International Capital Flows and Business Cycles in the Asia Pacific Region

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Choong Yong Ahn, President
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March 2003
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Executive Summary

This paper documents the evidence of business cycle synchronization in the selected Asia Pacific countries in the 1990s. We also find that business cycles in the Asian crisis countries are highly synchronized with those in Japan. We explain business cycle synchronization by focusing on the channel of international capital flows. Using the VAR method, we find that most Asian countries experience boom-bust cycles following capital inflows and that boom in output is mostly driven by consumption and investment. Empirical evidence also shows that capital flows in the region are highly correlated, which supports the conclusion that capital market liberalization contributed to business cycle synchronization in Asia.

JEL Classification : F02, F36, F41
Key Words : business cycles, synchronization, capital flows, financial integration, capital market liberalization.

Soyoung Kim is Associate Professor of Economics at Korea University. He held visiting research positions at the Bank of Spain and the Bank of Korea. He received Arnold Beckman Research Award in 1998. His recent publications include “Do Monetary Policy Shocks Matter in the G-7 Countries? Using Common Identifying Assumptions about Monetary Policy Across Countries” (Journal of International Economics, 1999), “Exchange Rate Anomalies in the Industrial Countries: Evidence from Structural VAR’s” (co-authored with Nouriel Roubini, Journal of Monetary Economics, 2000), and “International Transmission of U.S. Monetary Policy Shocks:
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International Capital Flows and Business Cycles in the Asia Pacific Region*

Soyoung Kim**, Sunghyun H. Kim***, and Yunjong Wang****

I. Introduction

Over the past decade, a number of Asia Pacific countries have liberalized their financial markets to foreign capital by reducing restrictions in inward and outward capital flows. At the same time, these countries have achieved a substantial degree of trade integration through trade liberalization policies. Increased capital flows due to financial and trade integration can generate substantial effects on

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business cycles. Large capital inflows following financial market liberalization can generate an initial surge in investment and asset price bubbles followed by capital outflows and recession, the so-called boom-bust cycles. In worst cases, the boom-bust cycles can end with a sudden reversal of capital flows and financial crises.\(^1\) On the other hand, financial market opening can reduce the volatility of some macroeconomic variables such as consumption through risk-sharing as it allows domestic residents to engage in international financial asset transactions.\(^2\)

What are the macroeconomic effects of capital flows, in particular on business cycle fluctuations? Do business cycles become less volatile and more synchronized across countries as the degree of financial or trade integration increases? Understanding business cycle implications of capital flows is important as it provides welfare implications of financial market and trade liberalization policies, as well as international monetary and trade arrangements.

This paper focuses on the effects of capital flows due to financial market liberalization on business cycles, in particular co-movements across countries.\(^3\) We aim to shed some light on this issue by

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1) Although other fundamental domestic problems contribute to financial crises, capital account liberalization and the resulting lending booms sometimes end in twin currency and banking crises.

2) Domestic residents can reduce fluctuations in income stream and consumption by borrowing from abroad during recessions or lending to foreign countries during booms. International portfolio diversification enables consumers and firms to achieve risk-sharing gains by diversifying risks associated with country-specific shocks.

3) We do not focus on the effects of capital flows on business cycle...
providing detailed stylized facts on capital flows and business cycles in the Asia Pacific region and by empirically analyzing the relationship between capital flows and business cycles. For empirical analysis, we adopt VAR (Vector Auto-regression) method. We, first, identify the capital flow shocks and then examine the effects of capita flow shocks on cyclical movements of key macroeconomic variables in each country. We also examine whether these effects are consistent with the boom-bust cycle theory. By further analyzing the correlation between capital flow shocks across countries, we try to infer the role of capital flows in explaining business cycle synchronization.

Economic theory does not provide a unanimous prediction on the effects of capital flows on co-movements of business cycles. Trade integration can generate synchronized business cycles if countries mostly engage in intra-industry trade, while trade integration can decrease the degree of co-movements if trade promotes inter-industry specialization and countries are subject to industry-specific shocks.\textsuperscript{4)} Financial market integration can increase business cycle co-movements as macroeconomic effects of capital flows in different countries follow similar patterns through various channels of contagion and common shocks.\textsuperscript{5)} However, co-movements of output can decrease as allocation of capital becomes more efficient, allowing production to become more specialized.\textsuperscript{6)} Other variables also affect the relationship between capital

\textsuperscript{4)} See Frankel and Rose (1998), and Krugman (1993).
\textsuperscript{5)} See Kim, Kose and Plummer (2001) for a detailed explanation on financial contagion.
\textsuperscript{6)} See Heathcote and Perri (2002), Imbs (2003), and Kalemli-Ozcan et al. (2001).
flows and business cycles, including monetary and fiscal policies, the
tature of underlying shocks in the economy, etc.

Using the data of twelve Asia Pacific countries, we find the
following stylized facts of business cycles. First, business cycles in the
five Asian crisis countries are highly synchronized and follow business
cycles in Japan, while they differ from cycles in Australia and New
Zealand. On the other hand, greater China, including Hong Kong and
Taiwan, show similar cyclical movements. Second, in general, business
cycles in the 1990s are more synchronized across countries than those
in the 1980s, which supports the view that financial and trade
integration increases business cycle synchronization in Asia.

Using the VAR method, we find empirical evidence that positive
capital flow shocks (capital inflows) affect output, consumption, and
investment positively in most countries, which is consistent with the
story of boom-bust cycles. In addition, capital flow shocks are highly
correlated across the crisis countries. These two results imply that
capital flow shocks can explain business cycle synchronization among
the crisis countries.

The remaining sections of this paper are organized as follows. In
section II, we review theoretical and empirical studies on the
relationship between business cycles and financial and trade integration.
In section III, we analyze trends and stylized facts of business cycles in
the region. In particular, we investigate how the volatility of business
cycles in each country has changed over time and whether we can find
any evidence of business cycle synchronization in the region. We
examine the following twelve countries in the Asia Pacific region: five
Asian crisis countries (Indonesia, Korea, Malaysia, the Philippines, and
Thailand), China, Singapore, Taiwan, Hong Kong, Japan, Australia and
New Zealand. Section IV documents the main characteristics of capital flows in the region. We investigate time-series data of the capital accounts and their components for each country and analyze whether there have been any major changes in the trend of capital flows before and after capital account liberalization. Section V provides an empirical analysis of the relationship between capital flows and business cycles. We use the VAR method to analyze how capital flows affect various macroeconomic variables and investigate whether capital flows generate boom-bust cycles in the region. Section VI concludes the paper.
II. Theoretical Overview

Both trade integration and financial integration can have positive or negative effects on business cycle synchronization. This section explains different theories on the effects of economic integration on the symmetry of business cycles and documents empirical studies on this issue. One should note that it is difficult to distinguish the effects of financial integration from the effects of trade integration because they are interrelated. Empirically, therefore, it makes more sense to test for both the implications of financial and trade integration in the same framework (Imbs, 2003).

1. Financial Integration and Business Cycles

Financial market integration can decrease co-movements of output by increasing industrial specialization (Kalemli-Ozcan et al. 2001). Countries with integrated international financial markets can ensure against country-specific shocks through portfolio diversification; therefore such countries can afford to have a specialized production structure. That is, financial market integration allows firms to take full advantage of comparative advantage and engage in production specialization, which in turn increases the asymmetry of output as long as industry-specific shocks exist. Heathcote and Perri (2002) analyzed

7) Note that we focus on the effects of financial market integration on output co-movements, not cross-country consumption correlation which is expected to increase as consumers in different countries receive a similar income stream through portfolio diversification and consumption smoothing.
the same issue from a different angle. They noted a significant drop in
the cross-country correlation of output in the 1990s and argued that the
drop was due to a decrease in cross-country correlation of productivity
shocks combined with increased financial market integration. Degree of
financial market integration endogenously and positively responds to
the correlation of shocks. That is, as productivity shocks become less
correlated, potential welfare gains from portfolio diversification
increase, as does the degree of financial market integration.

However, countries with liberalized capital accounts can be
significantly more synchronized, even though they are more specialized
(Imbs 2003). A large body of literature on contagion argues that capital
flows in different countries, in particular developing countries in the
same region, are synchronized through various channels of financial
contagion including herd behavior, information asymmetry, etc. (Calvo
and Mendoza 2000; Mendoza 2001). International investors may classify
different countries in a single group and make region-based investment
decisions. In addition, capital flows can be highly synchronized if
shocks that determine capital flows are positively correlated or spill
over across countries, or if developing countries go through financial
liberalization process at the same time. Since capital inflows have
significant effects on business cycles (so called “boom-bust” cycles), if
capital flows are highly correlated and have similar effects on business
cycles, then financial integration can contribute to synchronization of
business cycles.

2. Trade Integration and Business Cycles

From the theoretical point of view, trade integration can lead to
business cycle synchronization in either direction—convergence or divergence. For example, Eichengreen (1992) and Krugman (1993) argued that as trade linkages increased, greater specialization of production would occur, resulting in less synchronization of business cycles. In particular, this is more so if business cycles are dominated by industry-specific technological shocks. Frankel and Rose (1998) countered the above argument, insisting that if intra-industry trade was more pronounced than inter-industry trade, business cycles would become more positively correlated as trade became more integrated. As well, there are at least two additional important linkages that lead to a positive relation between increased trade and business cycle co-movements. First, if demand shocks drive a boom in one country, the effects can spill over to trading partners through an increased volume of imports. Second, increased trade may create a greater need for more coordinated macroeconomic policies, which synchronize policy shocks. Both of these linkages imply that increased trade leads to tighter business cycle co-movements. In sum, the theoretical implications of trade integration on business cycle co-movements are not clear.

A number of papers empirically studied this issue using samples from developed country. Frankel and Rose (1998) found that, based on 21 industrial countries, the more countries traded with each other, the more highly correlated were their business cycles. That is, there is a strong bilateral correlation of outputs. Recently, Fidrmuc (2001) has shown that, based on a cross-section analysis of OECD countries between 1990 and 1999, convergence of business cycles relates to intra-industry trade, but there is no direct relation between business cycles and bilateral trade intensity.

Using the data of East Asian countries, Choe (2001) found, using an
empirical method similar to that of Frankel and Rose (1998), that economic fluctuations are more synchronized as trade interdependence deepens in the region. Loayza, Lopez and Ubide (2001) analyze East Asia as a region and find significant short-run and long-run co-movements of business cycles. They find that this co-movement is due to the countries’ highly similar trade structures. Based on a panel regression, Shin and Wang (2003) also find that intra-industry trade is the major channel through which business cycles in East Asia become synchronized, although increased trade itself does not necessarily lead to close business cycle coherence.

According to Kawai and Takagi (2001), East Asia has a high share of intra-regional trade, which accounts for 45% of exports, 49% of imports, and 47% of total trade in the period of 1990-1998.\(^8\) They also show that the composition of trade in East Asian countries is highly weighted towards manufacturing goods, which account for four-fifths of total exports. The similar structure of industry among the East Asian countries provides a strong basis for business cycle synchronization. These recent empirical analyses suggest that business cycle co-movements are strengthened only when the increased trade is largely intra-industry trade.

\(^8\) Bayoumi and Mauro (1999) find that the degree of intra-regional trade in East Asia as a share of regional GDP is similar to that of the euro area. According to Bayoumi and Mauro (1999), the intra-ASEAN exports and imports reached 11.8% and 11.7% respectively in 1998. The Euro Area accounts for 12.0% for exports and 12.8% for imports. Intra-NAFTA trade had a smaller portion than these two regions 5.3% for exports and 5.4% for imports. Mercosur shows intra-regional exports of 2.1% and intra-regional imports of 2.3%. 
III. Trends and Stylized Facts of Business Cycles

In this section, we document the main characteristics of business cycles of the selected countries in the Asia Pacific region.\(^9\) We use the data from the International Financial Statistics (IFS) CD-Rom and examine volatility (measured by standard deviation) and co-movements (measured by cross-country correlation) of output, consumption and investment in these countries. The sample period is from 1980 to 2001 and all the data are Hodrick-Prescott filtered (with filtering parameter = 100). Since we are interested in changes in business cycle statistics as financial markets liberalize, we examine business cycles in different sub-sample periods: 1980-1989 and 1990-2001. For the second period, we use the data with and without the Asian crisis period because the data for that period may distort the statistics.

We focus on two aspects of business cycles related to financial market liberalization and examine whether the stylized facts derived from the data support the theoretical predictions studied in the previous section. First, we investigate how much the volatility of business cycles has changed over time. As financial markets develop over time, volatility of consumption is likely to decrease through consumption smoothing and risk sharing channels unless output volatility increases substantially. However, the impact on volatility of output is more ambiguous as argued in the previous section. Second, we focus on how synchronized business cycles in the region are and

\(^9\) Refer to Kim, Kose and Plummer (2000) for a detailed analysis of stylized facts of business cycles in Asia and G-7 countries.
the changes in the degree of business cycle synchronization over time. We expect that business cycles in this region become more synchronized due to the region’s trade integration and high portion of intra-industry trade. However, the effects of financial integration on business cycle co-movements are ambiguous as argued in the previous section.

1. Volatility of Business Cycles

Table 1 presents volatility of output, relative volatility of consumption and investment in four different periods - the whole period, the 1980s, and the 1990s with and without the Asian crisis period. For relative volatility, a ratio larger than one in this table indicates that the volatility of the respective variable is greater than that of aggregate output.

The output volatility is relatively low with a standard deviation ranging from 1.93 to 2.46 in more developed countries in the region: Japan, Australia and New Zealand. On the other hand, less developed countries in the region exhibit higher volatility: 5.60 in Thailand, 4.69 in Indonesia and 4.71 in Malaysia. Developed countries tend to have more stable industrial structures and output streams. Small countries that depend on natural resources for their main products tend to have volatile output streams due to volatile prices (terms of trade) of primary goods. Moreover, the share of agricultural activity is higher and the shares of industry and service sectors are lower in the less developed countries. The agricultural sector output is highly variable since it is heavily affected by extremely volatile productivity and price shocks.
Table 1. Volatility of Business Cycles

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Comparing output volatility in the two periods, the results are mixed. Five countries show significant increases (Korea, Indonesia, Malaysia, Thailand and Japan), one country shows a significant decrease (the Philippines), and the remaining countries do not experience significant changes over time. Except for the Philippines, the five Asian crisis countries show higher volatility of output in the 1990s compared to the 1980s. This result is consistent even when the crisis period is excluded. On the other hand, greater China (China, Hong Kong, and Taiwan) and Singapore do not experience a rise in output volatility in the 1990s, as well as Australia and New Zealand.

According to the consumption smoothing property in the intertemporal current account model, consumption should be less volatile than output (Obstfeld and Rogoff 1996). Countries, when facing positive shocks, lend to foreign countries in order to smooth the consumption stream over time, and vice versa. However, in the table, we observe that this is not the case in many countries.10) The table shows that consumption volatility is significantly less than output volatility in only five countries including more developed countries (Japan, Australia, and New Zealand) in the region. Developed countries can smooth their consumption by using various risk-sharing tools. As financial markets develop, developing countries should be able to gain access to these risk-sharing tools and reduce volatility of their consumption stream. There is no significant change over time in consumption volatility and no explicit pattern is detected in the table.

10) We should note that the volatility of consumption changes depending on the specific consumption data. It is known that the volatility of durable goods consumption is two to four times higher than that of nondurables consumption (see Backus, Kehoe and Kydland 1995).
Investment is three to four times more volatile than output in the table, which is the typical result in other empirical and simulation studies (Baxter and Crucini 1995; Kim, Kose and Plummer 2001). Investment volatility in China, Singapore and Japan is among the lowest with relative standard deviation less than or around three, while investment in five Asian crisis countries is quite volatile with relative standard deviation of higher than four. There are no significant patterns of change in investment volatility in the 1980s and 1990s. For some countries (Indonesia and Japan), it significantly decreases, while other countries do not display any notable pattern.

Including the crisis period in the data for the 1990s does not significantly change the statistics for all three variables. No systematic patterns of change in volatility result from including or excluding this period in the data. In sum, we found that output volatility increases in the 1990s in many countries and consumption smoothing is not realized as consumption volatility is higher than output volatility in most countries.

2. Co-movements of Business Cycles

Table 2 shows cross-country correlation of output to illustrate the degree to which business cycles are synchronized across countries. The first panel shows the results from the entire sample period. A significant and positive correlation is exhibited across most countries, except for Australia, New Zealand and China. The business cycles of Australia and New Zealand are negatively correlated with those of most other Asian countries: specifically 7 and 5 cases of negative correlation, respectively. Australia and New Zealand each have a
## Table 2. Cross-country Correlation of Output

### (1980-2001)

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### (1980-1989)

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Note: Negative coefficients are underlined. Bold and Italic numbers in the bottom panel indicate that correlation coefficients increase in the second period.
positive (but not strongly positive) output correlation with China, Hong Kong and Taiwan. This is no surprise because the industrial structures of these two countries are totally different from the typical structure in Asian countries. China’s business cycles are also negatively correlated with other economies except Taiwan and Hong Kong. This can be explained by the fact that these three economies—so-called Greater China including China, Hong Kong and Taiwan—are in the same economic zone.  

11) A high correlation between Malaysia and Singapore can be explained in the same context.

The seven Asian crisis countries (including Singapore and Hong Kong) show positive correlation with each other and they are positively correlated with business cycles in Japan as well. This indicates that Japan has been leading business cycles in the region. McKinnon and

11) Since its recent economic reform, China has embarked upon a process of financial and real integration with Hong Kong and Taiwan. Even before Hong Kong’s return to China’s sovereignty in 1997, it had achieved a high degree of integration with the mainland. With respect to trade, for instance, Hong Kong intermediates s lion’s share of China’s external trade via re-exports and offshore trade. Regarding financial activity, a substantial amount of the international capital (in the forms of foreign direct investment, equity and bond financing and syndicated loans) financing China’s economic expansion is raised via Hong Kong. Economic links between China and Taiwan have also proliferated since the 1990s. According to official statistics (although the official statistics under-represent the overall economic interest of Taiwan in China), China is the largest recipient of Taiwan’s overseas investment and Taiwan is China’s third-largest source of foreign direct investment (Cheung, Chinn and Fujii, 2002).
Schnabl (2002) showed that the yen/dollar exchange rate significantly affects business cycles in the East Asian countries through trade and FDI channels. For example, depreciation of the yen in 1995 slowed East Asian export expansion significantly, while yen appreciation accelerates Japanese FDI into the East Asian countries. Bayoumi and Eichengreen (1999) find that the correlation of supply shocks in the region is especially high for two groups, with Japan and Korea in one group and Indonesia, Malaysia, and Singapore in the other. Loayza, Lopez and Ubide (2001) examine common patterns in aggregate demand and supply shocks with a different methodology. They find strong co-movements for two groups: Japan, Korea and Singapore make up one group, and Indonesia, Malaysia and Thailand, another group. These results indicate that there are two different business cycles in the region, even though the East Asian countries show relatively strong co-movements as a whole.

Comparing the data of the 1980s and 1990s proves that business cycles are more synchronized in the 1990s. We examine this property by comparing the number of negative cross-country correlations of output in the two periods. We observe a negative correlation in 17 country pairs during the 1980s, while the number decreases to 10 in the 1990s. Moreover, in the 1990s, without Australia, only two country pairs display a negative correlation. Out of a total of 66 pairs, 41 cases show that correlation increases from the 1980s to the 1990s. In fact, correlation coefficients are significantly positive in most of the 41 cases; only four pairs exhibit a correlation coefficient less than 0.4.

12) This case is indicated by bold and italic numbers in the table. We do not report the case excluding the crisis period but the results are similar.
The empirical results for this region support the view that business cycles become more synchronized as financial markets liberalize. Empirical results on business cycle co-movements in previous studies are mixed, depending on sample countries and periods. Some document that the correlation of output decreases over time, in particular in the 1990s. Heathcote and Perri (2002) showed that output correlation among the U.S., Europe, Canada and Japan dropped from 0.76 to 0.26. On the other hand, Kose et al. (2002), using the data for 21 industrial and 55 developing countries, showed that output correlation in general increased in the 1990s from the previous periods. This is mostly due to the industrial country samples.

In conclusion, we can summarize the main characteristics of the business cycle co-movements as follows. First, business cycles in Australia and New Zealand are different from those in the East Asian countries. Second, Business cycles in the five Asian crisis countries are highly synchronized and follow business cycles in Japan. Third, Greater China including Hong Kong and Taiwan show similar cyclical movements. Finally, in general, business cycles in the 1990s are more synchronized across countries than those in the 1980s, which supports the view that financial integration increases business cycle synchronization.
IV. Trends and Stylized Facts of Capital Flows

The 1990s witnessed an unprecedented rise in net private capital flows to emerging market economies. Such flows continued to rise through the mid-1990s, peaking at US$335 billion in 1996. In particular, net private capital inflows to East Asia in the mid-1990s were conspicuous in the postwar period in terms of the size of the flow to emerging markets. The inflows to East Asia were driven by a mixture of push and pull factors, including the pursuit of perceived large profit opportunities, the diversion of Japanese overseas direct investment, the expansion of institutional investors and country funds, the development of regional ratings, and the easing of capital account restrictions (Grenville 1998; de Brouwer 1999, 2001).

In particular, Western governments were increasing the pressure to liberalize the financial markets in East Asia under the premise that unless financial liberalization were carried out quickly, the inertia would become too great and these countries would never pursue liberalization (Park 1996). However, except for a few countries that had already established a well-functioning system of supervision and regulation of financial institutions (i.e., Hong Kong and Singapore), most small East Asian countries could not deal with large capital inflows. As a result, subsequent years have seen a tumultuous shift in capital flows to emerging Asian markets.\(^{13}\)

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13) At the core of the East Asian crisis was the failure to appreciate the fatal risks of globalization in the context of weak domestic institutions. Traditional macroeconomic fundamentals were of secondary order. If countries had put in place sound institutions to prevent investor
Capital flows to emerging markets have been highly volatile: the flows to Latin America of two decades ago were abruptly reversed in the early 1980s, and the flows to Asia similarly so in 1997-98. In the 1990s, foreign direct investment to emerging markets remained the most stable source of capital inflows, even at the peak of the financial crisis. Much of the upswing in flows in the 1990s was in commercial bank loans, which reached US$124 billion in 1996 from only US$32 billion in 1992. However, this figure dropped to a net outflow of about US$20 billion in 2001 (IIF 2002). Fundamental changes in the composition of private capital flows seem to be occurring after the Asian crisis. The share of direct equity investment composed of foreign direct investment and portfolio investment has tended to increase, while the share of bank loans has substantially declined.

One reason for this compositional change has been the shift by internationally active commercial banks away from new lending for their own balance sheets to fee-based activities, in part due to improved risk management. Another reason is that commercial banks are taking a more direct role in domestic markets by investing in local operations and lending in domestic currencies. From 1992 to 2001, domestic currency lending by BIS-reporting banks to the 29 emerging market countries grew from US$5.5 billion to US$84.5 billion (IIF 2002).

herding, contagion, and speculative attacks, they would have been able to thwart the crisis, even while going through cyclically unfavorable macroeconomic conditions. Singapore and Taiwan managed the contagion by floating their currencies and insulating their financial markets through a gradual and orderly sequence of capital account opening. China, one of the less affected economies in the region, was salvaged by very restricted capital during the financial turmoil of its neighbors.
After the Asian financial crisis, most East Asian countries became net providers of international capital due to their current account surpluses. While receiving inflows of FDI and portfolio investments on a net basis, these countries have repaid large amounts of bank loans for the past several years. With the regional slowdown, net private capital flows to Asia dropped to US$53 billion in 2001 from US$76 billion in 2000. However, the leading emerging market economies in East Asia—China and South Korea—continue to be distinguished by their relatively strong growth.

In the remaining section, we document the main characteristics of capital flows in the Asia Pacific region during the 1990s.\textsuperscript{14} We examine stylized facts of international capital flows in each country and investigate any common patterns of capital flows in the region.\textsuperscript{15} We use two sets of graphs. First, in order to get a broad picture of capital flows, we show current account, capital account and overall balance. We define capital account as the sum of capital account and financial account according to the IFS (IMF) classification. These graphs show the overall external balances of a country and how countries finance current account imbalances. Second, we report the detailed components of the capital account balance: balances on direct investment, portfolio investment and other investment. In this figure, we can examine how the composition of capital flows changes over time, especially before and after the financial crisis.

\textsuperscript{14} We do not include the 1980s because many countries in the region maintained severe restrictions in capital flows and capital flows do not reflect market forces.

\textsuperscript{15} A detailed analysis of capital flows and their determinants in the case of Korea can be found in Kang et al. (2002).
1. Current Account, Capital Account and Overall Balance

Figure 1 shows current account, capital account and overall balance of the selected countries in the region, excluding Hong Kong because of the lack of data. In the five Asian crisis countries, we observe a similar pattern of pre-crisis capital account movement. The capital account balances of all five countries were in surplus and had been increasing when the 1997 Asian crisis hit. On the other hand, China, Japan, and Taiwan were accumulating huge amounts of current account surplus, which made East Asia as a whole a net lender, financing the bulk of U.S. current account deficits. In theory, external financing for current account deficit countries in East Asia could have been arranged regionally by recycling such current account surpluses in China, Japan, and Taiwan. Although some financing was carried out by Japanese banks, the larger part of it was arranged through Western financial institutions because few local institutions had either experience or expertise in international financing. That is, East Asian savers and investors were intermediated by Western financial institutions through global financial centers such as New York and London (Park 2002).

In most East Asian countries, the national budget was either balanced or generating a surplus. The saving rate was also high in many Asian countries, especially in Malaysia, Singapore, and South Korea, but the investment rate was even higher (Ito 2000). Given the region’s sound fundamentals and its commitment to capital account liberalization, foreign investors saw enormous opportunities for profit and moved vast sums of money into East Asia (Park 2001). As a result, capital flows to East Asia increased investment, which in turn contributed to the East Asian countries’ achievement of higher growth.
Figure 1. Current Account, Capital Account and Overall Balance
Figure 1. Continues
Then high growth performances attracted further capital inflows. A virtuous cycle of capital flows and economic growth was indeed an important part of the East Asian miracle. The “East Asian miracle” was believed to be a never-ending success story until the currency crisis broke out and evolved into a serious financial and economic crisis (Kawai 1999).

In particular, the low world interest rates and yen appreciation were external factors contributing to capital flows into East Asia during 1994-96. Yen appreciation increased Japanese overseas direct investment in East Asia. Low interest rates in the industrial countries including Japan produced the portfolio flows to the East Asian economies. The currency stability vis-à-vis the U.S. dollar was also instrumental in bringing in direct and portfolio investment. The currency risk was considered by investors and borrowers to be minimal, and the credit risk was also considered minimal due to high growth performance (Ito 2000; Ogawa and Sun 2000).

During the crisis, capital flows flipped suddenly from an inflow of over US$100 billion in both 1995 and 1996 to outflows of over US$42 billion in 1998 and US$27 billion in 1999. The reversal of capital flows is consistent with the abrupt change from current account deficit to surplus in all five crisis-affected countries. However, during the recovery process in the post-crisis period, these five countries showed different patterns of movement in capital account.

The capital account in the Philippines and Malaysia did not improve much and stayed in deficits, indicating that there were no net capital inflows even after the crisis. In Indonesia and Thailand, the capital account balance slightly improved but remained in deficits. However, Korea experienced a dramatic improvement in capital account balance,
posting a surplus of more than US$10 billion in both 1999 and 2000.\textsuperscript{16} We also observe a similar pattern in current account movement in the five countries. The current account in all the countries showed deficits before the crisis but dramatically improved after the crisis, mostly due to a decrease in demand for imported investment and consumption goods. The overall balance was in surplus or nearly balanced in most countries.

The capital account movement in China shows a very similar pattern to that of Korea, although the magnitude of China’s capital account deterioration in 1997 was less severe. The capital account surplus surges into over US$30 billion in 2001, recovering back to the pre-crisis amount. China has also maintained a huge current account surplus since 1996, even though it is on a decreasing trend. Therefore, the overall balance has been in surplus for the whole data period. On the other hand, Singapore experienced capital account deficits throughout most of the 1990s, as did Taiwan except for in 1998-99. Taiwan, unlike the Asian crisis countries, experienced a significant improvement in capital account in 1998-99. In 2000, however, there was a significant amount of capital outflow from Taiwan and the capital account balance turned into deficits. Both countries had surpluses in current account during the 1990s.

Australia and New Zealand exhibit a similar pattern in capital account movements. Both countries have had a surplus in capital account that has been used to finance current account deficits, resulting in an

\textsuperscript{16} After the crisis, the financing role of the capital account for any current account imbalances decreased. That is, the autonomous characteristics of the capital account have become more conspicuous (Kim, Kim and Wang 2002).
overall balance equilibrium during the 1990s. The amount of capital account surplus fluctuates between US$10 billion and 20 billion for Australia and around US$2 billion for New Zealand. However, the capital account surplus has been decreasing in both countries since 2000.

2. Components of the Capital Account

By analyzing the components of capital account, we can examine which component drives the aggregate capital account movement. Figure 2 presents three components of the capital account—direct investment, portfolio investment and other investment. We take the net value of assets and liabilities to calculate the balance in each component.\(^\text{17}\) Balance on direct investment is calculated by adding direct investment by domestic residents (negative sign) and direct investment into the host country (positive sign). Therefore, a surplus in direct investment means that foreign investors invested a greater amount in the host country than domestic residents invested in foreign countries. For balances on portfolio and other investments, we add assets (net purchase of foreign assets by domestic residents) and liabilities (net purchase of domestic assets by foreign investors). Surplus means net capital inflows.

Among the five Asian crisis countries, Korea has been exceptional in positing a capital account surplus in the post-crisis period. The graph tells us that the main component contributing to capital account surplus

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\(^{17}\) Note that liabilities are denoted with positive and assets are denoted with negative signs in the BOP accounting system. Note also that BOP data are flows data (purchase sales) instead of stock data (investment positions).
Figure 2. Components of Capital Account
Figure 2. Continues
is portfolio investment. Direct investment also increased, while other investment shows deficits. For Malaysia, Thailand, and the Philippines, the capital account deficits in the post crisis period are mainly due to deficits in other investment, although net direct investment shows a surplus in all three countries. In Indonesia, all three components of the capital account show deficits in 1997-2001. This amount of deficits is dramatic considering that Indonesia received huge sums of foreign direct investment and portfolio investment in the mid-1990s before the crisis.

Capital account surplus in China is mainly due to a surplus in foreign direct investment. The graph indicates that direct investment has been in surplus throughout the 1990s, while other investment and portfolio investment have been in deficits since 1997 except for portfolio investment in 2001.\(^\text{18}\) In Taiwan, capital account surplus right after the crisis in 1998 and 1999 comes from a surplus in portfolio investment and other investment. Direct investment has been in deficit throughout the 1990s. Singapore’s capital account deficits have been mostly due to deficits in portfolio investment and other investment, while direct investment stayed in surplus during most of the 1990s. In 2001, all three components show deficits.

Although both Australia and New Zealand show a capital account surplus, the composition of the surplus is different. In Australia, the capital account surplus comes from a surplus in all three components of capital account, except for direct investment in 2001. On the other hand, in New Zealand, portfolio investment showed deficits in 1999 and 2001, while the total capital account showed a surplus due to surpluses in direct investment and other investment.

\(^{18}\) Equity and bond markets in China are not fully open yet, while foreign direct investment is fairly flexible.
V. Capital Flows and Business Cycles: Empirical Studies

In this section, we investigate how capital flows affect the business cycle dynamics of the Asia Pacific countries, for example, whether capital flows generate boom-bust cycles, and whether capital flows help explain the synchronization of the business cycles in the East Asian countries. Capital flows, especially after the financial market liberalization, may increase the volatility of business cycles by creating boom-bust cycles, in particular fluctuations in investment, consumption, exchange rate, and other asset prices. Further, if capital flows are positively correlated across countries, either due to simultaneous capital market liberalization in East Asian countries or due to the herd behavior of international investors, the boom-bust cycles in each country may imply the synchronization of the business cycles.

For empirical methodology, we adopt the VAR estimation method to extract the shocks to capital flows, to analyze how shocks to capital flows affect the various macroeconomic variables in each country, and to examine how the shocks to capital flows are correlated across countries.19)

1. Vector Auto-Regression Model

We assume that the economy is described by a structural form equation

19) A similar empirical methodology was used in Kim, Kim and Wang (2002) to analyze the boom-bust cycles in Korea. Tornell and Westermann (2002) also examined the boom-bust cycles by using a sample of 39 countries.
\[ G(L) y_t = e_t \]  \hspace{1cm} (1)

where \( G(L) \) is a matrix polynomial in the lag operator \( L \), \( y_t \) is an \( n \times 1 \) data vector, and \( e_t \) is an \( n \times 1 \) structural disturbance vector.\(^{20} \) We assume that \( e_t \) is serially uncorrelated and \( \text{var}(e_t) = \Lambda \), which is a diagonal matrix where the diagonal elements are the variances of structural disturbances. That is, structural disturbances are assumed to be mutually uncorrelated.

We can estimate a reduced form equation (VAR)

\[ y_t = B(L) y_{t-1} + u_t, \]  \hspace{1cm} (2)

where \( B(L) \) is a matrix polynomial in lag operator \( L \) and \( \text{var}(u_t) = \Sigma \).

There are several ways of recovering the parameters in the structural-form equation from the estimated parameters in the reduced-form equation. The identification schemes under consideration impose restrictions on contemporaneous structural parameters only. Let \( G_0 \) be the contemporaneous coefficient matrix in the structural form, and let \( G^0(L) \) be the coefficient matrix in \( G(L) \) without the contemporaneous coefficient \( G_0 \). That is,

\[ G(L) = G_0 + G_0(L). \]  \hspace{1cm} (3)

Then, the parameters in the structural-form equation and those in the reduced-form equation are related by

\(^{20} \) For simplicity, I present the model without the vector of constants.

Alternatively, we can regard each variable as a deviation from its steady state.
\[ B(L) = -G_0^{-1}G_0(L). \]  \hspace{1cm} (4)

In addition, the structural disturbances and the reduced-form residuals are related by

\[ e_t = G_0u_t, \] \hspace{1cm} (5)

which implies

\[ \Sigma = G_0^{-1}\Lambda G_0^{-1}. \] \hspace{1cm} (6)

In the method proposed by Sims (1980), identification is achieved by Cholesky decomposition of the reduced-form residuals, \( \Lambda \). In this case, \( G_0 \) becomes triangular so that a recursive structure, that is, the Wold-causal chain, is assumed. In a general non-recursive modeling strategy suggested by Blanchard and Watson (1986), Bernanke (1986), and Sims (1986), maximum likelihood estimates of \( \Lambda \) and \( G_0 \) can be obtained only through the sample estimate of \( \Sigma \). The right-hand side of the equation (6) has \( n \times (n+1) \) free parameters to be estimated. Since \( \Sigma \) contains \( n \times (n+1)/2 \) parameters, by normalizing \( n \) diagonal elements of \( G_0 \) to 1’s, we need at least \( n \times (n-1)/2 \) restrictions on \( G_0 \) to achieve identification. In this generalized structural VAR approach, \( G_0 \) can be any structure (non-recursive). In this paper, recursive modeling is used.

2. Basic Model and Effects on Output

We construct a basic model to examine the effects of capital flows shocks on output. The basic model includes three variables, \{CUR, RGDP,
CAP), where CUR is the current account (as the ratio to the trend GDP), RGDP is the log of real GDP, and CAP is the capital account (as the ratio to the trend GDP).\textsuperscript{21} A constant term and complete seasonal dummies are included. Four lags are assumed.\textsuperscript{22} CAP and RGDP are included in the model since they are primary variables of interest; we examine the effects of capital flows or capital account on the real GDP. CUR is included to control the capital account movements that depend on current account movements since some capital account movements are often related to the financing of current account imbalances and we are interested in extracting autonomous capital flows.

The basic model uses a recursive structure, in which the ordering of the variables is \{CUR, RGDP, CAP\}, where the contemporaneously exogenous variables are ordered first. With this ordering, the shocks to capital flows are extracted by conditioning on the current and lagged CUR and RGDP, in addition to their own lagged variables. We condition on the current (and lagged) CUR since current account imbalances are often financed by capital account. We exclude such endogenous movements of capital flows from the shocks to capital flows. In addition, we condition on the current (and lagged) RGDP since changes in the real GDP may affect the capital account. For example, an increase in the real GDP may attract more capital, and improve the

\textsuperscript{21} We use an exponential trend on the GDP level (or a linear trend on the log level of GDP). When constructing the ratio, we use all variables in terms of U.S. dollars.

\textsuperscript{22} We adopt the Bayesian inference, which is not subject to conventional criticism in the presence of unit root and co-integration. Refer to Sims (1988) and Sims and Uhlig (1991). We also experimented with the log level of the variables but results were qualitatively unchanged.
capital account. We exclude the endogenous movements of capital flows due to the real GDP changes from the shocks to capital flows.\(^{23}\)

The sample period is 1990-2001, during which capital account was liberalized in these Asian-Pacific countries (Grenville 1998; de Brouwer 1999, 2001). We consider two samples, one with the crisis period and the other without it (dropping 1997:3-1998:2). We relate the capital flow shocks identified in the model to the financial market liberalization. If the capital account had been tightly controlled (i.e., China), the shocks to capital flows in our model or autonomous capital flows would have been very small since the capital account should have been directed to finance the current account imbalances (note that our model identifies capital flow shocks, by controlling for the current account movement). Therefore, by examining the effects of autonomous capital account shocks during the sample period, we can infer the consequences of capital account liberalization.

We use quarterly data for the estimation since monthly data is not available for most countries. We consider nine countries for which quarterly data series are available for most of the sample period. They are Korea, Japan, Indonesia, Thailand, the Philippines, Singapore, 

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23) Note that the effects of CAP shocks on CUR and RGDP are invariant to the ordering between CUR and RGDP. On the other hand, capital flows might affect CUR and RGDP within a quarter, and the CUR and RGDP shocks may reflect some part of (exogenous) CAP shocks. However, even in such cases, CAP shocks still represent the shocks to CAP that are not endogenous to CUR and RGDP changes since they do not result from endogenous responses to CUR and RGDP, although CUR and RGDP shocks may include (exogenous) shocks to CAP in addition to shocks to CUR and RGDP.
Taiwan, Australia, and New Zealand. Data sources are *International Financial Statistics, ADB Database, and Bloomberg.*

The impulse responses to CAP shocks over three years are reported in Figure 3 for the sample including the crisis period and Figure 4 for the sample dropping the crisis period. Dotted lines are one standard error bands. The scale represents percentage changes. At the top of each column, the country names are denoted. At the far left of each row, the name of each responding variable is reported.

First, we explain the results for the sample including the crisis period. In response to positive CAP shocks, the real GDP tends to increase in all countries, except for Singapore. In Singapore, capital inflows did not generate a boom in the economy. This can be explained by the fact that Singapore serves as intermediaries of international capital flows, not as final destination of foreign capital, which means that real economic activities in Singapore have little relationship with capital flows in and out of Singapore. The positive effect of capital

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24) The estimation period for Thailand is from 1993 since the data series are available only from 1993.
25) Although Singapore as a regional financial center has relatively more open financial markets vis-à-vis other East Asian economies, it maintained strong economic fundamentals and well-functioning financial systems. Singapore was a creditor country before the crisis, having no external debt. Furthermore, when neighboring countries were hit, Singapore was able to manage the contagion by floating its currency. Like Singapore, Hong Kong had financially sound and economically healthy fundamentals as well as mature institutions, but it still became a victim of the crisis because its firm commitment to the pegged exchange rate system invited speculative attacks. Hong Kong weathered a series of attacks at the expense of its overall macroeconomic performance.
Figure 3. Effect of Capital Flows Shocks: Sample Including Crisis Period

Taiwan

Singapore

Japan

Australia

New Zealand

CUR

RODP

CAP
Figure 3. Continues
Figure 4. Effect of Capital Flows Shocks: Sample Without Crisis Period
Figure 4. Continues
inflows is significant in most countries, including all crisis countries under consideration, and quite persistent in many countries. The positive effects last for more than three years in most countries. For example, in New Zealand and the Philippines, the positive effects are different from zero with more than 68% probability at least for two and a half years. Although the positive effects after two years are less significant in most other countries, the point estimates show that the effects are positive for more than three years in all countries but Korea, Thailand, and Singapore. The results for the sample dropping the crisis period, reported in Figure 4, are not much different except for Indonesia. The negative effects of capital outflows during the Crisis period were so dominant in Indonesia, and therefore without this period the boom-bust cycles disappear.

3. Effects on Other Macro Variables

We modify the basic model to examine the effects of capital flow shocks on other macroeconomic variables. The modified model uses a recursive structure, in which the ordering of the variables is \{CUR, X, CAP\}, where X denotes the variable in interest. With this ordering, the shocks to capital flows are extracted by conditioning on the current and lagged CUR and X, in addition to their own lagged variables. We condition on the current (and lagged) CUR and X as before. First, the current account imbalances are often financed by capital account, and we would like to exclude such endogenous movements of capital flows from the shocks to capital flows. Second, we condition on the current (and lagged) X since changes in X may affect the capital account.26

We include (real) consumption, (real) investment, the price level,
and the real exchange rate as X. Each variable is used as a log form. To construct real consumption and real investment, nominal data are deflated by using a GDP deflator. As the price level, we used the GDP deflator. The real exchange rate is constructed by nominal exchange rate against the U.S. dollar and the GDP deflators of each country and the U.S. Note that an increase in the real exchange rate is a real exchange rate appreciation.27)

Figures 5 and 6 report the results. We did not report the results for consumption and investment for Taiwan and consumption for Singapore since quarterly data series are not available.28) The first two rows report the responses of consumption ("CONS") and investment ("INV"); consumption and investment increase in almost all countries. Especially, the increase in consumption and investment is significant in all the Asian crisis countries. When we exclude the crisis period, the positive effects of capital inflows on consumption and investment become weaker in the Asian crisis countries, especially in Indonesia. This is because Indonesia experienced the most serious and prolonged damage from the crisis among the crisis countries. From this analysis, we can easily infer that the increase in output following capital flow shocks is mostly due to the increase in consumption and investment

26) As in the basic model, we order X before CAP. By doing so, CAP shocks represent the shocks to CAP that are not endogenous to CUR and RGDP changes since they do not result from endogenous responses to CUR and X, although CUR and X shocks may include (exogenous) shocks to CAP, in addition to shocks to CUR and RGDP.

27) For Taiwan, CPI is used since a GDP deflator is not available.

28) Note that the data for Indonesian investment and consumption are only available from 1993, so the results are for the period of 1993-2001.
Figure 5. Effect of Capital Flows Shocks on Various Macroeconomic Variables: Sample Including Crisis Period
Figure 6. Effect of Capital Flows Shocks on Various Macroeconomic Variables: Sample Dropping Crisis Period

Taiwan

Singapore

Japan

Australia

New Zealand

Cons  Inv  POBP  RER
Figure 6. Continues
because the current account negatively responds to capital flow shocks (Figures 3 and 4).

The third and the fourth rows report the responses of the price level (“PGDP”) and the real exchange rate (“RER”). The price level responses are mixed, depending on the country and the sample. For real exchange rate, we expect to observe real appreciation following capital inflows. The graphs show that real exchange rate appreciates in most countries except for Thailand. This is actually due to the inclusion of the crisis period, as Figure 6 without the crisis period shows a real appreciation in Thailand as well. For Indonesia and Korea, exchange rate initially depreciates and starts to appreciate with some time lag (2 quarters).

4. Synchronization of Capital Flows and Business Cycles

In the previous part, we show that a positive shock to capital flows increases output in most countries, and the increase in output is mostly due to consumption and investment boom. The finding, especially the one for the full sample including the crisis period, is consistent with the “boom-bust” cycle following the financial market liberalization. In our model, a big surge in capital inflows after the financial market liberalization can be captured as a positive shock to capital flows, and such a positive shock leads to the boom. Later, when capital flows are reversed, capital outflows can be captured as a negative shock to capital flows in our model, and such a negative shock leads to the bust stage.

However, the evidence alone is not enough to support the hypothesis that capital flow shocks or the financial market liberalization process increases business cycle synchronization in the Asia Pacific region. Only when capital flow shocks are highly correlated across
countries in the region, can they increase co-movements of business cycles. Otherwise, capital flow shocks may not contribute to business cycle synchronization.

In this regard, we calculate the correlations of capital flow shocks across the Asia Pacific countries. First, we extract the capital flow shocks identified in the estimated basic model. Second, we construct the moving average of the capital flow shocks. The moving average is calculated using the current and the lagged values of up to two years

| Table 3. Cross-country Correlation of Capital Flows Shocks  
(Including the Crisis Period) |
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<td>New Zealand</td>
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and three years. We use such a moving average since capital flow shocks typically have a persistent effect on output (lasting two or three years). Then, we calculate the correlation of the moving average.

Table 3 and 4 report the results, with and without the crisis period, respectively. For both sample periods, we find a significant positive correlation of capital flow shocks among the crisis countries. All correlations are positive, except for one case (between Indonesia and Thailand, three-year window, sample including the crisis period). For

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<td>New Zealand</td>
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<td>-0.42</td>
<td>-0.32</td>
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the sample including the crisis period, the average correlation is 0.48 and 0.41 for two and three-year windows, respectively. For the sample excluding the crisis period, the average correlation is 0.56 and 0.62 for two- and three-year windows, respectively. As shown in the previous section, since capital flow shocks have similar effects on business cycles, we can conclude that capital flow shocks contribute to business cycle synchronization among the crisis countries.

We suggest two possible explanations why capital flow shocks among the crisis countries are highly correlated. First, the timing of financial market liberalization in those countries was similar, and each country experienced the boom-bust cycle after the liberalization. Thus, the financial market liberalization process itself contributes to the synchronization of the business cycles. Second, given some extent of openness in the financial markets, contagion through financial channels contributed to similar capital flows in these countries. Due to information cascade, international investors classify these countries in the same group and apply a single investment decision for the whole group. Combined with herd behavior, financial contagion contributed to the synchronization of capital flows and eventually of business cycles.

We also find two interesting observations. First, there is a strong correlation of capital flow shocks between the crisis countries and Japan without the crisis period. For the sample including the crisis period, the average correlation is negative, $\bar{\rho} 0.15$ for a two-year window and $\bar{\rho} 0.55$ for a three-year window. On the other hand, for the sample excluding the crisis period, the average correlation becomes positive, 0.51 for the two-year window and 0.50 for the three-year window. These numbers suggest that capital flow shocks can explain the synchronization of the business cycles of Japan and the crisis countries during normal times.
(excluding the crisis period). However, if we include the crisis period, such a role of capital flow shocks is not evident. This is due to the opposite movement of capital flows during the crisis period; capital outflows in the crisis countries and capital inflows in Japan as shown in Figure 1.

Second, we may not observe synchronized business cycles among the crisis countries in the future. As shown in Figure 1, foreign investors started to differentiate Korea from the other four Asian crisis countries. Korea is the only country that has net capital inflows in the post-crisis period. Therefore, from the observation that capital flows have been generating similar boom-bust cycles in the crisis countries, business cycles in Korea may follow a different path from the other four countries in the future.
VI. Conclusion

The relationship between trade and financial integration and co-movements of business cycles is not unambiguous, both theoretically and empirically. In this paper, we first document business cycle synchronization in some countries in Asia and try to explain this phenomena using financial market liberalization and capital flows. We find that business cycle synchronization among Asian crisis countries in the 1990s can be at least partially explained by synchronization of capital flows and the ensuing boom-bust cycles after the financial market liberalization. Therefore, the results imply that financial market liberalization is likely to synchronize business cycles across a group of countries, which is interesting since recent studies using data from developed countries often found the opposite.

Understanding the effects of capital flows on business cycle co-movements is important and provides implications on various issues. First, potential welfare gains from international risk sharing highly depend on the degree of business cycle synchronization across countries. When countries follow similar business cycles, it would be less efficient to share risks across countries. If financial market liberalization and capital flows increase business cycle co-movements, then potential welfare gains from financial market liberalization become less than originally measured using the existing level of business cycle co-movements. Therefore, potential welfare gains from financial market liberalization might be over-estimated.

Second, our results in this paper can provide implications on financial market liberalization policies. Policies on the speed and
sequencing of financial market liberalization should take consideration of their effects on business cycles and eventually on welfare. Finally, our results provide implications on regional monetary and financial integration such as optimum currency area. For example, one of the conditions for optimum currency area is having similar business cycle movements in the potential candidate countries.

When most emerging East Asian countries started to liberalize their financial markets in the early 1990s, no regional risk-sharing mechanism existed. Although Japan still remained one important source country for external financing before the crisis, Western investors outside the region also played an important role. Since the crisis, however, most East Asian countries became net providers of international capital due to their current account surpluses. While receiving inflows of FDI and portfolio investment on a net basis, these countries have repaid large sums of bank loans for the past several years. Looking into the future, whether countries in the Asia Pacific region have similar patterns of capital flows will be an empirical question. However, until a regional risk-sharing mechanism for integrating financial markets in the region is fully developed, most East Asian countries are likely to become more integrated into the global financial markets. Regional financial centers will play a limited role by intermediating the flows between global centers and regional economies. Then, most East Asian countries will remain exposed to the vagaries of capital flows, and their business cycles will tend to synchronize despite some variations across countries in the region.
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