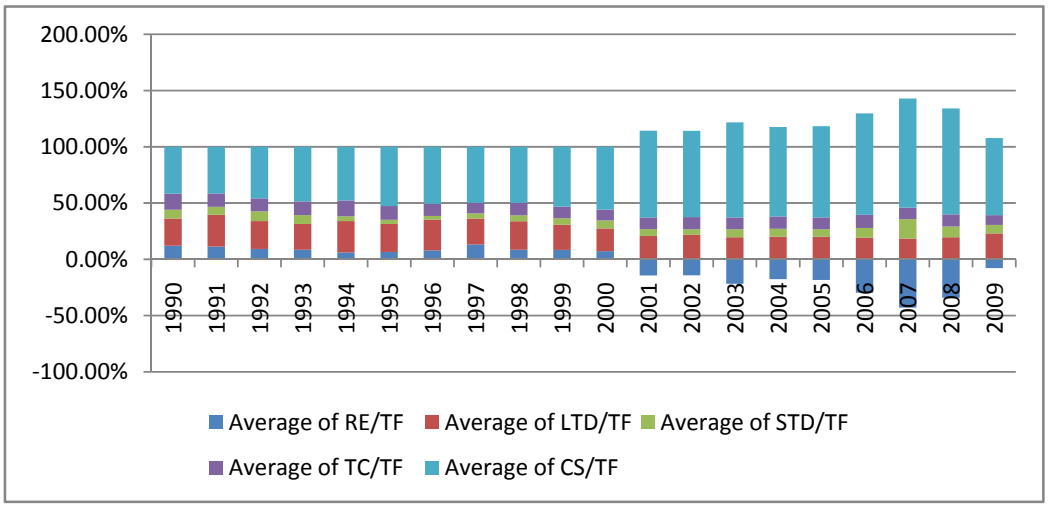
Average of RE/TF
Average of LTD/TF
Average of STD/TF
Average of TC/TF
Average of CS/TF

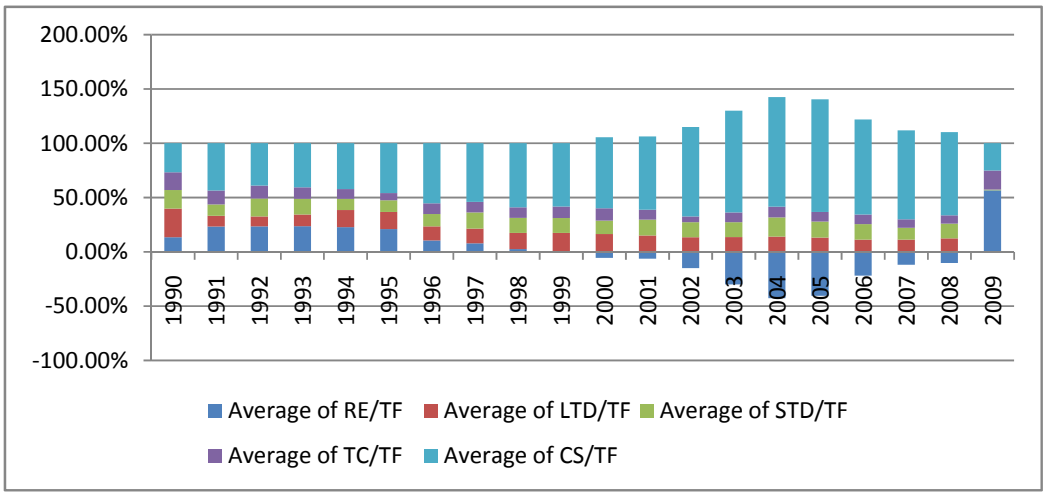
Malaysia



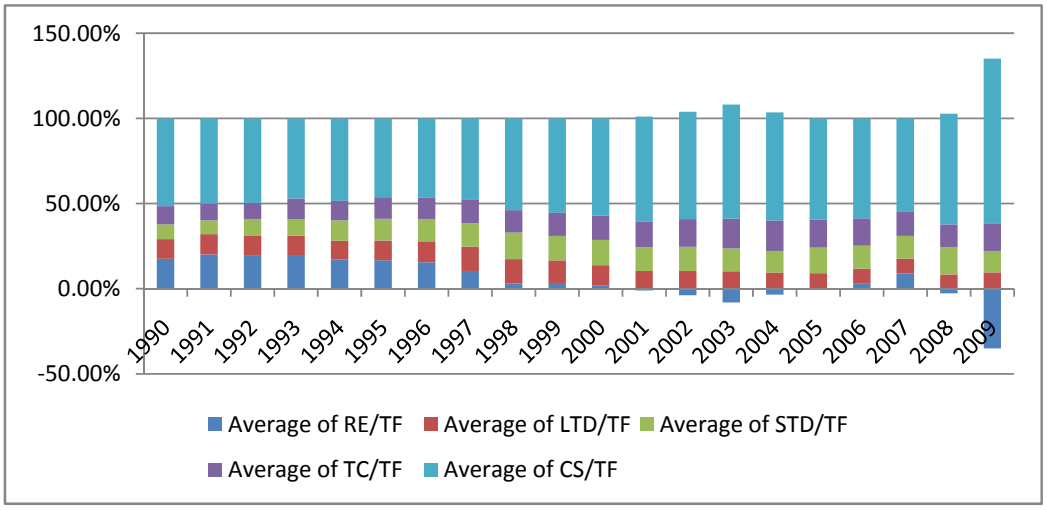
New Zealand



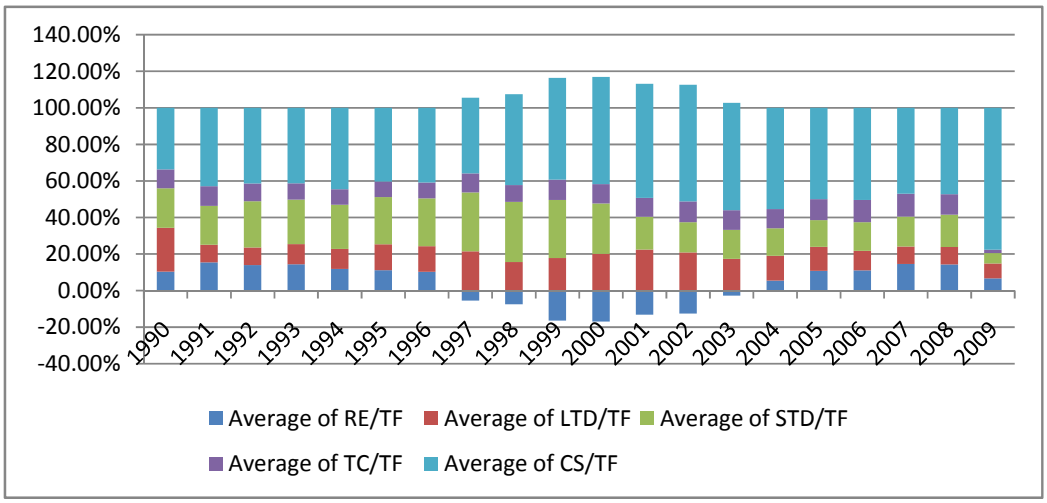
Philippines



Singapore



Thailand



Appendix 3

Table A3.1. R^2 for Separate Regressions

R-square	All Variables	Firm Only	Industry Only	Country Only
Td_ta	0.2454	0.1689	0.1067	0.0657
Td_tc_ta	0.2517	0.1481	0.1520	0.1038
Re_shf	0.0043	0.0034	0.0006	0.0006
Ltd_ta	0.3119	0.2058	0.1039	0.0533
Std_ta	0.1597	0.0511	0.0854	0.0935
Tc_ta	0.3371	0.2197	0.2311	0.0890

Chapter 7

The Banking System in East Asia and the Transmission of the Global Financial Crisis

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Abstract

This paper asks whether the impacts of the Global Financial Crisis on 10 East Asian economies were amplified through the banking system in the region. We examine balance sheets of 474 banks in East Asia for evidence on the bank lending channel of financial crisis transmission. We test whether the lending fell faster for banks with (1) a high reliance on money market funding and (2) a high exposure to the Lehman Brothers bankruptcy. We find a statistically significant correlation between loans growth in 2008 with the degree of dependency to the money market but not with the direct exposure to the Lehman Brothers. Interestingly, the importance of the lending channel of the transmission mechanism appears to vary across economies, possibly due to the differences in the nature of the relationship between banks and firms. Korean banks in our sample are relatively heavy on money market finance, and appear to be affected more by the Global Financial Crisis. In contrast, Japanese banks appear to have countered the shock by increasing lending, at least temporarily. Data limitations prevent

us from offering strong conclusions for other economies, but the impacts on ASEAN countries in our sample would have been small except for Singapore. Most banks around the region rely largely on deposits as the chief source of finance so that the effects through the bank lending channel would have been quantitatively modest on average.

***Keywords*:** financial crisis, bank lending channel, Asian banks

***JEL Classifications*:** G01, G21, G18

Introduction

The global financial crisis (GFC) of late 2008 both strained the financial sector and induced a dramatic drop in the export demand for East Asian products. This paper asks whether or not the GFC shock to East Asian economies was amplified through the financial sector in the region.

The global fall in the demand for industrial produce manufactured in East Asia, especially motor vehicles, is the main factor behind the declines in export from Asia. The conventional wisdom also suggests that the financial sector in East Asia withstood the GFC relatively well (Pomerleano, 2009). While the shock to the real sector is the main factor behind the decline in output, the well-established body of study linking financial shocks and loan supplies (e.g. Peek and Rosengren, 1997), leads one to suspect that the output decline in Asia after the Lehman Brothers shock of September 2009 might have been amplified by the transmission of financial sector shock into the real sector even with a relatively healthy financial sector.

In a complementary analysis, Siregar (2010) examines the role played by credits extended through international trade. This is another channel of the financial crisis transmission mechanism, considered by Amiti and Weinstein (2009) in the context of the Japanese financial crisis in the 1990s. We focus instead on the role of loans extended by domestic financial institutions, or the lending channel of financial sector transmission. Our aim is to see whether the lending channel of the GFC transmission amplified the GFC shock in East Asia. In particular, we pay attention to variations in the transmission mechanism across economies in the region. Understanding the regional diversity in the transmission channel of financial crisis is important in identifying the potential policy needs for the banking sector in East Asia.

That it is difficult to identify the lending channel is well known. For instance, as emphasized by Borensztein and Lee (2002) in the context of the Korean financial crisis, it is difficult to separate the decline in demands for loans and the constraint in supplies of available credits. In other words, a decline in bank loans is insufficient evidence for credit crunch, since such pattern is attributable to a decline in demand. To overcome this challenge, Borensztein and Lee (2002) consider an identification strategy developed

through the debate on the transmission mechanism of monetary policy. In theory, a monetary tightening could affect the real economy through either a reduced loan demand or a contraction in supply of loans. Thus, a shock transmitted through the bank lending channel is difficult to quantify in the context of a financial shock arising from a change in monetary policy stance or that arising from a financial crisis Given this similarity, the literature on the monetary transmission mechanism offers useful analytical tools.

We implement two complementary techniques proposed in the monetary transmission mechanism literature: the analysis of the ratio of commercial loans to bank lending, or the "mix" (Kashyap et al., 1993), and the two-step regression procedure (Kashyap and Stein, 2000). The first technique is a macro-level analysis and helps us visualize the overall impacts on the economy. Results from this analysis, however, admit alternative explanations. The second technique is based on bank-level information on lending activities. This micro-level analysis allows us to test whether banks that are expected to be vulnerable to GFC were affected more – thus providing more direct evidence on credit crunch.

The intuition behind the analysis of "mix" is the substitutability of sources of external finance: if the quantity demanded for loans remains constant at a given interest rate but the quantity of bank loans supplied at the respective interest rate fall, firms fill the shortfall by issuing commercial papers (Kashyap et al., 1993). An increased ratio of commercial papers to bank loans is interpreted as evidence consistent with the lending channel. We implemented this analysis on aggregate data for Japan, Korea and Taiwan, and found a pattern consistent with a temporary credit crunch for Korea and Taiwan during the first quarter of 2009. Japanese firms in aggregate issued less commercial papers and increased reliance on bank loans, suggesting that the lending channel was not in operation in Japan, at least until the second quarter of 2009.

In our adaptation of a procedure suggested by Kashyap and Stein (2000), we examined whether the bank lending fell more rapidly in 2007 and 2008 for banks with (1) a high reliance on money market funding and (2) a high exposure to the Lehman Brothers bankruptcy. The data used for this study are an unbalanced panel of 747 banks from China, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore,

Thailand and Taiwan at the annual frequency, and up to the financial year that spans the Lehman Brothers shock of September 2008. We find a statistically significant correlation between loan growths in 2008 with the degree of dependency to money market dependence. The direct exposure to the Lehman shock appears to be hedged away on average. The regression analysis on the whole suggests that on average the lending channel amplified the financial sector shock in the region to some degree. The experiences of countries appear heterogeneous: the lending channel was at work for Korea and Malaysia; Japan showed indications contrary to the lending channel.

Our result confirms the intuition that the business model of Asian banks, which rely on deposits as the main source of credits, shielded the bulk of the financial sector shocks from transmitting to the real economy through the lending channel. However, our empirical analysis provides evidence indicating that the GFC shock was amplified through the financial sectors for some countries in East Asia, particularly Korea, but less so in others.

Our examination of the GFC shock thus highlighted heterogeneity in the banking practices around the region, which has a bearing on the integration of the financial sector in East Asia. Korean banks in our sample are more dependent on short-term finance. Japanese banks appear to have countered the shock of the financial crisis by extending loans to firms, at least in the short run. For the integration of the financial sector in East Asia, regulators would need to be aware of differences in the banking sector within the region in developing a regulatory framework. One possibility is to develop a cooperative mechanism that pools risk by targeting vulnerable parts of the region.

This paper is organized as follows. Section 2 presents a macro-level analysis. Section 3 discusses the data and the sample selection procedure. Section 4 presents a micro-level analysis. Section 5 concludes.

2. Macro-level Evidence

2.1. Did Firms Substitute toward Commercial Papers?

This section follows Kashyap et al. (1993) in their analysis of the "mix" variable – the ratio of commercial papers to bank loans. Our aim in this macro-level analysis is to complement the micro-level analysis on individual banks, to be discussed below, by examining the net effects at the economy level. The intuition behind Kashyap et al. (1993) is the substitutability of sources of external finance: if the quantity demanded for loans remains constant at a given interest rate but the quantity of bank loans supplied at the respective interest rate fall, firms fill the shortfall by issuing commercial papers. An increased ratio of commercial papers to bank loans is interpreted as evidence consistent with the lending channel. Kashyap et al. (1993) find statistically significant increases in commercial paper issues relative to bank loans after the tightening of monetary policy. In the current application, an increase in this variable is taken as evidence consistent with the contraction of loan supplies relative to loan demands. Importantly, an increase in the mix variable is consistent with the lending channel, but admits an alternative explanation. As elaborated by Oliner and Rudebusch (1993) and Kashyap and Stein (1995), commercial papers are typically issued by large firms, so the mix can increase when small firms demand fewer credits while large firms maintain credit demand. We think that the analysis of mix provides a good starting point, but caution is needed in interpretation.

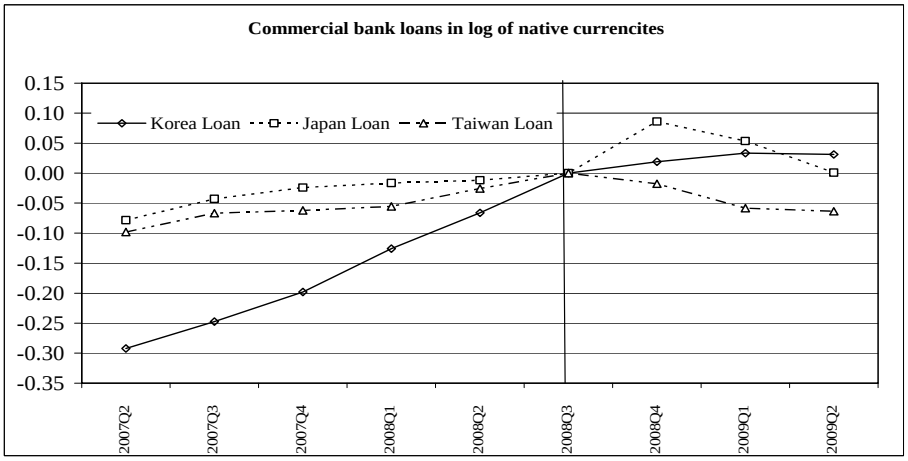
Our analysis focuses on Korea, Japan and Taiwan. Data availability determined this choice. For Korea and Japan, we obtained information on *loans outstanding from private financial institutions* and *commercial papers issued by private non-financial corporations* from the Flow of Funds data in Datastream. The Flow of Funds for other countries did not contain information on commercial papers. Data for Japan and Korea are quarterly and are available up to 2009Q2. Taiwanese data are based on monthly information on *commercial paper issued* and *loans and discounts at all banks*, also from Datastream. The Taiwan data were converted to quarterly data by taking the value from the latest month in respective quarters.

2.2. Results

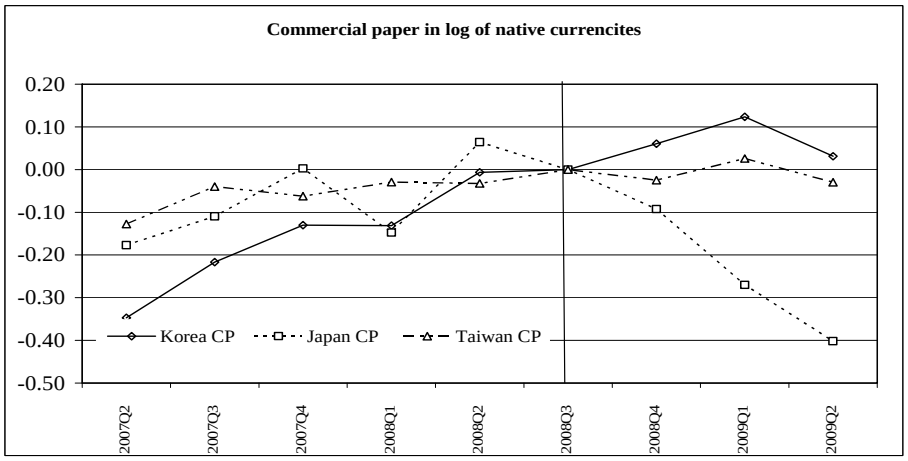
Figure 1 presents the log of bank loans, the log of commercial papers, and the mix for the three economies over 2007Q2–2009Q2. For convenience of visual comparison, the

Figure 1. Changes in Short-term External Finance around the Lehman Brothers Shock

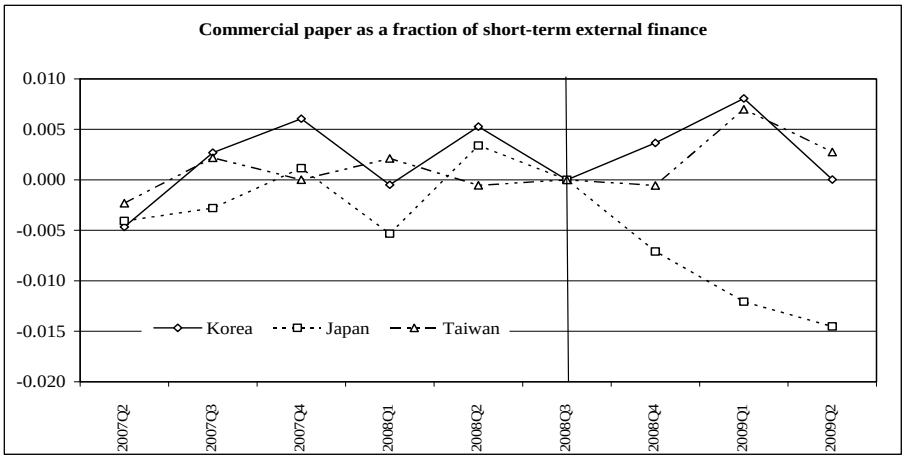
Panel A: Bank loans



Panel B: Commercial papers



Panel C: "Mix"



Source: Author

values in those figures are rescaled by subtracting the 2008Q3 value. For instance, 0.1 point in the top two panels indicates that the value is 10 percentage points higher than the base period. Korean and Taiwanese firms rely more on t commercial papers than Japanese firms; in 2008Q3 the values of commercial papers were 9.5 percent and 8.7 percent of total bank loans, respectively. The share of commercial papers for Japanese firms is 4.0 percent.

The top panel in Figure 1 presents the amount of bank loans in log. Bank loans in Korea increase over the period. The apparent kink at the 2008Q3 shows that the growth rate slows after the Lehman shock.[1] Surprisingly, Japanese bank loans increase sharply in 2008Q4, approximately 10 percentage points, and revert to the base level in 2009Q2. Taiwanese bank loans increase until 2008Q3, and decline thereafter. The middle panel presents the amount of commercial papers in log. The commercial papers increase for Korea, remain roughly the same for Taiwan, but decline sharply for Japan (approximately 40 percent reduction in outstanding commercial papers over 2008Q3 through 2009Q2).

The bottom panel shows the ratio of commercial papers to bank loans. The mix variable for Korea increases initially and reverts to the 2008Q3 level in 2009Q2. Likewise for Taiwan, the mix variable increases in 2009Q1 but reverts. These patterns for Korea and Taiwan suggest that firms temporarily resorted to commercial papers, possibly because of increased difficulty in obtaining bank loans. Notably, the mix variable in Japan falls by 1.5 percentage points over 2008Q3 through 2009Q2. According to the conventional wisdom of Japanese economists, a main bank – the largest lender to a company—extended loans to their main clients in response to the GFC; consequently those firms that did not have a close tie with a main bank were hit more severely. This is despite the decline in the role of main banks, which played a key monitoring role under the Figure 1.

[1] One may argue on the basis of the continuous increase in loans that Korea did not experience a "credit crunch." The question asked in this paper is whether or not the GFC led to a supply-driven contraction in credits. The slowdown in loan growth is consistent with banks reducing the supply of loans. Of course, the slowdown can be explained by the slowdown in loan demand. The point of looking at the mix is to gauge the demand condition by taking the commercial paper issues as a benchmark for the demand condition.

Source: Author "traditional" Japanese economic system, as documented in Hoshi et al. (2009). If anything, this result for Japan indicates the persistence of the main bank system.

In summary, our macro-level examination suggests a diverse experience among Korea, Japan and Taiwan: the bank lending channel might have been at work in Korea and Taiwan.

We turn next to a micro-level analysis of 10 Asian economies since the mix analysis admits alternative explanation and the low coverage of the economies is of interest.

3. Data for Micro-level Analysis

3.1. Individual Bank Data

We extracted the balance sheets and income statements of banks in 10 Asian regions from BankScope. Our data are based on the reporting format in BankScope that standardizes across countries so that variables should in general be comparable. We first selected 946 financial institutions for which unconsolidated financial statements for financial 2008 were available in December 2009. We dropped non-surviving banks because the main point of this exercise is to see the impact of the Lehman shock of September 2008. When we constructed the dataset, the year 2008 was the latest available. We next excluded securities companies since they reportedly extended customer loans but the amounts were usually small.

We then deleted observations that lack data consistency and sufficient information. (1) 16 institutions changed financial year during the sample period. Of those, two banks with three or fewer years of observations after the financial year change were dropped entirely. For 14 other banks, we dropped observations before the change in financial years. (2) Missing observations: we dropped observations that lack essential variables for the analysis (total customer loans, total deposits, and total liabilities). (3) Banks with no information on key variables in 2008 were dropped.

We also accounted for mergers and acquisitions (M&A). To prevent any structural changes from confounding the analysis we dropped observations prior to M&A. BankScope reports bank histories, including mergers, acquisitions or transfer of

divisions, and other significant changes. We tabulated from this bank history section the years of M&A, and if available, the months. To be conservative, for those without information on the month of merger, we assumed that M&A occurred in December. This led to more observations being dropped. Observations with financial years ending before recent M&A were dropped. We also dropped observations in which M&A dates fell within 365 days of the end of the financial year. Finally, we dropped observations with less than four years of data. This sample selection process left us with 747 banks, or about 80 percent of the original sample size.

3.2. Data on the Exposure to the Lehman Brothers Shock

The measure of exposure to Lehman Brothers and its subsidiaries is based on the list of individual Asian financial institutions summarized and reported by Reuters on 25 September 2008.[2] This report lists individual banks and the amount of exposure in millions of US dollars, assembling information from reports by major financial firms and the Lehman's Chapter 11 bankruptcy filing. Table 1 provides a summary by country. In the seven Asian economies included in this report, the total exposure is estimated to be US$6.1 billion. Not all information on individual banks is reported; the sum of individual-level information is US$3.6 billion, or 58.5 percent of the total. In particular, the Bank of Korea estimates its exposure to be US$1.34 billion—the second largest amount in the region following Japan. As the Reuters' report does not include individual information for Korean banks, we drop Korea from the analysis when examining the Lehman exposure. However, we assume that banks in Indonesia and Malaysia – two countries not included in the report – have insignificant exposure given the low exposures in other ASEAN countries. We matched this list with our BankScope sample on the basis of names. The reported exposure is sometimes at the holding company level. In light of the finding by Ashcraft (2006) that a holding company in the US shift capital among its group companies, we presumed those subsidiaries will be exposed indirectly at unspecified amount. Overall, the matching appears reasonable.

[2] http://uk.reuters.com/article/idUKMAN20091320080925 Accessed 5 January 2010.

Table 1. Exposure to the Lehman Brothers Bankruptcy: Asian Financial Institutions

	Reuters sample	Estimated total
Japan	1,721	2,200
Korea	n.a.	1,340
Taiwan	641	1,200
Hong Kong	398	
China	385	
Philippines	242	386
Thailand	101	124
Singapore	93	
Total	3,581	6,126
	(58.5%)	
Japan, Taiwan, Philippines, Thailand	2,705	3,910
	(69.1%)	

Note: Unit is in millions of US dollars. The estimated totals are based on respective agencies for countries: S&P for Japan; the Bank of Korea for Korea (includes the exposure to Merrill Lynch); the regulatory agency for Taiwan; the Philippines *Daily Inquirer*, on their bases of the hearing on the central bank, for the Philippines.

Source: Author's summary from Reuters.

4. Micro-level Evidence

4.1. Empirical Approach

This section considers an application of the identification strategy developed by Kashyap and Stein (2000) in the context of their analysis of the monetary transmission mechanisms, paying particular attention to necessary modifications.

Kashyap and Stein (2000) identify the credit channel of the monetary transmission mechanism by examining whether illiquid banks reduce loans when monetary policy tightens, all else being equal. To do so they take advantage of a large dataset that contains nearly a million bank-level observations from the quarterly call report of US banks. Their two-step regression procedure takes advantage of this large sample. In the first step, a difference in log of loan is regressed on four lags of itself, a measure of

liquidity, and geographical region dummies for each point in time. This cross-section regression estimates the correlation between liquidity and loan growth, accounting for region-specific time effects. If a credit channel existed, illiquid banks should exhibit low loan growth compared to their peers, holding all else constant. The second step takes the coefficient on liquidity from the first step as a dependent variable. In this time-series regression, the coefficient on liquidity is regressed on the measure of changes in monetary policy (and its lags), GDP growth rates (and its lags), and a linear time trend. If monetary policy affects illiquid banks, there should be a stronger relationship between liquidity and loan growth (i.e. a larger coefficient on liquidity) when the monetary policy is tight. Put differently, the liquidity should matter only when the monetary policy is tight, and the two-step procedure tests whether this is the case.

Instead of this two-step procedure, we apply its one-step variant considered by Kashyap and Stein (2000) for a sensitivity analysis. Both procedures are equivalent under certain assumptions on the functional form.. A loan growth regression includes an interaction of the liquidity measure and the monetary policy measure, in addition to other explanatory variables. Here, the coefficient on the interaction term is the key variable of interest. If the one-step model accurately captures the data generation process, in theory two procedures should produce the same coefficient estimates. If this is the case, the one-step procedure should provide a more powerful test by virtue of the stronger assumptions. The key advantage of the two-step procedure over the one-step procedure is the weaker degree of parameterization: The one-step procedure imposes a tighter functional form assumption on the data whereas the two-step procedure allows for more flexibility, or lets the data speak more freely. The two-step procedure, however, is data intensive: the second step is estimated using 20 years of quarterly data in Kashyap and Stein (2000). Given that our data contains at most 17 years of annual data, the one-step procedure seems more sensible for the dataset at hand. We take comfort in the fact that the one- and two-step procedures in Kashyap and Stein (2000) produce similar results. The variant of this one-step procedure is common in the literature (Gambacorta, 2005; Gambacorta and Mistrulli, 2004).

Furthermore, we modify the Kashyap–Stein one-step procedure by considering an alternative source of variation to identify a lending channel. In this, the balance sheet

strength is measured by the ratio of securities plus federal funds sold to total assets. In response to the shock to the monetary contraction, the bank with a strong balance sheet "should be better able to buffer their lending activity against shocks in the availability of external finance, by drawing on their stock of liquid asset" (Kashyap and Stein, 2000: 410–12). In the context of the GFC, we think that the dependence on the money market is the primary channel through which the bank balance sheet is affected. As often noted, the fund in interbank markets dried up, as shown by the shooting up of OIS-LIBOR spreads (e.g. Cecchetti, 2009). As a consequence, those banks that rely more on raising funds from the market for short-term debt securities would have faced difficulties raising the necessary funds to extend loans. Pomerleano (2009) observes that Asia continued to depend on deposits as the primary source of finance, with the exception of Korea. The importance of this channel thus may be limited given the business model of Asian banks in general, but this is an empirical question. In the following empirical analysis, we examine whether the money market dependence had any effects in 2008.

4.2. Summary Statistics

Table 2 shows the summary statistics by bank types; figures are in current US dollars. The cooperative banks, nearly all of which are from Japan, are the most highly represented. The second largest group is the commercial banks. Others total just 24 banks, or 3.2 percent of the total number of banks. The last three columns of the table report, respectively, the change in total loans over 2007–2008, the measure of money market dependence, and the fraction of banks that were exposed directly to the Lehman Brothers bankruptcy. Notably, investment banks reduced lending on average by 5.4 percentage points, and had a high money market dependence as well as a high exposure to the Lehman shock.

Table 2. Summary Statistics by Bank Types

Types	Number of Banks	All years (in USD millions) Total Loan	Total Deposit	Total Liabilities	2008 Loan growth	Money market dependence	Lehman Brothers Exposure (fraction)
Commercial Banks	301	15,684	20,086	24,093	0.204	0.062	0.060
		(37,962)	(52,809)	(66,464)	(0.318)	(0.115)	
		3,376	3,376	3,376	300	301	301
Cooperative Bank	422	2,510	4,271	5,312	0.291	0.007	0.002
		(11,540)	(23,482)	(32,636)	(0.147)	(0.030)	
		4,322	4,322	4,322	422	422	422
Investment Banks	11	8,923	5,045	14,704	-0.054	0.153	0.182
		(21,839)	(9,034)	(34,370)	(0.546)	(0.302)	
		95	95	95	11	11	11
Islamic Banks	5	1,428	2,671	2,767	0.345	0.001	0.000
		(782)	(1,552)	(1,612)	(0.769)	(0.001)	
		33	33	33	5	5	5
Savings Bank	8	2,271	13,286	24,028	0.102	0.001	0.125
		(3,521)	(32,564)	(44,966)	(0.102)	(0.002)	
		55	55	55	8	8	8
Total	747	8,225	11,111	13,590	0.249	0.031	0.029
		(27,171)	(39,573)	(50,893)	(0.252)	(0.090)	
		7881	7881	7881	746	747	747

Source: Author.

Table 3 presents the summary by economies, excluding cooperative banks. Japan is represented the most in this sample (111 banks). As noted elsewhere in studies that draw data from BankScope, this reflects the oversampling of banks from advanced economies. Banks in the sample are limited to larger banks for other economies.

Table 3. Summary Statistics by Economies

Regions	Number of Banks	All years (in USD millions) Total Loan	Total Deposit	Total Liabilities	2008 Loan growth	Money market dependence	Lehman Brothers Exposure (fraction)
CHINA	43	22,981	36,802	40,889	0.314	0.107	0.070
		(62,012)	(105,830)	(115,446)	(0.342)	(0.177)	
		364	364	364	43	43	43
HONG KONG	14	6,062	11,469	13,018	0.027	0.023	0.143
		(8,737)	(17,119)	(20,054)	(0.200)	(0.031)	
		56	56	56	14	14	14
INDONESIA	41	1,104	1,868	2,176	0.157	0.035	0.000
		(2,231)	(4,309)	(4,971)	(0.239)	(0.063)	
		416	416	416	41	41	41
JAPAN	111	21,255	26,122	31,991	0.295	0.047	0.045
		(43,006)	(53,870)	(75,006)	(0.066)	(0.079)	
		1611	1611	1611	111	111	111
KOREA	13	23,473	17,943	32,284	-0.169	0.271	NA
		(36,845)	(27,946)	(45,535)	(0.040)	(0.168)	
		152	152	152	13	13	13
MALAYSIA	30	2,816	4,159	4,596	0.022	0.035	0.000
		(6,040)	(8,026)	(8,957)	(0.481)	(0.097)	
		302	302	302	29	30	30
PHILIPPINES	18	1,051	1,829	2,075	0.247	0.008	0.167
		(1,347)	(2,407)	(2,713)	(0.828)	(0.012)	
		72	72	72	18	18	18
SINGAPORE	9	9,484	13,878	16,485	0.101	0.139	0.111
		(16,261)	(25,617)	(29,603)	(0.264)	(0.312)	
		38	38	38	9	9	9
TAIWAN	27	11,745	16,418	20,136	0.105	0.057	0.222
		(12,528)	(19,986)	(25,294)	(0.229)	(0.110)	
		337	337	337	27	27	27
THAILAND	19	8,304	9,642	10,588	0.186	0.061	0.053
		(8,719)	(9,863)	(10,619)	(0.425)	(0.128)	
		211	211	211	19	19	19
Total	325	15,164	19,418	23,643	0.195	0.062	0.065
		(37,221)	(51,699)	(65,258)	(0.337)	(0.125)	
		3559	3559	3559	324	325	325

Source: Author.

Table 4 lists banks with a positive Lehman exposure from our sample of banks and is ordered by the amount of exposure relative to total assets in 2008. The exposure on average is 0.49 percent of assets, indicating that the banks in general are diversified. Aozora Bank of Japan is exposed the most in terms of the absolute amount. The Reuters' report notes, however, that Aozora's net exposure could be less than US$25 million due to hedging and collateral. Inevitably, the true extent of exposure is difficult to assess, but this is the best available data we were able to obtain.

Table 4. The List of Banks Exposed to the Lehman Brothers Bankruptcy

ID	Bank Name	Country	Exposure (mil USD)	Ratio to Asset
853	RCBC Savings Bank Inc	PHILIPPINES	40	0.0407
77	Citibank (Hong Kong) Limited	HONG KONG	275	0.0211
858	Bank of Nova Scotia Asia Ltd (The)	SINGAPORE	93	0.0143
837	Bank of Commerce	PHILIPPINES	15	0.0074
168	Aozora Bank	JAPAN	463	0.0069
483	Mizuho Trust & Banking Co., Ltd	JAPAN	382	0.0055
848	Metropolitan Bank & Trust Company	PHILIPPINES	71	0.0054
875	Bank of Kaohsiung	TAIWAN	18	0.0031
889	EnTie Commercial Bank	TAIWAN	24	0.0027
924	Bangkok Bank Public Company Limited	THAILAND	101	0.0021
633	Shinsei Bank Limited	JAPAN	231	0.0020
893	Hua Nan Commercial Bank	TAIWAN	93	0.0017
70	Bank of East Asia Ltd	HONG KONG	54	0.0014
218	Chuo Mitsui Trust & Banking Co Ltd (The)	JAPAN	144	0.0009
879	Cathay United Bank Co Ltd	TAIWAN	33	0.0008
24	China Merchants Bank Co Ltd	CHINA	70	0.0003
628	Shinkin Central Bank	JAPAN	93	0.0003
45	Industrial Bank Co Ltd	CHINA	34	0.0002
913	Taiwan Business Bank	TAIWAN	7	0.0002
656	Sumitomo Mitsui Banking Corporation	JAPAN	177	0.0002
4	Bank of China Limited	CHINA	129	0.0001
898	Mega International Commercial Bank Co Ltd	TAIWAN	n.a.	n.a.
			121	0.0056

Source: Author.

4.3. Estimation Model

The goal of this section is to see if the banks that depend highly on money market funding reduced loans at the time of the GFC. We consider as our base-line specification the following adaptation of the one-step version of Kashyap and Stein (2000).

$$\Delta \ln L_{it} = \pi \Delta \ln L_{it-1} + g(M_{it};\Phi) + \sum_{t=2007}^{2008} \left[\rho_t D_t + g(M_{it};\Psi_t) D_t\right] + \sum_{j=2}^{10} \theta_j R_j + \sum_{t=1995}^{2006} \rho_t D_t + \sum_{k=1}^{5} \omega_k S_k + u_{it} \quad (1)$$

L_{it} is total loans of bank i at time t. Ideally, we would like to distinguish between commercial loans and residential loans but the breakdown is not reported in BankScope's Global Standardized Presentation. Changes in loans are regressed on past changes, as in Kashyap and Stein (2000). We include one lag, rather than four lags as in previous applications with quarterly data, since our data is annual. M_{it} is the measure of money market dependence, defined as the ratio of total deposits to money market funding. Money market funding is defined as *total liabilities* less *other liabilities* less *total loan loss reserve* less *total other funding*. Under BankScope's Global Standardized Presentation of the balance sheet, the latter term is identical to the *total money market funding*. We did not use *total money market funding* directly since we could not distinguish between missing observations and 0.

The distribution of M_{it} is heavily skewed toward 0, reflecting that most Asian banks rely on deposits for their main source of funding. To capture any non-linear relationship between a loan growth and a money market dependence, the model includes $g(.)$, a non-linear function of M_{it}. Φ is a vector of parameters of $g(.)$. We tried several specifications:

$$g(.) = \begin{cases} \beta_1 M_{it} \\ \alpha_1 K_{F(M_{it}|t)\geq 0.75} \\ \beta_1 M'_{it} + \beta_2 M'^2_{it} \\ \alpha_1 K_{F(M_{it}|t)\geq 0.75} + \alpha_2 K_{0.75>F(M_{it}|t)\, and\, M_{it}>0} \end{cases} \quad (2)$$

The first specification is a simple linear function of M_{it}. The second is a dummy specification. $F(.)$ represents a cumulative distribution function of M_{it}, conditional on year t. K is a dummy for M_{it} being in the top 25 percentile of the distribution of M_{it} at a given point in time, t. The set of banks that belongs to K=1 can change across years. As many of the banks in the bottom 75th percentile are close to zero, the latter term allows us to capture the average loan growth for banks at the higher end of the distribution. The third is a quadratic specification. Since M_{it} is less than one, we defined $M'_{it}=M_{it}+1$. The fourth is a 'step function,' augmenting the second specification by adding a dummy for non-zero M_{it} being in the bottom 75th percentile of the distribution.[3] The key difference between the second and fourth specifications is that the base sample is taken to be banks with zero money market dependence in the fourth specification, whereas the base is banks in the bottom 75th percentile in the second specification.

D_{2008} is a dummy variable for year 2008. Banks around the region adopt different timing of the financial years: many end on 31 December, while all Japanese banks and some Malaysian and Philippines banks end on 31 March. In the latest financial year available, most banks have one quarter after September 2008 while those in Japan, Malaysia and the Philippines have two quarters. With our annual data, the difference in fiscal year poses some inconvenience in interpretation. We define "year" to be a calendar year in which a financial year began.

$g(.)D_{2007}$ and $g(.)D_{2008}$ are the interaction terms of main interest. If the GFC affected money market dependent banks more, we would expect to observe a slower loan growth, or a contraction, for banks with higher money market dependence. A vector of parameters, Ψ, is designed to capture this effect. The Lehman shock occurred in September 2008, so any of those impacts are captured on the coefficient on $g(.)D_{2008}$. We have included the interaction term with year 2007 since the sub-prime mortgage crisis in the US began in 2007.

Our empirical model allows for heterogeneity in average growth rates by country and by bank types. R_j is the economic region dummies for 10 economies: 1. China, 2. Hong Kong, 3. Indonesia, 4. Japan, 5. Korea, 6. Malaysia, 7. The Philippines, 8. Singapore, 9.

[3] In addition, we implemented a spline function that included the top 25th percentile dummy and M_{it} but the result was hard to interpret due to collinearity.

Thailand and 10. Taiwan. China is the omitted category. D_t is year dummies. S_k is a dummy for bank types: 1. Commercial Banks, 2. Corporative Banks, 3. Investment Banks, 4. Islamic Banks, 5. Saving Banks. Commercial Banks is the omitted category. u_{it} is a heteroskedastic and idiosyncratic error term assumed to be serially uncorrelated.

OLS estimates produce unbiased estimates under the assumption that u_{it} is a white noise. To be consistent with Kashyap and Stein (2000), who report OLS estimates, we take OLS estimates as our baseline. One way in which OLS estimates become biased is if the true data generation process is such that u_{it} has a time-invariant component (i.e. $u_{it} = \mu_i + \nu_{it}$). Such a component may represent a bank-specific trend in loan growth over the sample period. In the presence of a fixed effect, the lagged dependent variable is mechanically correlated with u_{it}, leading to inconsistent estimates for short time series, as is well known in the dynamic panel regression literature (Baltagi, 2001). The time series dimension of data used by Kashyap and Stein (2000) is about 80 periods, so this dynamic panel bias is not of concern in their application. The time dimension in our unbalanced panel ranges from four to 16 periods. A simulation by Judson and Owen (1999) shows a substantial bias with 30 periods, so one may be concerned about the potential bias arising from the presence of some fixed components. To check robustness of the baseline OLS estimates, we implement the Difference GMM (Arellano and Bond, 1991) and the System GMM (Blundell and Bond, 1998). These estimation techniques are a widely applied solution to address the dynamic panel bias. In a setting close to ours, Gambacorta (2005) builds on Kashyap and Stein (2000) but estimates the Difference GMM.

4.4. Results: Combined Sample

Table 5 presents the estimation results. The lag of the dependent variable is highly significant across all specifications. The first column shows estimates for the linear specification (the raw value of money market dependence interacted with the dummy for year 2008 and 2007). The coefficient on the interaction term with 2008 has a negative coefficient, significant at the 1 percent level. The magnitude implies that, compared to banks with no money market funding, loans from a bank at the top 95 percent of M_{it} (=0.13 in 2008) grew 6 percentage points slower. A rough approximation

of the average impacts is that at most 3 percent of lending was reduced through the lending channel of the GFC transmission.[4] The coefficient on the interaction term with 2007 is low and not statistically significant. The second column shows the dummy variable specification. As with the linear specification, the estimate indicates a strong association between the high money market dependence and low loan growth in 2008 but not in 2007. The coefficient is negative and is significant at the 1 percent level. The magnitude of the coefficient on the interaction term with year 2008 indicates that the loans from the banks in the top 25th percentile of money market dependence grew on average 10.8 percentage points less than did the other category. The results from the third and fourth columns are qualitatively similar. The interaction term with the quadratic term for 2008 has a significantly positive coefficient (1.66), but the magnitude is much lower than that on the linear term (–4.68). These two terms are negative for all relevant ranges of $M'_{it} \in [1,2]$. The fourth column shows the "step function" specification. The interaction terms with dummies for medium dependence are not significant, and the results are similar to the simple dummy specification. Overall, the baseline analysis shows a negative association between loan growth and the degree of money market dependence in 2008.

To gauge the differences in the GFC impacts through the lending channel across the East Asian economies, Figure 2 presents the estimated impact of the GFC through money market funding. Specifically, the height in this bar chart represents negative impacts and is computed as the product of the coefficient estimate from column 1 in Table 5 (–0.463) and the average money market dependence in 2008 reported in Table 3. Higher values indicate greater impacts of the GFC through the lending channel. The estimate implies that Korea was affected the most, followed by Singapore and China, while the Philippines, Hong Kong and Indonesia were little affected. Pomerleano (2009) observes that Korea is unique in having a guaranteed loan for small- and medium-sized enterprises by the middle of 2009, and this relatively aggressive policy stance in Korea seems to support the result. Taking the estimates at face value, the importance of the lending channel appears to be heterogeneous across economies.

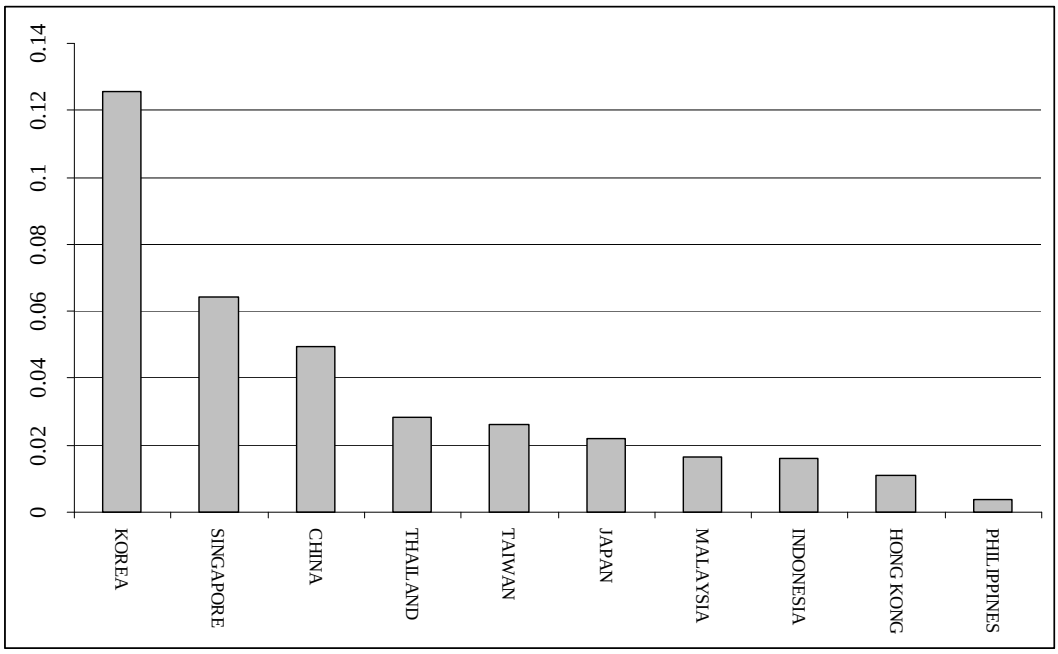
[4] This is based on the product of the coefficient (–0.463) and the average dependence in 2008 (0.065).

Table 5. OLS Estimates: All Sample

	(1) Raw	(2) Dummy	(3) Quadratic	(4) Step	(5) Exposure1	(6) Exposure2	(7) Exposure3
lagged dependent var.	0.186**	0.186**	0.185**	0.185**	0.185**	0.185**	0.186**
	(0.039)	(0.039)	(0.039)	(0.039)	(0.040)	(0.040)	(0.040)
MMDEP	0.117*		0.104+			0.087	
	(0.059)		(0.059)			(0.080)	
MMDEP × YEAR 2007	-0.005		-0.170			0.134	
	(0.094)		(0.815)			(0.138)	
MMDEP × YEAR 2008	-0.463**		-4.675**			-0.209	
	(0.163)		(1.008)			(0.173)	
HIGHDEP		0.017**		0.022**			0.014*
		(0.006)		(0.008)			(0.006)
HIGHDEP × YEAR 2007		0.001		-0.000			0.010
		(0.016)		(0.018)			(0.018)
HIGHDEP × YEAR 2008		-0.108**		-0.107**			-0.082**
		(0.025)		(0.027)			(0.026)
MIDDEP				0.008			
				(0.006)			
MIDDEP × YEAR 2007				-0.003			
				(0.012)			
MIDDEP × YEAR 2008				0.000			
				(0.017)			
MMDEP_SEQ × YEAR 2007			0.068				
			(0.307)				
MMDEP_SEQ × YEAR 2008			1.659**				
			(0.398)				
POSITIVE EXPOSURE					-0.017	-0.021	-0.023
					(0.017)	(0.018)	(0.017)
POS EXPO × YEAR 2007					0.001	-0.016	-0.005
					(0.034)	(0.036)	(0.037)
POS EXPO × YEAR 2008					-0.054+	-0.035	-0.017
					(0.030)	(0.035)	(0.037)
Hong Kong	-0.247**	-0.244**	-0.247**	-0.244**	-0.251**	-0.245**	-0.247**
	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)
Indonesia	-0.082**	-0.082**	-0.083**	-0.081**	-0.091**	-0.083**	-0.085**
	(0.026)	(0.027)	(0.026)	(0.027)	(0.027)	(0.027)	(0.027)
Japan	-0.164**	-0.167**	-0.165**	-0.168**	-0.170**	-0.164**	-0.168**
	(0.020)	(0.021)	(0.020)	(0.021)	(0.022)	(0.021)	(0.022)
Korea	-0.140**	-0.124**	-0.132**	-0.124**			
	(0.031)	(0.026)	(0.030)	(0.026)			
Malaysia	-0.182**	-0.182**	-0.183**	-0.179**	-0.192**	-0.184**	-0.186**
	(0.032)	(0.034)	(0.032)	(0.034)	(0.034)	(0.033)	(0.034)
Philippines	-0.113*	-0.114+	-0.118*	-0.114+	-0.116*	-0.108+	-0.115+
	(0.058)	(0.059)	(0.058)	(0.059)	(0.058)	(0.058)	(0.059)
Singapore	-0.028	-0.030	-0.058	-0.029	-0.048	-0.044	-0.038
	(0.087)	(0.083)	(0.086)	(0.083)	(0.086)	(0.087)	(0.084)
Thailand	-0.093**	-0.095**	-0.094**	-0.093**	-0.101**	-0.093**	-0.096**
	(0.030)	(0.031)	(0.030)	(0.031)	(0.031)	(0.030)	(0.031)
Taiwan	-0.135**	-0.136**	-0.136**	-0.136**	-0.134**	-0.131**	-0.133**
	(0.022)	(0.022)	(0.021)	(0.022)	(0.022)	(0.021)	(0.022)
Cooperative Bank	-0.013**	-0.013**	-0.016**	-0.010+	-0.014**	-0.012**	-0.013**
	(0.004)	(0.005)	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)
Investment Banks	-0.104+	-0.104+	-0.111+	-0.103+	-0.097	-0.102	-0.098
	(0.062)	(0.060)	(0.062)	(0.061)	(0.063)	(0.064)	(0.062)
Islamic Banks	0.058	0.056	0.054	0.057	0.061	0.060	0.057
	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)
Savings Bank	-0.018	-0.011	-0.020	-0.010	-0.010	-0.015	-0.011
	(0.033)	(0.032)	(0.033)	(0.032)	(0.032)	(0.033)	(0.032)
Constant	0.237**	0.238**	0.134*	0.234**	0.251**	0.247**	0.250**
	(0.025)	(0.025)	(0.062)	(0.027)	(0.028)	(0.027)	(0.028)
Year dummies	YES	YES	YES	YES	YES	YES	YES
Observations	6341	6341	6341	6341	6218	6218	6218
R-squared	0.35	0.35	0.36	0.35	0.36	0.36	0.36

Note: Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Year dummies are included but are not shown

Figure 2. Heterogeneity in the Impacts through the Lending Channel



Source: Author.

4.4. Results: Country-by-Country Analysis

Thus far, the key coefficient estimates are based on the average of 10 economies. This approach allows us to utilize the variation in the money market dependence created by banks operating in different business environments. We have repeated the analysis for the subsample of banks from each economy. The advantages of focusing on an economy-by-economy analysis are twofold. First, the sample of banks is relatively homogenous within each economy. Unlike in the previous exercise, we will be asking whether or not a bank with more money market dependence reduced lending relative to its peers within an economy. Second, time-economy specific shocks are better accounted for by including time dummies.[5] To the extent that banks within one

[5] We have tried to account for economy-specific time effects by including the interaction term between country and time in the baseline regression in the previous section. With this control, the negative relationship between money market dependence and loan growth is no longer statistically significant. One interpretation of this result is that the observed association was caused by unobserved country–time specificity. Caution is required in interpretation, given the symptom of multicollinearity – a large number of variables have variance–inflation factors of more than 10. Further, to the extent that the exogenous cross-country differences in business practices led to the cross-country variations in money market dependence, the country–time effects absorb the genuine relationship between the two. The difficulty

economy share similar characteristics and are subject to similar shocks, this approach allows for a cleaner identification of the lending channel by keeping the sample relatively homogeneous. However, an economy-based regression entails basing it on a within-economy variation in money market dependence in identifying lending channels. The power of the test is likely to be low given the smaller variation in money market dependence within a single economy. Moreover, due to the partitioning, subsamples are quite small for some economies, particularly for Hong Kong, the Philippines and Singapore. Results for those economies are prone to influential observations. Thus, estimation results in this exercise should be viewed with caution, especially for those economies with small sample sizes.

We estimated a parsimonious version of Equation (1) given the small sample size. Specifically, instead of year dummies for all years, we lump all years except 2008 into one base. As in Table 1, we estimate specifications with an intercept change in 2008 and a slope change in 2008. In addition, K is redefined as a dummy for M_{it} being in the top 34^{th} percentile of the distribution of M_{it} at a given point in time t for a given country. Other specifications could not be implemented for some economies owing to small sample size so they are not shown. Finally, we split the Japanese sample into cooperative banks and all other banks since the sample size is relatively large.

Table 6 presents the summary of the main coefficients. Estimates are generally imprecise, as expected from smaller sample sizes and from a lower within-country variation in money market dependence. Notable exceptions are Hong Kong and Singapore and the Japanese banks that have positive and significant coefficients. For those countries, on average, banks with higher money market dependence increased loans faster than other less-dependent banks in the respective countries. This is contrary to the prediction that the money market constrained bank lending for those countries at the early stage of the GFC. This result suggests that banks in relatively advanced financial sectors did not experience any constraint on the lending channel. The result for Hong Kong and Singapore, however, should be viewed with caution given the small sample size.

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distinguishing between alternative explanations precludes us from drawing a strong conclusion but it seems fair to suggest that the overall pattern indicates the transmission mechanism at work.

Malaysia and the Philippines have negative coefficients on all specifications that are sometimes significant at the 10 percent level. While the Philippines subsample is too small to draw reliable inference, the results show that Malaysian banks with higher money market dependence grew more slowly than their peers within their economy. While the overall importance of the lending channel was low in Malaysia, shown by the earlier analysis, this result suggests that the GFC constrained credit to some extent in Malaysia. Interestingly, as noted above many Malaysian and Philippines' banks have their financial year ending in March. It is possible that the longer coverage of the post-September 2008 operation in the sample might have made it easier to identify effects for those economies. The estimates for Korea, which has the highest average dependency ratio within our sample, are not significant, but this is likely to be due to the low within-economy variation and to the small sample size (13 banks).

Table 6. OLS Estimates: Country-by-Country

	CHINA	HONGKONG	INDONESIA	JPNCOOP	JPNBANKS	KOREA	MALAYSIA	PHILIPPINES	SINGAPORE	THAILAND	TAIWAN
INTERCEPT	0.003	0.370*	-0.026	-0.006	0.020*	-0.064	-0.347	-0.284+	0.278+	0.096	0.036
	(0.008)	(0.136)	(0.099)	(0.009)	(0.010)	(0.048)	(0.301)	(0.149)	(0.152)	(0.105)	(0.055)
R-squared	0.05	0.31	0.15	0.34	0.39	0.21	0.11	0.42	0.66	0.15	0.20
SLOPE	0.154	5.808*	-1.515	0.129	0.215+	0.004	-6.538+	-4.672	0.516**	-0.253	-0.173
	(0.384)	(2.310)	(1.727)	(0.140)	(0.111)	(0.116)	(3.851)	(8.637)	(0.106)	(0.370)	(0.208)
R-squared	0.08	0.30	0.15	0.34	0.39	0.21	0.11	0.47	0.65	0.15	0.20
Observations	280	28	316	3456	1366	123	243	36	20	169	281

Note: Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%.

Source: Author.

4.5. Did Lehman-exposed Banks Reduce Lending More?

As a preliminary examination to see whether direct exposure to the Lehman Brothers' bankruptcy shock affected lending, Table 7 compares the means of loan growth over 2007–2008 for those banks with any exposure to the Lehman shock and those without. The sample excludes Korea since we do not have bank-level information on exposure for Korean banks. On average, the total amount of loans in US dollars increased by 25.8 and 19.3 percent, respectively, for those with and without exposure. The difference in mean is significant at the 10 percent level. Thus, a simple comparison suggests the negative impact of direct exposure to the Lehman shock.

Table 7. Loan Growth (2007–2008) by the Lehman Exposure

	Positive Exposure	No Exposure	Difference
Loan Growth	0.190	0.259	0.069
	(0.156)	(0.250)	[0.058]
No. of Obs.	22	711	

Note: Standard deviations in parentheses. P-value for a two-tailed *t*-test with unequal variance in bracket. The sample is from 2008 and excludes Korea.

Source: Author.

We have tried incorporating a dummy variable for positive exposure in the baseline model. Columns 5 through 7 in Table 5 present the results. Column 5 shows the result from a model that does not include the money market dependence variable. The coefficient on the interaction term between the exposure dummy and the 2008 dummy is –0.054 and is significant at the 10 percent level. The coefficient on the interaction term with the 2007 dummy is 0.001 and is not significant. The correlation is no longer significant when the raw value of money market dependence or its binary transformation is included (Columns 6, 7). This is not surprising given the high correlation between positive exposure and money market dependence. Conditional on money market dependence being in the top 25th percentile of the sample, 7.5 percent had positive Lehman exposure whereas those below the top 25th percentile had only 1.25 percent positive exposure. However, we did not find any strong indication of a collinearity problem, suggesting that direct exposure to the Lehman shock alone is not important in explaining the lending behavior of banks. One possible explanation is that there was a measurement error in the Lehman exposure that attenuated the estimated effects. However, the results suggest that banks were sufficiently hedged against the Lehman shock.

4.6. Robustness Check

As the analysis so far has presumed no individual-specific trends in loan growth, OLS was a sensible estimation method given the assumption. To check the sensitivity of the estimates to this assumption, we have implemented the Difference GMM (Arellano and Bond, 1991) and the System GMM (Blundell and Bond, 1998). Table 8 presents the

results for the baseline specification. The first two columns show the results from the Difference GMM estimates, the last two columns show the results from the System GMM estimates. The specification tests indicate no second-order autocorrelation in the error term.

Table 8. Robustness Check: Difference and System GMM

	(1) Difference	(2) Difference	(3) System	(4) System
L. First Difference of LN(Loan)	0.194**	0.188**	0.219**	0.214**
	(0.045)	(0.044)	(0.043)	(0.012)
MMDEP	-0.142		-0.002	
	(0.225)		(0.231)	
MMDEP × YEAR 2007	-0.279		-0.284	
	(0.172)		(0.193)	
MMDEP × YEAR 2008	-0.866**		-0.896**	
	(0.208)		(0.227)	
HIGHDEP		0.014		0.025*
		(0.014)		(0.011)
HIGHDEP × YEAR 2007		-0.039+		-0.035+
		(0.022)		(0.018)
HIGHDEP × YEAR 2008		-0.174**		-0.175**
		(0.032)		(0.020)
Constant	0.148**	0.142**	0.151**	0.146
	(0.036)	(0.036)	(0.031)	(0.127)
Observations	5587	5587	6341	6341
Number of id	745	745	745	745
m_2	0.196	0.170	0.235	0.212

Note: Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Time dummies, country dummies, and bank type dummies are included but are not shown.

Source: Author.

The estimates from both estimation methods are qualitatively similar to those from the OLS baseline. In particular, the interaction terms with the 2008 dummy are negative and significant, indicating that the result is not sensitive to the assumption of no individual specific trend. There are some differences from the benchmark. Interestingly, the interaction terms with the 2007 dummy are significant for the dummy variable specification. The interaction of the raw value with the 2007 dummy is still not significant, indicating the sensitivity of the estimate to the model specification. Given

this sensitivity, it remains difficult to conclude the effect of the financial crisis transmitted to East Asia through the lending channel in 2007.

5. Conclusion

This paper applied two techniques developed in discussions of monetary transmission mechanisms to study the impacts of the GFC on the supply of bank loans in East Asia. Following Kashyap et al. (1993), we first examined aggregate data on the ratio of commercial papers to bank loans for Korea, Japan and Taiwan. We then applied the two-step regression procedure considered by Kashyap and Stein (2000), with suitable modifications to fit the available data, on 10 East Asian economies. The results from these two complementary techniques suggested that Korea would have experienced a temporary credit crunch as a result of the GFC. In contrast, Japanese banks appeared to have countered the GFC shock by increasing lending, suggesting that the main bank system is still alive. Data limitations prevent us from offering strong conclusions for other economies, but the impacts on ASEAN countries in our sample would have been small except for Singapore. Malaysia exhibited some indication of a credit crunch but its extent is estimated to be much smaller than in Korea. Taiwan also exhibited symptoms of a credit crunch in our analysis of macro variables, but this result was not corroborated in the analysis of bank-level data. Banks from mainland China were predicted to be affected, but their actual performance, in terms of the amount of loans extended, was robust, suggesting some other factor was in operation in China. A rough estimate is that at most 3 percent of lending was reduced through the lending channel of the GFC transmission, but the substitution of other sources of funding would have reduced the impacts of reduced bank lending. Overall, our exercise indicated that the GFC was transmitted through the lending channel to East Asian economies, but the effects were heterogeneous within the region.

These results have bearings on the financial integration in the region. Our finding suggests that a financial shock that originated in the US had heterogeneous impacts on East Asian economies. Closer integration of the financial sector of a region could mean that a shock to one country is likely to transmit across national borders. The shock, for instance, could be transmitted through the presence of foreign banks (Peek and

Rosengren, 1997) or could come about from a convergence in the models of bank and corporate financing. Since closer financial integration of East Asia could increase the risk of exposure to external shocks as a result of easier transmission within the region, it seems worthwhile to develop a framework for containing contagion from a weak link in the system. Such a framework could take the form of cross-border supports by injecting liquidity into economies that are hardest hit by an external shock. While regulators must watch for moral hazard, a risk-sharing framework seems a desirable accessory to closer financial integration. This would be a counterpart to the proposals for greater risk sharing in consumption that emerges from the paper by Corbett and Maulana in this volume.

Future Research

Finally, we view this paper as an early attempt to understand the transmission of the current financial crisis to East Asia and further work is necessary before making stronger conclusions.

- First, to better understand the impacts beyond the short-term impacts, the sample needs to be extended to cover a greater post-crisis period.
- Second, the data may be extended to make more precise inference: quarterly data would enable researchers to pinpoint the timing of changes; impacts on businesses are better analyzed with information on narrower categories of loans; and to limit any issues arising from the sample selection, more coverage of smaller lending institutions beyond that covered by BankScope is necessary. Comprehensive regulatory data on banks around the region would be a significant contribution to research.
- Third, we were not able to conduct an analysis of mix variables for ASEAN due to data limitations and it would be of interest to see the behavior of this variable.
- Fourth, our sample is restricted to banks that are operating in 2008, and does not include banks that were closed or absorbed. This restriction prevented us from comparing the impacts of current the GFC with the Asian financial crisis of 1998, but such a comparison would be of great interests.

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Chapter 8

Trade Financing and Export Performance: Experiences of Indonesia, Korea and Thailand[a]

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Abstract

The objective of this study is to examine the role of trade financing in explaining recent slowdowns of export activities in Indonesia, Korea and Thailand. In general, our findings confirm the vital role of trade credit in shaping export flows of these 3 economies during the past 2 decades. Nonetheless, the impacts of trade financing on the export demand differ from one country to another. In particular, the experiences of the 3 countries appear to suggest that the more developed a country's financial sector the more significant the role of trade financing would likely to be. As expected, the adverse consequences of falling trade credit on the export performance amplify during the financial crisis. This last finding highlights the importance of crisis contagion channels from the financial sector to the real sector of an economy.

***Keywords*:** export, price and income effects, trade credits, economic and financial crises

***JEL Classifications*:** F1, F41

[a] The views expressed are of the author's only and do not necessarily represent those of the SEACEN Centre

1. Introduction

The rate of decline in global trade during the recent sub-prime crisis has been more severe and more widely spread than during the era of Great Depression of the 1930s. Accompanying the sharp fall in global trade, the joint IMF–Banker's Association for Trade and Finance (BAFT) survey further found that the decrease in the value of trade finance accelerated between October 2008 and January 2009 in almost every region of the world (BAFT, 2009). Furthermore, the World Bank estimates that 85–90 percent of the fall in world trade since the second half of 2008 is due to falling international demand, and 10–15 percent is attributable to a fall in the supply of trade finance (Auboin, 2009).

Two contrasting trends emerged at the outset of the recent global financial crisis (GFC) in a number of key East and Southeast Asian economies. On the one hand, the resilient financial sectors, particularly the banking sector, in these Asian economies generally withstood the crisis and emerged relatively unscathed. In contrast to the period of the 1997 East Asian financial crisis, the capital adequacy and liquidity positions of the banking sector of these countries remain above the Basel requirements, and the level of non-performing loans has been kept at a very low level during recent years (Table 1). Yet the exports of key Asian economies have been indiscriminately impaired by the recent global financial meltdown (Table 2 and Figures 1–3). For those economies most acutely affected by the 1997 financial crisis, namely Indonesia, Thailand and Korea, export contractions were significantly more severe during the GFC than in 1997.

During the past 1997 financial crisis, 2 key factors have frequently been underlined by early studies as the root causes of poor export/trade performance in the East and Southeast Asian economies (Lane, 1999; Stephens, 1998). The first factor is the exchange rate factor. The large swings, especially severe depreciation, of the local currencies have exacerbated the fundamental weaknesses of the effected economies. Depreciated currencies brought more financial institutions and their customers into insolvency. The second factor is the scarcity of short-term trade financing facilities. The sudden drop in trade financing contributed to the sharp drops in Indonesia's exports and

Table 1. Soundness Indicators of Selected East and Southeast Asian Countries

	Non-Performing Loans (% of Bank Loans)			Risk-Weighted Capital Adequacy Ratio			Bank Return on Assets	
	1999	**2007**	**2009**	**1999**	**2007**	**2009**	**1999**	**2009**
Indonesia	32.9	4.02	3.9 Oct/	–6.7	19.18	17.5 Oct/	–8.7	2.7 Apr/
Korea	8.3	0.64	1.2 Sep/	10.8	11.95	14.3 Jun/	–1.3	0.5 Dec 08/
Malaysia	16.6	6.4	4.6 Apr/	12.5	13.2	14.1 Nov/	0.7	1.5 Dec 08/
Philippines	14.6	4.45	3.25 Sep/	17.5	15.93	15.48 Mar/	0.4	0.8 Mar/
Singapore	5.3	1.5	2.3 Sep/	20.6	13.5	16.5 Sep/	1.2	1.1 Dec 08/
Taiwan	4.9 Dec/	1.83	1.38 Sep/	11.2 Dec/	10.8	11.6 Sep/	0.49	0.3 Jun/
Thailand	38.6	7.28	5.31 Sep/	12.4	15.38	16.4 Sep/	–5.7	1.0 Dec 08/

Source: James et al. (2008) and Siregar and Lim (2010)

imports. Establishing possible links between trade financing and trade sector performance is indeed crucial to gather better understanding on the impacts of a financial sector meltdown on real sectors.

Supporting those early works on the 1997 financial crisis, more recent studies such as Auboin (2009), BAFT (2009) and Claudio (2008) underline further the importance of trade financing in explaining slowdowns in trade activities. Claudio (2008) has further claimed that the role of trade financing has been strengthened by the structure of production lines through regional supply chains and the move to the greater importance of cross-border dispersion of component production and assemblies within vertically integrated production processes in Asia.

The objective of our study is to empirically explore the role of trade financing in inducing the recent slowdowns of trade activities in key economies of East and Southeast Asia, namely Indonesia, Korea and Thailand. These 3 countries were selected because of their acute collapse in trade financing during the 1997 East Asian financial crisis. Yet, despite the severity of this crisis, to my knowledge virtually no empirical work has assessed the dependency of these countries' export sectors on the availability of trade financing on a country-by-country case. The availability of official data on trade financing or credit remains a major hurdle to carrying out comprehensive empirical studies, which partly explains why early works on trade financing for emerging markets are relatively scarce and are mostly based on panel testing.[1]

My paper extends the early works by focusing on individual countries and conducting empirical testing on each of those 3 countries' cases, individually. This allows me to highlight and contrast different cross-country experiences. In particular, I wish to address the following set of policy concerns. First, did these economies experience equally severe export drops during the GFC as in the 1997 crisis? At the same time, has trade financing contracted more sharply in the recent crisis when compared to the 1997 crisis? Has trade financing played a role in explaining the drastic fall in exports of major Southeast and East Asian economies during the past 2 decades, including in the recent sub-prime financial crisis? Furthermore, has the export sector's degree of dependence

[1] One of the few empirical works including the East and Southeast Asian economies is Ronci (2005), which works on panel data of 10 countries in Asia, Latin America, Turkey and Russia.

on trade financing heightened during times of economic crisis? More interestingly, is there any conclusive evidence to suggest that the impact of trade credit on export performance is highly dependent on the depth of financial development of the country?

The rest of the chapter is as follows. The next section presents the literature review and analyses key facts. Section 3 discusses the data, model specification and econometric testing. Key empirical findings are analyzed and highlighted in Section 4. Discussions on the appropriateness of the stimulus policy measures implemented in these 3 economies are presented in Section 5. Brief conclusions end the paper.

2. Literature Review and Stylized Facts

2.1. Literature Review

A number of studies have, either directly or indirectly, addressed the question of whether trade financing matters for export activities. However, it is important to first underscore that trade financing, especially trade credit, has been commonly extended by both financial and non-financial institutions. The role of non-financial firms in providing trade credits is even more important in a country where the quality of financial intermediation is low (Fisman and Love, 2003). In short, trade credit may provide access to capital for firms that are unable to raise it through more traditional channels, such as the banking sector. Why do industrial firms extend trade credit when financial institutions, such as banks, could provide that facility? A number of possible motives have been theoretically supported (Petersen and Rajan, 1997). More importantly, the motives clearly accentuate the benefits of trade credits on export performance.

According to the financing motive, imperfect capital markets enable suppliers to finance borrowing firms at a lower cost than financial institutions (Smith, 1987). In their work, Petersen and Rajan (1995) demonstrate that suppliers of trade credit have a long-term interest in the survival of the borrower. Credit suppliers are willing to subsidize borrowers with lower interest rates since they expect to reap a higher return from future activities.

In addition, according to the transaction theory of trade credit, firms can economize on the joint costs of exchange by using trade credits. Many have demonstrated theoretically that trade credit providers have information advantages to sort 'buyers' of their trade financing (Biais et al., 1993; Brennan et al., 1998; Smith, 1987). Banks could get such necessary information, but, through their normal course of business activities, firms may be able to get them faster and more accurately. In addition, suppliers of trade credit have the advantage over collateral. In particular, the more durable the goods exchanged in the business transactions, the better collateral they provide and the greater the credit the supplier can extend (Mian and Smith, 1992). Ferris (1981) has also demonstrated that trade credit may reduce transaction costs for the borrower. Rather than paying bills every time goods are delivered, the firm might want to schedule the payment on a monthly basis, for instance. Transaction costs could also be lowered as trade finance could allow the firm to stock inventory and manage it better.

Some empirical work has closely examined the bond between the availability of finance and firm/sector performance and found that the growth of firms depends heavily on the availability of trade finance. Fisman and Love (2003) further claim that, where the quality of financial intermediation is low, firms relying more on trade finance tend to grow faster. Studies have also arrived at a general agreement that the role of trade finance/credit on export performance is even more formidable during crises or recessionary periods. Dell'Ariccia et al. (2008) show that during periods of financial distress, industries that depend more on external finance are hurt disproportionally more. In a related study, Borensztein and Panizza (2006) find that industries with a higher propensity to export are more adversely affected during periods of sovereign defaults. Similarly, Braun and Larrain (2005) demonstrate that during a recession industries that depend relatively more on external finance get hurt more.

Despite anecdotal evidence that the contraction of trade financing may have affected the trade performance of the emerging economies, including those in Asia, only a few empirical studies have been conducted. In addition, past empirical works have largely applied panel testing, hence have failed to capture country-specific experiences. Ronci (2005), for instance, carried out panel testing on 10 countries, including a number of the Southeast and East Asian economies. The study examines the impacts of world trade

volume, price factors (export and import prices), trade finance and banking crisis on export and import volumes.[2] Given data availability, my study revisits the set of issues discussed above, and further enhances the analyses by comparing and contrasting the experiences of the 3 major Asian economies.

2.2. Brief Facts

While Asia has not been the epicenter of the recent global financial meltdown, the real sectors, particularly the trade sectors, of major economies in the region have been indiscriminately affected and the real GDP of Thailand and Korea contracted during the first 2 quarters of 2009. In fact, the adverse impacts of the recent GFC on the export performance of our 3 economies have been much more severe than during the 1997 East Asian crisis. In particular, Thailand and Korea have seen their exports in recent years contract by more than twice the reported rates in the 1997/1998 period (Table 2).

As the financial crisis unfolded, the availability of trade finance declined and its cost increased. Liquidity pressure in matured markets led to general scarcity of capital in the global market in recent years. The fall in trade finance was also fueled by the collapse and closure of critical market participants, such as Lehman Brothers. Banks in developed countries are required to hold more capital at home and provide less liquidity to the banks and non-bank financial institutions in the emerging economies (ICC, 2009).

However, the magnitudes of collapse (in percentage) in trade financing during the recent GFC have been significantly less for Indonesia and Korea, and only marginally higher for Thailand, when compared to the corresponding rates recorded during the 1997 financial crisis (Table 2 and Figures 1–3). By eyeballing the reported trends on export and trade credit, one could be tempted to argue that the cut in trade finance had a rather limited contribution, or was not the main determining factor of the sharp falls in exports of these 3 major Asian economies during the recent economic turmoil.

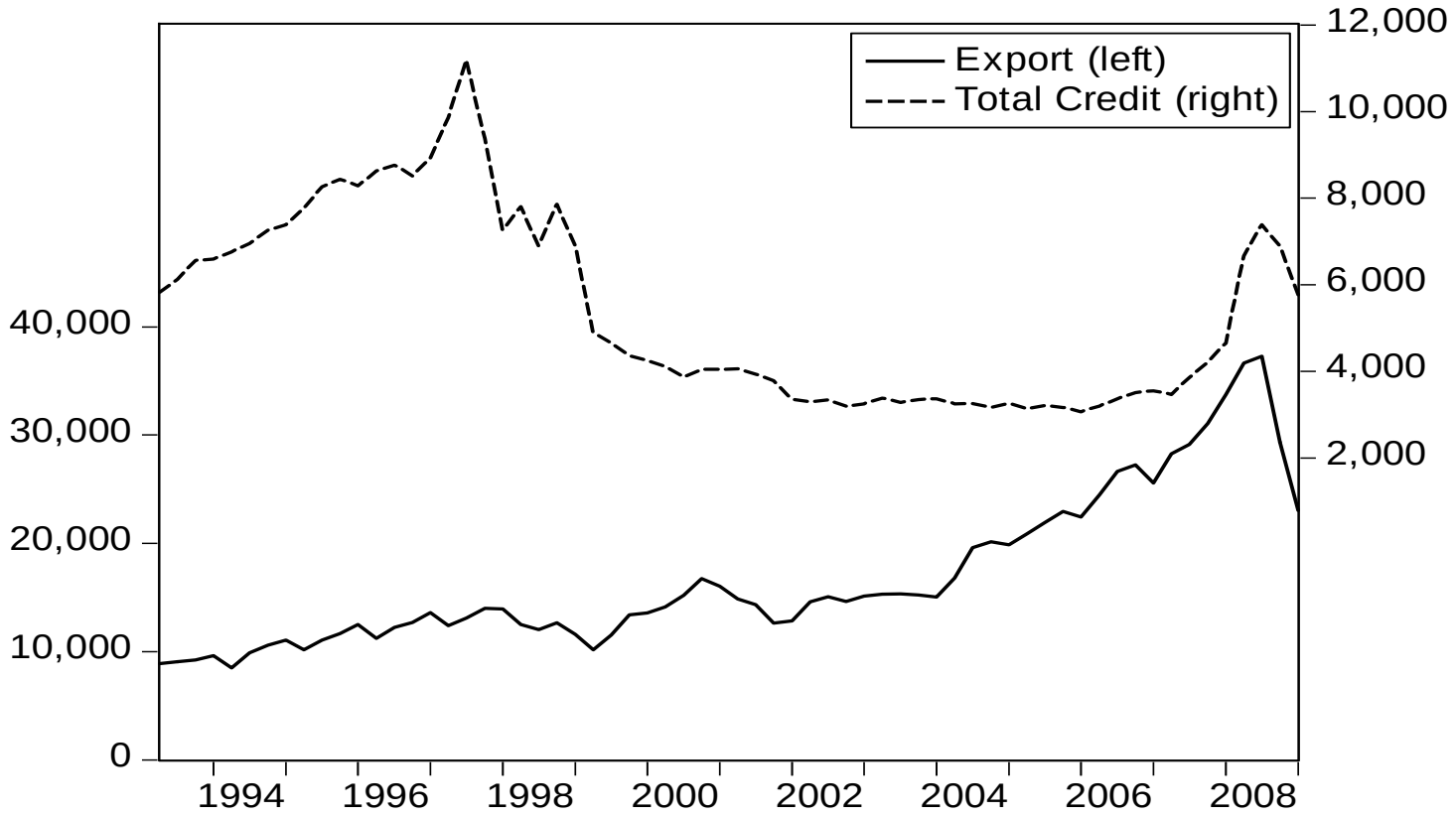
[2] The countries included in the panel testing are the East and Southeast Asian economies (Malaysia, Philippines, Thailand, Indonesia, Korea), Russia, Brazil, Argentina, Mexico and Turkey.

Table 2. The Tales of Two Crises*

Country	The 1997 Financial Crisis		The Sub-prime Crisis	
	Export	Trade Financing	Export	Trade Financing
Indonesia	–27% (Quarter 3, 1997–Quarter 1, 1999)	–38% (Quarter 3, 1997–Quarter 3, 1998)	–38% (Quarter 3, 2008–Quarter 1, 2009)	–22% (Quarter 3, 2008–Quarter 1, 2009)
Korea	–17% (Quarter 4, 1997–Quarter 3, 1998)	–17% (Quarter 2, 1997 – Quarter 1, 1998)	–35% (Quarter 3, 2008 – Quarter 1, 2009)	–7% (Quarter 3, 2008 – Quarter 3, 2009)
Thailand	–11% (Quarter 4, 1997–Quarter 2, 1998)	–35% (Quarter 1, 1997–Quarter 3, 1998)	–31% (Quarter 3, 2008–Quarter 1, 2009)	–38% (Quarter 3, 2008–Quarter 1, 2009)

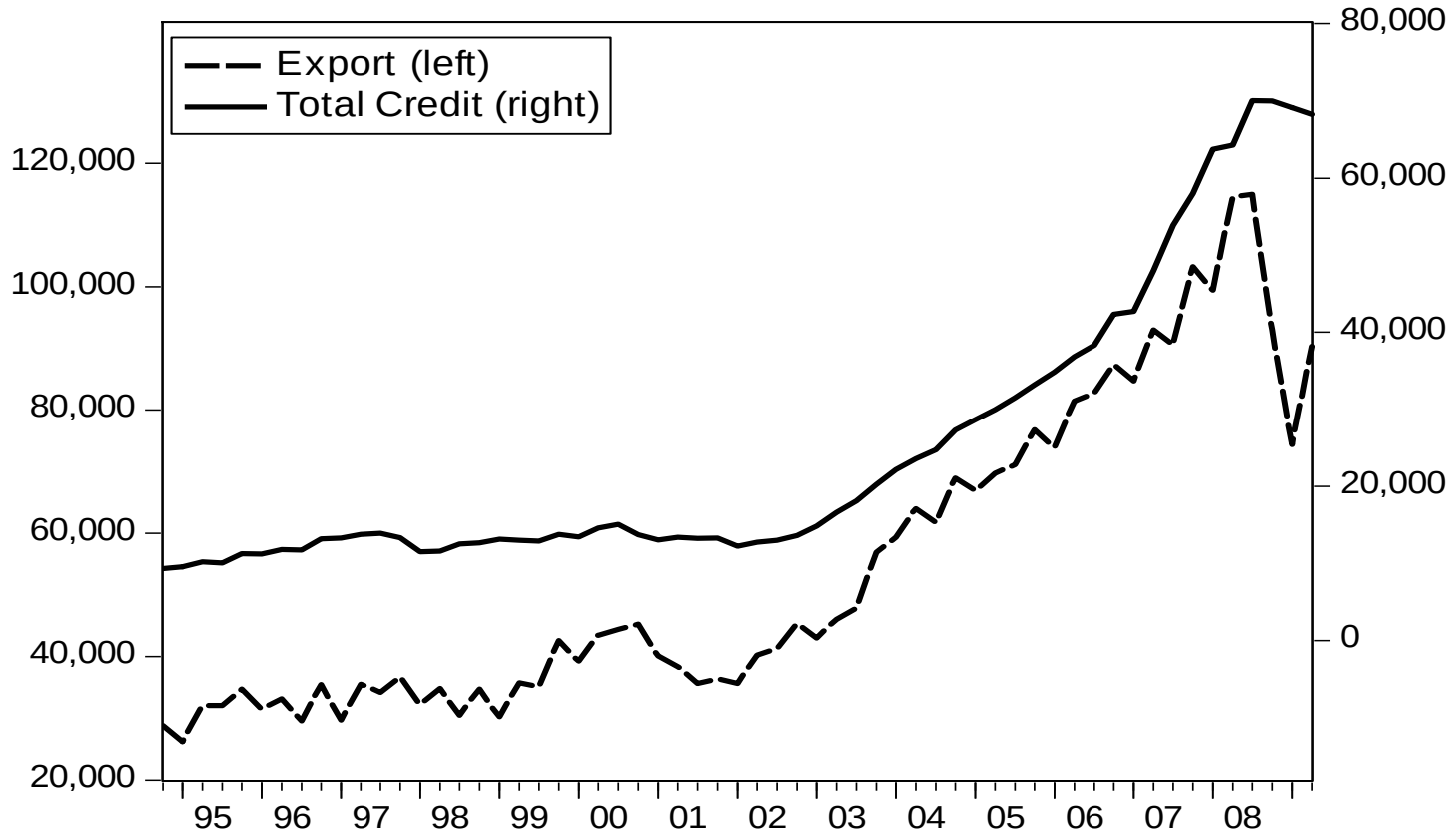
*Note: I limit the observation period to an 8-quarter span following the peak amount prior to the outbreak of the crisis.
Source: CEIC database, the websites of Bank Indonesia, Bank of Korea and Bank of Thailand, and the author's own calculation.

Figure 1. Quarterly Export and Export Credit of Indonesia (in million US$)



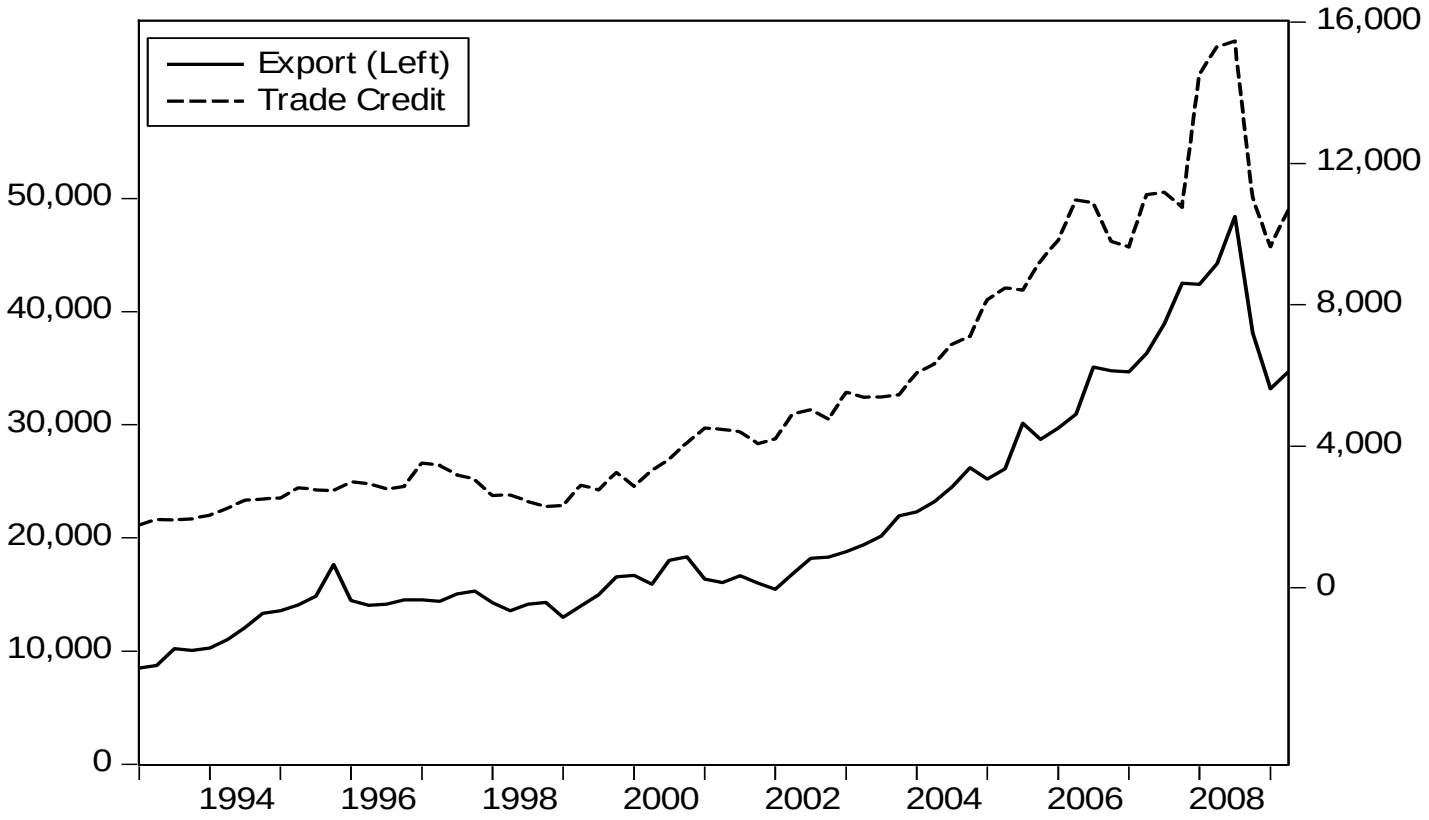
Source: Bank Indonesia database and CEIC database.

Figure 2. Quarterly Export and Trade Credit of Korea (in million US$)



Source: Bank of Korea website.

Figure 3. Quarterly Export and Trade Credit of Thailand (in million US$)



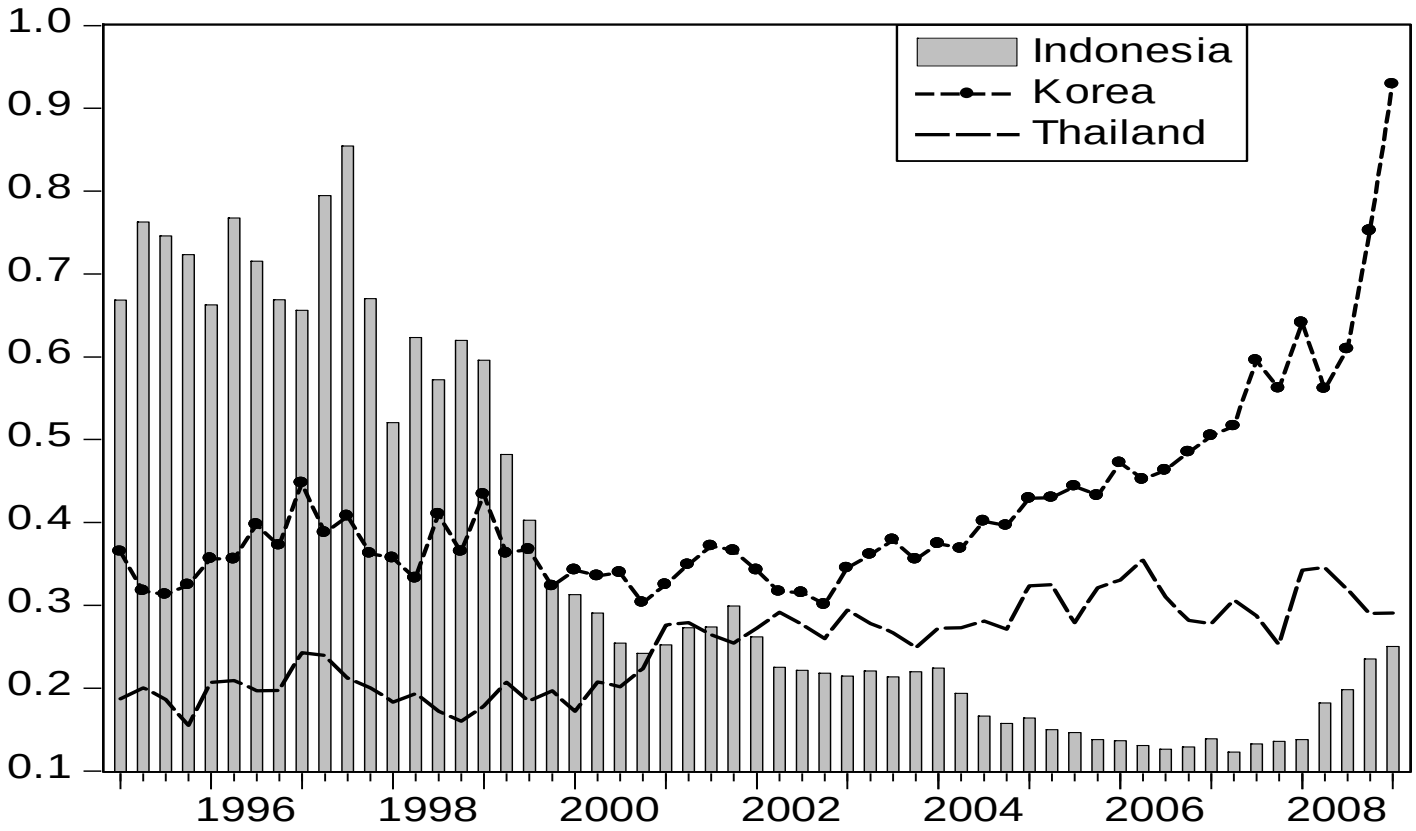
Source: Bank of Thailand website and CEIC database.

Moreover, the relative amount of trade credit over total exports is the highest for Korea when compared to Indonesia and Thailand (Figure 4). In fact, it is clear that the actual amount of trade financing to Korea dwarfed the amounts enjoyed by the other 2 countries. This seems to suggest that the Korean trade sector has the most access to trade credit, and that Korean traders have been more heavily dependent on trade credit. This fact is indeed consistent with the analyses of Iacovone and Zavacka (2009) and Kroszner et al. (2007) that exporters from developed economies with a more developed financial sector are likely to have more access to trade financing.

It is interesting to compare the trends of trade financing of these 3 countries during the past 2 decades. Indonesia and Korea, in particular, reported distinctive experiences. On the one hand, Indonesia attracted steady and strong flows of export credits, ranging from 65 percent to 85 percent of total exports on a quarterly basis during the pre-1997 financial crisis. However, since the outbreak of financial and political turmoil in 1998, export credit continued to slide from the 3rd quarter of 1998 to the 1st quarter of 2006. By the 2nd quarter of 2007, the ratio of export credit over total exports was only marginally above 12 percent. Like a mirror image, the trend for Korea was the opposite: between early 1993 and late 2003, the ratio of trade credit over total exports was in the range of 35–40 percent. From late 2005 and early 2006, the ratio surged to as high as 90 percent. Interestingly, Thailand seems to have managed a very steady ratio of around 20 to 30 percent for the last 15 years.

The overall impact of trade credit on export performance should arguably be influenced not only by the severity of the fall, but also the persistence of weak trade credit. During the 1997 financial crisis, export credit in Indonesia contracted for 12 quarters from the 1st quarter of 1997. In Korea, the reported total credit, particularly short-term credit, contracted from the 3rd quarter of 1997 to the 1st quarter of 1999. The persistence of the contraction in trade credit was also reported for Thailand for about 9 quarters from the 1st quarter of 1997. Unfortunately, data availability only allows us to analyze up to the 2nd quarter of 2009, but seems to suggest that the degree and persistence of trade credit contraction during the recent sub-prime crisis were less than reported in the 1997 financial crisis. It is interesting to note that the amount of quarterly export credit to

Figure 4. Quarterly Ratio of Trade Financing over Total Export



Source: Bank of Indonesia, Bank of Korea, Bank of Thailand and author's own calculations.

Indonesia (in US dollars) has never returned to its peak of the 3rd quarter of 1997. In contrast, the average value of trade credits to Korea and Thailand in 2008 were more than 5 times the levels in 1997.

3. Empirics

3.1. Model Specification

There are 2 primary determinants of export demand (Dornbusch, 1988; Hooper and Marquez, 1993). The first is the foreign income variable, which measures the economic activity and the purchasing power of the trading partner country ("income effect"). The second is the relative price or the terms-of-trade factor. Capturing the price effect in international trade, the terms-of-trade factor implicitly captures the impacts of exchange rate fluctuations on export demand. As noted above, another instrumental determinant of export performance is the availability of trade financing. Furthermore, economic crises or downturns have been argued to adversely affect export performance. Incorporating all of these possible determinant factors, I derive the following model specification of export demand function.

$$\Delta X_t = \alpha + \sum_i \beta_i \Delta X_{t-i} + \sum_i \delta_i \Delta TOT_{t-i} + \sum_i \theta_i \Delta GDPTP_{t-i} + \sum_i \eta_i \Delta TCR_{t-i} + \sum_i \chi_i \Delta (DGDP * TCR)_{t-i} + e_t \quad (1)$$

where (Δ) denotes the quarterly growth rate from $(t-1)$ to (t); (X) is the export value in US dollars; (TOT) denotes the terms of trade, measured as the ratio of unit value of exports over unit value of imports; $(GDPTP)$ represents the major trading partners' trade-weighted GDP; (TCR) is the trade credit; and $\Delta(DGDP * TCR)$ represents the interactive variable of domestic GDP and trade credit; (e) is the error term and is assumed to have 0 mean, constant variance and not be autocorrelated. Note: $i = 1,2$.

Theoretically, I expect $\left(\sum_i \delta_i\right)$ to be positive. A rise in the terms of trade (TOT) should have a positive impact on export growth. The inclusion of (TOT) allows us to capture the impact of

price, including exchange rate, shocks in the global market. Similarly, fluctuations in external demand would have consequences on export performance. To account for the external demand, $(GDPTP)$, the trade-weighted trading partners' GDP is included in the regression model (Equation 1). The rise in the purchasing power of trading partners, reflected by a positive growth of $(GDPTP)$, should lead to a higher demand for export products. Hence, $\left(\sum_i \theta_i\right)$ is expected to be positive. The importance of external demand shocks has been shown to be very significant in recent works by Freund (2009) and Freund and Klapper (2009).

Next, a sharp decline in trade credit (TCR) is likely to have a number of adverse consequences and to disrupt trade and growth performance (Wang and Tadesse, 2005). As already discussed, the availability of trade credit should enable export producers to meet demand. The loss of liquidity in the trade sector may also force exporters (and importers) to obtain spot foreign exchange to make necessary payments, thereby increasing demand in foreign exchange and possibly creating delays in payment. Furthermore, exports may have a high import content in some countries. In these cases, a collapse in import financing could end up adversely affecting exports. Hence, $\left(\sum_i \eta_i\right)$ is expected to be positive.

Finally, the impact of a trade financing shortage during a financial crisis on export performance would be likely to be more severe. As discussed, studies such as Braun and Larrain (2005) have demonstrated that during recessions the performance of an industry is heavily influenced by its dependence on the availability of finance. Moreover, the deeper the crisis (higher GDP loss) the further the tightening of credit, including trade credit, which in turn has a much more severe adverse impact on trade sectors.

To test the role of trade financing during the crisis on export performance, I introduce an interactive variable between the growth rates of domestic GDP and total trade credit $\Delta(DGDP * TCR)$. The growth rate of domestic GDP $(DGDP)$ captures the boom and bust of the local economy. For this study in particular, the GDP growth captures the deepness of the economic slowdown/crisis. This series is adopted, instead of the frequently applied crisis dummy, to allow for a continuous time series. During a period of economic crisis, macroeconomic volatility sharpens and causes severe restrictions to firms' access to external

finance, especially from the banking sector (Braun and Larrain, 2005). This situation in turn raises the demand for trade finance, and thus enhances the role of trade finance in explaining export performance (Nielsen, 2002).

The adoption of this interactive variable has been reported in many studies, including recent work such as Dell'Ariccia et al. (2008) and Iacovone and Zavacka (2009). Finding a positive $\left(\sum_i \chi_i\right)$ suggests that during a crisis or economic slowdown the adverse impact of trade credit on the export sector would be more significant. Hence, this variable confirms the existence of a trade credit channel operating during a period of economic crisis. The case of Brazil in 2002, for instance, demonstrates that the initial impact of a drop in trade credit on export performance created further selling pressure on the local currency. In turn, it worsened external debt payment and increased country risk, leading to further cutbacks in all funding, including trade financing (Mori, 2005). Hence, $\left(\sum_i \chi_i\right)$ is expected to be positive.

3.2. Data and Empirical Testing

3.2.1. Data

Our quarterly observation covers the period from quarter 1, 1993 to quarter 2, 2009. The observation set is particularly dictated by the availability of trade credit/financing data for each country. The trade finance data series are all sourced from the respective central banks' databases, namely Bank Indonesia, Bank of Thailand and Bank of Korea. The export series (X) is the total export in US dollars of Indonesia, Korea and Thailand. They are all from the CEIC database. The terms-of-trade series (TOT), calculated as the ratio of unit value of exports over unit value of imports, are gathered from the CEIC Asia database for Korea and Indonesia. The terms of trade data for Thailand, on the other hand, are obtained from the Bank of Thailand's database. The real trading partner GDP $(GDPTP)$ is the trade-weighted combination of the GDPs of the top 3 major export destination countries for each country included in our study. The $(GDPTP)$ variable is calculated by the following standard formula:

$$GDPTP = \omega_1 GDPTP_1 + \omega_2 GDPTP_2 + \omega_3 GDPTP_3 \qquad (2)$$

$$\omega_1 = \frac{X_1}{(X_1 + X_2 + X_3)} \tag{3}$$

$$\omega_2 = \frac{X_2}{(X_1 + X_2 + X_3)} \tag{4}$$

$$\omega_3 = \frac{X_3}{(X_1 + X_2 + X_3)} \tag{5}$$

where $(GDPTP_1)$, $(GDPTP_2)$ and $(GDPTP_3)$ are the GDPs for trading partner countries #1, # 2 and #3, respectively. Accordingly, $(\omega_1, \omega_2, \omega_3)$ are the trade weights for trading partners #1, #2 and #3, respectively. Finally, (X_1), (X_2) and (X_3) are the exports of Indonesia, Korea and Thailand, individually, to each country's respective 3 major trading partners. For all 3 countries in our study, the first 2 major export destinations during our sample period are the United States of America and Japan. The People's Republic of China has emerged as a key trading partner for Indonesia, Korea and Thailand in recent years.[4] However, as I do not have a complete set of quarterly GDP data for China, Korea is listed as the third partner for Indonesia and Thailand. For Korea, Germany is the third major export destination. The raw data needed to construct the real trading partner GDP are sourced from the CEIC database.

The variable $\Delta(DGDP * TCR)$ is computed as the first difference of the product of the quarterly domestic GDP $(DGDP)$ and the quarterly trade credit (TCR) for each country included in our study. The domestic GDP series are adopted from the CEIC Asian database. All variables in regression equation (1) are log-normalized.

3.2.2. Empirical Testing

In this study, I employ the frequently applied ARDL (Autoregressive Distributed Lag) testing with the general-to-specific approach (Hendry, 1976).[5] The ARDL testing includes lags up to 4 quarters.[6] The combination of the ARDL and the general-to-specific approach allows us to start

[4] For Indonesia and Thailand, Singapore has also been a key trading partner and a primary export destination. However, as exports to Singapore from these two economies are largely re-exported and Singapore is not the final main destination of the export goods, I do not include Singapore.

[5] The application of the ARDL approach with the general-to-specific approach is common. Recent studies applying the ARDL framework include Siregar and Goo (2010), Campa and Goldberg (2002) and Gagnon and Ihrig (2004).

[6] Because of the degree of freedom, I only consider 4-quarter lags. Pesaran and Shin (1999) suggested up to two lags for annual data. Since I work with quarterly data, I expanded the lags to four.

from the general model by including all key explanatory variables and their time lags supported by various theoretical frameworks. The general-to-specific procedure is then adopted to reduce the complexity of the model by eliminating the statistically insignificant variables. This process should ensure the consistency of the final reduced model. The final outcomes of the ARDL and general-to-specific approach should enable us to capture not only the significant determinants and eliminate the insignificant ones, but to arrive at the number of lags/periods needed for the impacts of changes in the explanatory variables on the dependent variable.

Before conducting the ARDL testing, I test the unit root properties for each of the variables in Equation 1. To anticipate the possible presence of structural breaks, I employ Banerjee et al. (1992) (henceforth BLS) in addition to standard unit root tests, i.e. the ADF test, the Phillip–Perron test and the KPSS test.[7] Depending on the unit root properties of the series, I then test for the possible cointegration relationship among the variables listed in Equation 1 at their levels. If a cointegration relationship is found, then the error correction component series (ECM_{t-1}) will be included in the ARDL testing.

A battery of test statistics will be reported to ensure that our coefficient estimates are valid and robust. In addition to the standard F-statistics to confirm the significance of one or more explanatory variables, I also report the Breusch–Godfrey serial correlation LM test statistics to verify that autocorrelations in the residuals are not a problem in any of the regressions.

4. Key Results and Lessons Learned

Based on our set of unit root tests, all relevant series are found to be non-stationary and integrated of order 1 at their level ---I(1) series.[8] Hence, I cannot rule out the presence of a cointegration relationship among the variables presented in Equation 1 for all 3 countries'. The standard Johansen cointegration test was carried out. Based on the trace statistics, no cointegration relationship is found at the 5% level of significance. I do however find a weak

[7] The BLS provides a more in-depth investigation of the possibility that the aggregate economic time series can be characterized as being stationary around 'a single or multiple structural break'. It extends the Dickey–Fuller *t*-test by the construction of the time series of rolling computed estimators and their *t*-statistics. Following the BLS procedure, I compute the smallest (minimal) and the largest Dickey–Fuller *t*-statistics.

[8] For the sake of brevity, the test results of the unit root testing are not reported but are available upon request.

cointegration relationship at 10% for Indonesia. The number of lags included in the cointegration for each country case is determined by the Akaike Information Criterion (AIC).[9]

The overall ARDL test results are reported in Tables 3–5. The adjusted R^2 values suggest that the explanatory variables can clarify around 44 to 55 percent of the quarterly changes in the export values of these 3 economies, with Korea having the largest adjusted R^2 and Indonesia the smallest. The F-statistics confirm that one or more of the independent variables are non-zero. In addition, the Breusch–Godfrey serial correlation LM test statistics confirm that no autocorrelation in the residuals is found in any of the 3 regressions. All key explanatory factors, namely income, terms of trade and trade financing, contribute at 10 percent or more significance level to the ups and downs of export values of these countries. In addition, I find the coefficient estimates of these key factors to be theoretically consistent.

Several key lessons from the experiences of these 3 countries can be highlighted from the ARDL test. First, trade financing has a positive effect on exports, as theoretically expected. However, the size and significance of the estimated parameters vary significantly from one country to another. Based on the sum of the coefficient estimates

[9] Based on the AIC, each of the cointegration tests includes around 2 to 3 quarter lags. No robust cointegration relationship is reported at the 5% significance level from any of the 3 countries' test results. For Indonesia, I do find a weak cointegration relationship at the 10% level when I consider lags at least for 4 quarters. I included the error correction component for the case of Indonesia, but did not find the variable to be significant at the 10% significance level.

Table 3. Indonesia

Dependent Variable: (ΔX)

Variable	Coefficient	Std. Error	t-statistics
(ΔTOT_t)	0.713	0.341	2.091**
(ΔTCR_t)	0.744	0.132	5.633***
(ΔTCR_{t-1})	–0.875	0.149	–5.876***
(ΔTCR_{t-4})	0.172	0.077	2.220**
$(\Delta GDPTP_{t-2})$	0.960	0.365	2.633**
$\Delta(DGDP*TCR)_{t-1}$	–1.784	0.494	–3.612***
(α)	0.021	0.009	2.369**
Adjusted R-squared: 0.443		Prob (LM test): 0.409	
F-statistics: 8.677		Prob (F-statistics): 0.000	

Note: * significant at 10%; ** significant at 5%; and *** significant at 1%.
Source: Author's own calculations.

Table 4. Korea

Dependent Variable: (ΔX)

Variable	Coefficient	Std. Error	t-statistics
(ΔX_{t-1})	–0.208	0.114	–1.181*
(ΔTOT_{t-1})	0.725	0.287	2.525**
$(\Delta GDPTP_{t-1})$	0.986	0.481	2.050**
(ΔTCR_t)	0.437	0.195	2.239**
(ΔTCR_{t-2})	0.393	0.195	2.008**
$(\Delta DGDP*\Delta TCR)_t$	3.749	1.679	2.231**
$(\Delta DGDP*\Delta TCR)_{t-2}$	4.162	1.659	2.507**
(α)	–0.025	0.015	–1.686*
Adjusted R-squared: 0.468		Prob (LM test): 0.747	
F-statistics: 7.921		Prob (F-statistics): 0.000	

Note: * significant at 10%; ** significant at 5%; and *** significant at 1%.
Source: Author's own calculations.

Table 5. Thailand

Dependent Variable: (ΔX)

Variable	Coefficient	Std. Error	t-statistics
(ΔTOT_{t-3})	0.572	0.288	1.980**
$(\Delta GDPTP_{t-1})$	1.189	0.240	4.945***
(ΔTCR_t)	0.223	0.075	2.962***
(ΔTCR_{t-1})	0.242	0.074	3.286***
$(\Delta DGDP^* \Delta TCR)_{t-1}$	–3.874	1.430	–2.708***
$(\Delta DGDP^* \Delta TCR)_{t-2}$	4.141	1.515	2.734***
(α)	0.004	0.006	0.681
Adjusted R-squared: 0.559		Prob (LM-test): 0.112	
F-statistics: 13.172		Prob (F-Statistics): 0.000	

Note: * significant at 10%; ** significant at 5%; and *** significant at 1%.
Source: Author's own calculations.

of (TCR), $\left(\sum_i \eta_i\right)$, the role of trade credit on export performance is found to be the largest for Korea, and the least for Indonesia. This finding supports the claim that exporters in countries with a more developed financial system are perceived to be more reliable and thus have access to more trade credit (Iacovone and Zavacka, 2009). As discussed, the ratio of trade credit over exports for Korea is relatively more significant than reported for Thailand and Indonesia (Figure 4).

Looking at the significant lags of $\left(\sum_i \eta_i\right)$, I can also conclude that the consequences of falling trade credit would immediately be felt and would influence the export performance of these economies within the same quarter (t). The results seem to also suggest that the impact of trade finance on exports is most persistent in the case of Indonesia – up to 4 quarters $(t-4)$.

Among the 3 primary determinant factors, namely price, income and trade financing, income effect has been consistently the most significant determinant of the export performance in all 3 countries. The size of the coefficient estimate for $(GDPTP)$, $\left(\sum_i \theta_i\right)$, suggests that the full

implication of income movement is felt on the export demand within the first quarter. That is, a rise of 1 percent in a trade-weighted trading partners' GDP would result in an average of about 1 percent increase in export demand, and vice versa. The most significant income impact is reported in the case of Thailand, with the size of the coefficient estimate to be significantly larger than 1 (Table 5). This seems to support the World Bank's finding that a major factor explaining the fall in world trade in general (including in Asia) is the falling international demand or the "income effect" (Auboin, 2009).

Finally, test results for all 3 countries confirm the claim that the deeper the crisis, the more significant the adverse consequence of trade credit collapse ($\Delta(DGDP * TCR)$) on the export sector. Even more interesting to note here is that the results suggest that the effect of a financial crisis is deeper in countries with a more developed financial system. The sum of the coefficient estimates for variable ($\Delta(DGDP * TCR)$) is the largest for the case of Korea. This general finding is consistent with Kroszner et al. (2007). However, most importantly, this result substantiates the importance of the stage of financial development in linking the financial sector to the real sector, particularly the trade sector.

Suffice to say that our results have confirmed the role of terms of trade in influencing export activities in these major Asian economies. Looking at the sum of the coefficient estimates for the variable (TOT) for each country, it is apparent that the price factor is particularly important for Indonesia. The coefficient estimate for this country is not only significant and relatively large, but it also suggests that the impacts of global price change on exports are immediately felt within the same quarter. This appears to be consistent with the nature of Indonesian exports, which have predominantly been primary commodities.

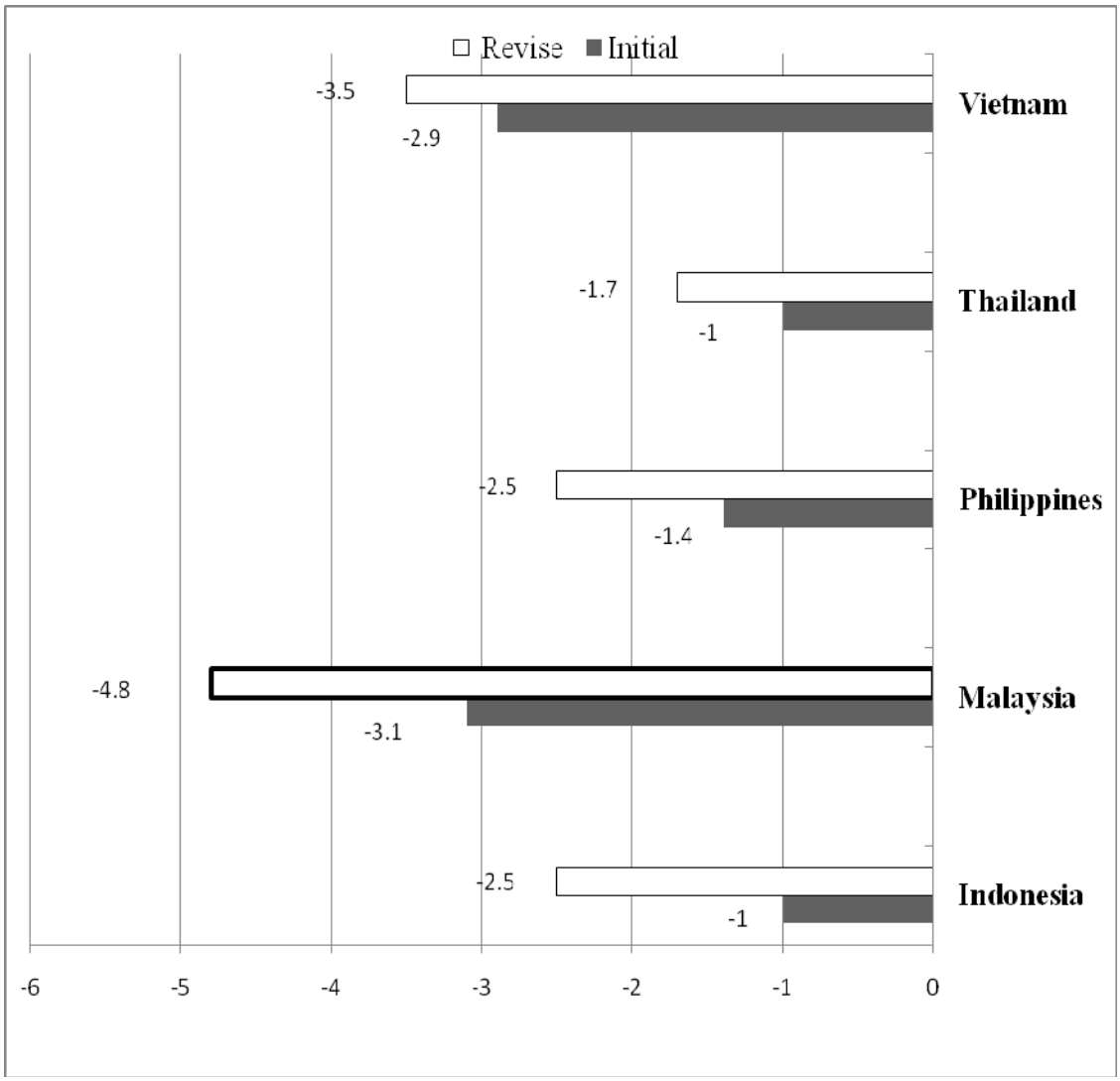
5. Financial Crisis and Trade Sector Linkages: Have the Stimulus Policy Responses Been Appropriate?

The recent global financial meltdown presented the emerging market economies (EMEs) with 2 shocks: a 'sudden stop' of capital flows driven by the deleveraging, and a collapse in export demand associated with the global slump. The past episodes of sudden stops have demonstrated that countries with tighter fiscal policy experienced sharper contractions than those with a looser

stance (Ortiz et al., 2009). In particular, given the limitation of monetary policy discussed earlier, the role of fiscal stimulus is critical, not only in terms of minimizing the impacts of the crisis, but more importantly in stimulating economic recovery. Therefore, it is not a surprise that a similar measure would be pursued during the recent GFC. However, one of the hallmarks of the GFC is the unprecedented size of fiscal and monetary policies carried out by countries, and in some cases done in a coordinated fashion, around the world.

Among the 3 economies included in this study, Korea has been the most aggressive. The country's overall fiscal balance was still positive at 1.2 percent of GDP in 2008 but by the end of the first half of 2009 it reported an overall deficit balance of around 5 percent of GDP. On the other hand, the governments of Indonesia and Thailand both expanded their stimulus measures in 2009. The Ministry of Finance of Indonesia initially aimed at a very modest budget deficit of around 1.0 percent of GDP in 2008, but eventually decided to double the stimulus package in early 2009 to a deficit of around 2.5 percent of GDP. Similarly, Thailand stepped up its fiscal expansion target to –1.7 percent of GDP in 2009 from a mere –1.0 percent in 2008. In fact, a number of Southeast Asian economies pursued these expansionary efforts in a consistent manner regionally (Figure 5). In general, the fiscal stimulus of the Asian economies involved both expansion on the expenditure side and reduction of a number of key tax rates. To support the activities of firms, especially small and medium firms, the governments of these 3 economies extended tax cuts and other forms of investment funds. A significant number of these small and medium enterprises are export-oriented firms.

Figure 5. Budget Deficit as Percent of GDP for Selected Southeast Asian Economies



Source: Bloomberg, CEIC Asia Database.

In addition, a number of monetary policy expansionary measures have accompanied fiscal expansion in most emerging markets in Asia. As in advanced economies, the basic thrust of the monetary policy in our 3 major Asian economies is to ease the impacts of the deleveraging process in the global economy on domestic liquidity, and to help mitigate the full implications of the sub-prime crisis on the real sectors of the economy. To start, most Southeast and East Asian economies lowered their policy rates considerably. Indonesia, for instance, reduced its policy rate from 9.5 percent in December 2008 to 6.5 percent in August 2009. Similar policy measures were reported in other major SEACEN economies, including Thailand, Malaysia and Korea. For

some of these economies, the rates by end of the 3rd quarter of 2009 hovered around the lowest ranges reported for a long time, between 1 and 2 percent.

Beyond the standard interest rate policy and reserve requirement adjustments, to further stimulate their credit markets, the Asian central banks have also adopted a number of 'quantitative measures', including various 'credit easing' (CE) and 'quantitative easing' (QE) policies. Korea has been among the most active in employing various CE and QE measures. To instill market confidence and financial sector stability, the Korean government, together with the Bank of Korea, guaranteed repayment of banks' external borrowings; extended foreign currency liquidity through foreign exchange swaps; provided liquidity to domestic banks, including those of the Korean branches of foreign banks; and instituted tax exemptions for foreign investment in Korean treasury bonds and monetary stabilization bonds.

Have these stimulus policies been appropriate to mediate the impacts of the global financial crisis on the exports of these 3 economies? To address this important policy question, one needs to first review and understand various possible channels of transmission of a financial crisis to trade contraction. Borrowing the analyses of Bayoumi and Melander (2008), one common feature of a financial crisis is the presence of much tighter banking credit. Often this tightened credit can be explained by 2 sequential factors. The first is due to adverse shocks to the bank's capital position. To avoid further deterioration of their balance sheets, banks often tighten their lending standards, which results in further tightening credit availability. The drying up of bank lending has been linked to the tightening up of trade credit (Borensztein and Panizza, 2006; Braun and Larrain, 2005; Dell'Ariccia et al., 2008).

The analyses above suggest that the stimulus packages have been appropriate policy responses. With the clear objectives of ensuring continuous flows of bank credit and adequate foreign exchange supply in the local market during the difficult period of the GFC, the stimulus policies have probably contributed to less severe declines in trade financing, especially for Indonesia and Korea (Table 2). However, further in-depth studies are required to examine more closely the components of export credits/trade financing to better understand the role of stimulus policies in mediating the adverse consequences of the recent global financial meltdown on trade financing in our Asian economies.

6. Concluding Remarks

Trade finance has long been an important component of international financial flows, but has often been overlooked. However, during the 1997 financial crisis the important contribution of trade credit to export performance was finally fully appreciated when the major trade-dependent economies of East and Southeast Asia saw their trade sectors shrink and further worsen the balance-of-payment crisis. My study covers the period from the pre-1997 financial crisis to the recent sub-prime crisis. Extending early works, I focus on the experiences of Indonesia, Thailand and Korea, individually. By adopting time series data for each country case, and not the panel data of the early works, a number of cross-country experiences can be compared and contrasted.

In general, my findings confirm the critical role of trade credit in explaining export performance of the 3 economies. However, the impacts of trade financing on export demand differ from one country to another. The experiences of the 3 countries included in this study seem to suggest that the more developed is a country's financial sector, the more significant the role of trade financing is likely to be. As expected, the adverse consequences of a fall in trade credit on export performance amplify during a financial crisis. This last finding confirms the importance of a crisis contagion channel from the financial sector to the real sector of the economy.

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Chapter 9

Export Credit and Export Performance in Indonesia

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Abstract

Despite the relatively strong economic landscape, Indonesia's export sector suffered more severely during the recent global financial crisis than in the 1997 Asian financial crisis. This study examines the link between export credits and export performance. Has the export sector in Indonesia been dependent on export credit during the past two decades? In particular, did export financing contribute to the boom and bust of the two major export groups, namely manufacturing and mineral exports? Did the economic and financial crisis amplify the role of export credit in sustaining exports? Furthermore, was working capital more critical than investment capital in explaining the performance of Indonesia's exports?

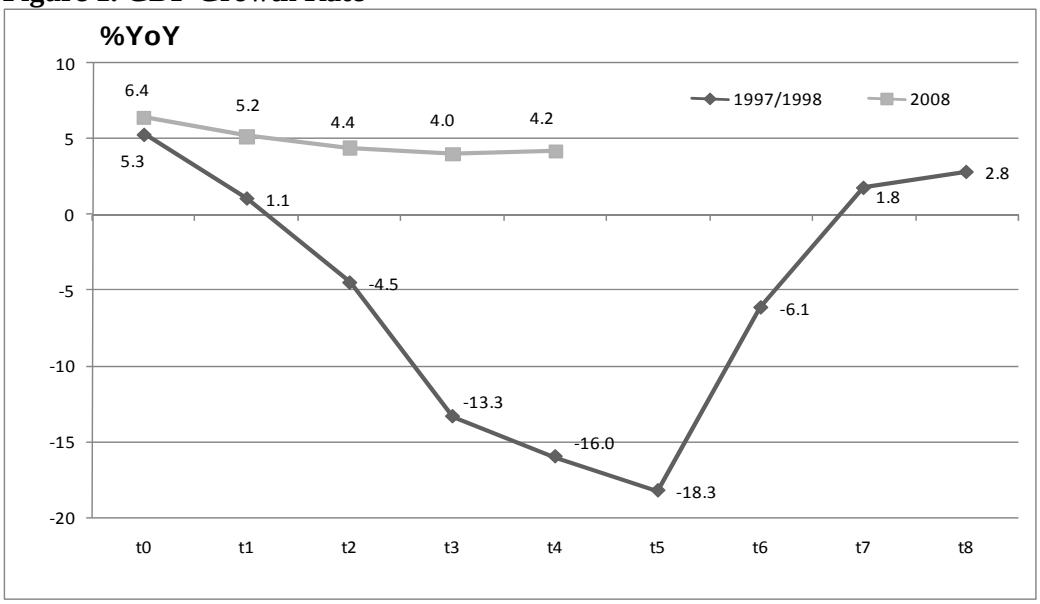
***Keywords*:** export, price and income effects, trade credit, economic and financial crisis

***JEL Classifications*:** F14, F41

1. Introduction

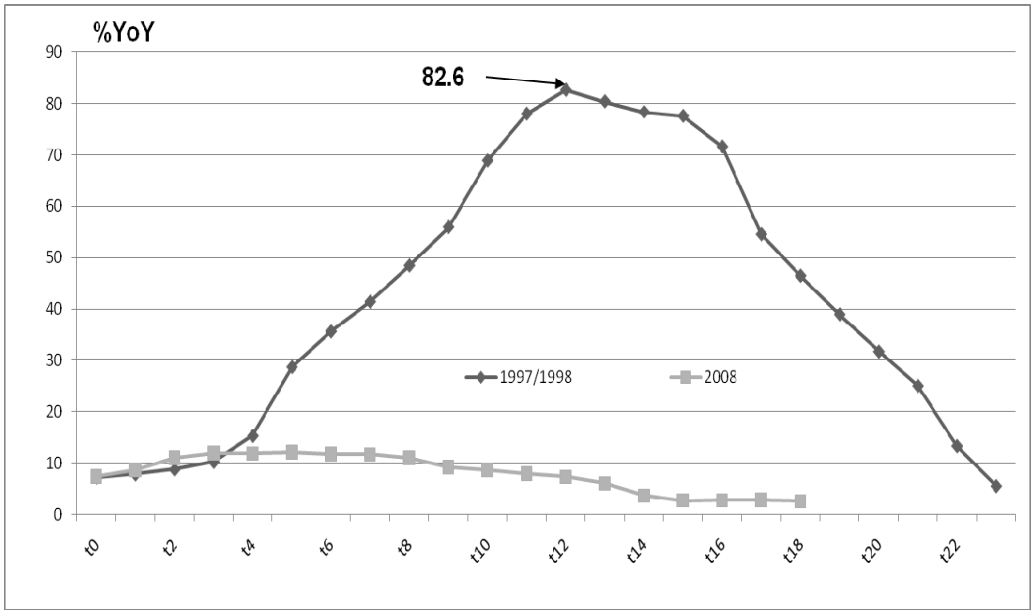
Having been among the most severely hit economies in the Asian Financial Crisis (AFC) of 1997–1998, Indonesia weathered the global slump of 2008–2009 remarkably well. The country maintained the third highest gross domestic product (GDP) growth in the Group of Twenty economies (G-20) and the major Asia Pacific economies—slower only to China and India—averaging more than 4 percent quarterly growth during the first half of 2009 (Figure 1). Both the fiscal and monetary authorities have coordinated their efforts to maintain price stability. In contrast to the 1997 crisis, domestic inflation has been well anchored throughout the height of the sub-prime crisis (Figure 2). Moreover, while the local currency depreciated sharply against the US dollar, it stabilized much quicker in the recent crisis than during the 1997 currency meltdown.

Figure 1. GDP Growth Rate



Note: a). 1997 Crisis: t0 = September (third quarter) 1997 and t8 = September (third quarter) 1999
b). 2008 Sub-prime crisis: t0 = September 2008 and t4 = September 2009
c). t1 represents a period one quarter after t0
Source: CEIC database

Figure 2. Inflation



Note: a). 1997 Crisis: t0 = October 1997 and t23 = September 1999
b). 2008 Sub-prime crisis: t0 = April 2008 and t18= October 2009
c). t1 represents a period one month after t0
Source: CEIC database

The strength of Indonesia's financial sector in this recent sub-prime crisis is in sharp contrast to the financial meltdown of the 1997/98 AFC. Even at the peak period of the global financial slowdown between the last quarter of 2008 and the first quarter of 2009, banks continued to be profitable and to maintain capital adequacy level well above the Basel requirement (Table 1). During the first half of 2009, Indonesian banks reported the highest capital adequacy ratio and return on assets among the major Southeast and East Asian economies.

Table 1: Soundness Indicators of Indonesia and Selected East and Southeast Asian Countries

	Non-Performing Loans (% of Bank Loans)			Risk-Weighted Capital Adequacy Ratio			Bank Return on Assets	
	1999	**2007**	**2009**	**1999**	**2007**	**2009**	**1999**	**2009**
Indonesia	32.9	4.02	3.9 Oct/	–6.7	19.18	17.5 Oct/	–8.7	2.7 Apr/
Korea	8.3	0.64	1.2 Sep/	10.8	11.95	14.3 Jun/	–1.3	0.5 Dec 08/
Malaysia	16.6	6.4	4.6 Apr/	12.5	13.2	14.1 Nov/	0.7	1.5 Dec 08/
Philippines	14.6	4.45	3.25 Sep/	17.5	15.93	15.48 Mar/	0.4	0.8 Mar/
Singapore	5.3	1.5	2.3 Sep/	20.6	13.5	16.5 Sep/	1.2	1.1 Dec 08/
Taiwan	4.9 Dec/	1.83	1.38 Sep/	11.2 Dec/	10.8	11.6 Sep/	0.49	0.3 Jun/
Thailand	38.6	7.28	5.31 Sep/	12.4	15.38	16.4 Sep/	–5.7	1.0 Dec 08/

Nevertheless, despite the relatively strong economic landscape, the export sector suffered more severely during the recent global financial crisis than in the AFC. Weak demand, especially from the traditional markets of the US, Japan and Europe, has been identified as one detrimental force for Indonesian exports. Another possible transmission channel from the financial crisis to the real sector meltdown is trade financing. Indeed, Indonesian exporters had access to a wide variety of trade financing options, including letters of credit and export credits in the forms of working capital and investment capital.

This study examines the link between export credits and export performance in Indonesia. The primary task is to address the following questions. Has the export sector been dependent on export credit during the past two decades? In particular, did export financing contribute to the boom and bust of the two major export groups, namely manufacturing and mineral exports? Did the economic and financial crisis amplify the role of export credit in sustaining exports? Furthermore, was working capital more critical than investment capital in explaining the performance of Indonesia's exports?

To my knowledge, little work has addressed empirically the previous set of questions. Studies such as Brown and Magiera (2000) and Ronci (2005) have either examined the issues qualitatively, or considered the Indonesian case as part of a large pool of a very diverse panel testing. With the availability of time series export credit data from quarter 3, 1993 to quarter 1, 2009 from Bank Indonesia, my study is in a unique position to look more comprehensively into the role of export financing to explain the performance of the export sector.

In the next section I present a literature review and analyse key stylized facts. An empirical section (Section 3) follows that includes a discussion of data, model specifications and econometric testing. Key empirical findings are analysed and highlighted in Section 4. In Section 5, a number of policy responses to support the export sector during the recent global financial crisis are presented and discussed. A brief concluding remark section ends the paper.

2. Literature Review and Stylized Facts

2.1 Literature Review

A number of studies have attempted to address, both directly and indirectly, the question of whether trade financing matters for export activities. However, it is important to first underscore that trade financing, especially trade credit, is offered by both financial and non-financial institutions. In particular, the role of non-financial firms in providing trade credits is more important in a country where the quality of financial intermediation is low (Fisman and Love (2003)). In short, trade credit may provide access to capital for firms that are unable to raise it through more traditional channels, such as the banking sector. Why do industrial firms extend trade credit when financial institutions such as banks could provide that facility? There are a number of possible reasons that have also been theoretically supported (Petersen and Rajan (1997)).

One reason is that imperfect capital markets enable suppliers to finance borrowers at a lower cost than financial institutions (Smith (1987)). In their work, Petersen and Rajan (1995) demonstrate that the supplier of trade credit has a long-term interest in the survival of the borrower. The credit supplier is willing to subsidize borrowers with lower interest rates since they expect to reap a higher return from future activities.

In addition, according to *transaction theory* of trade credit, firms can economize on the joint costs of exchange by using trade credits. Many have demonstrated theoretically that trade credit providers have information advantages that enable them to sort the 'buyers' of their finance (Brennan et al. (1998), Smith (1987) and Biais et al. (1993)). Banks can get such necessary information but, through the normal course of business activities, firms may be able to get it faster and more accurately. In addition, the supplier of trade credit has an advantage over the collateral. The more durable the goods exchanged in the business transaction, the better collateral they provide and the greater the credit the supplier can extend (Mian and Smith (1992)). Ferris (1981) has also demonstrated that trade credit may reduce transaction costs for the borrower. Rather than paying bills every time goods are delivered, the firm, for instance, might want to schedule the

payment on a monthly basis. Transaction costs could also be lowered as trade finance could allow the firm to stock inventory and manage it better.

Some empirical work, has focused more on the link between the availability of finance and firm/sector performance. These works show that the growth of firms depends heavily on the availability of trade finance. Fisman and Love (2003), for instance, claim that where the quality of financial intermediation is low, firms relying more on trade finance tend to grow faster. Studies also generally agree that the role of trade finance/credit on export performance is even more formidable during a crisis or recessionary period. Dell'Ariccia et al. (2008) show that during periods of financial distress, external finance-dependent industries are hurt disproportionately more. In a related study, Borensztein and Panizza (2006) find that industries with higher propensity to export are more adversely affected during periods of sovereign defaults. Similarly, Braun and Larrain (2005) demonstrate that during a recession industries that depend relatively more on external finance get hurt more.

Despite anecdotal evidence that the contraction of trade financing may have affected trade performance, only a few empirical studies have been conducted, particularly on the experiences of emerging economies in Asia. For the case of Indonesia in particular, there has been little empirical study. In addition, past empirical works have largely applied panel testing, hence have failed to capture country-specific experiences. Ronci (2005) carried out panel testing on 10 countries, covering a number of the Southeast (including Indonesia) and East Asian economies. The study examines the impacts of world trade volume, price factors (export and import prices), trade finance and the banking crisis on the export and import volumes.[1]

2.2 Brief Stylized Facts: Indonesian Economy and the Tales of Two Crises[2]

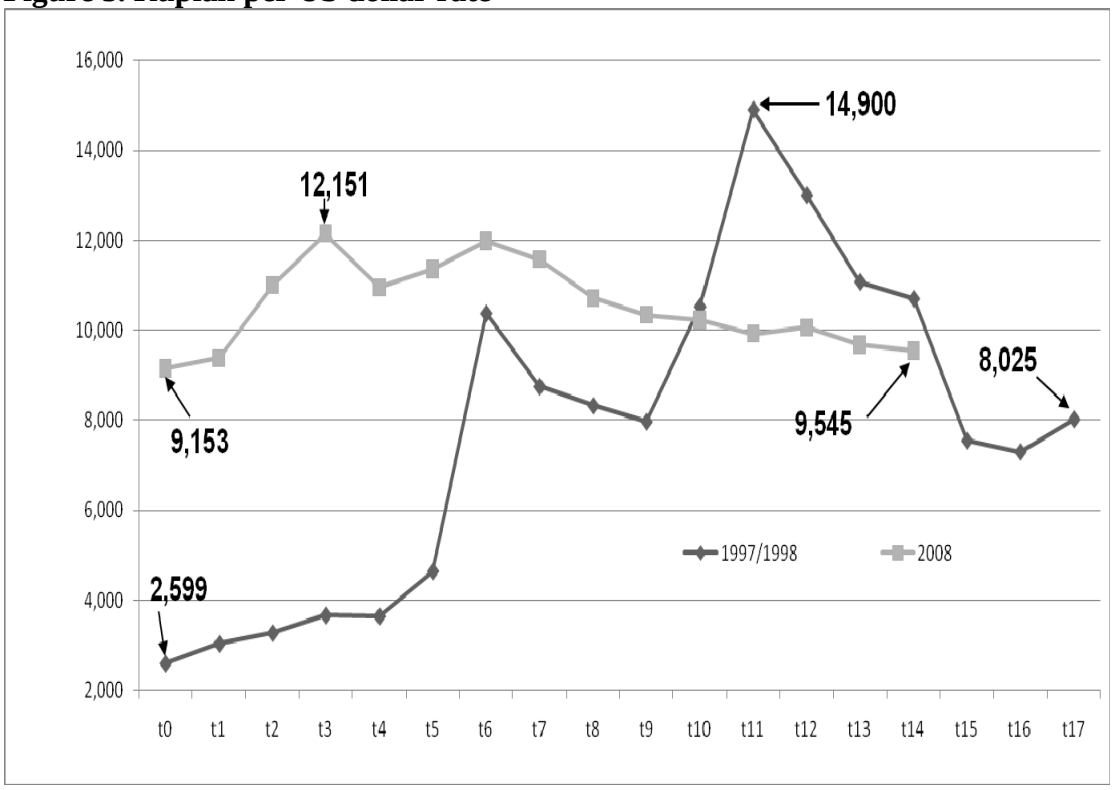
As the worst phase of the recent global financial crisis has arguably passed, it is timely to compare its impacts on the Indonesian economy with that of the 1997/98 AFC. In

[1] The countries included in the panel testing are the East and Southeast Asian economies (Malaysia, Philippines, Thailand, Indonesia, Korea), Russia, Brazil, Argentina, Mexico and Turkey.

[2] This section greatly benefits from the valuable contribution of Anton H. Gunawan of Bank Danamon, Indonesia.

particular, it is worthwhile to extract, where possible, contrasting features of the impacts of these economic slowdowns on the country's export performance. It is safe to conclude at this stage that the AFC was far more damaging on the Indonesian economy than the 2008/2009 Global Financial Crisis (GFC). As shown in Figures 1–3, a series of primary macroeconomic indicators confirms this conclusion.

Figure 3. Rupiah per US dollar rate



Note: a). 1997 Crisis: t0 = July 1997 and t17 = December 1998
b). 2008 Sub-prime crisis: t0 = August 2008 and t14= October 2009
c). t1 represents a period one month after t0
Source: CEIC database

During the 1997 crisis, the Indonesian economic growth rate contracted sharply into negative territory a mere two quarters after the onset of the crisis, and remained at negative growth rate for the following five quarters. In the last quarter of 1998 the economy contracted at an unprecedented rate of –18.3 percent (year on year). In contrast, the real GDP growth during the GFC slowed only gradually and mildly in the following three quarters, and quickly bounced back in the third quarter of 2009. Most

importantly, there was clearly no threat of contraction in the country's GDP during the recent GFC.

The severity of the AFC was evident from the skyrocketing inflation rate, hitting over 82 percent year on year in September 1998. On the contrary, the price level remained in a single-digit level for most of the GFC: the inflation rate did rise to a double-digit level, at around 12 percent year on year in September 2008, but quickly weakened to 2.4 percent year on year in November 2009. The nominal exchange rate of rupiah against the US dollar was another key barometer of the severity of the AFC in Indonesia. The currency depreciated very sharply during the 1997/98 crisis, from around Rp2,559 per US dollar in early July 1997 (two weeks before the full blown speculative attack on the rupiah) to reach Rp14,900 per US dollar by June 1998, a span of 11 months. The rupiah depreciated during the GFC by slightly over 30 percent from August to November 2008, but recovered most of the loss swiftly by early January 2009.

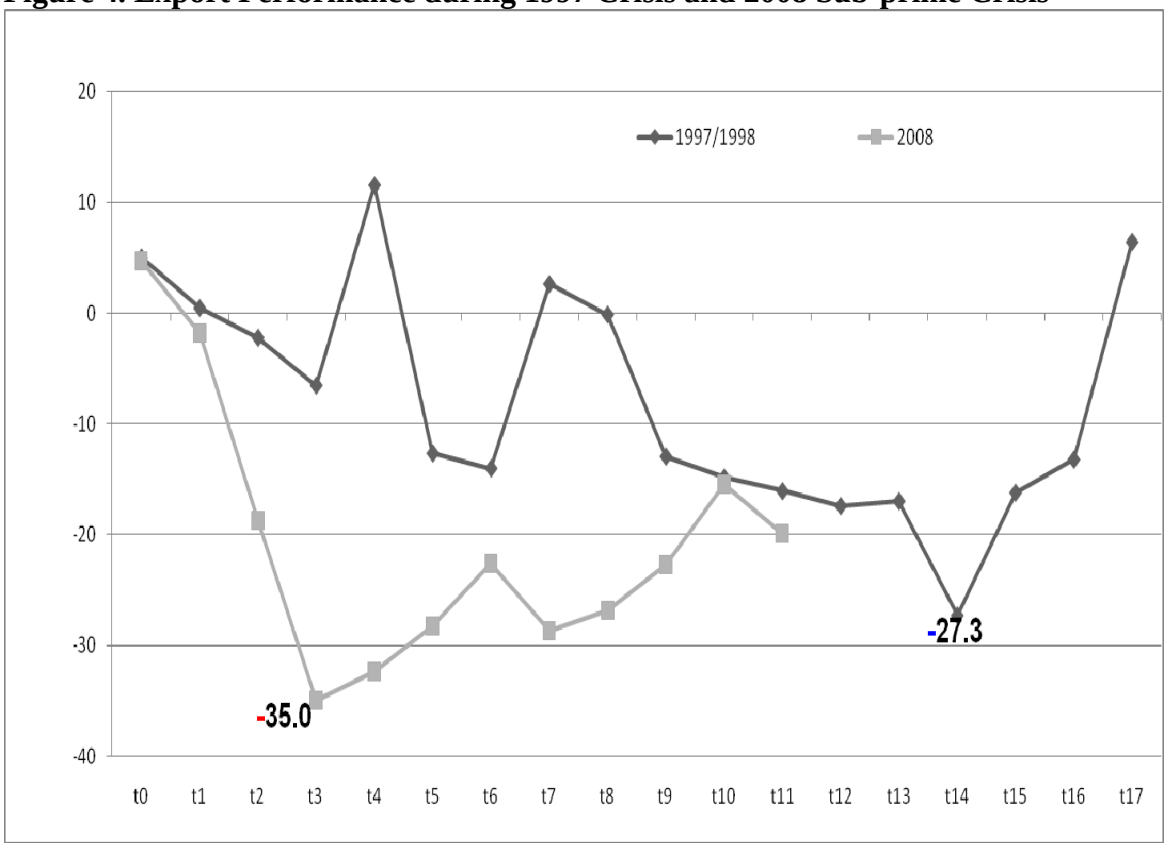
However, Indonesia's exports experienced a massive beating, despite the stable income (GDP) and price levels (inflation and exchange rate) (Table 2). The total export value contracted by around 35 percent year on year within three months after the initial decline in October 2008. The 1997/1998 crisis saw a more gradual meltdown of the export sector. It took about 14 months for the total export value to reach its nadir, reporting around 27 percent contraction year on year by the end of 1998. Similarly, the recovery process was much quicker during the AFC (Figure 4). What explained the severe collapse of the export in the recent crisis? Did export credit decline more sharply during the recent crisis vis-à-vis the 1997 AFC?

Table 2. The Tales of Two Crises

	The 1997 Financial Crisis	The Sub-prime Crisis
Total Exports	–27% (Quarter 3, 1997–Quarter 1, 1999)	–38% (Quarter 3, 2008–Quarter 1, 2009)
Manufacturing Exports	–34% (Quarter 2, 1997–Quarter 4, 1998)	–35.6% (Quarter 3, 2008–Quarter 1, 2009)
Mineral and Lubricant Products Exports	–31% (Quarter 2, 1997–Quarter 2, 1998)	–51% (Quarter 3, 2008 – Quarter 1, 2009)
Total Export Credit	–38% (Quarter 3, 1997–Quarter 3, 1998)	–22% (Quarter 3, 2008–Quarter 1, 2009)
Working Capital Credit	–43% (Quarter 3, 1997–Quarter 3, 1998)	–25% (Quarter 3, 2008–Quarter 1, 2009)
Investment Credit	–26% (Quarter 3, 1997–Quarter 3, 1998)	–20% (Quarter 2, 2008–Quarter 1, 2009)

Source: CEIC database, the database of Bank Indonesia.

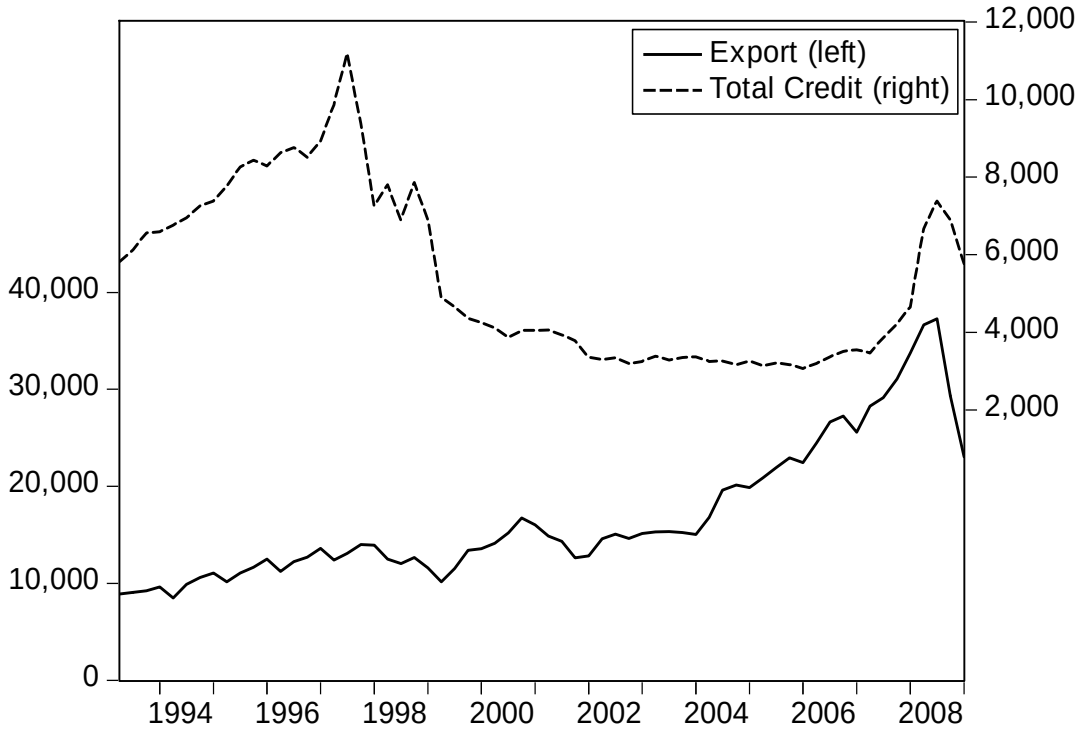
Figure 4. Export Performance during 1997 Crisis and 2008 Sub-prime Crisis



Note: a). 1997 Crisis: t0 = October 1997 and t17 = March 1999
b). 2008 Sub-prime crisis: t0 = October 2008 and t11= September 2009.
Source: CEIC database.

Figures 5 and 6 indicate that the collapse of export credit was much more severe during the 1997/1998 AFC. Although the government tried to calm panicked depositors by issuing a blanket guarantee on all banking sector assets and liabilities in February 1998, big social and political shocks in May 1998 led to a near collapse of the Indonesian banking sector. Less than two years after the start of the AFC in Indonesia in August 1997, around 64 banks were closed and a number of big banks, including state banks and large conglomerate-owned banks, were either taken over or bailed out and recapitalized.

Figure 5. Export and Export Credit of Indonesia (in million US$)

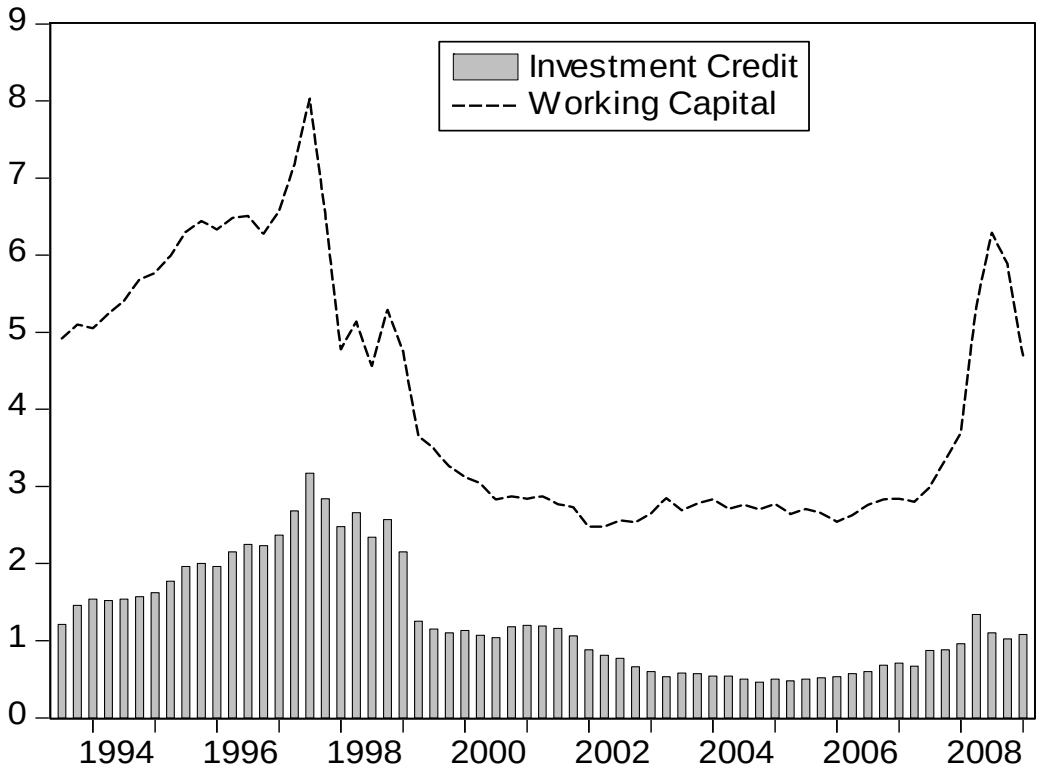


Source: Bank Indonesia.

This near collapse of the Indonesian banking sector in 1998 greatly compromised the availability of trade finance, and the collapse of many large conglomerates also reduced external trade activities (Brown and Magiera (2000)). Total export credit contracted as much as 38 percent at the third quarter of 1998 from one year ago. Both long-term and short-term financing declined sharply but short-term financing contracted more sharply,

by well above 40 percent for the same period. In general, the share of short financing (working capital) in the overall export credit averaged around 70 percent between 1997 and 1999.

Figure 6. Quarterly Decomposition of Export Credit (in billion, US$)



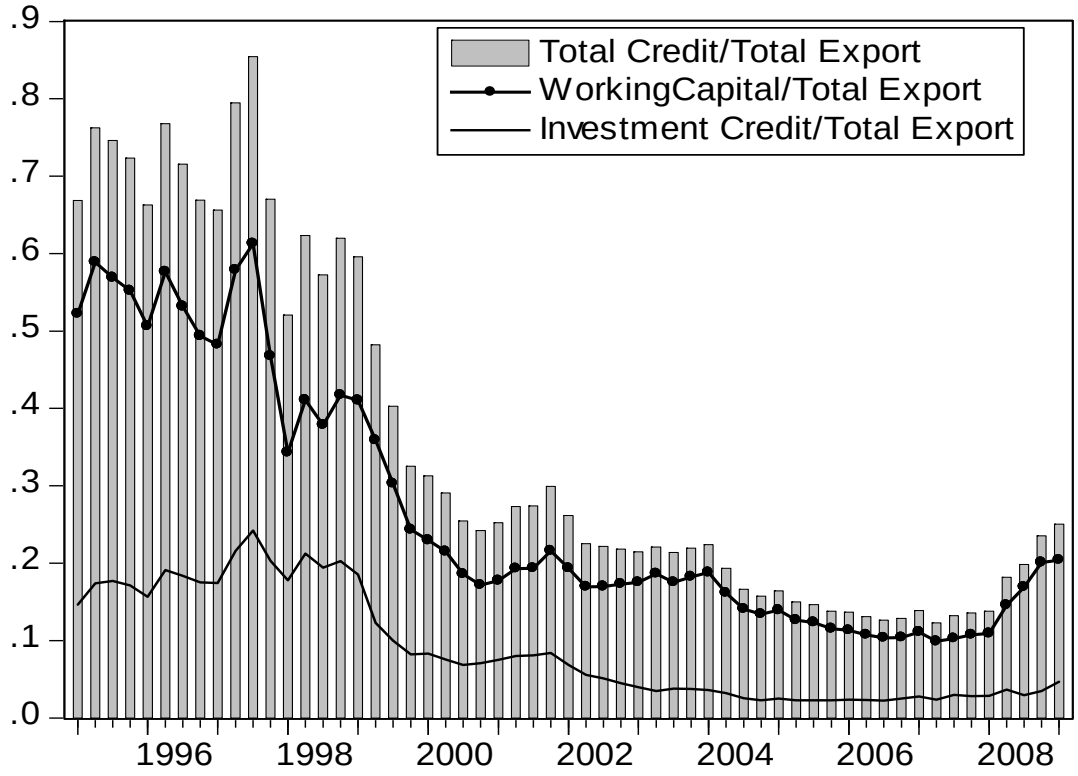
Source: Bank Indonesia

The declining trend of export credit may have stabilized by the third quarter of 1998, but the waning trend in fact continued until the first quarter of 2006. The new height of the export credit at around US$7.4 billion in the third quarter of 2008 remained well below its peak in 1997 of over US$11 billion in the third quarter of 1997. During the GFC, the export credit contracted by 22 percent, well below the sharp fall during the AFC. The tumble at its highest amounted to only slightly over US$1.5 billion between late 2008 to the first quarter of 2009, compared to about US$4.3 billion from the third quarter of 1997 to the third quarter of 1998. The decline has largely resulted from the tightening of

short-term financing. The share of working capital in overall export credit was about 80 percent from the last quarter of 2004 (Figure 6).

The above suggests that the role of export credit in explaining recent export slowdowns has weakened. Figure 7 reports the ratio of export credit and its breakdowns to total export. At its height in the third quarter of 1997, total export credit reached around 85 percent of the country's total exports. By the end of the second quarter of 2007, almost a decade later, total export credit amounted to only 12 percent of total exports. The Indonesian exporters appear to have become less and less dependent on export credit in recent years.

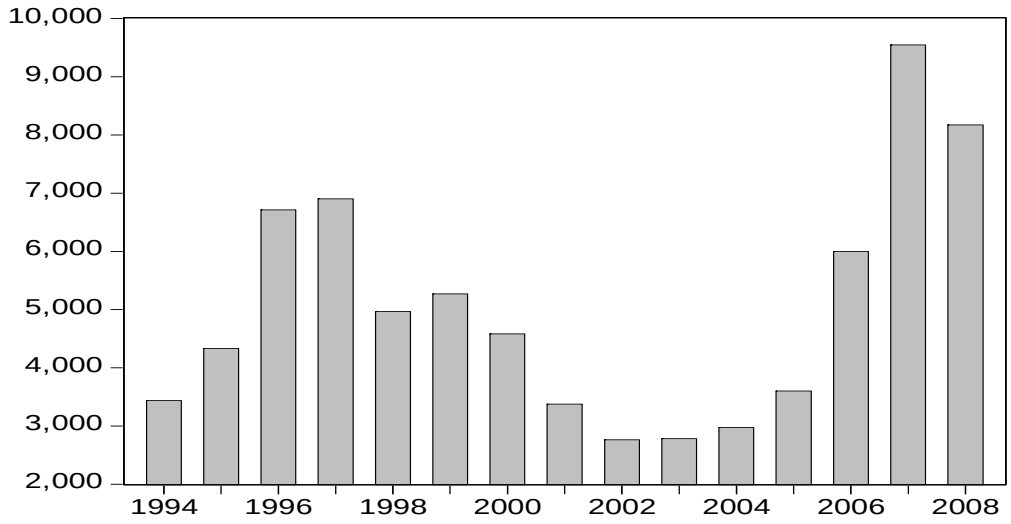
Figure 7. Ratio of Export Credit to Total Export



Source: Bank Indonesia and author's calculations.

It is interesting to note that there seems to be a strong correlation between the fluctuations of export credit and the flows of the international bank claims to Indonesia from US banks (Figures 5, 6 and 8).[3] Both of these flows dropped significantly during the 1997 AFC, followed by a mild increase in 1999 and a declining trend until 2002. The two flows finally showed a substantial upward trend in 2006. Siregar and Choy (2010) reported a similar trend for the total international claims of banks from seven OECD nations to Thailand and Indonesia. This evidence of co-movements between trade finance and international bank claims suggests that during the period of economic crisis, with bank lending drying up, including those from the international banks, the availability of trade finance should tighten as well in Indonesia.[4] Naturally, it is important to study further the direction of causality between these two flows, if any, before arriving at any firm conclusion.

Figure 8. Annual Lending to Indonesia from the US Banks (in millions of US dollars)



Source: The World Bank and the Bank for International Settlements' Databases.

[3] The total international claims of the US banks to Indonesia ranked among the top three during the period 1990–2004. Japanese banks and UK banks were the other two largest international lenders to Indonesia (Siregar and Choy (2010)).

[4] This possible relationship supports the argument extended by previous works, such as Dell'Ariccia et al. (2008), Borensztein and Panizza (2006) and Braun and Larrain (2005).

3. Empirics

3.1. Model Specification

There are two primary determinants of export demand (Dornbusch (1988); Hooper and Marquez (1993)). First is the foreign income variable that measures the economic activity and purchasing power of the trading partner country ("income effect"). Second is the relative price or the term of trade factor. Capturing the price effect in international trade, the terms of trade factor also implicitly captures the impacts of exchange rate fluctuations on export demand. As noted in above, another instrumental determinant of export performance is the availability of trade financing. Furthermore, economic crisis or downturn has also been argued to adversely affect export performance. Incorporating all of these possible determinant factors, we derive the following model specification of export demand function.

$$\Delta X_t = \alpha + \sum_i \beta_i \Delta X_{t-i} + \sum_i \delta_i \Delta TOT_{t-i} + \sum_i \theta_i \Delta GDPTP_{t-i} + \sum_i \eta_i \Delta TCR_{t-i} + \tag{1}$$

$$\sum_i \chi_i \Delta (DGDP * TCR)_{t-i} + e_t$$

where: (Δ) denotes growth rate from $(t-1)$ to (t); (X) is the export value in US dollars; (TOT) denotes the terms of trade, measured as the ratio of unit value of export over unit value of import; $(GDPTP)$ represents Indonesia's major trading partners' trade-weighted GDP (in US dollars); is the total export credit in US dollars; $\Delta(DGDP * TCR)$ represents the interactive variable of domestic GDP and export credit; and (e) is the error term and is assumed to have zero mean, constant variance and is not autocorrelated.

Theoretically, we expect $\left(\sum_i \delta_i\right)$ to be positive. A rise in the terms of trade (TOT) should have a positive impact on export growth. The inclusion of (TOT) allows us to capture the impact of price shocks in the global market, including exchange rates. Similarly, fluctuations in external demand would have consequences on export performance. To account for the external demand, $(GDPTP)$, the trade-weighted trading

partners' GDP, is included in the regression model (Equation 1). The rise in the purchasing power of trading partners, reflected by a positive growth of $(GDPTP)$, should lead to a higher demand for export products. Hence, $\left(\sum_i \theta_i\right)$ is expected to be positive. Recent works by Freund (2009) and Freund and Klapper (2009) have shown the importance of external demand shocks to be very significant.

Next, a sharp decline in trade credit (TCR) would likely have a number of adverse consequences and would therefore disrupt trade and growth performance (Wang and Tadesse (2005)). As discussed above, the availability of trade financing/credit should enable export producers to meet demand. The loss of liquidity in the trade sector may also force exporters (and importers) to obtain spot foreign exchange to make necessary payments, thereby increasing demand in foreign exchange and possibly creating delays in payment. Furthermore, exports may have high import content in some countries. In these cases, a collapse in import financing could end up adversely affecting exports. Hence, $\left(\sum_i \eta_i\right)$ is expected to be positive.

Finally, the impact of trade financing shortage during a financial crisis on export performance would likely be more severe. As discussed, studies such as Braun and Larrain (2005) have demonstrated that during recessions the performance of an industry is heavily influenced by its dependence on the availability of financing. Moreover, deeper crises (higher GDP loss) often trigger further tightening of credit, including trade credit, and in turn have much more severe adverse consequences on trade sectors.

To test the role of trade financing during the crisis on export performance, we introduce an interactive variable between the growth rates of domestic GDP and total trade credit $\Delta(DGDP * TCR)$. The growth rate of domestic GDP $(DGDP)$ captures the boom and bust of the local economy. For this study in particular, the GDP growth captures the deepness of the economic slowdown/crisis. In addition, this series is adopted instead of the frequently applied crisis dummy, to allow for a continuous time series. During the

period of economic crisis, macroeconomic volatility sharpens and causes severe restrictions to firms' access to external finance, especially from the banking sector (Braun and Lerrain (2005)). This situation in turn raises the demand for trade finance, and thus enhances the role of trade finance in explaining export performance (Nielsen (2002)).

The adoption of this interactive variable has been reported in many studies, including recent ones such as Dell'Ariccia et al. (2008) and Iacovone and Zavacka (2009). Finding a positive $\left(\sum_i \chi_i\right)$ would suggest that during a crisis or economic slowdown, the adverse impact of trade credit on the export sector would be more significant. Hence, this variable confirms the existence of the trade credit channel operating during the economic crisis. The case of Brazil in 2002 demonstrates further that the initial impact of a drop in trade credit on export performance created further selling pressure on the local currency. In turn, it worsened external debt payment and increased country risk, leading to further cut backs in all funding, including trade financing (Mori (2005)). Hence, $\left(\sum_i \chi_i\right)$ is expected to be positive.

To deepen the analysis and to further contribute to the literature in this area, I decompose the export credit into two key components, working capital $\left(TCR^{WK}\right)$ and investment capital $\left(TCR^{INV}\right)$, and test the following working model:

$$\Delta X_t = \alpha + \sum_i \beta_i \Delta X_{t-i} + \sum_i \delta_i \Delta TOT_{t-i} + \sum_i \theta_i \Delta GDPTP_{t-i} + \sum_i \lambda_i \Delta TCR_{t-i}^{WK} + \sum_i \gamma_i \Delta TCR_{t-i}^{INV} + \sum_i \chi_i \Delta\left(DGDP^{*}TCR\right)_{t-i} + e_t \quad (2)$$

The objective here is to further examine which particular kind of export credit that Indonesian exporters have been relying on more for delivering their final products. In their papers, Fisman and Love (2003) and Iacovone and Zavacka (2009) claim that long-term financing, i.e. investment credit, hurts export performance during a crisis. The latter study looks at panel data of around 23 banking crisis episodes between 1980 and 2000

across 21 developed and developing countries, including Indonesia. To my knowledge, however, no empirical study has looked into this issue on the individual case of Indonesia.

Next, I further extend previous research by testing the contribution of investment and working capital export credits in the overall performance of two major groups of Indonesian exports, manufacturing exports $\left(X^{MAN}\right)$ and the export of minerals and lubricant products $\left(X^{MIN}\right)$. Since the terms of trade for manufacturing and for mineral and lubricant product exports are not available, I exclude the $\left(TOT\right)$ variable from the following modified export demand model:

$$\Delta X_t^{MAN/MIN} = \alpha + \sum_i \beta_i \Delta X_{t-i} + \sum_i \theta_i \Delta GDPTP_{t-i} + \sum_i \lambda_i \Delta TCR_{t-i}^{WK} + \sum_i \gamma_i \Delta TCR_{t-i}^{INV} + \qquad (3)$$

$$\sum_i \chi_i \Delta\left(DGDP^{*}TCR\right)_{t-i} + e_t$$

Note for both working models (2) and (3), the interactive variable, $\Delta\left(DGDP*TCR\right)$, is included to capture potential impacts of crisis on exports and potential structural break in the regressions.

3.2. Data and Empirical Testing

3.2.1. Data

In general, the raw data series are sourced from the CEIC database and the IMF-IFS, unless otherwise noted. The observation set included in the empirical testing covers the period from the last quarter of 1993 to the second quarter of 2009. This period is dictated by the availability of export credit data $\left(TCR\right)$, which is sourced from the Bank Indonesia database. The total export series $\left(X\right)$, the manufacturing export $\left(X^{MAN}\right)$ and the mineral and lubricant export $\left(X^{MIN}\right)$ are in US dollars and were all obtained from the CEIC database. The terms of trade series $\left(TOT\right)$ is calculated as the ratio of unit value of export over unit value of import. The real trading partners' GDP $\left(GDPTP\right)$ is the trade-

weighted combination of the GDPs of the top three major export destination countries of Indonesia. The $(GDPTP)$ variable is computed by the following standard formula:

$$GDPTP = \omega_1 GDPTP_1 + \omega_2 GDPTP_2 + \omega_3 GDPTP_3 \quad (4)$$

$$\omega_1 = \frac{X_1}{(X_1 + X_2 + X_3)} \quad (5)$$

$$\omega_2 = \frac{X_2}{(X_1 + X_2 + X_3)} \quad (6)$$

$$\omega_3 = \frac{X_3}{(X_1 + X_2 + X_3)} \quad (7)$$

where: $(GDPTP_1)$, $(GDPTP_2)$ and $(GDPTP_3)$ are the GDPs for trading partner countries #1, #2 and #3, respectively. Accordingly, $(\omega_1, \omega_2, \omega_3)$ are the trade weights for trading partners #1, #2 and #3, respectively. Lastly, (X_1), (X_2) and (X_3) are the exports of Indonesia to country #1, #2 and #3, individually. The first two major export destinations during the sample period are the United States of America and Japan. The People's Republic of China has emerged as a key trading partner for Indonesia.[5] However, we do not have a complete set of quarterly GDP data for China. Instead, Korea is listed as Indonesia's third major trading partner.

The variable $\Delta(DGDP * TCR)$ is computed as the first difference of the product of the quarterly domestic GDP $(DGDP)$ and the quarterly trade credit (TCR). All variables in the regression equations (1)–(3) are log-normalized.

[5] For most of the Southeast Asian nations, including Indonesia, Singapore has also been a key trading partner and a primary export destination. However, exports to Singapore from Indonesia are largely going to be re-exported Hence, Singapore is not the final main destination of the export goods from Indonesia, thus I do not include Singapore.

3.2.2. Empirical testing

In this study, I employ the frequently applied Autoregressive Distributed Lag (ARDL) testing with the general-to-specific approach (Hendry, 1974).[6] The ARDL testing includes lags up to four quarters.[7] The combination of ARDL and the general-to-specific approach allows us to start from the general model by including all key explanatory variables and their time lags supported by various theoretical frameworks. The general-to-specific procedure is then adopted to reduce the complexity of the model by eliminating the statistically insignificant variables. This process should ensure the consistency of the final reduced model. The final outcomes of the ARDL and general-to-specific should enable us to capture not only the significant determinants and eliminate the insignificant ones, but also to arrive at the number of lags/periods needed for the impacts of changes in the explanatory variables on the dependent variable.

Before conducting the ARDL testing, I test the unit root properties for each of the variables in equations (1)–(3). To anticipate the possible presence of structural breaks, I employ Banerjee et al. (1992) (henceforth BLS) in addition to standard unit root tests, i.e. the ADF test, the Phillip Perron test and the KPSS test.[8] Depending on the unit root properties of the series, I then test for the possible cointegration relationship among the variables at their levels. If a cointegrating relationship is found, then the error correction component series (ECM_{t-1}) will be included in the ARDL testing.

A battery of test statistics will be reported to ensure that the coefficient estimates are valid and robust. In addition to the standard F-statistics to confirm the significance of one or more explanatory variables, I also report the Breusch–Godfrey serial correlation

[6] The application of the ARDL approach with the general-to-specific approach is common. Recent studies applying the ARDL framework include Siregar and Goo (2010), Campa and Goldberg (2002) and Gagnon and Ihrig (2004).

[7] Pesaran and Shin (1999) suggested up to two lags for annual data. Since I work with quarterly data, I expanded the lags up to four.

[8] The BLS provides a more in-depth investigation of the possibility that the aggregate economic time series can be characterized as being stationary around 'a single or multiple structural breaks'. It extends the Dickey–Fuller *t*-test by the construction of the time series of rolling computed estimators and their t-statistics. Following the BLS procedure, I compute the smallest (minimal) and the largest Dickey–Fuller *t*-statistics.

LM-test statistics to verify that autocorrelations in the residuals are not a problem in any of the regressions.

4. Key Results and Lessons Learned

Based on our set of unit root tests, all relevant series included in equations (1)–(3) are found to be non-stationary and integrated of order 1 at their level ---I(1) series.[9] Hence, we cannot rule out the presence of a cointegrating relationship among the variables presented in Equation (1) for all three countries' cases. The standard Johansen cointegrating test is carried out. Based on the trace statistics, no robust cointegrating relationship is found at the 5% level of significance. The number of lags included in the cointegrating for each country case is determined by the Akaike Information Criterion (AIC).[10]

The overall ARDL test results are reported in Tables 3–6. The adjusted R^2 values suggest that the explanatory variables can clarify around 18 to 69 percent of the quarterly changes in the export values of Indonesia. The F-statistics confirm that one or more of the independent variables are non-zero. In addition, the Breusch–Godfrey serial correlation LM test statistics confirm that no autocorrelation in the residuals is found in any of the three regressions. In general, the coefficient estimates of the explanatory factors are theoretically consistent. Next, we return to the set of policy-relevant issues motivating this study.

Has the Indonesian export sector been dependent on export credit during the past two decades? In particular, did export financing contribute to the boom and bust of the two

[9] For the sake of brevity the test results of the unit root testing are not reported, but they can be made available upon request.

[10] Based on the AIC, each of the cointegrating tests includes around two to three quarter lags. No robust cointegrating relationship is reported at the 5% significance level from any of the three countries' test results. A weak cointegrating result is found at the 10% level for total export demand (Equation 1). I consider this a weak case because the relationship exists only when we consider lags beyond four quarters. For the sake of completeness, I include the error correction component into the regression equations. However, I do not find the error correction component to be significant in all regressions.

major export groups in the country, the manufacturing and mineral exports? The evidence is robust that export credit has indeed contributed significantly to the export performance of Indonesia during most of the last two decades. However, the test results also suggest that the size of the contribution of export credit to the boom and bust of the country's exports has been modest. The sum of the total export credit coefficient for total exports $\left(\sum_i \eta_i\right)$ is reported at (0.04) or equal to (0.744+(–0.875)–0.172) (Table 3). That is, a one percent increase in export credit would only translate into an increase in exports of less than 0.04 percent. It is worth noting too that the impacts of changes in trade credit on the performance of exports in Indonesia was felt immediately within the same quarter (t) and lasted up to four quarters $(t-4)$.

Table 3. Total Export Credit on Total Export
Dependent Variable: (ΔX)

Variable	Coefficient	Std. Error	t-statistics
(ΔTOT_t)	0.713	0.341	2.091**
(ΔTCR_t)	0.744	0.132	5.633***
(ΔTCR_{t-1})	–0.875	0.149	–5.876***
(ΔTCR_{t-4})	0.172	0.077	2.220**
$(\Delta GDPTP_{t-2})$	0.960	0.365	2.633**
$\Delta(DGDP^*TCR)_{t-1}$	–1.784	0.494	–3.612***
(α)	0.021	0.009	2.369**
Adjusted R-squared: 0.443		Prob (LM-test): 0.409	
F-statistics: 8.677		Prob (F-statistics): 0.000	

Note: * significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Author's own calculation

Furthermore, *was working capital more critical than investment capital in explaining the performance of the country's exports?* When we decompose the export credit into working capital and investment capital, the robust results suggest that Indonesian exporters depend more predominantly on working capital. The importance of working capital is highlighted by the immediate impact (within the same quarter) that it has on

exports and the persistence of the impact (lasting up to four quarters). None of the regressions has in fact shown any significant role of investment credit (Tables 4–6). This finding contradicts the results posted by Fishman and Love (2003) and Iacovone and Zavacka (2009), where they find the importance of long-term financing (i.e. investment credit), but not working capital.

Consistent outcomes with the case of total exports are reported when we consider two major groups of Indonesian exports, namely manufacturing and mineral fuels and lubricants. Exporters of both export groups have been significantly dependent only on working capital. As reported for the case of total credit, the role of working capital has been modest. The sums of the coefficients for working capital $\left(\sum_i \lambda_i\right)$ are only (0.10) for the case of manufacturing exports (Table 5) and (0.05) for the case of mineral and lubricant exports (Table 6). As far as the timing, however, trade credit fluctuation has more immediate and short-term impacts on the growth rate of mineral and lubricant exports than on that of manufacturing exports.

Table 4. Working and Investment Export Credit on Total Export
Dependent Variable: (ΔX)

Variable	Coefficient	Std. Error	t-statistics
(ΔX_{t-1})	0.293	0.053	5.571***
(ΔTCR_t^{WK})	0.457	0.091	5.042***
(ΔTCR_{t-1}^{WK})	–0.278	0.139	–1.990*
(ΔTCR_{t-2}^{WK})	–0.299	0.135	–2.212**
(ΔTCR_{t-4}^{WK})	0.216	0.101	2.132**
(ΔTOT_t)	0.688	0.210	3.259***
(ΔTOT_{t-3})	0.469	0.251	1.871*
(ΔTOT_{t-4})	–0.489	0.271	–1.809*
$(\Delta GDPTP_t)$	–0.405	0.210	–1.926*
$(\Delta GDPTP_{t-3})$	0.619	0.226	2.738***
$\Delta(DGDP^*TCR)_t$	1.489	0.364	4.083***
$\Delta(DGDP^*TCR)_{t-2}$	–1.456	0.436	–3.343***
$\Delta(DGDP^*TCR)_{t-3}$	1.208	0.415	2.907***
(α)	0.021	0.005	3.963***
Adjusted R-squared: 0.689		Prob (LM-test): 0.601	
F-statistics: 10.572		Prob (F-Statistics): 0.000	

Note: * significant at 10%; ** significant at 5%; and *** significant at 1%.
Source: Author's own calculation

Next, did the economic and financial crisis amplify the role of export credit in sustaining exports? With the exception of the case of mineral exports, the remaining test results robustly concluded that indeed economic downturn or crisis amplified the dependence of Indonesian exporters on export credit. This result confirms the claim that during economic slowdown, tightening of liquidity in the economy will also affect the trade sector.

Table 5. Working and Investment Export Credit on Manufacturing Export
Dependent Variable: $\left(\Delta X^{MAN}\right)$

Variable	Coefficient	Std. Error	t-statistics
$\left(\Delta TCR_{t-2}^{WK}\right)$	–0.514	0.194	–2.654***
$\left(\Delta TCR_{t-3}^{WK}\right)$	0.613	0.193	3.182***
$\left(\Delta GDPTP_{t-1}\right)$	–1.041	0.431	–2.416**
$\left(\Delta GDPTP_{t-2}\right)$	1.579	0.452	3.490***
$\Delta\left(DGDP^{*}TCR\right)_{t-4}$	1.017	0.543	1.872*
$\left(\alpha\right)$	0.0009	0.017	0.052
Adjusted R-squared: 0. 341		Prob (LM-test): 0.110	
F-statistics: 6.991		Prob (F-Statistics): 0.000	

Note: * significant at 10%; ** significant at 5%; and *** significant at 1%.
Source: Author's own calculation

In addition to the above findings, our test results confirm the importance of two primary determinants of export demand, namely income and price factors. The total sum of the coefficient estimates for trading partner income variable $\left(GDPTP\right)$, as captured by $\left(\sum_i \theta_i\right)$, however, ranges from (0.538) for manufacturing exports, $\left(\sum_i \theta_i\right)$ to (0.641) for mineral and lubricant exports. The results may fail to capture the true coefficient estimates for income factor $\left(GDPTP\right)$ as the selection of three trading partners, namely the US, Japan and Korea, was based on the individual shares of total Indonesian exports to those three countries. It is possible that these three countries are not among the top three destinations of Indonesian manufacturing exports. Regrettably, we do not have detailed breakdowns by country of destination of Indonesia's manufacturing exports and mineral and lubricant exports to select more appropriately the top three partners and calculate their individual weights for each group of exports.

Given the importance of the export of commodities and raw materials in the overall export sector of Indonesia, the terms of trade should play a crucial role in explaining the demand for Indonesian exports. As discussed above, we do not have the individual terms-of-trade series for the manufacturing and mineral export groups. Hence, I could

not examine the importance of the price factor for those two major groups of exports. The limitation with the data may have contributed to the relatively low levels of adjusted R-square for the individual groups of exports (Tables 5 and 6).

Table 6. Working and Investment Export Credit on Mineral & Lubricant Export
Dependent Variable: $\left(\Delta X^{MIN}\right)$

Variable	Coefficient	Std. Error	t-statistics
$\left(\Delta X_{t-2}^{MIN}\right)$	–0.393	0.140	–2.801***
$\left(\Delta TCR_{t}^{WK}\right)$	0.313	0.102	3.065***
$\left(\Delta TCR_{t-1}^{WK}\right)$	–0.262	0.110	–2.373**
$\left(\Delta GDPTP_{t-2}\right)$	0.641	0.379	1.686*
$\left(\alpha\right)$	0.026	0.015	1.758*
Adjusted R-squared: 0. 175		Prob (LM-test): 0.167	
F-statistics: 4.283		Prob (F-Statistics): 0.004	

Note: * significant at 10%; ** significant at 5%; and *** significant at 1%.
Source: Author's own calculation

5. Policy Response[11]

Two policy approaches are often implemented in Indonesia to support the export sectors during economic downturns. The first set pays particular attention to ensuring the availability of trade financing. The second set of policies concentrates on areas that enhance the competitiveness of the sector. Given its relevance, I begin by reviewing policy efforts to ensure the adequacy of export financing.

To provide post-shipment guarantees and to reduce the liquidity risks of exporters, commercial banks were allowed to sell (re-discount) export receivables (drafts) to Bank Indonesia, starting in December 2008. Furthermore, to increase on-shore supply of US dollars and to protect against risk of counter-party default, in January 2009 the Indonesian government issued a regulation on mandatory use of a Letter of Credit (L/C) for export payment for certain products (i.e. coffee, CPO, cocoa, rubber, mining

[11] This section greatly benefits from the valuable contribution of Anton H. Gunawan of Bank Danamon, Indonesia.

products and tin), stipulating that this payment was to be done through on-shore foreign exchange bank.

The effectiveness of these two policies has been somewhat limited. Until late 2009, only a few banks participated and sold their export receivables to Bank Indonesia. Similarly, the implementation of the L/C policy has been postponed three times because it was rejected by the exporters of those commodities. The latest schedule of implementation is expected to be in July 2010. It is unlikely that it will result in a significant rise in the L/C payment. Data from the Bank Indonesia has in fact demonstrated that there has been a decline in the use of L/C as an export payment since the first half of 2008 (Table 7).

In addition, Lembaga Pembiayaan Ekspor Indonesia (LPEI) was legally established in January 2009 to replace the state-owned Bank Ekspor Indonesia (BEI), which was established in September 1999 to provide financing and co-financing, and to guarantee facilities for international trading activities. The BEI, operating as a state bank, was ineffective in giving out loans since, like any other commercial bank, it relied on mostly short-term deposits to fund lending. Hence, during economic downturns the institution faced significant tightening of its third party liabilities (deposits).

The LPEI, which will operate under the name Indonesia Eximbank, was initially expected to open its office in July 2009, but was delayed until September 2009. Despite its name, the LPEI is not a commercial bank, thus cannot take third-party deposits. It is a state agency with government backing to provide financing, insurance, guarantees and consultancy services to exporters. Its authorized capital of at least Rp4 trillion is in the form of government equity participation. The government may add another Rp2 trillion equity participation in the first half of 2010. This additional capital can be used as a guarantee for as much as six to 10 times additional business credit extension, estimated around Rp12 to 20 trillions. This is possible, since besides extending credit directly and export insurance, the LPEI is also allowed to give credit guarantees.

Table 7. Types of Export Payments (in millions of USD)

Types	2000	2001	2002	2003	2004	2005	2006	2007	Jan-08	Feb-08	Mar-08	Apr-08	May-08
1. Letter or Credit	13,294	11,329	10,791	9,976	10,082	10,787	12,498	12,868	1,028	1,031	1,092	1,033	1,153
2. Others	35,189	31,908	34,130	36,582	44,222	55,223	67,594	79,731	7,876	7,237	7,934	7,477	8,362

Source: Bank Indonesia

If warranted, the LPEI may raise capital by issuing bonds or borrowing from international multilateral or bilateral agencies. In October 2009, the LPEI received almost Rp1 trillion (or slightly above US$100 million) in a trade-financing loan from the Japanese government through the Japan Bank for International Cooperation (JBIC), with an interest rate of LIBOR plus 230bps, maturing in five years, and a grace period of two years. JBIC has committed to extend up to US$500 million of loans to LPEI to support its business credit growth plan. In 2009, the LPEI was expected to give trade financing of as much as US$1.35 billion, roughly around 17% of the total national commercial banks' capability. The LPEI has also set a target of trade-related loan growth at 60 percent in year 2010, which is much higher than the overall banking sector loan growth target of 17–20% set by Bank Indonesia.

The injection of capital to the LPEI was part of a series of major fiscal stimulus packages initiated in 2008–2009 (Gunawan and Siregar (2009)). Given the important role of short-term export financing, namely working capital, liquidity provision from fiscal stimulus for export activities has ibeen an appropriate strategy to bridge much-needed temporary financing constraints facing exporters. However, due to limited data and information available, further studies are warranted to examine the overall effectiveness of Indonesia Eximbank.

As indicated above, another set of policy efforts has concentrated on enhancing the competitiveness of the export sector during the global financial slowdown. One particular policy adjustment targeted a key commodity export, namely crude palm oil (CPO). Seeking to raise domestic supplies of CPO-based cooking oil, the government imposed a high exports tax on CPO when the price of CPO skyrocketed between late 2007 and the first half of 2008. However, starting in the third quarter of 2008, the CPO price experienced a sudden and sharp decline. To support the industry the government eliminated (or reduced to zero) the exports tax on CPO in November 2008.

Furthermore, the government launched a one-stop service for processing import and export documents/procedures at a number of key ports around Indonesia. Coordinated with 25 government agencies, it is known as the National and ASEAN New Single

Windows (NSW). The pilot project was completed in 2007 in Batam, followed by a similar undertaking at Tanjung Priok port in Jakarta in 2008. This development involves standardizing documents/business processes for flows of documents, and integrating port clearance procedures for flows of goods. The final target is to have on-line application, processing and electronic manifests. The government has also been trying to establish a new registration system as part of its NSW program, leading to a better database system that will benefit the business community. The new system is expected to shorten the registration process to within a seven-day period. By late 2009 the new registration system has approved around 75 percent of traded commodities.

6. Brief Concluding Remarks

Despite an overall much stronger economic outlook during the recent global financial crisis, Indonesia's export sector suffered a more severe decline than during the 1997 Asian financial crisis. This study evaluates the role of export credit in explaining the performance of the export sector in Indonesia. I am particularly concerned with the role of this financing facility during the economic downturns. The test results found robust evidence that export credit contributed to the boom and bust of the export sector in Indonesia. However, the results also suggest that the size of the contribution is modest at the most. The significance of export credit has indeed magnified during the crisis. Furthermore, it is short-term financing, not investment capital, which has been detrimental to the performance of the export sector in Indonesia. Similar conclusions are reported when I examined the two largest export groups in the country.

Two traditional determinants of export demand remain the most significant contributing factors, namely income and price factors. The slump of the economies of the major trading partners weakened demand for Indonesia's exports. Finally, the country's exports have been highly sensitive to the uncertainties and volatilities in the price of major commodities in the world market.

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Chapter 10

Bank Efficiency, Regulation and Response to Crisis of Financial Institutions in Selected Asian Countries[1]

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Abstract

This paper studies the determinants of efficiency of banks in the Southeast Asian countries of Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam. The study, which covers nearly 600 banks from 1994 to 2008, adopts the two-stage least square fixed-effects (FE2SLS) and two-stage least square random-effects estimators (RE2SLS) as provided by Baltagi (2001) to address individual bank heterogeneity and endogeneity issues related to bank efficiency. It focuses on three key areas: (1) bank-specific activities such as off-balance sheet activities of banks, (2) financial liberalization through foreign participation and ownership, and (3) impact of bank regulation and supervision. The results of the paper indicate that off-balance sheet activities tend to reduce bank efficiency. The foreign participation and ownership in the financial markets tend to increase bank efficiency. Bank regulation in restricting activities on non-interest income and authority of official supervision tends to improve bank efficiency. Bank supervision through the intensity of private monitoring of the

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financial markets tends to reduce bank efficiency. The results of the paper indicate that bank regulation and supervision will be crucial to improve the efficiency of the banks and stability in the financial markets in the Southeast Asia.

Keywords**:** banking efficiency, regulation, supervision, off-balance sheet

JEL Classifications: G18, G21, G28

1. Introduction

With the pace of financial market liberalization, financial institutions are facing increasing competition and greater volatility from external shocks. In such an environment, efficient banks and financial institutions will have greater competitive advantage. Banking efficiency is also important to maintain the stability of the financial markets (Berger et al., 1993; Schaeck et al., 2009. Efficient banks are, in addition, better able to diversify their activities and channel funds effectively to economically viable activities in the economy, thereby providing greater stability for the economy.

A competitive environment is a spur to efficiency but it may also increase risk-taking activities as banks are forced to adopt non-traditional banking activities to maintain their share in the financial markets (Edwards and Mishkin, 1993). The regulatory concern is that competition in the financial market could lead to excessive risk-taking behaviour leading to instability in the financial markets. The 2007 global crisis provides examples of excessive off-balance sheet activities of banks. The traditional banking model was replaced by the "originate and distribute" banking model where loans are pooled, tranched and then resold via securitization (Brunnermeier, 2009). Financial innovation that had supposedly made the banking system more stable by transferring risk to those most able to bear it had an unprecedented credit expansion. To offload the risk, banks repackaged the loans and passed them on to other financial investors through structured products often referred to as collateralized debt obligations (CDOs). Financial market regulation plays an important role in maintaining a balance between competition and risk-taking activities in the financial sector, but in the process it may affect the efficiency of the financial institutions.

The determinants of efficiency of banks in the Southeast Asian countries of Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam are discussed in this paper, which covers nearly 600 banks from 1994 to 2008. The study is expected to help improve the institutional, regulatory and supervisory framework of financial institutions in the region by identifying factors that could contribute to their efficiency.

There are four key aspects of the paper. First, it studies the impact of financial market

regulation on bank efficiency. One of the objectives of bank regulation is to manage competition and risk-taking activities in the financial sector. In this case, bank regulation tends to retard competition and innovative activities of financial institutions, thereby affecting the efficiency of financial institutions. Recent studies highlight the positive impact of regulation on banking activities in terms of increased market monitoring and a better-quality contracting environment, which has a positive impact on bank efficiency (Gonzales, 2009). In this paper, we study the impact of bank regulation and supervision on bank efficiency in terms of the regulation of the activities that generate non-interest income, the intensity of monitoring of banks by private sector organizations, and the extent of official supervision by the central bank. To our knowledge, this is the first paper to address the impact of bank regulation and supervision on bank efficiency for Southeast Asian banks.

The paper also studies the impact of financial market liberalization, in terms of opening up the financial sector to foreign participation and foreign ownership, on the efficiency of financial institutions. Foreign banks are generally restricted in entry and operations in Asia, and the penetration of foreign banks in Asia is much lower than in Central Europe and Latin America (Montgomery, 2003). Foreign banks in Asia are restricted in commercial lending activities and limited to a few branches in comparison to the local banks. For example, in Indonesia, foreign banks are restricted geographically in lending activities in the Jakarta region and in taking time deposits. In most Asian countries, foreign banks are restricted in access to the Central Bank discount window and to subsidized trade credit facilities. In Korea, foreign banks are allowed to operate only restricted branches within the city area, thereby restricting their access to local currency deposits; and the total amount of deposit they can accept is also restricted (Montgomery, 2003).

The impact of financial market liberalization is an important talking point following the experience of the Asian Crisis in 1997. Following the Crisis, Singapore liberalized its financial sector by increasing the foreign ownership and participation of foreign banks in the domestic economy. In contrast, Malaysia adopted capital controls that limited the flow of capital and also the role of foreign participation in the financial and domestic

markets. Malaysian policies are argued by some to have led in the short run to a faster economic recovery, smaller decline in unemployment and wages, and a more rapid turnaround of the stock market (Kaplan and Rodrik, 2001). However, there is no clear evidence of the impact of capital controls in the long run on bank efficiency. An understanding of the impact of foreign participation on the productive performance of banks in the long term is valuable. A recent study by Kose et al. (2009) also shows that financial openness has a robust positive impact on TFP growth in the domestic economy. A study by Xu (2010) provides strong empirical evidence that foreign entry led to a more competitive and efficient banking industry in China. However, Obstfeld (2009) says that there is little evidence of a direct positive impact of financial openness on the economic welfare of developing countries. The paper studies the impact of foreign ownership and participation in the financial markets on individual bank efficiency.

Our study further examines the impact of the off-balance sheet activities of banks on their efficiency. Increasingly, banks are using off-balance sheet activities in pursuit of higher profits and to satisfy the increase in demand for non-banking products by customers. These off-balance sheet activities could be associated with excessive risk taking, which subsequently affects efficiency. There is little research that examines financial innovation in terms of the off-balance sheet activities of Southeast Asian banks and this study fills this gap. This is particularly relevant in the context of the experience of the global financial crisis.

Finally, this work contributes to the understanding of the risk of the misallocation of funds by banks arising from the moral hazard issues associated with state influence and guarantees (Radelet and Sachs, 1998). We used a bank's equity-to-asset ratios and its corporate linkages, via its own ownership structure or its links to subsidiaries, to capture the impact of the related moral hazard issues on productive performance.

The chapter is organized as follows. Section 2 discusses the methodology, and the construction of the data is presented in Section 3. The results are presented in Section 4 and the conclusion in Section 5.

2. Empirical Methodology

The paper adopts panel data framework to study the determinants of bank efficiency. The regression equation is given as:

$$\text{Bank-Efficient}_{it} = \alpha_0+\alpha_1\text{Fin}_{it}+\alpha_2\text{Reg}_{it}+\alpha_3\text{Types}_{it}+\mu_i+\theta_t+\varepsilon_{it} \quad (1)$$

where *Bank-Efficient*$_{it}$ is the bank efficiency measure of bank *i* in year *t*; *Fin*$_{it}$ is the set of specific characteristics of Bank *i* in year *t*; *Reg*$_{it}$ is the set of bank regulatory and supervision variables; *Types*$_{it}$ captures the bank types; θ_t are dummies to capture any unobserved bank-invariant time effects not included in the regression; μ_i are unobservable bank-specific effects that vary across the banks but are constant over time; and ε_{it} are white-noise error terms.

We adopt fixed-effects and random-effects to estimate Equation (1). It is very likely that there are endogeneity problems in Equation (1) in terms of reverse causation, whereby bank regulation and supervision might be responding to the efficiencies of the bank. Thus, failure to account for the simultaneity problems might lead to biased estimation and coefficients.[2] To address this problem we adopt the two-stage least square fixed-effects (FE2SLS) and two-stage least square random-effects estimators (RE2SLS) as provided by Baltagi (2001). Both FE2SLS and RE2SLS are expected to control for the presence of unobservable bank-specific effects and potential endogeneity of bank efficiency.

3. Data and Construction of Variables

3.1. Data

The main bank level data for the study is obtained from BankScope Database. Bank-level information to estimate bank efficiency is taken from BankScope Database. All data used are expressed in 1996 US dollar terms and consolidated bank balance

[2] The FE2SLS and RE2LS estimations are expected to correct for the key endogeniety problems in the estimation such as those related to bank regulation and supervision and also any endogeniety effects from the TE-TA ratio.

sheet and income statement data will be used whenever available. The construction of regulatory and supervisory variables is based on Barth, Caprio, and Levine (2004, 2006) and the World Bank's Bank Regulation and Supervision Database. The full description of the data is given in Table A1 in the Appendix.

3.2. Variables

3.2.1. Bank efficiency measure

To measure bank efficiency, we adopted the DEA (data envelopment analysis) analysis. This framework has been extensively used to study the efficiency of financial institutions as in Casu et.al (2004), Gonzales (2009), Isik and Kabir (2003), Leightner and Lovell (1998), Strum and Williams (2004) and Wheelock and Wilson (1999).[3] A recent paper by Gonzales (2009) used DEA to measure the bank efficiency of commercial banks in 69 countries to study the impact of political economy variables on bank efficiency. Isik and Kabir (2003) utilized DEA analysis to examine productivity growth and technical progress in Turkish commercial banks during the deregulation of financial markets in Turkey. Strum and Williams (2004) adopted the DEA framework to study the efficiency of banking in Australia during the post-deregulation period 1988 to 2001. Casu et al. (2005) examined the efficiency of European banks for the period 1994 to 2000 using the DEA framework and found Italian and Spanish banks have higher productivity increases compared to German, French and English banks.

Data envelopment analysis (DEA) is a nonparametric method to estimate production functions, particularly the productive efficiency of decision-making units. DEA employs mathematical programming to estimate the tradeoffs inherent in the empirical efficient frontier. The efficient frontier identified by DEA is the benchmark against which other decision-making units will be compared (see Gonzales, 2009). Two alternative approaches can be employed in the determination of the efficient frontier: input-oriented and output-oriented approaches. In the input-oriented approach, the outputs of each decision-making unit are held at the current levels and the minimal amount of inputs required by an efficient producer to produce those specific levels of outputs will be

[3] See Berger and Humphrey (1997) for an application of DEA analysis in the financial sector.

estimated. A comparison between this optimal level of inputs required and the actual level of inputs each producer uses will yield an efficiency measure for each decision-making unit. The output-oriented approach is similar, except that the inputs are kept fixed at the current levels and the maximum amount of outputs that can be produced at those levels of inputs will be estimated and compared against the actual levels of outputs of each producer. In the estimation of the efficient frontier, either constant returns to scale (CRTS) or variable returns to scale (VRTS) can be assumed. DEA efficiency scores ranges between 0 and 1, with 1 being fully efficient.

DEA has several advantages in terms of its application to the financial sector. It does not require knowledge of the explicit functional form or assumptions with regard to its stochastic error terms, which is particularly important as it is difficult to define the functional forms of bank production. Nor does it require a large sample size to implement. In this study we adopt the input orientation to measure the efficiency of each bank with the assumptions of constant (Input CRS) and variable returns to scale (Input VRS). As in Berger and Mester (1997), DeYoung and Nolle (1998) and Gonzales (2009), we used three inputs – personnel expenses, book value of fixed assets and loanable funds (sum of deposits and non-deposit funds) – and two outputs – total loans and non-interest income. In this approach, a frontier is calculated for each individual country and a bank's efficiency is measured relative to its country's own frontier (banks are equally weighted).

The average bank efficiency measure using DEA for the selected Southeast Asian countries is given in Table A2 in the Appendix. Indonesia, Malaysia and Vietnam have experienced low levels of bank efficiency among the countries in the sample. In fact, the bank efficiency for Vietnam is lowest among the six Southeast Asian countries while Singapore and the Philippines have the highest. It is interesting to notice that the banking efficiency of Malaysia is lower than that of Indonesia and Thailand, and is a declining trend over time except for 1999–2003. It will be interesting to examine if this result is due to the capital controls and restrictions on foreign participation imposed by Malaysia since 1998 after the Asian Crisis. We also notice that banking efficiency is declining for all Southeast Asian banks except for Vietnam. Although the bank

efficiency measures for the Philippines, Singapore and Thailand are relatively high, they also declined in recent years.

In this paper, we adopt the two-stage framework to study the determinants of bank efficiency. The efficiency measure derived from DEA in the first stage is used as an independent variable in the second stage. Recent studies by Banker and Natarajan (2008), Simar and Wilson (2007) and Souza and Staub (2007) highlight that the two-stage analysis using DEA is viable and under certain conditions can even capture the nonparametric stochastic efficiency results.

Our measure of efficiency is based on activity, particularly loans and other banking activities that earn a fee, and might better be described as a productivity or technical efficiency measure. A more complete measure of efficiency would be based on profits or margins, and that extension is a topic for further work, which may also involve the application of other estimation methods, such as a stochastic frontier.

3.2.2. Bank regulation and supervision

The study used three key regulatory and supervisory variables. The variable RESTRICT measures the extent of bank regulations that restrict activities that generate non-interest income. This variable indicates if bank activities in the securities, insurance, and real estate markets and bank ownership and control of nonfinancial firms are unrestricted, permitted, restricted or prohibited. Higher values indicate a higher level of restrictions.

The bank supervision variables are represented by the intensity of private monitoring (MONITOR) and official supervision of banks (OFFICIAL). Both variables were derived as given in Barth, Caprio and Levine (2004, 2006). The MONITOR index contains information regarding the external auditing of banks, ratings by international agencies, the availability of an explicit deposit insurance scheme, and the disclosure of risk-management procedures to the public. The OFFICIAL index provides information regarding the extent to which regulators have the authority to take regulatory actions. Higher values for MONITOR and OFFICIAL indicate greater private oversight and more official supervisory power, respectively.

3.2.3 Specific Characteristics of Financial Institutions

We used several variables to capture specific banking activities that could directly affect the productive performance of banks. Several studies have highlighted the importance of capital requirements. Higher capital requirements will have a direct impact on the risk-taking activities of the owners of the bank. To capture this effect, we introduced the total equity to total assets ratio (TE_TA). To capture the liquidity effects of the banks we used loan loss reserve to total loans ratio (LOANLR_GL), liquid assets to total assets ratio (LA_TA), and non-earning assets to total assets ratio (NEA_A). To account for the off-balance sheet activities of banks, we used off-balance sheet to total assets ratio (OFFBAL_A).

The impact of foreign ownership and partnership on bank performance is given by a dummy variable, FOREIGN, which represents majority foreign ownership of more than 50 percent equity ownership of the banks. We also show whether the bank is a public bank (PUBLIC), wherein the government has more than 25 percent ownership. To capture the moral hazard issues related to banks taking ownership of banks and private companies taking ownership of banks, we introduce the dummy variable SUBSIDIARY that indicates if the bank is a subsidiary or if it has a subsidiary. We also introduce dummy variables to capture the types of banking activities of the bank.

4. Results: Determinants of Bank Efficiency

The key trends of TE_TA (ratio of total equity to total assets ratio), LOANLR_GL (loan loss reserve to total loans ratio), LA_TA (liquid assets to total assets ratio), NEA_A (non-earning assets to total assets ratio) and OFFBAL_A (off-balance sheet to total assets ratio) are given in Table A3 in the Appendix. We also present the plots of TE_TA, LOANLR_GL, LA_TA, and NEA_A in Figures A1 to A5. In Figure A1, TE_TA tends to fall in the Asian crisis period of 1997–1999 and then increase during the post-crisis period of 2000–2008. Singapore and Thailand increase their total equity to total assets ratio by nearly 20 percent in 2000–2008. The other selected ASEAN countries of Malaysia, Indonesia, The Philippines and Vietnam also increase their TE_TA ratio by nearly 15 percent. In particular, Indonesia experienced a TE_TA ratio of less than 5

percent in 1997–1999, which increased to nearly 15 percent in 2000–2008.

The LOANLR_GL ratio tends to increase during an economic crisis, which is shown clearly among the ASEAN countries in Table A2. Most ASEAN countries increased their LOANLR_GL ratio in 2000–2008 by nearly 10 percent except Vietnam. The higher LOANLR_GL indicates that the financial institutions are holding higher liquidity reserves to ride volatility in output in the post-Asian crisis period. The higher liquidity assets holding is also reflected by the liquidity assets to total assets ratio (LA_TA ratio) for Malaysia in Figure A3, which shows that it is holding more than 25 percent of liquid assets to total assets. In comparison, the other countries are holding more than 15 percent of liquid assets to total assets

In Figure A4, the non-earning assets to total assets (NE_A) is nearly 30 percent for Malaysia in 2000–2008, indicating the vulnerability of the Malaysian financial markets relative to other ASEAN countries. The vulnerability of Malaysian financial markets is also indicated in Figure A5, the off-balance sheet to total assets ratio (OFFBAL_A). Although the off-balance sheet to total assets ratio declined in 2000–2008, it remained nearly 25 percent for Malaysia. The other ASEAN countries experienced around 15 percent of OFFBAL_A ratio.

The results of the panel study are given in Tables 1 to 4. Tables 1 and 2 report the estimations based on the bank efficiency measurement using constant returns to scale (CRS) and variable returns to scale (VRS) using fixed- (FE) and random-effects (RE) specifications, respectively. To account for bank-specific effects and endogeneity issues in our estimation, we adopted the two-stage least square estimation for fixed- (FE2SLS) and random-effects (RE2SLS) specifications proposed by Baltagi (2001). We used the liquid assets to total bank deposits and borrowing ratio, the sample size for DEA estimation, and types of banks as instrumental variables in the estimation. The results of FE2SLS and RE2SLS estimation are reported in Tables 3 and 4. The results of our study are very consistent across both the fixed- (FE) and random-effects (RE) specifications.

Table 1. Determinants of Bank Efficiency Based on Constant Returns-to-Scale Measure (CRS DEA–Input CRS) in Selected Southeast Asian Banks

	FE(1)	FE(2)	RE(1)	RE(2)
TE_TA	0.257** (2.280)	0.283** (2.490)	0.243** (2.540)	0.242** (2.150)
LOANLR_GL	0.074 (0.820)	0.078 (0.843)	0.099 (0.790)	0.035 (0.401)
LA_TA	0.009 (0.140)	0.051 (0.701)	–0.066 (–1.140)	0.019 (0.390)
NEA_A	0.135* (1.710)	–	0.116 (1.500)	–
OFFBAL_A	–0.011*** (–7.220)	–0.013*** (–7.424)	–0.010*** (–5.300)	–0.014*** (–7.820)
FOREIGN	0.029*** (3.531)	0.032*** (3.805)	0.053*** (5.660)	0.023*** (2.730)
PUBLIC	0.015 (0.962)	0.014 (0.930)	0.023 (1.550)	0.004 (0.320)
SUBSIDARY	–0.089*** (–4.063)	–0.090*** (–4.071)	–0.117*** (–6.600)	–0.103*** (4.800)
RESTRICT	0.107*** (5.040)	0.099*** (5.210)	0.097*** (4.630)	0.096*** (4.530)
MONITOR	–0.495*** (–15.500)	–0.478*** (–15.750)	–0.464*** (–15.350)	–0.464*** (–15.350)
OFFICIAL	0.088** (2.875)	0.078** (2.780)	0.077** (2.580)	0.073** (2.460)
Commercial Banks	0.097*** (3.975)	0.106*** (4.302)	0.077 (0.160)	0.023 (0.520)
Investment Banks	0.192*** (6.330)	0.199*** (6.550)	0.114** (2.260)	0.125** (2.600)
Finance & Securities Companies	0.202*** (5.280)	0.208*** (5.260)	0.101* (1.610)	0.205** (2.355)
Savings Banks	0.072 (1.306)	0.073 (1.290)	–0.069 (–0.710)	–0.044 (–0.650)
Holding Finance Companies	0.069** (2.510)	0.074** (2.680)	–0.023 (–0.480)	–0.011 (–0.220)
Government Savings Banks	0.228*** (5.510)	0.232*** (5.710)	0.129** (2.170)	0.147** (2.631)
Islamic Banks	0.222*** (5.090)	0.231*** (5.320)	0.100* (1.650)	0.122** (1.920)
Others	0.089** (2.020)	0.094*** (5.080)	–0.015 (–0.260)	–0.086* (–1.690)
Constant	1.710*** (4.450)	1.791*** (5.080)	1.851*** (4.420)	1.874*** (4.650)
Country Dummies	Yes	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes	Yes
R-Square	0.550	0.549	0.556	0.551
Obs	1359	1359	1359	1359

* 10 percent level of significance; ** 5 percent level of significance; *** 1 percent level of significance;

t-Statistics in parenthesis; FE – Fixed Effects; RE – Random Effects

Table 2. Determinants of Bank Efficiency Based on Variable Returns-to-Scale Measure (Input VRS) in Selected Southeast Asian Banks

	FE(1)	FE(2)	RE(1)	RE(2)
TE_TA	0.408*** (4.030)	0.467*** (4.170)	0.370*** (3.670)	0.427*** (5.310)
LOANLR_GL	0.192** (2.890)	0.202*** (2.940)	0.148** (2.030)	0.151 (1.260)
LA_TA	0.023 (0.330)	0.115* (1.820)	–0.0008 (–0.130)	0.080 (1.330)
NEA_A	0.304** (2.940)	–	0.266** (2.870)	–
OFFBAL_A	–0.009*** (–3.360)	–0.013*** (–5.470)	–0.009*** (–3.680)	–0.013*** (–3.810)
FOREIGN	0.038** (2.200)	0.044*** (2.410)	0.036** (2.280)	0.041** (2.080)
PUBLIC	0.011 (0.470)	0.011 (0.440)	0.003 (0.150)	0.004 (0.180)
SUBSIDARY	–0.078*** (–4.320)	–0.081*** (–4.610)	–0.104*** (–8.430)	–0.103*** (5.660)
RESTRICT	0.171*** (7.110)	0.153*** (6.410)	0.164*** (7.620)	0.148*** (8.690)
MONITOR	–0.572*** (–16.370)	–0.533*** (16.410)	–0.548*** (17.650)	–0.515*** (21.280)
OFFICIAL	0.189*** (6.390)	0.166*** (5.610)	0.179*** (6.280)	0.157*** (6.060)
Commercial Banks	0.128*** (4.190)	0.146*** (4.790)	0.040 (0.820)	0.138*** (4.510)
Investment Banks	0.176*** (4.130)	0.192*** (4.250)	0.099** (2.170)	0.194*** (5.240)
Finance & Securities Companies	0.185*** (4.000)	0.195*** (4.020)	0.093 (1.470)	0.183** (4.020)
Savings Banks	0.066 (1.310)	0.068 (1.230)	–0.062 (–0.810)	0.024 (0.390)
Holding Finance Companies	0.020 (0.690)	0.031 (0.980)	–0.069 (–1.370)	0.021 (0.610)
Government Savings Banks	0.210*** (5.700)	0.217*** (5.770)	0.116** (2.200)	0.204*** (4.270)
Islamic Banks	0.209*** (4.230)	0.228*** (4.830)	0.0093** (2.170)	0.196** (2.420)
Others	0.097* (1.880)	0.107** (2.050)	–0.081 (–1.450)	0.092 (1.080)
Constant	0.490 (1.400)	0.676* (1.840)	0.647* (1.760)	0.741** (2.190)
Country Dummies	Yes	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes	Yes
R–Square	0.521	0.518	0.524	0.525
Obs	1359	1359	1359	1359

* 10 percent level of significance; ** 5 percent level of significance; *** 1 percent level of significance

t-Statistics in parenthesis; FE – Fixed Effects; RE – Random Effects

Table 3. Determinants of Bank Efficiency Based on Constant Returns-to-Scale Measure (Input CRS) Using IV Estimation in Selected Southeast Asian Banks

	FE2SLS		RE2SLS	
	(1)	(2)	(3)	(4)
TE_TA	0.606*** (6.240)	0.591*** (8.260)	0.567*** (5.460)	0.564*** (5.560)
LOANLR_GL	0.117 (0.820)	0.113 (0.640)	0.060 (0.340)	0.060 (0.430)
LA_TA	0.052 (0.76)	0.038 (0.480)	0.022 (0.360)	0.020 (0.330)
NEA_A	–	0.049 (0.330)	–	0.008 (0.070)
OFFBAL_A	–0.013*** (–3.840)	–0.013*** (–3.230)	–0.015*** (–4.750)	–0.015*** (–4.130)
FOREIGN	0.028** (2.630)	0.026** (2.550)	0.019** (1.940)	0.018* (1.670)
PUBLIC	0.011 (0.710)	0.012 (0.790)	0.001 (0.120)	0.002 (0.110)
SUBSIDIARY	–0.091*** (–3.580)	–0.081*** (–3.360)	–0.094*** (4.760)	–0.095*** (–4.020)
RESTRICT	0.112*** (5.360)	0.115*** (4.260)	0.179*** (17.660)	0.180*** (15.750)
MONITOR	–0.502*** (–16.080)	–0.508 (–11.700)	–0.488*** (–13.310)	–0.490*** (–12.530)
OFFICIAL	0.094*** (3.110)	0.098** (2.540)	0.159*** (7.900)	0.160*** (7.760)
Commercial Banks	0.089** (3.700)	0.086*** (3.160)	0.103** (2.960)	0.103** (2.990)
Investment Banks	0.164** (6.730)	0.160*** (5.780)	0.184*** (4.860)	0.183*** (5.180)
Finance & Securities Companies	0.201*** (5.280)	0.207*** (5.071)	0.220*** (4.310)	0.220*** (4.810)
Savings Banks	0.263*** (4.320)	0.262*** (3.870)	0.250*** (4.040)	0.250*** (4.250)
Holding Finance Companies	0.051** (1.980)	0.048* (1.750)	0.059 (1.600)	0.058* (1.710)
Government Savings Banks	0.207*** (4.450)	0.205*** (4.940)	0.215*** (4.970)	0.218*** (3.890)
Islamic Banks	0.225*** (3.050)	0.220** (2.550)	0.215** (2.430)	0.214** (2.660)
Others	0.126** (2.310)	0.123** (2.14)	0.129* (1.830)	0.128* (1.650)
Constant	1.621*** (4.610)	1.589*** (3.530)	1.680** (2.840)	1.675** (2.010)
Country Dummies	Yes	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes	Yes
R–Square	0.590	0.589	0.591	0.590
Obs	1220	1220	1220	1220

* 10 percent level of significance; ** 5 percent level of significance; *** 1 percent level of significance.

t-Statistics in parenthesis; FE2SLS – Two-Stage Least Square Fixed Effects; RE2SLS – Two-Stage Least Square Random Effects (Baltagi, 2001)

Table 4. Determinants of Bank Efficiency Based on Variable Returns-to-Scale Measure (Input VRS) using IV Estimation in Selected Southeast Asian Banks

	FE2SLS		RE2SLS	
	(1)	(2)	(3)	(4)
TE_TA	0.731*** (7.660)	0.653*** (6.280)	0.683*** (5.700)	0.616*** (5.690)
LOANLR_GL	0.236 (1.590)	0.216 (1.370)	0.155 (1.190)	0.146 (1.120)
LA_TA	0.108* (1.690)	0.034 (0.470)	0.073 (1.200)	0.006 (0.090)
NEA_A	–	0.250** (2.190)	–	0.207* (1.780)
OFFBAL_A	–0.015*** (–3.710)	–0.012** (–2.470)	–0.015*** (–3.170)	–0.012** (–2.410)
FOREIGN	0.040** (2.050)	0.033** (2.000)	0.037* (1.790)	0.031* (1.800)
PUBLIC	–0.012 (–0.690)	–0.011 (–0.520)	–0.016 (0.730)	–0.015 (–0.700)
SUBSIDIARY	–0.065*** (–3.740)	–0.064*** (–3.800)	–0.092*** (–5.430)	–0.093*** (–5.440)
RESTRICT	0.159*** (5.990)	0.176*** (7.610)	0.186*** (15.290)	0.193*** (16.140)
MONITOR	–0.556*** (–13.940)	–0.590*** (–16.910)	–0.535*** (–13.190)	–0.562*** (–13.860)
OFFICIAL	0.172*** (5.440)	0.193*** (6.430)	0.194*** (11.380)	0.206*** (11.950)
Commercial Banks	0.146*** (4.760)	0.128*** (4.290)	0.143*** (2.760)	0.130*** (2.560)
Investment Banks	0.177*** (4.060)	0.158*** (4.810)	0.182*** (3.150)	0.169** (2.960)
Finance & Securities Companies	0.214*** (4.310)	0.200*** (4.040)	0.201** (2.88)	0.194** (2.860)
Savings Banks	0.151*** (3.900)	0.154*** (5.050)	0.110 (1.600)	0.111* (1.880)
Holding Finance Companies	0.031 (1.030)	0.018 (0.610)	0.023 (0.460)	0.015 (0.340)
Government Savings Banks	0.223*** (3.940)	0.214*** (5.290)	0.213** (3.300)	0.207** (3.310)
Islamic Banks	0.302*** (3.270)	0.274** (2.830)	0.285** (2.800)	0.261** (2.471)
Others	0.167*** (3.010)	0.152** (2.180)	0.152* (1.750)	0.142 (1.650)
Constant	0.678* (1.770)	0.510 (1.390)	1.796** (2.020)	1.812** (2.960)
Country Dummies	Yes	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes	Yes
R–Square	0.543	0.549	0.545	0.547
Obs	1220	1220	1220	1220

* 10 percent level of significance; ** 5 percent level of significance; *** 1 percent level of significance; t-Statistics in parenthesis;

FE2SLS – Two-Stage Least Square Fixed Effects; RE2SLS – Two-Stage Least Square Random Effects (Baltagi, 2001).

4.1. Specific Bank Characteristic

It is interesting to note that bank-specific characteristics have an important impact on the efficiency of banks. TE_TA, the capital requirement variable, is positive and statistically significant, which indicates that an increase in capital requirements of banks tends to improve their efficiency. This suggests that banks might experience better risk management if they assume greater ownership of their activities. This result is in line with the recent recommendation by the Basel II Accord to increase capital requirements to manage the risk-taking activities of banks (BIS, 2006). This result is also robust to the estimation using a bank efficiency measure which assumes variable returns to scale (VRS) as given in Table 2. The estimation based on FE2SLS and RE2SLS indicate that the impact of TE_TA on bank efficiency is much stronger and more robust (see Tables 3 and 4). Our results are also consistent with the recent study on the Brazilian banks by Staub et al. (2009) that indicates that higher bank equity ratio reduces the moral hazards of bankers and thus reduces the allocative inefficiencies of banks.

The variables to capture the bank liquidity effects are not statistically significant in FE and RE estimations as given in Table 1 using the constant returns-to-scale measure. However, the non-earning assets to total assets ratio (NEA_A) is statistically significant in Table 2 using variable returns to scale. We also notice that the loan loss reserve to gross loans ratio (LOANLR_GL) and non-earning assets to total assets ratio (NEA_A) variables are statistically significant in FE2SLS and RE2SlS estimations as indicated in Tables 3 and 4. The provisions for more reserves to protect loan losses and more liquid assets tend to improve the overall productive performance of banks.

The off-balance sheet effect of banks (OFFBAL_A) is negative and statistically significant at the 1 percent level to both the FE and RE estimation specifications. It is also robust to the FE2SLS and RE2SLS estimations. The negative coefficient of off-balance sheet activities indicates that constraining the non-traditional activities of banks will have a positive outcome on the efficiency of banks.

Foreign participation and ownership in the financial sector have positive effects on banking efficiency (see the positive and statistically significant coefficient for the

FOREIGN variable). Again, the result is robust to both CRS and VRS estimations and also to the 2SLS estimations given in Tables 3 and 4. We notice that the impact of foreign participation is stronger with variable returns to scale (VRS).

There is a negative coefficient on the SUBSIDIARY variable. This result is statistically significant at the 1 percent level and robust to FE2SLS and RE2SLS estimations. This indicates that there are moral hazard issues if banks take ownership of companies and if they are bought by corporations.

The results indicate that the types of banking activities have different impacts on the efficiency of banks in Southeast Asia and thus diversification of banking activities is important to maintain banking performance and efficiency. To avoid perfect collinearity of the dummies in our regressions, we dropped the dummy for cooperative banks and thus the coefficients on the types are interpreted as efficiency of the respective types of banks relative to the cooperative banks. The results indicate that commercial, savings banks, and holding finance companies tend to have lower levels of banking efficiency relative to the cooperative banks. In contrast, investment banks and finance and security companies show higher efficiency and performance relative to the cooperative banks in our sample. It is also interesting to observe that more prudent types of banking, such as government savings banks and Islamic banking, are associated with higher levels of efficiency relative to the cooperative banks. These results are also robust to the FE2SLS and RE2SlS estimations.[4]

4.2. Bank Regulation and Supervision

The results for the banking regulation and supervision variables of RESTRICT (restrictions on activities that generate non-interest income), MONITOR (intensity of private monitoring) and OFFICIAL (index of official supervision) are statistically significant and robust to both the CRS and VRS measures and also to the FE2SLS and RE2SLS estimations.

The MONITOR variable in our study is negative and statistically significant at the 1 percent level. This result is very robust in our FE2SLS and RE2SLS specifications. It is

[4] The country dummies are not statistically significant in the above regressions.

supported by the recent study by Gonzales (2009) that indicated a negative coefficient for intensity of private monitoring of financial markets. The negative coefficient in our study indicates that private monitoring does not yield a positive outcome for the financial markets in Southeast Asia. It is likely that more developed and well-diversified financial markets will rely heavily on the private sector to provide information on the activities of the banks for depositors and potential investors. However, given the stage of growth of the financial markets in Southeast Asia and developing countries, private monitoring might not produce a positive impact in these countries as compared to those hosting well-developed financial markets. This result supports the views expressed during both the recent Global Financial Crisis and the Asian Crisis concerning the moral hazard issues related to weak private sector monitoring of the financial markets by rating agencies and private investors.

In contrast, the supervisory and regulatory role of the central bank seems to produce a positive outcome in terms of improvements in the bank efficiency of the financial institutions in Southeast Asia. The RESTRICT variable that captures the restrictions on activities that generate non-interest income is positive and statistically significant. This suggest that the regulatory role of central banks in the region is crucial to bank efficiency. Monitoring and regulating the balance sheet activities of banks tends to improve the productive performance of the banks in our sample. The coefficient on the bank supervisory variable (OFFICIAL) is also positive and statistically significant in our estimations. The transparency of the supervisory function and the official authority of the supervisory activities of the central bank improve banking efficiency. In comparison, the variable on the restriction of activities of non-interest income (RESTRICT) tends to have a higher coefficient in our estimation, indicating that restrictions on bank activities are associated with higher increments to bank efficiency compared to the OFFICIAL variable.

5. Conclusion

This paper studied the determinants of the technical efficiency of banks in Southeast Asia using individual bank data from 1994 to 2008. The study controlled for bank heterogeneity and endogeneity issues by adopting the two-stage least square estimation

of fixed and random effects as provided by Baltagi (2001).

The results highlight certain key activities that could be valuable to policy makers to improve banking efficiency and thereby stability in financial markets. More extensive non-traditional banking activities, in terms of off-balance sheet activities, are associated with lower levels of efficiency. More extensive corporate linkages to a bank also tend to reduce efficiency. There are further implications of these linkages that may also have a direct impact on system stability. Based on the experience from the Asian Crisis, linkages with corporations that may induce moral hazard have to be monitored and the transparency of such relationships will be very important for the stability of the financial system.

Given the different stages of financial and economic development, a greater concentration on traditional banking activities such as government savings banks and Islamic banking has a positive impact on efficiency..

Compared with private sector monitoring of financial activities, the role of banking regulation and supervision is important for the efficiency of banks in Southeast Asia. Our results highlight the importance of bank regulation and supervision for improving bank efficiency in the region compared with private sector monitoring of banking activities. In particular, restrictions on risky activities of banks tend to produce more efficient banks. Thus, central banks in the region gain from a better system of monitoring and supervising the risk-sensitive activities of the banks.

The results of the paper have important implications for liberalizing the financial sector in terms of increasing foreign ownership and participation as they show that there are positive impacts on bank efficiency from foreign ownership and participation. The financial openness of the financial markets will be important for their development and regional integration.

Bank regulation and supervision is important for the efficiency of banks and for stability in the financial markets in the Southeast Asia. However, different types of bank regulation and supervision produce different results and recognition of the impact of different policies will be important to achieve the desired outcomes. The right balance

between creating a competitive market, including foreign participation, alongside prudent banking regulation and supervision will be important for banking efficiency and for stability in financial markets.

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6. Appendix

Table A1. Description of Variables

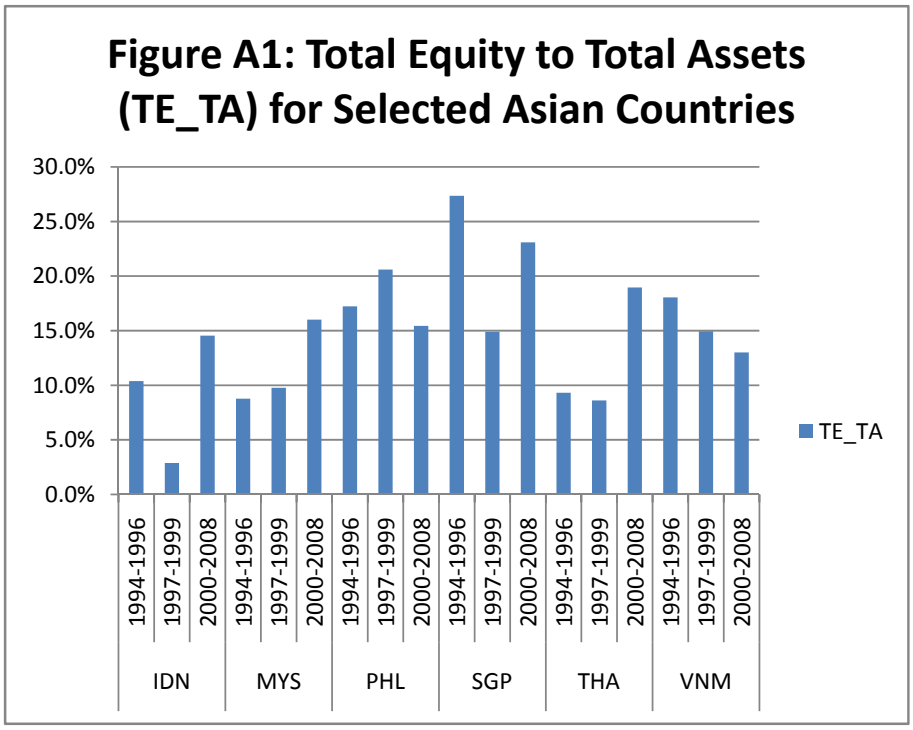
• Period	1994–2008
•	
• **Country**	**Coverage of Number of banks**
• Indonesia	129
• Malaysia	131
• Singapore	110
• Thailand	73
• The Philippines	83
• Vietnam	43
•	
• **Description**	**Variables**
• Total Equity/Total Assets	TE_TA
• Loan Loss Reserve/Gross Loans	LOANLR_GL
• Liquid Assets/Total Assets	LA_TA
• Non Earning Assets/Assets	NEA_A
• Off Balance Sheets/Assets	OFFBAL_A
• Majority foreign owned	FOREIGN
• Public bank (>25% Govt ownership)	PUBLIC
• Subsidiary or has Subsidiary	SUBSIDIARY
• **Bank Regulation & Supervision**	
• Bank Regulation: Restrictions on activities that generate non-interest income	RESTRICT
• Bank Supervision: Intensity of private monitoring	MONITOR
• Bank Supervision: Official Supervision	OFFICIAL
• **Bank Efficiency**	
• DEA efficiency, input CRS method	Input CRS
• DEA efficiency, input VRS method	Input VRS
• Sample size for DEA estimation for country year	DEAsize

Table A2. Average Bank Efficiency for the Years 1994–2008

	Input CRS	Input VRS
Indonesia		
1994–2008	**0.269**	**0.484**
1994–1998	0.210	0.431
1999–2003	0.430	0.662
2004–2008	0.170	0.359
2007–2008	0.184	0.329
Malaysia		
1994–2008	**0.185**	**0.327**
1994–1998	0.150	0.333
1999–2003	0.231	0.352
2004–2008	0.175	0.295
2007–2008	0.187	0.332
Singapore		
1994–2008	**0.761**	**0.919**
1994–1998	0.908	0.966
1999–2003	0.778	0.922
2004–2008	0.616	0.877
2007–2008	0.650	0.882
Thailand		
1994–2008	**0.698**	**0.817**
1994–1998	0.752	0.825
1999–2003	0.621	0.783
2004–2008	0.721	0.843
2007–2008	0.714	0.843
Philippines		
1994–2008	**0.860**	**0.937**
1994–1998	0.920	0.966
1999–2003	0.921	0.966
2004–2008	0.740	0.881
2007–2008	0.830	0.916
Vietnam		
1994–2008	**0.060**	**0.113**
1994–1998	0.025	0.025
1999–2003	0.048	0.050
2004–2008	0.105	0.114
2007–2008	0.120	0.131

Table A3. The Trends of Key Bank Variables from 1994–2008 (%)

	Year	TE_TA	LOANLR_GL	LA_TA	NEA_A	OFFBAL_A
Indonesia	1994−1996	10.4	1.8	23.1	5.3	11.8
	1997−1999	2.9	17.0	32.2	11.3	8.1
	2000−2008	14.5	7.1	32.6	9.9	15.0
Malaysia	1994−1996	8.8	3.2	23.9	18.5	38.1
	1997−1999	9.8	6.5	19.9	17.9	36.5
	2000−2008	16.0	8.3	29.2	20.4	24.7
The Philippines	1994−1996	17.2	2.0	25.2	8.4	29.0
	1997−1999	20.6	5.0	23.0	10.9	11.5
	2000−2008	15.4	9.6	22.5	13.5	10.0
Singapore	1994−1996	27.3	3.7	19.7	8.5	11.7
	1997−1999	14.9	10.9	19.5	7.8	15.1
	2000−2008	23.1	9.4	27.1	13.7	15.3
Thailand	1994−1996	9.3	1.5	9.5	3.7	14.3
	1997−1999	8.6	11.7	11.8	4.9	16.1
	2000−2008	19.0	8.4	15.4	10.4	19.2
Vietnam	1994−1996	18.0	6.5	25.7	8.9	16.3
	1997−1999	14.9	1.3	40.0	7.7	12.8
	2000−2008	13.0	1.2	37.5	9.3	10.0



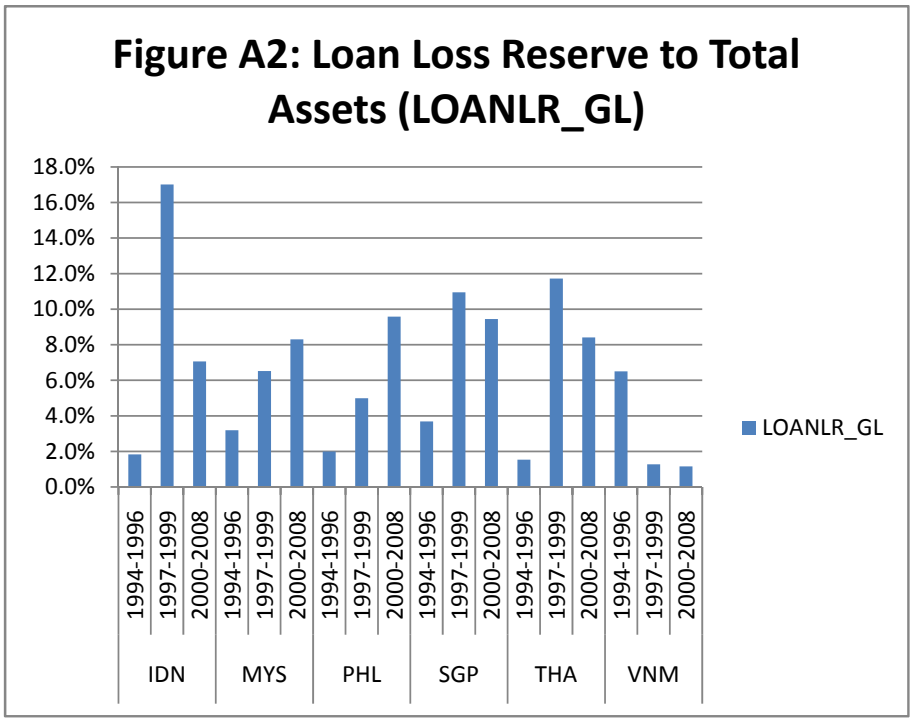


Figure A2: Loan Loss Reserve to Total Assets (LOANLR_GL)
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
1994-1996
1997-1999
2000-2008
IDN
MYS
PHL
SGP
THA
VNM
LOANLR_GL

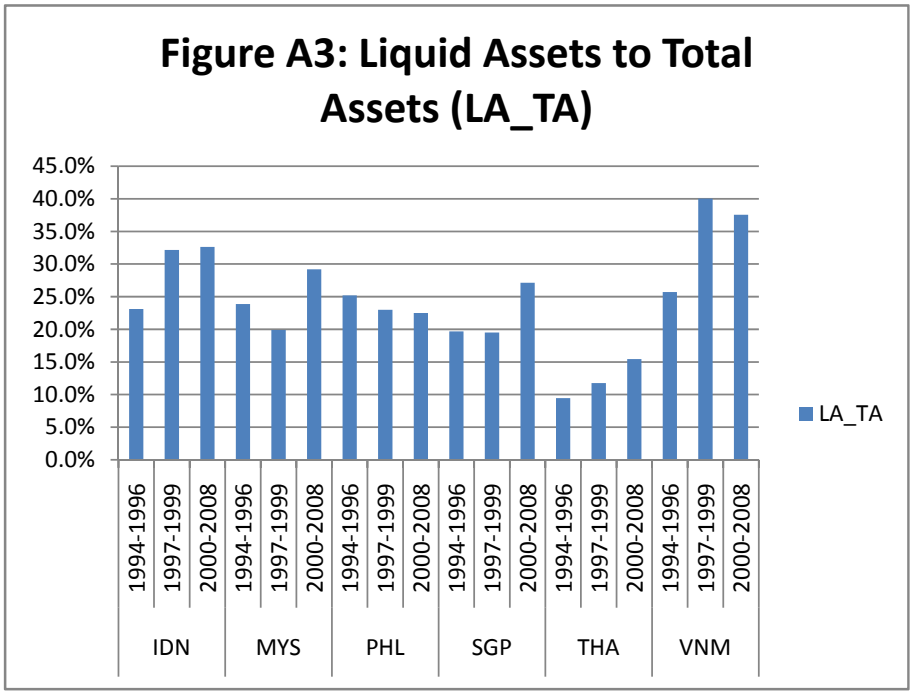


Figure A3: Liquid Assets to Total Assets (LA_TA)
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
1994-1996
1997-1999
2000-2008
IDN
MYS
PHL
SGP
THA
VNM
LA_TA

Figure A4: Total Non-Earning Assets to Total Assets (NEA_A) for Selected Asian Countries

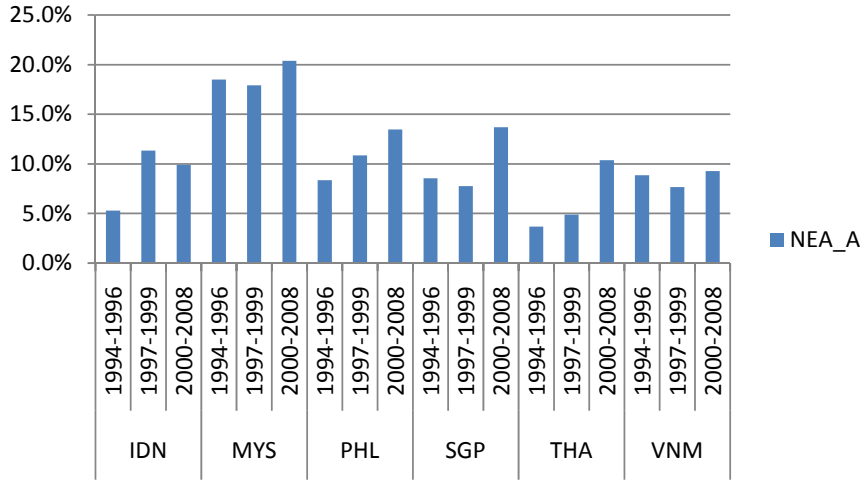
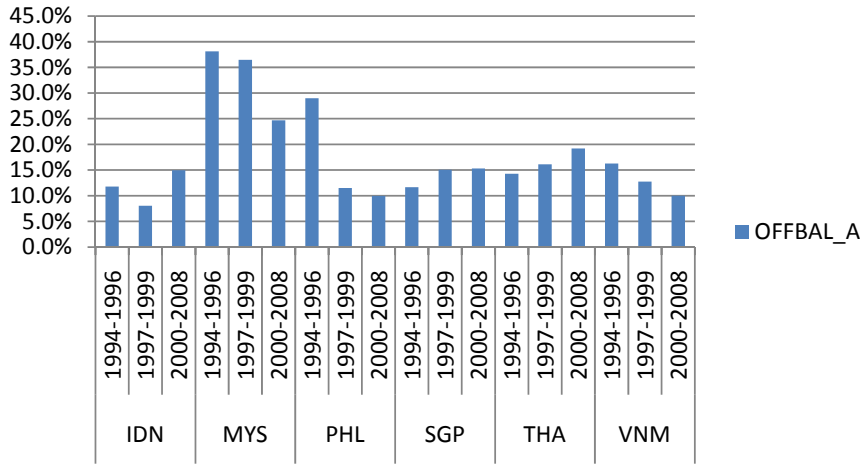


Figure A5: Off-Balance Sheet Activities to Total Assets (OFFBAL_A) of Selected Asian countries



Chapter 11

FDI, Financial Constraints, and Productivity: Firm Level Study in Vietnam[1]

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Abstract

This paper empirically investigates the effects of foreign ownership, financial constraints, and other firm characteristics using a micro panel of firms in Vietnam from 2002 to 2008. We adopted the semi-parametric framework of Levinsohn–Petrin (2003) to estimate the total factor productivity (TFP) by controlling for the unobserved firm heterogeneity and endogeneity of the structural variables. The results of the paper highlight that foreign ownership is positively correlated with productivity. Financial constraints (e.g. low liquidity and limited access to external credit) appear to be a major threat to the productive performance of firms in the manufacturing industries in Vietnam. Our evidence also points to the presence of scale efficiency and the importance of high-tech and human capital accumulations to productivity enhancement.

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***Keywords*:** total factor productivity (TFP), foreign direct investment (FDI), financial constraints, multinational enterprises (MNEs).

J.E.L. Classification: F21, F23, O40

1. Introduction

Foreign direct investment has been the key engine of growth for developing countries for the past decades. These countries have increasingly relied on foreign direct investment (FDI) as a key engine of output, employment and productivity growth. The underlying rationale for attracting FDI in host countries rests with productivity spillovers associated with FDI, whereby positive externalities created by the multinational activities allow indigenous firms to pick up their productivity. Based on the transaction costs theory of FDI (Caves, 1996), multinational enterprises (MNEs) exploit superior knowledge (e.g. technological and informational advantage, managerial expertise and superior organizational structure) transferred from their foreign parents to compensate for the higher operating costs incurred in the host markets. MNEs are therefore expected to demonstrate higher performance in terms of profitability and productivity than domestic-owned firms.

The productivity characteristics of MNEs and their foreign affiliates have been examined extensively in the literature. There is some evidence that foreign affiliates exhibit higher productivity performance than do domestic-owned firms. For instance, Aitken and Harrison (1999) using micro data of firms in Venezuela showed that MNEs outperform domestic-owned firms. The superior productivity performance of foreign affiliates in developing countries has been confirmed by Arnold and Javorcik (2009) for Indonesia, Javorcik (2004) for Lithuania, and Sabirianova et al. (2005) for the Czech Republic. A few studies found that the productivity advantage of MNEs' affiliates also prevails in developed countries, such as Benfratello and Sembenelli (2006) for Italy, Doms and Jensen (1998) for the US, and Girma and Görg (2007) and Griffith (1999) for the UK. However, these studies compare productivity between MNEs and domestic-owned firms, thereby neglecting the effects of difference in degree of foreign ownership within a firm on its productive performance. For instance, if a foreign stake matters to the productivity advantage of a firm, one should expect that Greenfield FDI outperforms a partially foreign-owned firm.

In addition to heterogeneous degree of foreign ownership, our empirical analyses add another two new elements of firm-specific characteristics into this strand of literature. First, we incorporate financial attributes into our empirical framework, which builds upon a body of empirical findings that point to the negative effects of financial constraints on firm survival and development (Beck et al., 2005; Demirguc-Kunt and Maksimovic, 1998; Levine, 2005). The mechanism through which financial health shapes the productivity prospects of a firm is that availability of funds stands a firm in good stead to leverage on ample business opportunities, to make superior investment decisions, and ultimately to enjoy exceptional business capacity and ability to survive in the market. Addressing this issue is vital in that financial constraints have affected multinational activities especially in developing countries where the development of financial markets is usually limited. A recent study by Alfaro et al. (2006) shows that firms in countries with well-developed financial markets tend to experience positive gains in FDI. Thus, reducing the financial constraints of firms by developing financial markets could have positive impacts on the productivity of firms.

Recent studies highlight the importance of financial markets in inducing innovation and entrepreneurship with the presence of FDI activities. Countries with better-developed financial markets increase their innovative activities in the domestic economy and thus there will be higher spillover and innovation in open economies with trade and FDI (Alfaro et al., 2004). Financial markets could increase the innovation and productivity of domestic firms with the presence of multinational firms in the following ways. First, domestic firms rely on external firms to finance their innovative and investment activities from multinational activities in the domestic economy. Second, the presence of foreign firms will induce new technologies into the domestic economy and thereby increase the entrepreneurial activities in the domestic economy. Well-developed financial markets will increase these entrepreneurial activities. The paper also studies the impact of financial constraints on the innovation of domestic firms with the presence of foreign ownership. Finally, well-functioning financial markets enhance the potential for FDI to create backward linkages and transfer technologies in the domestic economy (Javorcik and Spatareanu, 2008).

The second firm-specific treatment is the following. The current study examines the productivity of performance of firms by focusing on the effects of the high-tech capital accumulation (e.g. computers and automated machinery) on productivity, as in Oliner and Sichel (2000), Siegel (1997) and Siegel and Griliches (1992).[2] However, the roles of human capital utilization have not been sufficiently emphasized even if the developing Asian countries, including Vietnam, have flourished on swift development toward a knowledge-intensive economy where rich skilled labor sources serve as a key catalyst of sustainable productivity growth. Therefore, it may be interesting to control for the effects of human capital utilization, in addition to high-tech capital accumulation.

The present paper empirically examines linkages between total factor productivity (TFP) and firm characteristics, using a panel of 5,302 firms in Vietnam spanning the period of 2002–2008. The focus on Vietnam is motivated by two main considerations. First, foreign ownership has been increasingly important to output and employment growth in the Vietnamese economy. Second, the past decade witnessed rapid proliferation of multinational activities as a result of its market-driven momentum toward trade and investment liberalization, coupled with several policy initiatives such as tax exemption, legal reforms and improved institutional infrastructure.

Taking into account the unobserved productivity shocks, unobserved firm heterogeneity, and endogeneity of variables, among other relevant econometric issues, our empirical results indicate that firms with higher foreign ownership tend to exhibit higher TFP. One implication may be that, if employed, FDI promotion policy is better redirected toward Greenfield FDI instead of joint ventures if the policymakers' objective is to maximize benefits from productivity spillovers. In other results, financial constraints appear to have a negative impact on a firm's productivity performance. We also find robust evidence of scale efficiency. The estimates further point to positive contributions of high-tech and human capital accumulations to TFP enhancement. We

[2] Their empirical evidence points to a significant contribution of high-tech capital investment such as computers, data processing equipment, automated machinery and Information Technology (IT) capital, to total factor productivity (TFP).

find only weak evidence that international trade exposure helps Vietnamese firms advance their productive performance.[3]

The organization of the paper as follows. Section 2 discusses data sources and measurements. The derivation of TFP using the Levinsohn–Petrin (LP) framework is given in Section 2. Section 3 discusses the model and empirical methodology. Section 4 presents and analyzes the empirical results. Section 5 provides a robustness check using an alternative TFP measurement. Section 6 concludes and draws policy implications.

2. Derivation of the TFP Measure – Levinsohn–Petrin Framework

In this paper, we adopted the semi-parametric framework of Levinsohn and Petrin (2003) to estimate the total factor productivity (TFP) in order to control for the unobserved firm-specific productivity shocks. We adopt the Levinsohn–Petrin framework because of the availability of material inputs data and also the lack of consistent investment data.

A crucial issue of production function estimations is concerned with the potential correlation between unobservable firm-specific productivity shocks and input levels, which, as is well known, makes the standard OLS estimates biased and inconsistent (Grilliches and Mareisse, 1998). There are at least two econometric approaches to TFP measurement the existing literature conventionally utilizes to control for the unobservables. One is the Olley–Pakes TFP measurement in which investment serves as a proxy for these productivity shocks (Olley and Pakes, 1996). The other builds upon the production theory and is first introduced by Levinsohn and Petrin (2003) using intermediate input proxies.

We employ the Levinsohn–Petrin TFP measurement as in Levinsohn and Petrin (2003) for two main reasons. First, a proxy of investment is not valid in our case because of the absence of investment information. In contrast, the Levinsohn–Petrin TFP measurement

[3] The weak evidence may be attributable to measurement biases. Because of the lack of export and import volume data our proxy of international trade exposure pertains to dummies of exporting and importing activities, instead of the intensity of exports and imports.

is strictly data-driven now that our dataset provides complete information on the uses of materials. More importantly, even if the investment data were available, the estimates would suffer from truncating all the establishments reporting "zero" investment.

We assume that a firm's production technology takes the log-linearized Cobb-Douglas functional form.

$$y_t = \beta_0 + \beta_l l_t + \beta_k k_t + \beta_m m_t + \omega_t + \eta_t, \quad (1)$$

where y_t is the logarithm of the firm's gross output in year t, l_t and m_t denote the log-levels of freely variable inputs labor and materials respectively, and k_t refers to the logarithm of quasi-fixed input capital. A productivity shock to a firm's technology (1) is assumed to be additively separable and comprises two components: a transmitted component (ω_t) and an i.i.d. component (η_t). It should be highlighted that the former is correlated with input choices and is the source of simultaneity biases, while the latter is not.

Levinsohn and Petrin write the demand for m_t merely as a function of the two state variables, ω_t and k_t. They show that this function is monotonically increasing in ω_t and k_t and allows inversion of the demand for m_t. Therefore, the unobservable ω_t can be re-written as a function of k_t and m_t: $\omega_t = \omega_t(k_t, m_t)$. As in Olley and Pakes (1996), we assume that ω_t follows a first-order Markov process: $\omega_t = E[\omega_t | \omega_{t-1}] + \xi_t$, where ξ_t is a shock to productivity that is uncorrelated with k_t, but not necessarily correlated with l_t. With this identification, the production technology (1) can be expressed as

$$y_t = \beta_l l_t + \phi_t(k_t, m_t) + \eta_t, \quad (2)$$

where $\phi_t(k_t, m_t) = \beta_0 + \beta_k k_t + \beta_m m_t + \omega_t(k_t, m_t)$.

The estimation can be done in two steps. We first carry out a third-order polynomial approximation to estimate the conditional moments $E(y_t | k_t, m_t)$ and $E(l_t | k_t, m_t)$. The second step pertains to solving the GMM minimization problem to identify β_k and β_m.

The Levinsohn–Petrin estimation of a firm's production technology (2) is reported in Table 1. The Wald's test of returns to scale implies increasing returns for the estimated production function even though the null of constant returns to scale cannot be rejected at the 5 percent level of significance. Having obtained the parameter estimates of the production technology, we then generate the predictions of ω_t as a proxy of firm-specific TFP.

Table 1. Levinsohn–Petrin Estimation of Production Technology

Dependent Variable: y_t	
l_t	$.3357^{***}$ (.0435)
m_t	.1065 (.2121)
k_t	$.6716^{***}$ (.1714)
No. Obs.	1825
Wald's Test of Returns to Scale	3.31^{*}

Note: 1) ***, * statistically significant at 1 and 10 percent, respectively.
2) Wald's test is Chi-square distributed against the null that the production technology is constant returns to scale.

3. Data Construction

We construct our dataset of firms from the *Annual Statistical Censuses & Surveys: Enterprises* from 2002 to 2008, gathered by the General Statistics Office of Vietnam. It provides firm-level information on foreign ownership and production characteristics, such as the number of workers, gross revenue, working capital, materials, profits, and export/import status, as well as financial attributes such as liquid assets, fixed assets, liabilities and equity, among many others.

Table 2. Output and Employment Growth by Ownership, 2000–2008

	Output Growth (% p.a.)	Employment Growth (% p.a.)
Total	7.5	2.3
State	6.8	1.85
Non-state	7.3	1.93
Foreign Firms	10.4	20.41

Source: General Statistics Office, Vietnam.

Table 3. Surveyed Firms by Foreign Ownership Characteristics

	2002	2003	2004	2005	2006	2007	2008
	Number of Firms						
Total	**51680**	**62908**	**72012**	**91756**	**112950**	**131318**	**155771**
Foreign Firms	**2011**	**2308**	**2641**	**3156**	**3697**	**4220**	**4961**
100% foreign capital	1294	1561	1869	2335	2852	3342	4018
Joint venture	717	747	772	821	845	878	943
	Percentage of Firms						
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Foreign Firms	**3.89**	**3.67**	**3.67**	**3.44**	**3.27**	**3.21**	**3.19**
100% foreign capital	2.50	2.48	2.60	2.55	2.52	2.54	2.58
Joint venture	1.39	1.19	1.07	0.89	0.75	0.67	0.61

Source: General Statistics Office, Vietnam.

Firms in our dataset operate in a wide range of economic sectors; most of which are concerned with manufactures and service activities such as trade, hotels and restaurants, and real estate business and consultancy. Table 2 indicates that relative performance of MNEs in Vietnam compared to state and non-state enterprises is striking. The growth rate of outputs during the period of 2000–2008 reached 10.4 percent. This figure is

much higher than the average GDP growth rate of 7.5 percent. Likewise, multinationals seemed to be increasingly important in terms of employment, with 20.41 percent employment growth per annum. As portrayed in Table 3, while the proportion of MNEs was stable, the number of foreign affiliates increased exponentially throughout the period 2002–2008, when they accounted for approximately 3.19 to 3.89 percent of surveyed firms. Interestingly, approximately 70 to 80 percent of MNEs are associated

with Greenfield FDI (100 percent foreign capital). This figures point to a pivotal role of Greenfield FDI in the Vietnamese economy.

For estimation efficiency, our dataset is cleaned in the following ways. First, we exclude firms that do not report foreign ownership from the dataset. Firms that have no complete record throughout the period 2002–2008 are also dropped to avoid errors of data entry. Therefore, our firm-level panel comprises a total of 5,302 annual observations, spanning the years 2002–2008.[4]

4. Empirical Framework and Estimations

We now turn to a formal analysis of productivity effects associated with FDI and financial characteristics. Our empirical strategy is to incorporate FDI and financial constraint variables, in addition to the conventional determinants of productivity spillovers, into the econometric specification. We adopt the following reduced form econometric model to estimate the productive performance of firms.

$$TFP_{it}^{L-P} = \alpha_0 + \alpha_1 \ln FDI_{it} + \alpha_2 \ln LIQUIDITY_{it} + \alpha_3 \ln LEVERAGE_{it} + \alpha_4 \ln SIZE_{it}$$
$$+ \alpha_5 \ln COM_{it} + \alpha_6 \ln HUMANK_{it} + \alpha_7 XM_{it} + \mu_i + u_{it}, \quad (3)$$

where the subscript i indexes firms; and t time. TFP_{it}^{L-P} refers to total factor productivity, measured by the LP approach. μ_i represents the firm-specific fixed effects, and u_{it} is the error term.

Central to our empirical analysis are the structural variables of foreign ownership and financial characteristics. The existing literature conventionally employs the dummies of foreign ownership as a proxy of FDI (Arnold and Javorcik, 2009; Benfratello and Sembenelli, 2006; Girma at al., 2004; Griffith, 1999). Nevertheless, this FDI measurement does not take into account changes in foreign ownership within firms and may lead to biased estimates of FDI contribution to firm performance. In addition, the use of the FDI dummies confines the scope of empirical evidence to a comparison

[4] We are not able to include the 2006 survey in the dataset now that the firm codes are absent.

between foreign-owned and domestic firms, while relative performance of firms with different degrees of foreign ownership, e.g. a performance comparison between Greenfield FDI and joint venture remains unexplored. To tackle these issues, our proxy of FDI abstracts from the traditional measure, utilizing the ratio of investment capital undertaken by foreign parties to total registered capital, denoted by FDI_{it}.

Two variables enter our econometric specification as proxies of financial health. The first is liquidity, denoted by $LIQUIDITY_{it}$, and is measured by the ratio of liquid (short-term) assets to total assets. A firm with higher liquidity is expected to be more resilient to unexpected financial shocks, to grow faster and therefore to be more productive (Beck et al., 2005). In addition, the ratio of liabilities to equity, $LEVERAGE_{it}$, is meant to capture the degrees of credit constraints facing a firm. This financial variable has been adopted in studies of financial development since access to external finance and the existence of financial constraints can have crucial effects on the firm's ability to improve its productivity performance and stay in the market (Aghion et al., 2007; Levine, 2005).

Apart from the explanatory variables representing foreign ownership and financial constraints, we also controlled for several firm-specific characteristics using the conventional determinants of productivity performance. First, our estimated production function shown in Table 1 exhibits increasing returns to scale, suggesting the existence of scale effects on TFP. Firm size, $SIZE_{it}$, is measured by total sales to control for the effects of scale economies on productivity performance.[5] Second, high-tech capital accumulation is an important engine of growth in developing economies. It has been a source of policy and academic debate that investment in high-tech capital upgrades operating performance and profitability, thereby enhancing productivity growth (Morrison and Berndt, 1991; Siegel and Griliches, 1992).[6] Analogous to the measure

[5] An alternative measurement of firm size is the number of labor. However, this seems inappropriate in our case due to the potential multicollinearity with COM_{it}.

[6] However, empirical evidence regarding the linkages between high-tech capital accumulations and productivity growth is rather mixed. While Morrison and Berndt (1991) using US firm-level data find that the contribution of high-tech capital investment to productivity growth is small, Siegel and Griliches

employed by Oliner and Sichel (1994, 2000), COM_{it} aims to account for high-tech capital investment and is proxied by the number of computers used per worker.

Another crucial source of productivity growth is human capital utilization. It has been widely observed that developing economies have paved the way toward knowledge-intensive economies by higher rates of investment in education, training and R&D activities since the 1990s. It may be interesting to empirically investigate the roles of human capital uses in explaining firm productivity performance in Vietnam. We employ the ratio of skilled to total workers as a proxy of human capital intensity, denoted by $HUMANK_{it}$.

We also included a variable to capture the role of exporting on the productivity of firms. Firms operating in export markets tend to enjoy higher productivity growth. In principle, such activities can generate positive externalities, e.g. technological and informational spillovers in terms of better access to new technology and technical assistance, through international contacts and competition (Clerides et al., 1998; Evenson and Westphal, 1995). Nevertheless, our dataset does not provide information on volumes of international trade. We hence resort to the second-best measure of international trade exposure to control for the effects of export market linkages on productivity performance using the dummy XM_{it}. It takes values of 1 if the firms engage in exporting/importing activities and 0 otherwise.

The simplest way to obtain parameter estimates in our base-line econometric specification (3) is to carry out the standard Ordinary Least Squares (OLS) estimations. However, our concern is that OLS estimations tend to convey biased estimates owing to firm heterogeneity. The unobservable firm heterogeneity seems plausible given the knowledge that firms operate in a wide range of economic activities like manufacturing, financial intermediation, trade, real estate and consultancy services. To control for unobservable firm heterogeneity, we make use of Fixed Effects (FE) and Random Effects (RE) estimations. The former is undertaken by using OLS with

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(1992) draw contrasting conclusions that high-tech capital formation is a crucial source of economic growth.

heteroskedasticity-robust estimators to take into account the heteroskedasticity problem that arises from variation in firm size, whereas the latter is obtained by Generalized Least Squares (GLS) with the Swamy–Arora estimators.

FE and RE estimates may also be biased and inconsistent, however. The reason is that all of our structural variables, e.g. FDI, financial characteristics, high-tech capital investment, human capital utilization, and export/import status, are very likely to be endogenously determined by other unobserved variables. If the potential endogeneity bias problem exists, neither FE nor RE estimates is consistent and asymptotically efficient. There are at least two standard approaches to accounting for the potential endogeneity biases. The first is to employ the valid instrumental variables (IVs) – ones which are exogenous and strongly correlated with endogenous explanatory variables. However, this approach is data-intensive and thus may be inappropriate for our dataset. Alternatively, we adopt the second approach whereby lags of structural variables are chosen as IVs to correct any simultaneity bias in the estimations, using Generalized Method of Moment (GMM) to obtain two-step estimators (Arellano and Bover, 1995; Blundell and Bond, 1998). In so doing, our base-line econometric specification (3) is modified as follows.

$$TFP_{it}^{L-P} = \alpha_0 + \alpha_1 TFP_{it-1}^{L-P} + \alpha_2 \ln FDI_{it} + \alpha_3 \ln LIQUIDITY_{it} + \alpha_4 \ln LEVERAGE_{it}$$
$$+ \alpha_5 \ln SIZE_{it} + \alpha_6 \ln COM_{it} + \alpha_7 \ln HUMANK_{it} + \alpha_8 XM_{it} + \mu_i + u_{it}, \quad (4)$$

where α_1 captures partial dynamic adjustments of TFP_{it}^{L-P}.

Tables A1 and A2 in the Appendix summarize statistics of the abovementioned structural variables and present their correlation matrix, respectively. We are concerned that the correlation between FDI_{it} and other firm characteristics may exist, now that a foreign stake tends to affect decisions on financing, firm size, high-tech capital investment, human capital utilization, and export/import status. However, the correlation matrix in Table A2 indicates that the correlation coefficients between FDI_{it} and other firm attributes are satisfactorily low. This implies that the multicollinearity may not pose a serious problem in our estimation.

5. Empirical Results

Our empirical framework comprises two parts. The first deals with the estimation of the Levinsohn–Petrin TFP using the estimated production function reported in Table 1. Having obtained the Levinsohn–Petrin TFP, we then produce parameter estimates based on our econometric specification (3).

Table 4. OLS, FE, and RE Estimations for Levinsohn–Petrin TFP

Dependent Variable: TFP_{it}^{L-P}			
Independent Variable	**OLS**	**FE**	**RE**
$\ln FDI_{it}$	$.4603^{***}$ (.1164)	1.013^{***} (.3255)	$.5249^{***}$ (.1302)
$\ln LIQUIDITY_{it}$	1.650^{***} (.3034)	1.427^{***} (.5214)	1.613^{***} (.1328)
$\ln LEVERAGE_{it}$	$.2041^{***}$ (.0647)	$.1351^{*}$ (.0724)	$.1906^{***}$ (.0584)
$\ln SIZE_{it}$	$.7095^{***}$ (.0997)	1.170^{***} (.2649)	$.7811^{***}$ (.1107)
$\ln COM_{it}$	$.7441^{***}$ (.1352)	$.8439^{***}$ (.1967)	$.7816^{***}$ (.1328)
$\ln HUMANK_{it}$	$.4166^{**}$ (.1869)	$.5521^{*}$ (.3136)	$.4205^{**}$ (.1853)
XM_{it}	.2037 (.3210)	$-.5079$ (.3458)	$-.0113$ (.2828)
Constant	1.204 (.8292)	$-.9246$ (2.155)	1.020 (.8620)
No. of Obs.	726	726	726
R-squared	.1734	.1495	----
Wald's Chi-squared	----	----	124.50^{***}
Breusch–Pagan Test	----	----	5.13^{**}

Note: 1) Heteroskedasticity-robust standard errors in parentheses for OLS and RE.
2) RE estimates are based on Generalized Least Squares (GLS) with the Swamy–Arora estimators.
3) The Breusch–Pagan test statistic is Chi-squared distributed under the null hypothesis that there are no random effects.
4) ***, **, and * statistically significant at 1, 5, and 10 percent, respectively.

Table 4 reports preliminary estimates of the econometric specification. The first column portrays the OLS estimates with the heteroskedasticity-robust estimators. As emphasized earlier, the OLS estimates tend to be biased owing to the unobservable firm heterogeneity. We address this econometric issue by utilizing Fixed Effects (FE) and Random Effects (RE) estimations reported in the second and third columns,

respectively. Even though the parameter estimates are consistent in terms of signs and statistical significance across all estimations, the Breusch–Pagan test in the last row of Table 3 rejects the null hypothesis of no random effects at the 5 percent level of significance and is thus in favor of RE estimates.

Table 5. GMM Estimations for Levinsohn–Petrin TFP

Dependent Variable: TFP_{it}^{L-P}			
Independent Variable	**Model 1**	**Model 2**	**Model 3**
TFP_{it-1}^{L-P}	$-.0184$ (.1316)	.0847 (.1406)	.0688 (.1313)
$\ln FDI_{it}$	$.6629^{**}$ (.2728)	$.7090^{**}$ (.2984)	$.6306^{**}$ (.2658)
$\ln LIQUIDITY_{it}$	1.648^{***} (.6277)	1.244^{**} (.5909)	1.738^{***} (.6533)
$\ln LEVERAGE_{it}$	$.1437^{*}$ (.0814)	$.1581^{**}$ (.0790)	$.1672^{**}$ (.0738)
$\ln SIZE_{it}$	$.9460^{***}$ (.2793)	$.9776^{***}$ (.2614)	$.9136^{***}$ (.2388)
$\ln COM_{it}$	$.9080^{***}$ (.2819)	$.8399^{***}$ (.2493)	$.9027^{***}$ (.2485)
$\ln HUMANK_{it}$	.6598 (.4166)	—	$.8540^{**}$ (.4319)
XM_{it}	$-.3789$ (.5459)		—
Constant	.2390 (2.954)	-1.778 (2.348)	.0654 (2.505)
No. of Obs.	309	381	380
Wald's Chi-squared	34.17^{***}	33.72^{***}	33.72^{***}
No. of IVs	15	17	17
Sargan test	7.88	11.90	10.78

Note: 1) The Bond–Blundell estimates are based on GMM with the two-step estimators.
2) The maximum lag for AR tests is 2.
3) Standard errors in parentheses.
4) ***, **, and * statistically significant at 1, 5, and 10 percent, respectively.
5) The Sargan test is chi-squared distributed under the null hypothesis that over-identifying restrictions are valid.

Table 5 accounts for the possibility that our dependent variable may be endogenously determined by other unobserved variables, in which case even the FE and RE estimates are biased and inconsistent. We tackle this issue by employing the two-step Bond–Blundell estimations with GMM, where our structural variables are instrumented by

their lags.[7] As shown in Table 5, the first column reports the full model GMM estimation (Model 1). We then perturb the base-line model by dropping $HUMANK_{it}$ and XM_{it} from the specification (Model 2). The last column excludes only XM_{it} (Model 3). We examine the over-identifying restrictions using the Sargan test reported in the last row of Table 5. The null of valid over-identifying restrictions cannot be rejected across all specifications. The Sargan test is therefore in favor of our treatment of lagged endogenous variables as if they were exogenous, and substantiates our well-specified econometric model. Interestingly, the coefficients of TFP_{it-1}^{L-P} are statistically insignificant across all specifications, suggesting that firms in Vietnam promptly respond to productivity shocks.[8]

Our parameter estimates are strikingly robust across all estimation strategies and specifications since the different estimation techniques and model specifications in Tables 3 and 4 produce qualitatively identical results. The robust estimates imply that firm heterogeneity and endogeneity biases may not pose a serious problem in our case. The main findings can be summarized as follows.

First, the degrees of foreign ownership contribute positively to the TFP of firms in Vietnam. The coefficients of FDI_{it} are positive and statistically significant at 1 percent for OLS, FE and RE estimations and 5 percent for the GMM estimations. The productivity premium offered by an acquisition of a domestic firm by foreign investors can be explained by superior know-how, technology and organizational management, which may be transferred easily across borders from the parent to subsidiaries abroad (Markusen, 2002). However, the observed productivity enhancement effects in principle could also be market-driven in the sense that the foreign parents tend to acquire the best-performing indigenous firms.

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[7] We also carry out the Arellano–Bond estimations using GMM and the two-step estimators. The results are qualitatively identical to those of the Blundell–Bond estimations in Table 5. The results are available upon request.

[8] The insignificant coefficients of TFP_{it-1}^{I-P} are consistent with the fact that our results are strikingly robust when the dynamic specifications with the GMM estimations are undertaken in lieu of the baseline specification.

Empirical evidence that points to a positive correlation between foreign ownership and productivity advantage is not new. Our results are consistent with a substantial body of empirical studies that have asserted productivity effects of FDI across a number of industries and countries, such as Arnold and Javorcik (2009), Doms and Jensen (1998), Girma and Görg (2007) and Girma et al. (2001), among many others. These studies usually regard the productivity advancement associated with FDI as MNEs' technological advantage vis-à-vis domestic firms and leave out changes in foreign ownership within firms. Our empirical finding pushes forward the existing literature in this subject by showing that firms with higher foreign ownership (e.g. Greenfield FDI) tend to be more productive than those with low foreign ownership (e.g. joint ventures).

Second, the financial health of firms matters to TFP. Our estimates associated with financial variables, $LIQUIDITY_{it}$ and $LEVERAGE_{it}$, are positive and statistically significant at least at 10 percent across all estimations and specifications. Firms with financial constraints either in terms of low liquidity ($LIQUIDITY_{it}$) or limited access to external sources of fund ($LEVERAGE_{it}$) tend to be characterized by inferior productivity performance. Financial characteristics have effects on market selection mechanisms and investment decisions, thereby shaping growth prospects (Levine, 2005). Our empirical results also confirm the findings of past studies that liquidity helps ease the obstacles facing firms to grow faster and hence augment productivity performance (Beck et al., 2005; Demirguc-Kunt and Maksimovic, 1998), and that limited access to external credit imposes constraints on development, innovation and overall investment decisions (Becchetti and Trovato, 2002).

Third, scale efficiency appears to play a major role in improving the productivity performance of firms in Vietnam. The coefficients of $SIZE_{it}$ exhibit a positive sign and are strongly significant at 1 percent across all estimations and specifications. Therefore, our empirical exercise is consistent with the productivity analysis literature that underscores the role of changes in scale for productivity growth, such as Balk (2001). This result may also reflect the learning-by-doing effect put forward by Lucas (1988).

Fourth, firms with large high-tech capital accumulation and intensive human capital utilization tend to outperform others. The coefficients of COM_{it} appear to be positive and statistically significant at 1 percent across all estimations and specifications even though the GMM estimates of $HUMANK_{it}$ seem to be vulnerable to econometric specifications. As portrayed in Table 4, the GMM results show the positive, statistically significant coefficient only when XM_{it} is dropped. Our empirical results point to investment in high-tech equipment and human resources as a key driver of productivity performance among firms in Vietnam. In addition, our empirical framework sheds light on the literature on the linkage between capital formation and productivity growth, such as Siegel (1997) and Siegel and Griliches (1992), which puts emphasis on the role of high-tech capital such as computers and automated machines in enhancing industrial productivity. We further show that human capital is equally important.

Finally, we find only weak evidence that international trade exposure is correlated with the productivity of firms in Vietnam. The coefficients of the export/import dummy, XM_{it}, turn out to be statistically insignificant, with mixed signs across all estimations and specifications. Although measurement biases may account for the weak evidence of linkages between participation in international trade and productivity performance, our empirical findings are consistent with a number of cross-country studies that show that productivity improvements associated with international trade are small. These include Aw et al. (2000) for South Korea, Bernard and Jensen (1999) for the US, Clerides et al. (1998) for Colombia, Mexico and Morocco, and Greenaway and Kneller (2007) for the UK.

6. A Robustness Check

We undertake several robustness checks of our main findings to establish the robustness of our results using an alternative approach to TFP measurement. To inspect the robustness of our main empirical results, we perturb our empirical framework by

employing the Bond–Blundell approach to TFP measurement (Blundell and Bond, 2000).

In contrast to production technology (1), we attempt to estimate the following modified Cobb–Douglas production function.

$$y_t = \beta_0 + \beta_l l_t + \beta_k k_t + \beta_m m_t + \gamma_t + \eta_i + (\nu_{it} + \varepsilon_{it}), \quad (5)$$

Where γ_t and η_i are time- and firm-specific fixed effects respectively, and the error terms ν_{it} and ε_{it} follow AR(1) and MA(0) respectively. As highlighted earlier, estimation biases arise from correlation between each of these errors and input choices. Blundell and Bond suggest input choices lagged at least two periods as instrumental variables (IVs), instead of intermediate materials as in the LP approach, in the first-differenced equation. An additional set of moments for identification pertains to suitably lagged first-differenced inputs as IVs for the equations in levels.

Table 6. Bond–Blundell Estimation of Production Technology

Dependent Variable: y_t	
y_{t-1}	$.0179^{*}$ (.0108)
l_t	$.2984^{***}$ (.0474)
m_t	$.1517^{***}$ (.0238)
k_t	$.6753^{***}$ (.0424)
Constant	$.6926^{***}$ (.2647)
No. Obs.	1521
Wald's Chi-squared	1906.01^{***}
No. of IVs	18

Note: 1) The Blundell–Bond estimates are based on GMM.
2) The maximum lag for AR tests is two.
3) ***, * statistically significant at 1 and 10 percent, respectively.

Table 6 represents the Bond–Blundell GMM estimates of production technology (5) with the two-step estimator. We make use of the estimates to generate the Bond–Blundell TFP, denoted by TFP_{it}^{B-B}. Having obtained TFP_{it}^{B-B}, we re-estimate our

econometric models where TFP_{it}^{L-P} in Equations (3) and (4) is replaced by TFP_{it}^{B-B}. Tables 6 and 7 reveal the estimates for TFP_{it}^{B-B}.

Table 7. OLS, FE, and RE Estimations for Bond–Blundell TFP

Dependent Variable: TFP_{it}^{B-B}

Independent Variable	**OLS**	**FE**	**RE**
$\ln FDI_{it}$	$.1474^{***}$ (.0304)	$.4628^{***}$ (.1323)	$.1761^{***}$ (.0367)
$\ln LIQUIDITY_{it}$	$.3997^{***}$ (.0755)	.1926 (.1567)	$.3754^{***}$ (.0725)
$\ln LEVERAGE_{it}$	.0138 (.0239)	.0078 (.0230)	.0131 (.0226)
$\ln SIZE_{it}$	$.2459^{***}$ (.0503)	$.5558^{***}$ (.1362)	$.2784^{***}$ (.0562)
$\ln COM_{it}$	$.1302^{***}$ (.0372)	$.1646^{***}$ (.0366)	$.1439^{***}$ (.0338)
$\ln HUMANK_{it}$	$.0893^{**}$ (.0418)	.0512 (.0659)	$.0838^{**}$ (.0411)
XM_{it}	.0931 (.0758)	−.0641 (.0706)	.0443 (.0678)
Constant	-1.476^{***} (.5339)	-3.599^{***} (1.091)	-1.639^{***} (.5617)
No. of Obs.	702	702	702
R-squared	.2833	.2286	----
Wald's Chi-squared	----	----	169.53^{***}
Breusch-Pagan Test	----	----	11.86^{***}

Note: 1) Heteroskedasticity-robust standard errors in parentheses for OLS and RE.
2) RE estimates are based on GLS with the Swamy–Arora estimators.
3) The Breusch–Pagan test statistic is chi-squared distributed under the null hypothesis that there are no random effects.
4) ***, **, and * statistically significant at 1, 5, and 10 percent, respectively.

Table 7 shows the OLS, FE and RE estimates for the model with TFP_{it}^{B-B}. Our estimations with TFP_{it}^{B-B} seem to convey less significant results even though signs of the coefficients remain unchanged, and the Breusch–Pagan test again rejects the null of no random effects. The parameter estimates are qualitatively identical to those in our

base-line estimations,[9] except for the fact that the coefficients of $LEVERAGE_{it}$ turn out to be statistically insignificant.

Table 8. GMM Estimations for Bond–Blundell TFP

Dependent Variable: TFP_{it}^{B-B}

Independent Variable	**Model 1**	**Model 2**	**Model 3**
TFP_{it-1}^{B-B}	.1126 (.1209)	.0428 (.1031)	.0403 (.0985)
$\ln FDI_{it}$	.6482** (.2556)	.5729*** (.2192)	.5626** (.2232)
$\ln LIQUIDITY_{it}$	.0921 (.2855)	.1327 (.2139)	.1906 (.2448)
$\ln LEVERAGE_{it}$	.0214 (.0373)	.0350 (.0260)	.0356 (.0256)
$\ln SIZE_{it}$	.8156*** (.2031)	.7185*** (.1874)	.7102*** (.1924)
$\ln COM_{it}$	.1466*** (.0475)	.1120** (.0503)	.1309*** (.0485)
$\ln HUMANK_{it}$	.0722 (.1272)	----	.1249 (.1156)
XM_{it}	−.0010 (.1671)	----	----
Constant	−5.961*** (1.527)	−5.387*** (1.401)	−5.142*** (1.547)
No. of Obs.	287	358	357
Wald's Chi-squared	154.99***	68.78***	98.43***
No. of IVs	13	14	15
Sargan test	5.02	10.44	10.39

Note: 1) The Bond–Blundell estimates are based on GMM with the two-step estimators.
2) The maximum lag for AR tests is two.
3) Standard errors in parentheses.
4) ***, **, and * statistically significant at 1, 5, and 10 percent, respectively.
5) The Sargan test is chi-squared distributed under the null hypothesis that over-identifying restrictions are valid.

Table 8 reports the GMM estimations that take into account potential endogeneity biases. Again, the Sargan test indicates that the null of valid over-identifying restrictions cannot be rejected across all specifications. Our econometric models with TFP_{it}^{B-B} are therefore well-specified, and employing the lagged structural variables as IVs is

[9] The FE estimate for $LIQUIDITY_{it}$ in Table 7 is statistically insignificant and hence in contrast to that in Table 4. However, the Breusch–Pagan test rejects the null hypothesis of no random effects in favor of the RE estimate, which remains positive and statistically significant. Therefore, our findings of a positive correlation between liquidity and productivity performance remain unaffected.

appropriate. While the estimate of XM_{it} remains statistically insignificant, the coefficients of FDI_{it}, $SIZE_{it}$ and COM_{it} are still positive and statistically significant at least at 5 percent, across different specifications. This implies that our findings concerned with the absence of productivity effects associated with international market openness and the positive contribution of foreign ownership, scale economy, and high-tech capital accumulation to productivity performance are robust with respect to TFP measurements. Nevertheless, our evidence that financial attributes and human capital utilization matter to productivity performance appears to be susceptible to the ways in which TFP is measured. As shown in this table, the coefficients of $LIQUIDITY_{it}$, $LEVERAGE_{it}$ and $HUMANK_{it}$, although exhibiting an unchanged sign, become statistically insignificant.

Our overall findings are satisfactorily robust with respect to the different approaches to TFP measurements, although financial characteristics and human capital utilization are sensitive to different specifications. Even though the Bond–Blundell TFP measurement is less satisfactory than the LP TFP from a theoretical point of view, the econometric exercise in this section serves as a sensitivity test of our main findings and yields clearer insights into the effects of our structural variables on TFP.

7. Conclusions

This paper empirically examines the determinants of productivity performance using micro-level panel data of firms in Vietnam from 2002 to 2008. Our empirical framework builds upon a well-established body of literature on the effects of foreign ownership and firm performance incorporating financial variables and other conventional determinants of firm productivity measured by the LP TFP. We attempt to control for several econometric issues and find the following interesting results.

First, and perhaps most importantly, the degree of foreign ownership is positively correlated with productivity performance. This implies that not just the presence of but also higher degrees of foreign ownership are associated with higher productivity

performance in affiliate firms in the host country. Our result supports the recent industrial development policy in Vietnam that weighs in on raising the cap on foreign ownership.[10] Our empirical exercises reveal that such a policy potentially helps local firms increase their productivity performance and maintain their competitiveness in the international market. At the very least, these results indicate the value of a more careful assessment of its costs and benefits.

Our empirical framework identifies several characteristics of multinational activities that produce high productivity performance. A positive correlation between size and productivity performance points to the existence of scale efficiency whereby production factors employed in-house can advance their sophistication through an expansion of production scale. Investment in high-tech machinery (e.g. computers and automated machines) and utilization of human capital (e.g. education and training) serves as a key engine of productivity enhancement among firms in Vietnam.

Furthermore, financial constraints are also relevant to firms' productivity performance. We show that firms operating in an environment with more liquidity and more access to external credit demonstrate better productivity performance. The result of our study is consistent with the recent evidence that firms in well-developed financial markets tend to experience greater positive gains from multinational activities (Alfaro et al., 2006). Well-developed financial markets will support investment activities of firms to reorganize their production structure, to adopt new technologies, and to support the development of new industries that could create linkages (suppliers) with multinational companies.

[10] In June 2009, the Vietnamese government announced an increase in the ceiling of foreign ownership ratio from 30 to 49 percent.

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Appendix

Table A1. Summary of Statistics

Variable	Obs.	Mean	S.D.	Min	Max
ln *FDI*	5158	–.2833	.4515	–4.382	1.099
ln *LIQUIDITY*	5138	–.5264	.7160	–6.598	.0533
ln *LEVERAGE*	1845	–.6158	2.411	–10.55	6.743
ln *SIZE*	4905	9.136	2.475	.6932	17.99
ln *COM*	4642	–2.028	1.126	–5.622	2.481
ln *HUMANK*	5078	–1.121	.7046	–4.727	0
XM	3401	.8944	.3073	0	1

Table A2. Correlation Matrix of Structural Variables

	FDI	*LIQUIDITY*	*LEVERAGE*	*SIZE*	*COM*	*HUMANK*	*XM*
FDI	1.000						
LIQUIDITY	–.0117	1.000					
LEVERAGE	–.0185	.0816	1.000				
SIZE	–.0318	.0965	.2064	1.000			
COM	.0586	.1319	–.0634	–.2767	1.000		
HUMANK	.0248	–.0895	–.0579	–.1830	.1102	1.000	
XM	.0415	–.0351	–.1375	–.1255	.0130	–.0655	1.000

Note: All variables are represented in logarithmic forms, except for *XM*.