Understanding the Asian Contagion: "An International Business Cycle Perspective"

Sunghyun Henry Kim

M. Ayhan Kose

Michael G. Plummer

Graduate School of International Economics and Finance

Brandeis University

Working Paper Series Vol. 2000-14
August 2000

The International Centre for the Study of East Asian Development, Kitakyushu

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Sunghyun Henry Kim*
M. Ayhan Kose*
Michael G. Plummer*

This version: March 2000

Abstract: The objective of this paper is to examine the contagious nature of the Asian Crisis by analyzing the key features of business cycles of the Crisis countries. We study the validity of the two prevailing explanations of the Asian contagion: (1) propagation of adverse shocks and international investors' behavior, and (2) symmetric problems in domestic economic fundamentals. First, we categorize various propagation channels into trade, financial and pure contagion channels, and evaluate their relative importance. Then, we examine the business cycle comovements of several macroeconomic aggregates to investigate whether these countries share similar cyclical properties. We also analyze the role of common shocks that the region faced before the Crisis. This allows us to evaluate the role of domestic fundamental problems in explaining the contagious nature of the Crisis. The results suggest that the transmission of shocks through the trade channel can explain only part of the Asian Crisis and that the financial channel and domestic fundamentals together play a significant role in most countries.

JEL Classification: F42, E32, E61, O53
Key Words: Asian Crisis, contagion, business cycles, trade channel, financial channel.

* Graduate School of International Economics and Finance, Brandeis University, Waltham MA, 02454. e-mail (Kim): hkim@brandeis.edu, e-mail (Kose): akose@brandeis.edu, e-mail (Plummer): plummer@brandeis.edu, phone (Kim): (781) 736-2268, phone (Kose): (781) 736-2266, phone (Plummer): (781) 860-7415. We gratefully acknowledge financial support from The International Center for the Study of East Asian Development (ICSEAD). Earlier versions of this paper were presented at the 1999 ACAES International Conference on Asian Economics in Seoul, The International Center for the Study of East Asian Development (ICSEAD) in Kitakyushu, Japan, and the 1999 Eastern Economic Association Conference in Boston. We would like to thank Shinichi Ichimura, William E. James, Eric Ramstetter, and seminar participants for their comments. We are thankful to Kulaya Tantitemit for superb research assistance. The usual disclaimer applies.

1. Introduction

"Contagion" is a loaded word. Many believe that it can explain most, if not all, dimensions of the recent economic crisis that originated in Thailand, and rapidly spread to several other countries in Asia, Russia, and Latin America. When a country with seemingly stable fundamentals suddenly collapses following an economic crisis in another country, contagion seems to be a perfect word describing the spread of the Crisis from the source country to the others.

However, there is no consensus even as to the definition of contagion.[1] Some define contagion in a broad sense as the transmission of shocks from one country to another through various channels, even those we observe in normal times.[2] Others narrowly define contagion as specific transmission channels that we observe only during periods of crisis and that cannot be explained by the standard propagation channels emphasized in the broad definition.[3] The excess variation and comovement during times of economic turbulence, not captured by the standard channels, constitutes contagion.

On the other hand, some argue that contagion is a myth and that problems associated with domestic fundamentals of these economies initiated the Crisis.[4] In other words, there is no pure contagion without some fundamental domestic economic problems that all these countries have accumulated before the initiation of the Crisis. Hence, what appears to be contagion is merely symmetric structural weaknesses.

This paper analyzes the contagious nature of the Asian Crisis by investigating the two prevailing explanations mentioned above: (1) transmission of adverse shocks through various channels, and (2) symmetric problems in domestic economic fundamentals. This paper does not intend to investigate the sources of the Asian Crisis, which has already been studied extensively.[5] Instead, we focus on explaining why the crisis rapidly spread to several countries in the region.

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[1] For recent survey papers on contagion, see Claessens, Dornbusch, and Park (1999), Forbes and Rigobon (1999), Kodres and Pritsker (1999), and Wolf (1999).
[2] See, for example, Eichengreen and Rose (1996), and Glick and Rose (1998).
[3] See Rigobon (1998), Masson (1998), and Van Rijckeghem and Weder (1999).
[4] See, for example, Corsetti, Pesenti and Roubini (1999a, 1999b), and Forbes and Rigobon (1998).
[5] It is important to note that most studies on the sources of the Asian Crisis focus on explaining why the crisis occurred in a particular country, while this paper analyzes why the crisis in one country spread to the others. Ichimura (1999), Corsetti, Pesenti and Roubini (1999a, 1999b), and Radelet and Sachs (1999) provide extensive information about the causes of the Asian Crisis.

To study the role of transmission of shocks, we adopt the broad definition of contagion and examine three transmission channels—trade channel, financial channel, and pure contagion.[6] We analyze how these channels work to transmit shocks across countries and survey recent research on these issues. We also employ simple statistical methods to empirically validate each channel.

We, then, investigate whether the contagion can be explained by common fundamental economic and financial problems in this region. We study business cycle features of these countries to find any comovements of macroeconomic and financial variables. If cross-country correlations among the Crisis countries show significant increases over time in the pre-crisis period, then the comovement of domestic fundamentals during the crisis period can be explained without much difficulty. We also investigate the role of common shocks in the region that may have led to similar cyclical fluctuations in these countries.

The three transmission channels work as follows: First, transmission of shocks through the trade channel occur when the devaluation of one country in response to a country-specific shock affects the economic fundamentals of other countries through terms of trade and income effects. In particular, if a group of countries compete for the same export markets, when one devalues its currency and builds a competitive edge in export markets, the other countries might soon have to devalue. Many researchers have analyzed spillovers through the trade channel even before the Asian Crisis.[7]

Second, the financial channel considers the role of international investors and their contribution to the spread of the Asian Crisis. When an emerging country is hit by an economic crisis, all international market participants reevaluate their positions in other emerging countries and may withdraw their funds from those countries. Possible reasons for this include restoring capital-adequacy ratios, satisfying margin calls, lack of liquidity, etc.

Finally, unlike the mechanical spillovers discussed above, pure contagion is related to shifts in market sentiments and perception towards risk. In other words, contagion takes place because the initial country-specific shock is artificially replicated in other countries by the sudden reversal in the market's perception about

[6] The narrow definition of contagion contains only pure contagion, not trade or financial channels.
[7] See, for example, Gerlach and Smets (1995) and Eichengreen, Rose and Wyploz (1996).

the state of those economies.[8] This type of transmission, however, should be only a short-run phenomenon.

To understand the role of domestic fundamentals in explaining contagion, we investigate the business cycle features of these countries regarding volatility and comovements of the components of national expenditure. If these countries' macroeconomic data share similar cyclical properties even before the Crisis, the contagious nature of the Asian Crisis can be explained by the synchronization of economic fundamentals. However, if the business cycles show no similarities, then the observation that the Crisis happened at the same time in Asian countries should require some other explanations specific to the crisis period.

We also examine the role of external shocks that simultaneously affect several countries. For example, oil price shocks, fluctuations in the prices of primary commodities, and exchange rates and interest rates of key countries can affect many countries at the same time. These shocks may have weakened the fundamentals of the crisis countries at the same time and make them vulnerable to crisis.

The remainder of this paper is organized as follows. We first examine three transmission channels and discuss how each channel explains the contagious nature of the Asian and other crises. Then, we survey recent empirical studies of each channel. In particular, we document the key properties of the data of Asian Crisis countries that enable us to examine the validity of trade and financial channels. Next, we analyze business cycle features of the countries that have experienced the Crisis–Korea, Indonesia, Malaysia, the Philippines, and Thailand–and investigate the similarities and differences of cyclical fluctuations of various macroeconomic and financial variables. We then study whether common shocks have contributed to the synchronization of business cycles in these countries. The final section concludes the paper.

[8] See, for example, Radelet and Sachs (1998), and Masson (1998).

2. Channels of Contagion

We categorize the factors explaining contagion into three groups: (1) trade channel, (2) financial channel, and (3) pure contagion.[9] Some researchers, including Masson (1998), consider external common shocks as channels of contagion, but we consider them together with domestic fundamentals since these shocks work indirectly through changing domestic fundamentals. Since all countries under consideration are to some extent engaged in commodity and asset trading with each other, transmission or spillover of negative shocks through trade and financial channels can explain the contagious nature of the Asian Crisis. Pure contagion is related to changes in international investors' behavior caused by shifts in their perception towards market risk.

2.1. Trade Channel

We categorize the trade channel into direct and indirect channels. The direct channel works as follows: suppose two countries, A and B, heavily trade with each other. If the crisis in country A is accompanied by a devaluation of its currency, the trade balance of country B will deteriorate because of (1) an increase in the price competitiveness of country A, and (2) a decrease in demand for imported goods in country A. If the two countries have a high volume of bilateral trade, the direct trade channel can explain the contagion of the crisis.

The indirect channel works as follows: when a country devalues its currency, other countries competing for the same export markets tend to devalue soon afterwards in order to maintain their price competitiveness. For example, when Thailand floated the baht, other countries in the region that compete for the same export markets became under pressure to devalue their currencies since they were not able to compete with Thailand at the prevailing exchange rate. Thus, the indirect channel will be a function of export similarities, which are in turn a reflection of relative factor endowments and other economic characteristics.

[9] Others use different definitions for classifying channels of contagion: Forbes and Rigobon (1999) use crisis-contagion and non crisis-contagion theories to distinguish the normal channel of transmission and particular channel of transmission that works only during crisis. Kodres and Pritsker (1999) define rational channels that include real, financial market, and financial institution channels. Abeysinghe (1999) uses the real interest rate channel in explaining the contagion from the Thailand recession to the rest of Asia.

With respect to the Asian Crisis, the trade channel does not appear to work through changes in real economic variables such as the volume of exports and imports or the trade balance. Real economic variables slowly adjust to the changes in exchange rate and other economic shocks, while in the Asian Crisis, shocks spread over a short period of time.[10] Therefore, it is more plausible to say that contagion works through changes in the investors' expectations regarding the future competitiveness of the economy. The decreased competitiveness caused by the devaluation of other countries makes a country more vulnerable to a currency attack.

Previous Empirical Studies

Eichengreen, Rose and Wyploz (1996), using 30 years of panel data from 20 industrialized countries, find evidence that shocks spread more easily from one country to another if the two countries have strong trade relations. Their view is based on the observation that once a country had experienced a speculative attack—Thailand in 1997, Mexico in 1994, Finland in 1992—its trading partners and competitors in the same region were more likely to be attacked themselves. In estimating the role of the international trade channel in spreading currency attacks, they control for similar macroeconomic fundamentals such as the growth rate of domestic credit and the government budget deficit. They conclude that international transmission of speculative attacks takes place mostly through the trade channel.[11]

Their subsequent papers such as Glick and Rose (1998), and Eichengreen and Rose (1998) provide similar empirical evidence that international trade is an important channel of contagion. Glick and Rose (1998) examine five currency crisis episodes, starting with the breakdown of the Bretton Woods system in 1971 and ending with the Asian Currency Crisis in 1997-98. They find that countries affected by crisis have strong trade relations with the country that was the first victim of the crisis episode. However, they do not find the trade channel to be important relative to other channels, such as problems in macroeconomic fundamentals or common shocks, in explaining contagious crisis.

[10] J-curve effects can explain a slow speed of adjustment of the trade balance to changes in exchange rates.

[11] Another related study is done by Corsetti, et al. (1999b). They provide a theoretical model of the contagion via trade links. Their model evaluates beggar-thy-neighbor effects within an optimization framework, and provides an analysis of the effect of the devaluation by one country on the welfare of other countries.

Kochar, Loungani, and Stone (1998) consider international trade competition as a source of contagion in the Asian Crisis. They provide data on the composition of exports to the U.S. of four Asian countries affected by the Crisis—Korea, Malaysia, the Philippines, and Thailand. While shares of semiconductors and capital goods exported to the U.S. from these countries have risen from 1989 to 1997, the share of relatively labor-intensive goods such as apparel, footwear, and household goods in total exports has declined. Their results suggest that these countries export similar goods to the same destinations, implying that the trade channel plays an important role in transmitting crisis in the region.[12]

Empirical Examination of Trade Channel

In order to examine the importance of the trade channel, we examine the cross-country correlations of trade variables. High cross-correlation suggests that these countries share similar cyclical patterns of trade. Tables 1 and 2 present contemporaneous cross-correlations of exports and imports of the five Asian Crisis countries. All the data are real, logged and detrended with the Hodrick-Prescott filters. The table reports the correlation from the whole sample period from 1960 to 1996 and two sub-samples, 1960-1984 and 1984-1996, to examine changes of correlation over time.

The results show that exports are strongly correlated among Malaysia, Thailand, and Indonesia, and imports are strongly correlated among Malaysia, Thailand and the Philippines. High correlation can result from similar business cycle patterns of these countries or similar changes of trade structures. Korea seems to maintain low or negative correlation with other countries. This can be explained by different components of traded goods: Korea has a more advanced industrial structure than other four Asian Crisis countries. The results also indicate that correlations increase over time in most countries. For a further examination of the trade channel, we investigate the trade pattern of each country.

In order to test the validity of the direct trade channel, we examine trade shares among the five countries in total trade. Table 3 shows merchandise exports and

[12] Additional evidence supporting the trade channel can be found in the Russian case: Russia's collapse was not transmitted to other Eastern European countries and this can be explained by the fact that the trade ties between Eastern Europe and Russia are no longer significant (exports to Russia from Czech Republic, Hungary, and Poland are less than 5% of their total exports).

imports by partner countries in 1997. Surprisingly, the share of trade among the five Crisis countries is around or less than 10% of total exports in all cases. Compared to trade shares with other countries such as the U.S. and Japan, these numbers are relatively small. This suggests that the direct channel through trade may not have a significant role in propagating the Crisis. However, once China, Japan, Hong Kong and Singapore are included, the intra-Asia trade consists of more than 50% of total exports in all five countries.

To test indirect channels, we examine the shares of Japan, the U.S. and other common markets in which the five countries are competing for exports. In table 3, the most significant trading partners of the five countries are the U.S., Japan, Hong Kong, Singapore, and China. However, the relative importance of each country is different. The U.S. occupies the largest share among the trading partners of the Philippines (35%), while it is around 14-19% in the other countries. The share of Japan in Indonesia's exports is the largest (25%), while other countries have lower export shares of Japan (11-16%). Two interesting observations are that China's portion is not particularly large (1-5%) except in Korea (10%), while Hong Kong and Singapore's shares are the most significant in Malaysia (25%). These can be explained by the important role played by established networks and the geographical locations of these countries.

Shares of exports to major trading partners may not be sufficient to determine the degree of export competition, since the five countries may compete in different categories of goods. Table 4 shows the merchandise exports and imports by major commodity groups. Machinery exports consist of more than 50% of the total exports of Korea and Malaysia, while in Indonesia they constitute only 9%. Agricultural goods comprise 19% in Thailand's exports, while in Korea they account for 2%. Mineral fuels and crude materials are 33% in Indonesia and 13% in Malaysia, but in the other countries, they are only 3-7%. These results suggest that the components of exports are significantly different across countries, which implies that the indirect trade channel does not fully explain the Asian contagion.

2.2.Financial Channel

The financial channel is directly related to international investors' behavior. A sudden withdrawal of investment by foreign investors can be critical, as it was for Asia in 1997. Within six months, the region was called upon to reimburse lending and make current payments equal to the accumulated reserves of the previous seven years. No country that is open to international capital flows can instantaneously repay virtually all of its short-term borrowing without a collapse in the exchange rate and a substantial disruption of the real economy.

The potential role of international investors at the start of the Crisis is clear. Does it follow, then, that international investors' behavior can explain financial contagion? If international investors withdrew their investments from these countries at the same time, this would be a sufficient explanation. However, it would be a challenge to explain the motives or reasons behind this herding behavior and also the magnitude of its effects on the economy.

Transmission through financial markets can also be divided into direct and indirect channels. The direct channel involves foreign investment—bank lending, portfolio investment, and direct foreign investment—by the Asian Crisis countries. Financial market liberalization of these countries gave incentives to their banks and financial institutions to increase their investment abroad. If a country made significant portfolio investments in the other Asian countries where the crisis occurred, this country can also be affected by the crisis. Contagion through the direct financial channel was especially significant in the case of Korea, which made considerable investments in Southeast Asian countries beginning in the early 1990s.[13]

The indirect channel works through the international investors who have asset positions in various countries under crisis.[14] Many financial institutions in the U.S., Japan and Europe have increased their investment positions in Asian countries in the 1990s. A crisis in one of these Asian countries can affect international investors' portfolio strategies due to various reasons. For example, losses in one country could lead international investors to withdraw their investment in other developing countries to meet the capital-adequacy ratio or margin calls, or to resolve their liquidity

[13] Many Korean banks and financial institutions experienced a significant loss from their investment in the other four Asian Crisis countries.

[14] International investors are defined as investors from a third country that is not involved with the crisis or investors that are not directly related to the crisis countries.

problems. Contagious crisis can take place if these international investors suddenly and simultaneously change their investment positions in several countries.[15]

Before we investigate the financial channel in detail, we need to answer the following question: why have domestic and international investors made risky and inefficient investments in developing countries, including the five Asian Crisis countries? If lending and borrowing were to stay within levels set by optimal behavior, they would not cause significant problems in an economy. However, we observed overlending and overborrowing in most Asian countries before the Crisis. In the domestic economy, firms arguably increased investment more than their optimal level, while commercial banks overlended to firms. Overlending naturally leads to excess investment in risky businesses to which, under normal conditions, there should be no lending at all.[16] The economy becomes more vulnerable to adverse shocks. Some recent research has placed an emphasis on this issue in explaining the Asian Crisis.

Overlending and overborrowing are observed across countries as well as within countries due to recent financial market liberalization, as well as "supply-side" changes, such as the emergence of institutional investors as important actors in emerging markets. A significant increase in cross-country net asset holdings in the 1990s is partly related to overlending/overborrowing.

The direct financial channel works mainly through international bank lending and portfolio investment in stock and bond markets.[17] Excess and unhedged cross-country asset holdings can damage foreign investors' profits and create contagion. Increased volume of direct foreign investment can also facilitate the transmission of shocks across countries. For example, a number of Japanese and Korean firms have directly invested in the Southeast Asian countries through subsidiaries and branch offices. The increase in bankruptcies and banking problems, as well as currency depreciation, in this region can result in significant losses to the Korean and Japanese multinational firms. However, further investigation is required to determine the exact role of the

[15] In this paper, we distinguish between spillovers through financial channel and pure contagion. Financial channel is related to the international investors' behavior due to certain systematic portfolio transaction rules or liquidity problems, while pure contagion involves changes in the investors' attitudes towards risks.

[16] Some have studied the causes of overborrowing/overlending in the credit economy including moral hazard problems. See, for example, Aizenman (1998) and Schneider and Tornell (1998).

[17] Some relate the direct financial channel to the credit crunch in the banking sector of the crisis countries. See various papers presented in the conference, "The Credit Crunch in East Asia: What do we know and what do we need to know?" by WIDER.

direct financial channel in the Asian Crisis, including empirical studies using data on country-by-country and sector-by-sector asset holdings.

The spread of crisis through the indirect financial channel is related to various types of international investors' behavior. Facing losses in one country, international banks have an incentive to sell assets in other countries to restore their capital adequacy ratios, to meet the regulatory requirements, or to manage their risk exposure. Losses in one emerging market can lead mutual funds to reposition their portfolio and sell off their assets in other emerging markets due to margin calls from investors. This channel is related to the liquidity constraint of financial institutions. Calvo (1999) emphasizes the role of asymmetric information among investors in explaining contagion. The idea is relatively simple: suppose informed investors, due to some type of liquidity constraint, sell their assets in a country with no change in its macroeconomic fundamentals. Uninformed investors may sell off this country's assets because they cannot distinguish between a liquidity shock and a bad signal. This can explain a sell-off of assets of a country whose fundamentals are sound.

Previous Empirical Studies

A large volume of empirical works on the financial channel exists. However, there is no consensus on how significant the role of international investors' behavior was at the onset of crisis. Some argue that foreign investors played an important role in initiating the Asian Crisis, while others argue that their role was minimal compared to other causes.

Kaminsky and Reinhart (1998), Caramazza, Ricci and Salgado (1999), and Van Rijckeghem and Weder (1999) test the significance of the indirect financial channel, especially the role of bank lending and portfolio investment—"common bank lender effect" according to their definition. The results are mixed. Van Rijckeghem and Weder (1999) find evidence in favor of a common bank lender effect in the Thai, Mexican, and Russian cases, while Caramazza, Ricci and Salgado (1999)'s results suggest weak evidence for Russian case. These results become less significant when the trade channel and domestic fundamentals are also included in the analysis.

Some have attempted to directly measure the behavior of foreign investors during the Asian Crisis. Three papers can be cited in this category. First, using Korean data, Kim and Wei (1999) show that non-resident investors were "positive feedback

traders" during the crisis. That is, foreign investors destabilized the market by selling stocks when prices were declining. However, they find that domestic investors also turned into "positive feedback traders" at the time of the Crisis.

The other two papers find little or no hard evidence that foreign investors were behind the market declines. Brown, Park and Goetzmann (1998) focus on the role of hedge funds in the Southeast Asian currency markets in the summer of 1997. They conclude that the hedge funds do not seem to have had large exposures to these currencies. Moreover, they appear to have been buying into the currency as it collapsed during this period. Choe, Kho and Stulz (1998) investigate the role of foreign investors on the Korean stock market and conclude that there is no evidence that heavy foreign selling leads to falling stock prices.

It is hard to derive a definitive conclusion on the relative importance of the financial channel. We need more concrete empirical studies to properly consider the role of hedge funds, mutual funds, and other foreign institutional investors on the contagious nature of the Asian Crisis.

Empirical Examination of Financial Channel

In this section, we study aggregate financial data to supplement the tests of the financial channel. We consider two series, net private capital flows (Fig. 1) and total foreign reserves minus gold (Fig. 2) of the five Asian Crisis countries. If the timing of capital outflow coincides with the start of the Crisis, especially collapses in exchange rates, then we can assign a role to foreign investors in propagating the Crisis through this channel.

We can induce the timing of capital outflows in figure 1. The results are
(1) Thailand: started at the 1st quarter, 1997 and peaked at the 2nd quarter, 1997.
(2) Indonesia: started at the 2nd quarter, 1997 and peaked at the 4th quarter, 1997.
(3) The Philippines: started at the 3rd quarter, 1997 and peaked at the 4th quarter, 1997.
(4) Korea: started at the 3rd quarter, 1997 and peaked at the 4th quarter, 1997.

With respect to the magnitude of capital outflows, Korea experienced the largest change followed by Thailand and Indonesia. The Philippines experienced the smallest amount of capital outflows. The timing and magnitude of capital flight coincide with those of the Crisis itself: the Crisis started in Thailand first and Korea last. The magnitude of Crisis was the least in the Philippines among the five countries.

We can observe similar patterns in foreign reserves as well. Figure 2 shows total reserves minus gold in US $: Korea had the most significant drop in the foreign reserve in the 4th quarter, 1997 and 1st quarter, 1998, followed by Thailand and Malaysia during the same period. Indonesia and the Philippines had less significant decreases in foreign reserves compared to the other countries. We can interpret that these results partially support the role of international investors in explaining the contagion of the Asian crisis, while noting that it is necessary to further examine the data.

2.3. Pure Contagion

Pure contagion is related to changes in international investors' behavior, not caused by systematic or mechanical changes in their portfolio composition but caused by shifts in their perception towards market risk. This group includes the following terms that are used by other studies: herd behavior, informational cascades, demonstration effect, wake-up call, etc. Some researchers such as Rigobon (1998) and Masson (1998) define contagion as this channel only. The basic idea behind all these terms is that a crisis in one country can provide information to investors and change the market sentiments or their interpretation of market situations.

One theory in this category assumes that international investors follow "herd behavior" in portfolio and risk allocations. Investors pay close attention to other investors' behavior in the market, partly because they worry about their relative performance in the market compared to others. Therefore, as one investor moves, especially a market leader, others follow.

"Informational cascade" works in the following way. Instead of evaluating countries one by one considering their fundamentals separately, investors tend to consider all developing countries as the same. Therefore, if they decide to withdraw their investment from certain markets, they would decrease their portfolio investments in other emerging markets. Suppose one country collapses and significantly damages investors' profits. This would reduce the investors' risk tolerance and would induce them to withdraw their investment from other similar markets, too.

Contagion through this channel can be "dangerous" since even if there is nothing wrong with the fundamentals of a country, international investment can be withdrawn suddenly due to the change in foreign investors' attitude towards risk. If one investor

suddenly realizes that a country is in trouble, others are likely to follow this investor and pull their investments out of this country at the same time.[18]

However, even in the presence of scrupulous investors who closely follow fundamentals, contagion can still occur. Investors may not realize that an economy is struggling. When countries with similar fundamental imbalances face attacks on their currencies, investors reevaluate the economic conditions of other countries and withdraw their investments from these countries. This process pushes these countries into crisis. This channel is called the "demonstration effect" or "wake-up call." For example, weaknesses in the banking sector of the Asian Crisis countries emerged in the main only after the Thai baht collapsed.

Several papers have tested the role of pure contagion in the spread of the Asian Crisis. Most researchers estimate pure contagion by using residuals of cross-country correlations that cannot be explained by fundamentals or other spillover channels. Kim and Wei (1998) use Korean stock market data and find evidence that foreign investors show a herding behavior during the Crisis. Kodres and Pritsker (1999) emphasize the interaction of financial market and financial institutions, defined as "cross-market hedging channel", in explaining the contagion. Forbes (1999) use firm-level data and confirm the role of country specific effects, which can reflect some kind of wake-up call or country revaluation.

3. Domestic Economic Fundamentals

Unlike the view that the Crisis was transmitted from one country to others, some argue that there is no contagion and similar domestic fundamentals can explain the contagious nature of the Asian crisis. In this section, we analyze cross-country correlations of macroeconomic and financial variables of the Asian Crisis countries to evaluate how similar these countries' business cycles were before the Crisis. We also analyze the role of common shocks that this region faced before the Crisis.

3.1. Business Cycle Comovements

This section analyzes the cross-country correlation of key macro variables among the five Asian Crisis countries.[19] We use the Hodrick-Prescott filtered annual data

[18] See Radelet and Sachs (1988).

series of the five countries–Korea, Indonesia, Malaysia, Thailand and the Philippines–from 1960 to 1996. We also examine the data from two sub-samples, 1960-1984 and 1984-1996, to study the changes in correlations over time. This analysis provides information about the extent of similarities among cyclical economic activities in these countries. If these economies' business cycles exhibit a significant degree of synchronization, then it is not surprising to observe the rapid contagion of crisis from one country to another. If, on the other hand, the degree of comovements of business cycles is low, domestic fundamentals may not explain the contagious nature of the Crisis.

Most empirical studies that test the existence of contagion or transmission of shocks during the Asian Crisis conclude that the contagion occurred during the crisis, no matter how the contagion is defined. However, Forbes and Rigobon (1998, 1999) criticize various empirical methods that have been used in these papers and provide an improved estimation method. They estimate stock market correlations of the Crisis countries and conclude that contagion did not occur during the Crisis and there was only "interdependence." De Gregorio and Valdes (1999) also emphasize the role of similar growth rates of the Crisis countries in explaining contagion.

Tables 5 through 10 document the similarity of business cycle movements of the five Crisis countries using the contemporaneous cross-country correlations of main macroeconomic aggregates—output, consumption, investment, government spending, money stock and price level.

Table 5 reports cross-correlations of output fluctuations. In all cases except Korea, output is positively correlated across countries, indicating that the ASEAN-4 countries follow similar output cycles. Especially, among Malaysia, Indonesia and the Philippines, the correlation is significantly positive around 0.4-0.5. Korea has low or even negative cross-correlations with the ASEAN countries except with Thailand. Sub-sample analysis tells us that there is no systematic pattern in the change of correlation over time.

With the exception of Indonesia, consumption is also positively correlated across countries in table 6. Indonesia has zero or negative cross-correlations of consumption with the other countries. An important observation is that the cross-correlations of consumption significantly increase in the second period in most cases: it becomes

[19] The detailed analysis of business cycles of Asian countries can be found in Kim, Kose and Plummer

over around 0.7-0.8 except the correlation with Indonesia, while the correlation is less than 0.1 in the first period for all cases.

Table 7 shows cross-correlations of investment. In the whole sample period, significant and positive cross-correlations of investment are observed in only three cases: between Malaysia and the Philippines, Thailand and the Philippines, and Thailand and Korea. As in the case of output fluctuations, Thailand and Korea share similar cyclical pattern of investment. We also observe that the cross-correlations of investment significantly increase in the second period: all correlations except one case rise. This indicates that the five Asian countries follow similar investment patterns in the 1990s.

Table 8 reports cross-correlations of government consumption, where we cannot find any clear pattern: most correlations are low around zero. This implies that the government policies in these countries are not coordinated. We also observe no clear pattern in cross-correlations of money stock in table 9. These results suggest that the policy variables—monetary and fiscal—do not follow any common cyclical pattern in the Asian Crisis countries and therefore do not induce similar cyclical patterns in consumption and investment.

Finally, in table 10, we report cross-correlations of price levels (CPI). Unlike the money supply, price levels display significantly positive cross-correlations, especially in the second period.

We conclude that the cross-correlations of consumption, investment and price levels are significantly positive in the 1990s, while there is no pattern in the cross-correlations of monetary and fiscal policy variables. Cross-correlations of output, exports and imports show somewhat positive numbers in most cases. While it is hard to derive strong conclusions using annual data, our results suggest some interesting observations. Korea has different cyclical patterns compared to the ASEAN-4 countries, especially in terms of output fluctuations. This is because Korea started its economic development at least a decade earlier than the other four Asian Crisis countries and therefore possesses more advanced industrial structures.

Meanwhile, business cycles in the ASEAN-4 countries, except Indonesia, show similar cyclical movements, implying that as one country suffers from adverse shocks, it is highly likely that the other countries follow similar cyclical patterns and

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(1999).

experience negative shocks. This result suggests that the contagion among Thailand, the Philippines and Malaysia can be partially explained by similar cyclical movements of domestic economic fundamentals, while we need other explanations to explain contagion with respect to Korea and Indonesia.

Which factors can explain the synchronization of business cycles of these countries? The most plausible explanation can be found from the fact that these countries have developed similar industrial structures, even though the stage of development is somewhat different across countries. Specifically, they share export-oriented and manufacturing-oriented industrial policies and also the same exchange rate regime—pegging to the U.S. dollars. Therefore, they are likely to experience similar domestic and foreign shocks and also follow similar cyclical patterns when facing certain shocks. In the next section, we analyze three cases of common external shocks that might have affected these countries in the same pattern in the pre-Crisis period.

3.2. Common External Shocks

Since most Asian countries are considerably open, they are highly vulnerable to sudden fluctuations in world prices. Corsetti, Pesenti and Roubini (1999a) provide data on openness, measured by the average of exports and imports to GDP, of Asian countries. They report that the degree of openness ranges from 26 % in Indonesia, to 130% in the city-states of Hong Kong and Singapore.

If the Asian Crisis countries are affected by common negative shocks before or during the Crisis, similarities in cyclical fluctuations of these economies can be explained. It eventually contributes to the explanation of the Asian contagion using fundamental economic variables. There are at least three types of external shocks that have been blamed as sources of the Crisis:

3.2.1. Devaluation of the Chinese Renminbi

Some researchers have argued that the devaluation of the Chinese renminbi in 1994 was a major external shock in the region, and that this had a significant impact

on the Asian economies that compete with China for the same export markets. Fernald, Edison, and Loungani (1998) study this issue and conclude that the devaluation of the renminbi was not economically important. They argue that the relevant exchange rate was a floating rate that was not devalued, and more importantly, that since China had a very high inflation rate during the 1994-1995 period, there was a sharp real appreciation of the currency. They also find that there is a significant common movement between export growth in China and that of other developing countries in the region, suggesting that other common external shocks driving the growth dynamics of exports of these countries.

3.2.2. Depreciation of the Yen

Until mid-1997, the currencies of the Asian Crisis countries had been pegged to the dollar. In 1994 and early 1995, as the U.S. dollar depreciated vis-a-vis the yen, which positively affected the competitiveness of these countries and resulted in an increase in export earnings. However, as the yen depreciated against the dollar in 1996, export growth plummeted. Kochar, Loungani, and Stone (1998) examine the relationship between the export growth of the Crisis countries and changes in the yen/dollar exchange rate. They find that the depreciation of the yen relative to the U.S. dollar has negatively affected the real export growth in the Asian Crisis countries. In particular, export growth in Korea, Thailand, and Indonesia had been adversely affected by the yen depreciation, while there was a relatively smaller impact on the exports of the Philippines and Malaysia.

3.2.3. Increase in world oil price

In 1996, world oil prices significantly increased. Since developing countries in Asia account for almost 15 percent of world petroleum consumption, this is a potentially important negative global shock affecting the economies prior to the Crisis.

Depressed demand in Asian countries decreases the prices of primary commodities: Asian countries are important commodity consumers. Commodity prices were quite low when the Asian Crisis sparked. As the Asian economies severely affected by the Crisis reduced their demand for industrial raw materials, the prices of those goods further dropped. As currency depreciation in Asia has encouraged producers in the region to supply more, prices of timber, rice, natural rubber, and vegetable oils have also been reduced. This channel can be important in

explaining contagion effects from Asia to Latin America since most Latin American countries are exporters of primary commodities. Russia has also been severely affected by the fall in commodity prices as its export revenue from oil and natural gas fell.

Empirical Examination of Common External Shocks

Some recent studies examine the importance of price shocks in inducing macroeconomic fluctuations in developing economies. Kose (1998) finds that, using data of a large number of developing countries in the context of a dynamic business cycle model, sudden fluctuations in the prices of main export and import items explain almost two thirds of the aggregate variation in economic activity in developing countries.

Hoffmiaster and Roldos (1997) and Ahmed and Loungani (1998) examine the sources of business cycles in Asian countries using time-series econometric methods. The results of the former study indicate that the main source of output fluctuations in Asian countries are domestic supply shocks, while the latter one finds that external shocks explain roughly 28 percent of output variation. Ahmed and Loungani (1998) consider three types of external shocks: foreign output, oil price, and terms of trade disturbances. Among the three factors, foreign output shocks along with the oil price shock play a more important role than the terms of trade shocks in inducing macroeconomic fluctuations.

Figure 3 shows export growth rates of the four Crisis countries in the 1990s.[20] If depreciation of yen and renminbi or oil price shocks negatively affected the fundamentals of these economies at the same time, export growth rates of these countries should show similar cyclical movements, especially decline in the growth rates. The graph shows that all four countries experienced similar cyclical movements in 1995 and 1996. However, the export growth rate increased until mid-1995, while it significantly decreased in late 1995 and 1996. These results suggest that among the three common shocks, depreciation of Japanese Yen and oil price shocks in 1995-96 can be considered to be effective in weakening the fundamentals of the Crisis

[20] We exclude Malaysia due to the lack of quarterly data.

countries, while depreciation of Chinese renminbi in 1994 actually provided positive effects on these economies.

4. Conclusions and Policy Implications

This paper makes two contributions. First, we attempt to resolve the ambiguity about the concept "contagion" by structurally classifying various channels through which a shock in one country can be transmitted to another. We classify the transmission channel into trade, financial, and pure contagion channels. Specifically, we analyze direct and indirect channels of each transmission mechanism, focusing on the Asian Crisis. Next, we analyze the role of domestic economic fundamentals in explaining the contagious nature of the Asian Crisis examining comovement properties of the key macroeconomic variables in the pre-Crisis period.

We find that contagion through the trade channel is not significant by examining merchandise trade by trading partners and major commodity groups of the five Crisis countries. The role of international investors' behavior through the indirect financial channel is an important source propagating the crisis. This can be seen by studying the time-series data of net private capital flows and central banks' foreign reserves. However, we clearly need further empirical tests to find the relative importance of each channel in explaining the Asian contagion.

We also study the role of domestic fundamentals in explaining the contagious nature of the Crisis. If these countries share similar cyclical dynamics before the Crisis, then contagion can be explained without much difficulty. Cross-country correlations suggest that Malaysia, the Philippines, and Thailand exhibit similar cyclical fluctuations, while Korea and Indonesia show differences in some dimensions. Finally, we analyze the possibility that common shocks have simultaneously weakened the fundamentals of these countries. We find that Yen depreciation and oil price shocks in 1995 and 1996 were significantly and negatively affected these countries, but not the devaluation of Chinese Renminbi in 1994.

The nature of the policies aimed at stabilizing the region heavily depends on the dominating paradigm about the spread of the “Asian contagion.” If we explain Asian contagion with indirect financial channel and pure contagion initiated by the financial panic, policies promoting a new global financial architecture should be pursued. Does free movement of goods and capital constitute a potential threat to otherwise healthy

economies that might be severely affected by some irrelevant shock hitting a distant country? Recent policy responses of Malaysia and Chile restricting short-term capital movement can be an example of this. Other policy options include monetary and fiscal policies as shock absorbers, policies that revive the investors' confidence in emerging markets, and supervision of speculative capital flows by international organizations such as IMF and World Bank.

On the other hand, if there are underlying problems associated with the fundamentals of these economies, and some structural links spread the "Asian contagion," then some structural policies need to be implemented to strengthen the weak real systems and/or financial systems causing the fundamental problems in these countries.

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Table 1. Cross-Country Correlations of Exports

1960-1996	Indonesia	Korea	Malaysia	Philippines
Korea	-0.10			
Malaysia	0.36*	0.03		
Philippines	0.28	-0.32	0.26	
Thailand	0.30	0.23	0.49*	0.09

1960-1984	Indonesia	Korea	Malaysia	Philippines
Korea	0.00			
Malaysia	0.28	0.13		
Philippines	0.28	-0.42	0.24	
Thailand	0.27	0.36	0.37	0.10

1985-1996	Indonesia	Korea	Malaysia	Philippines
Korea	-0.39			
Malaysia	0.41 (+)	-0.11		
Philippines	-0.46	0.67 (+)	0.09	
Thailand	0.50 (+)	0.04	0.62 (+)	-0.01

Data source: IFS.
Notes: All data are real at 1990 prices and logged and detrended using the Hodrick-Prescott (HP) filter with the smoothing parameter set at 100. The cross-country correlation is measured by the correlation coefficient of the series of two countries. The reported statistic for the 60-96 period is significant at 5% level if it lies outside of [-0.32 , 0.32], and it is indicated by *. The (+) sign indicates an increase of the statistic in the 85-96 period from the 60-84 period. Export data for Indonesia starts from 1962.

Table 2. Cross-Country Correlations of Imports

1960-1996	Indonesia	Korea	Malaysia	Philippines
Korea	0.34*			
Malaysia	0.09	0.19		
Philippines	-0.14	0.14	0.69*	
Thailand	0.16	0.30	0.55*	0.46*

1960-1984	Indonesia	Korea	Malaysia	Philippines
Korea	0.33			
Malaysia	-0.03	0.17		
Philippines	-0.26	0.06	0.62	
Thailand	0.10	0.40	0.18	0.34

1985-1996	Indonesia	Korea	Malaysia	Philippines
Korea	0.38 (+)			
Malaysia	0.34 (+)	-0.13		
Philippines	0.05 (+)	0.30 (+)	0.42	
Thailand	0.49 (+)	-0.11	0.83 (+)	0.45 (+)

Data source: IFS.
Notes: All data are real at 1990 prices and logged and detrended using the Hodrick-Prescott (HP) filter with the smoothing parameter set at 100. The cross-country correlation is measured by the correlation coefficient of the series of two countries. The reported statistic for the 60-96 period is significant at 5% level if it lies outside of [-0.32 , 0.32], and it is indicated by *. The (+) sign indicates an increase of the statistic in the 85-96 period from the 60-84 period. Import data for Indonesia starts from 1962.

Table 3. Merchandise Trade by Partner Countries (percentage of the total)

Exports: 1997					
	Korea	**Indonesia**	**Malaysia**	**Philippines**	**Thailand**
Partner					
Japan	10.86	24.35	12.55	15.99	15.18
United States	15.85	14.41	18.57	34.43	19.39
Europe-9	12.36	14.31	13.53	15.44	15.25
Hong Kong & Singapore	12.89	11.11	25.52	10.36	17.06
Taiwan	3.39	-	-	-	-
Korea & Taiwan	-	10.26	4.35	6.63	4.48
ASEAN-4	-	6.58	7.05	5.65	8.86
ASEAN-5	10.55	-	-	-	-
China	9.99	4.54	2.37	1.05	3.03
Others	24.11	14.45	16.07	10.46	19.76

Imports: 1997					
	Korea	**Indonesia**	**Malaysia**	**Philippines**	**Thailand**
Partner					
Japan	19.26	21.31	21.68	19.75	25.71
United States	20.73	12.72	16.55	16.87	13.79
Europe-9	12.97	18.71	13.82	12.35	14.06
Hong Kong & Singapore	2.24	6.77	16.79	11.71	6.31
Taiwan	1.67	-	-	-	-
Korea & Taiwan	-	10.54	9.88	11.02	8.13
ASEAN-4	-	5.29	7.11	6.14	7.36
ASEAN-5	6.47	-	-	-	-
China	6.90	3.86	2.84	3.03	3.59
Others	29.76	20.79	11.33	19.14	24.65

This table is constructed based on the monograph, "Recent Trends and Prospects of Major Asian Economies," 1999, East Asian Economic Perspectives Vol. 10, ICSEAD.

Table 4. Merchandise Trade By Major Commodity Group (percentage of the total)

Exports: 1997					
	Korea	**Indonesia**	**Malaysia**	**Philippines**	**Thailand**
Commodity Group					
Agricultural products	2.11	11.34	8.60	8.24	18.50
Crude materials excl. fuels	1.31	8.16	4.57	1.86	4.51
Mineral fuels	3.93	24.62	8.33	1.21	2.17
Chemical manufactures	7.83	3.51	3.55	1.52	3.70
Machinery manufactures	50.02	8.65	55.98	29.86	38.24
Other manufactures	30.21	31.15	17.72	14.07	28.77
Not classified & re-export	4.59	12.57	1.24	43.25	4.10

Imports: 1997					
	Korea	**Indonesia**	**Malaysia**	**Philippines**	**Thailand**
Commodity Group					
Agricultural products	5.21	8.04	5.07	7.34	3.76
Crude materials excl. fuels	7.21	7.15	2.49	3.19	5.16
Mineral fuels	18.93	9.71	2.90	8.49	8.75
Chemical manufactures	9.07	14.19	6.97	8.09	9.84
Machinery manufactures	33.69	42.16	60.14	38.95	48.56
Other manufactures	21.30	18.75	18.23	14.90	21.29
Not classified	4.59	0.01	4.20	19.04	2.64

This table is constructed based on the monograph, “Recent Trends and Prospects of Major Asian Economies,” 1999, East Asian Economic Perspectives Vol. 10, ICSEAD.

Table 5. Cross-country Correlations of Output Fluctuations

1960-1996	Indonesia	Korea	Malaysia	Philippines
Korea	0.11			
Malaysia	0.53*	-0.18		
Philippines	0.37*	-0.06	0.46*	
Thailand	0.11	0.35*	0.19	0.53*

1960-1984	Indonesia	Korea	Malaysia	Philippines
Korea	0.28			
Malaysia	0.42	0.05		
Philippines	0.28	-0.07	0.14	
Thailand	-0.03	0.40	-0.15	0.27

1985-1996	Indonesia	Korea	Malaysia	Philippines
Korea	-0.60			
Malaysia	0.73 (+)	-0.64		
Philippines	-0.09	0.60 (+)	-0.18	
Thailand	-0.29	0.30	0.27 (+)	0.32 (+)

Data source: IFS.
Notes: All data are real at 1990 prices and logged and detrended using the Hodrick-Prescott (HP) filter with the smoothing parameter set at 100. The cross-country correlation is measured by the correlation coefficient of the series of two countries. The reported statistic for the 60-96 period is significant at 5% level if it lies outside of [-0.32 , 0.32], and it is indicated by *. The (+) sign indicates an increase of the statistic in the 85-96 period from the 60-84 period.

Table 6. Cross-country Correlations of Consumption

1960 - 1996	Indonesia	Korea	Malaysia	Philippines
Korea	-0.34*			
Malaysia	-0.08	0.32*		
Philippines	0.01	0.12	0.27	
Thailand	-0.17	0.32*	0.36*	0.36*

1960 - 1984	Indonesia	Korea	Malaysia	Philippines
Korea	-0.34			
Malaysia	-0.15	0.07		
Philippines	-0.04	-0.19	-0.24	
Thailand	-0.31	0.03	-0.08	-0.09

1985 - 1996	Indonesia	Korea	Malaysia	Philippines
Korea	-0.37			
Malaysia	-0.19	0.85 (+)		
Philippines	-0.37	0.82 (+)	0.77 (+)	
Thailand	-0.11 (+)	0.80 (+)	0.83 (+)	0.60 (+)

Data source: IFS.
Notes: All data are real at 1990 prices and logged and detrended using the Hodrick-Prescott (HP) filter with the smoothing parameter set at 100. The cross-country correlation is measured by the correlation coefficient of the series of two countries. The reported statistic for the 60-96 period is significant at 5% level if it lies outside of [-0.32 , 0.32], and it is indicated by *. The (+) sign indicates an increase of the statistic in the 85-96 period from the 60-84 period.

Table 7. Cross-country Correlations of Investment

1960-1996	Indonesia	Korea	Malaysia	Philippines
Korea	-0.25			
Malaysia	0.10	-0.35*		
Philippines	-0.02	0.11	0.45*	
Thailand	-0.05	0.51*	0.17	0.51*

1960-1984	Indonesia	Korea	Malaysia	Philippines
Korea	-0.33			
Malaysia	0.12	-0.64		
Philippines	-0.12	-0.01	0.03	
Thailand	-0.28	0.43	-0.43	0.08

1985-1996	Indonesia	Korea	Malaysia	Philippines
Korea	0.76 (+)			
Malaysia	-0.05	0.22 (+)		
Philippines	0.38 (+)	0.42 (+)	0.17	
Thailand	0.68 (+)	0.89 (+)	0.44 (+)	0.65 (+)

Data source: IFS.
Notes: All data are real at 1990 prices and logged and detrended using the Hodrick-Prescott (HP) filter with the smoothing parameter set at 100. The cross-country correlation is measured by the correlation coefficient of the series of two countries. The reported statistic for the 60-96 period is significant at 5% level if it lies outside of [-0.32 , 0.32], and it is indicated by *. The (+) sign indicates an increase of the statistic in the 85-96 period from the 60-84 period.

Table 8. Cross-Country Correlations of Government Consumption

1960-1996	Indonesia	Korea	Malaysia	Philippines
Korea	0.46*			
Malaysia	-0.04	-0.21		
Philippines	-0.13	0.20	0.32*	
Thailand	0.14	0.17	0.02	-0.23

1960 -1984	Indonesia	Korea	Malaysia	Philippines
Korea	0.47			
Malaysia	-0.06	-0.24		
Philippines	-0.12	0.13	0.45	
Thailand	0.01	0.04	-0.03	-0.04

1985-1996	Indonesia	Korea	Malaysia	Philippines
Korea	0.50 (+)			
Malaysia	0.54 (+)	-0.08 (+)		
Philippines	-0.61	-0.03	-0.29	
Thailand	0.67 (+)	-0.23	0.45 (+)	-0.66

Data source: IFS.
Notes: All data are real at 1990 prices and logged and detrended using the Hodrick-Prescott (HP) filter with the smoothing parameter set at 100. The cross-country correlation is measured by the correlation coefficient of the series of two countries. The reported statistic for the 60-96 period is significant at 5% level if it lies outside of [-0.32 , 0.32], and it is indicated by *. The (+) sign indicates an increase of the statistic in the 85-96 period from the 60-84 period.

Table 9. Cross-Country Correlations of Money Stock

1960-1996	Indonesia	Korea	Malaysia	Philippines
Korea	-0.39*			
Malaysia	0.39*	-0.22		
Philippines	-0.28	0.15	0.01	
Thailand	0.09	0.48*	-0.23	0.08

1960-1984	Indonesia	Korea	Malaysia	Philippines
Korea	-0.44			
Malaysia	0.71	-0.23		
Philippines	-0.34	0.24	-0.18	
Thailand	-0.02	0.53	-0.12	0.22

1985-1996	Indonesia	Korea	Malaysia	Philippines
Korea	-0.11 (+)			
Malaysia	-0.40	-0.60		
Philippines	0.20 (+)	0.12	0.03 (+)	
Thailand	0.69 (+)	-0.09	-0.46	-0.24

Data source: IFS.
Notes: All data are real at 1990 prices and logged and detrended using the Hodrick-Prescott (HP) filter with the smoothing parameter set at 100. The cross-country correlation is measured by the correlation coefficient of the series of two countries. The reported statistic for the 60-96 period is significant at 5% level if it lies outside of [-0.32 , 0.32], and it is indicated by *. The (+) sign indicates an increase of the statistic in the 85-96 period from the 60-84 period. The M2 series of Indonesia starts from 1965.

Table 10. Cross-Country Correlations of Price Level (CPI)

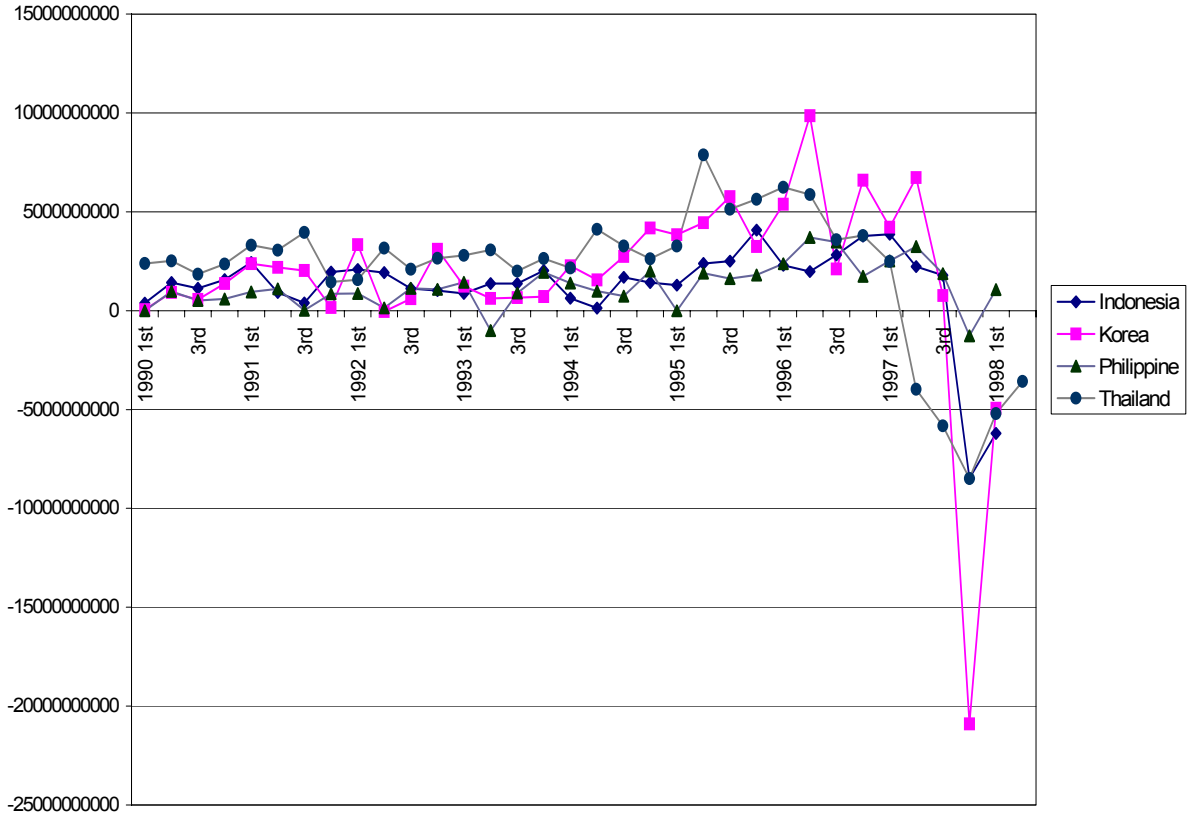
1960-1996	Indonesia	Korea	Malaysia	Philippines
Korea	-0.01			
Malaysia	-0.10	0.41*		
Philippines	-0.27	-0.11	0.39*	
Thailand	-0.07	0.62*	0.85*	0.14

1960-1984	Indonesia	Korea	Malaysia	Philippines
Korea	-0.02			
Malaysia	-0.13	0.20		
Philippines	-0.35	-0.14	0.51	
Thailand	-0.08	0.48	0.82	0.22

1985-1996	Indonesia	Korea	Malaysia	Philippines
Korea	0.04 (+)			
Malaysia	0.58 (+)	0.43 (+)		
Philippines	0.06 (+)	0.97 (+)	0.52 (+)	
Thailand	0.06 (+)	0.67 (+)	0.71	0.78 (+)

Data source: IFS.
Notes: All data are real at 1990 prices and logged and detrended using the Hodrick-Prescott (HP) filter with the smoothing parameter set at 100. The cross-country correlation is measured by the correlation coefficient of the series of two countries. The reported statistic for the 60-96 period is significant at 5% level if it lies outside of [-0.32 , 0.32], and it is indicated by *. The (+) sign indicates an increase of the statistic in the 85-96 period from the 60-84 period. The CPI series of Korea starts from 1963.

Fig. 1 Net Private Capital Flows



Data source: IFS.

Fig 2. Total reserve minus gold in US $

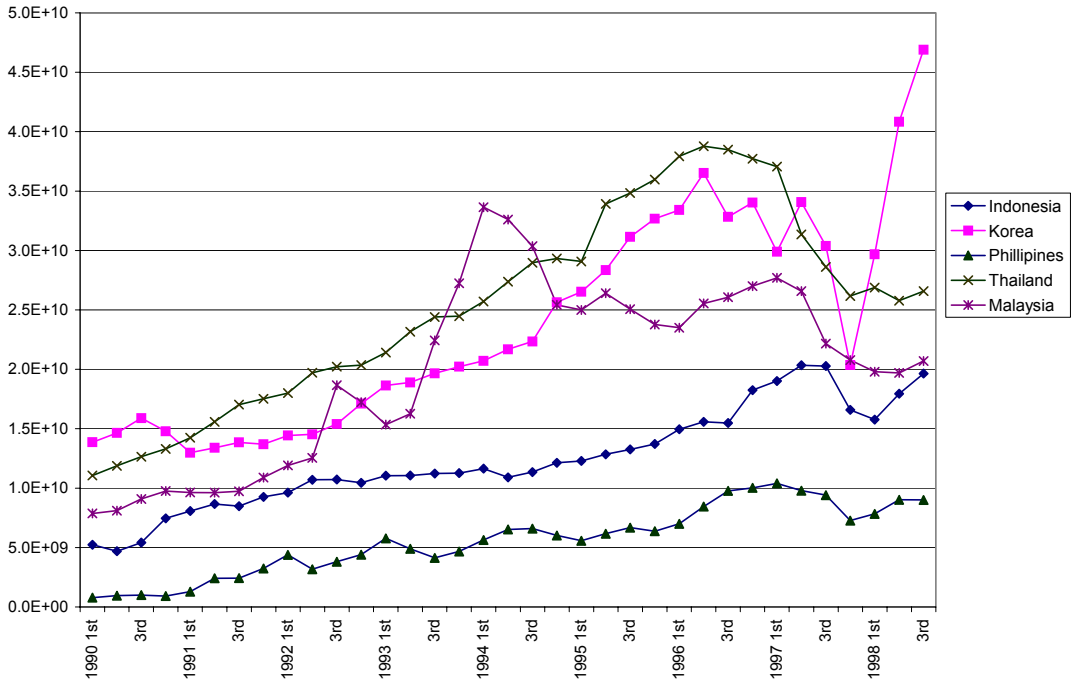


Fig. 3 Export growth rates