

**U.S., Japanese and Korean Foreign Direct Investment and the Various  
Modes of East Asian Trade**

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**Abstract**

In this paper we document the growing importance of intra-East Asian trade of parts and components. Our empirical analysis shows that FDI does play an important and *independent* or *exogenous* role in facilitating the trade of parts and components in East Asia. This is true for aggregate FDI as well as FDI from individual countries, including investment from the United States, Japan and South Korea. Using Antras (2005) basic taxonomy, East Asia remains at Stage II of the product cycle of offshoring. Our empirical studies also show that FDI from Japan has a particularly strong influence on both trade in parts and components as well as trade in capital goods.

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## 1. Introduction

East Asia<sup>1</sup> has witnessed a remarkable increase in the volume of intraregional trade during the past two decades. An important development that has contributed to the expansion of intra-East Asian trade has been identified as the international fragmentation of production where the production process of a final product is split into two or more steps and each production stage is undertaken in different locations across national boundaries. The international fragmentation of production occurs if such fragmentation leads to sufficient reduction in production cost. A part of cost reduction arises from the standard comparative advantage of trade theory. The theory predicts that the firms locate relatively labor-intensive segment of the production in the country where labor is abundant and locate relatively capital-intensive segment of the production in the country where capital is abundant. In other words, one major theory argues that the fragmentation of production is encouraged by factor-endowment dissimilarities.

Many alternative names have been coined for such a phenomenon, including “slicing the value chain” (Krugman, 1995), “vertical specialization” (Hummels, Ishii and Yi, 2001, Dean, Fung and Wang 2008), “international production sharing” (Ng and Yeats, 2001) and “outsourcing” (Hanson et al, 2001). There is increasing evidence of the phenomenal increase in international fragmentation of production around the globe in a variety of sectors, including textiles and apparel, machinery and transport equipment, consumer electronics, toys and furniture. The extent of international production fragmentation and the depth of the regional production networks however, varies according to industries (Fung, Garcia-Herrero and Siu 2009). As Hiratsuka (2008) points out, the international production fragmentation in industries such as textile involves a relatively simple disintegration of procurement and production. In contrast, a much more elaborate and well-developed production network is found in the electronics and computer-related industry.

It is often hypothesized that Multinational Enterprises (MNEs) play a very important role in creating and coordinating the activities of production networks. MNEs

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<sup>1</sup> In this study, East Asia covers the following countries/regions: China, Taiwan, Hong Kong, Japan, Republic of Korea, Indonesia, the Philippines, Malaysia, Singapore, and Thailand.

that operate on the global stage combine many resources available at different locations across national borders by establishing their production networks. In East Asia, the rapid growth of intra-regional trade has also been associated with a rising volume of foreign direct investment (FDI). Partly because of this, East Asia (excluding Japan) has gained in importance as recipients of FDI over time. Recent improvements in service links in terms of lower transportation and communications costs as well as the progressive liberalization and deregulation of international trade and foreign direct investment in the region also contributed to this trend. Furthermore, the dispersed production networks created by such fragmentation appear to be more extensive in East Asia than in other parts of the world (Fung, Garcia-Herrero and Siu 2009, Athukorala, 2006; Ng and Yeats, 2001 and 2003).

International production fragmentation and the formation of regional production networks can have various important implications for international trade. When MNEs engage in production fragmentation, initially, production may be geographically fragmented across national boundaries but organizationally confined within the boundaries of a transnational firm. Affiliates of MNEs may rely heavily on imported intermediate products from their home countries if they are faced with limited choices of local suppliers of those products. This will be the case if intermediate inputs require specialized production techniques that are not yet available in the host countries. It is widely recognized that a significant amount of trade in the global economy is indeed carried out in the form of intra-firm trade, which may be symptomatic of the prevalence of FDI-based production fragmentation. Moreover, as production is fragmented across locations, exports of capital goods required to produce parts and components from an FDI source country may also expand. It may also increase imports by an FDI source country as a host country increases exports of finished products back to the source country.

These networks overtime disseminate knowledge to local suppliers in the host countries, which can then enhance local capability formation (Ernst, 2000). Advanced knowledge possessed by the MNEs may be spilled over through contractual relationship with local firms. Production linkages as well as procurement relationships between the foreign affiliates and the domestic firms are likely to be created and local technological capability for producing intermediate goods improves. Furthermore, against the backdrop

of intensified competition in the world market in many industries, MNEs have been under pressure to reduce their costs of sourcing intermediate products instead of focusing on the origin of the suppliers. Regional production networks then cover both intra-firm and inter-firm transactions linking together affiliates, joint ventures with its subcontractors, suppliers as well as service providers. When foreign affiliates start sourcing intermediate goods locally, it will partially offset the trade-creating effect of FDI.

At the same time, industry agglomeration or industrial clusters in various sectors may form covering affiliates and non-affiliates for intermediate products when economies of scale create more profit to offset transportation costs. Countries then tend to specialize more narrowly within industries to define their own niche markets and achieve scale economies. Take the hard disk drive industry in Thailand for instance. Parts and components are procured locally as well as from other countries in Asia. Furthermore, several suppliers located in different countries supply the same parts and components to several assemblers on behalf of Seagate, Western Digital, Hitachi, Fujitsu and etc. (Hiratsuka 2008.) The evidence of industrial clusters can be found in various parts of East Asia; examples include the Shanghai-Jiangsu corridor and Guangzhou in China, the Eastern Seaboard in Thailand, Penang in Malaysia and parts of Hsingchu and Taoyuang in Taiwan. The establishments of a number of industrial clusters subsequently led to the expansion of the international exchange of parts and components within East Asia.

Increasing evidence of the strong effects of these international production networks on the volume and the direction of regional trade flows has been documented. But, is it really true that foreign direct investment systematically facilitate trade in parts and components, particularly in East Asia? Antras (2005) proposes a theory of incomplete contracts that suggests that production fragmentation will go through several stages. First, parts and components will be produced within a single country where the firm is located. Second, attracted by lower wages in the developing countries and facilitated by the standardization of the production of such parts, the multinational firms will seek to outsource some of the lower end production activities. The constraining factor however is the weakness of the institutions (particularly intellectual property rights protection) in these emerging economies. Thus the first stage of transnational production sharing is intra-firm—using foreign direct investment and foreign affiliates to protect the

technology and skill content contained in these components. The next stage of offshoring is to localize the fragmentation process by subcontracting with the local firms. The last stage consists of the entire process being produced overseas, with only marketing, research and development and other managerial functions being retained in the home country.

We have seen a rise of production fragmentation activities in East Asia. But where is East Asia situated in the product cycle of offshoring? Does foreign direct investment play an important role? Furthermore, does the nationality or the source of investment make a difference in this regard? This paper is an attempt to examine the question for two of the largest foreign direct investors in the developing countries of Asia, the U.S., Japan and South Korea. More specifically, we attempt to analyze the FDI-trade linkages in intra-regional exports and imports in East Asia focusing on Japanese, U.S. and Korean investment in East Asia in order to investigate whether production networks established by those two countries have different implications on intra-regional trade. Our analysis will be conducted on intra-regional exports and imports of parts and components as well as capital goods.

The remainder of the paper is organized as follows: Section 2 describes some characteristics of international trade in East Asia, particularly the extent of intraregional trade and the characteristics of trade by stages of production for each country. Section 3 briefly discusses the general trend of inward FDI in East as well as direct investment from Japan, U.S. and South Korea. Section 4 presents an empirical analysis investigating the effects of FDI from these three countries on the volume of trade in various East Asian countries. It begins with a description of the variables used in the regression analysis, followed by the estimation methodology. The results for all regressions are reported and analyzed in Section 4.2. Concluding remarks are given in section 5.

## **2. Patterns of trade in East Asia<sup>2</sup>**

### **2.1 Intraregional trade**

Table 1a and 1b examine the changes in the share of geographic direction of

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<sup>2</sup> As defined in table 1, in this chapter East Asia includes China, Hong Kong, China, Indonesia, Japan, Republic of Korea, Malaysia, Philippines, Singapore, Taiwan Province of China and Thailand.

individual East Asian imports and exports, respectively for 1985, 1995, 2003 and 2006. These Tables also include the figures for North America and EU15 for comparisons.

East Asia in general appears to have gone through significant changes in the direction of their imports. The share of East Asia's imports from other East Asian countries increased from 23.0% in 1985 to 40.9% in 2003 and to 45.2% in 2006, indicating increased dependency on regional trade. The increase is largely attributed to the NIEs and China. China's share more than doubled from 5.9% to 12.5% in 2003 and further increased to 16.3% in 2006, whereas the share of the NIEs increased from 10.7% to 18.4% in 2003 and appears to have leveled off since. On the other hand, the table reports relatively small gain in the share of the ASEAN by 3.6% between 1985 and 2006. In contrast, a sizeable decline occurred in the share of Japan by almost 11.3% during the same period. Despite the setback, however, Japan still remains as the single largest import sourcing country for East Asia. The shares of the U.S. and Canada as well as EU15 in the

Table 1.a The Geographic Destinations of East Asian Imports: 1985, 1995, 2003, 2006

|             |      | East Asia | Japan | China | NIEs  | ASEAN4 | N. America | EU15  |
|-------------|------|-----------|-------|-------|-------|--------|------------|-------|
| East Asia   | 1985 | 23.0%     | 25.7% | 5.9%  | 10.7% | 6.4%   | 17.1%      | 13.6% |
|             | 1995 | 33.6%     | 22.8% | 10.0% | 16.0% | 7.5%   | 15.8%      | 13.9% |
|             | 2003 | 43.3%     | 17.5% | 14.3% | 18.4% | 10.7%  | 11.3%      | 11.0% |
|             | 2006 | 45.2%     | 14.4% | 16.3% | 18.4% | 10.4%  | 9.6%       | 9.8%  |
| Japan       | 1985 | 25.9%     |       | 5.1%  | 7.7%  | 13.1%  | 24.0%      | 7.6%  |
|             | 1995 | 34.7%     |       | 10.8% | 12.3% | 11.5%  | 25.9%      | 14.5% |
|             | 2003 | 42.4%     |       | 19.7% | 10.2% | 12.5%  | 17.6%      | 12.8% |
|             | 2006 | 41.4%     |       | 20.5% | 9.8%  | 11.1%  | 13.7%      | 10.0% |
| Korea       | 1985 | 10.6%     | 24.2% | 0.0%  | 3.5%  | 7.1%   | 22.8%      | 11.0% |
|             | 1995 | 15.4%     | 24.6% | 5.6%  | 4.2%  | 5.6%   | 24.7%      | 13.4% |
|             | 2003 | 26.8%     | 20.3% | 12.3% | 7.1%  | 7.5%   | 15.0%      | 10.8% |
|             | 2006 | 28.3%     | 16.8% | 15.7% | 5.6%  | 7.0%   | 11.9%      | 9.4%  |
| Taiwan      | 1985 | 9.6%      | 27.6% | 0.0%  | 3.8%  | 5.7%   | 25.5%      | 11.1% |
|             | 1995 | 18.8%     | 29.2% | 3.0%  | 8.8%  | 7.0%   | 21.6%      | 14.4% |
|             | 2003 | 30.4%     | 25.7% | 8.7%  | 11.4% | 10.3%  | 14.2%      | 10.4% |
|             | 2006 | 31.8%     | 23.0% | 12.3% | 10.9% | 8.6%   | 11.9%      | 8.6%  |
| Hong Kong   | 1985 | 45.8%     | 23.1% | 25.5% | 17.5% | 2.8%   | 9.8%       | 12.3% |
|             | 1995 | 59.6%     | 14.8% | 36.2% | 18.8% | 4.6%   | 8.4%       | 10.8% |
|             | 2003 | 67.0%     | 11.8% | 43.3% | 17.1% | 6.6%   | 5.9%       | 8.3%  |
|             | 2006 | 70.7%     | 10.3% | 45.8% | 18.4% | 6.6%   | 5.2%       | 7.1%  |
| Singapore   | 1985 | 32.6%     | 17.0% | 8.6%  | 6.8%  | 17.2%  | 15.5%      | 12.2% |
|             | 1995 | 36.5%     | 21.1% | 3.3%  | 11.8% | 21.5%  | 15.5%      | 13.4% |
|             | 2003 | 46.8%     | 11.3% | 8.1%  | 10.7% | 28.0%  | 13.6%      | 11.7% |
|             | 2006 | 49.2%     | 8.3%  | 11.4% | 12.5% | 25.3%  | 13.1%      | 10.9% |
| China       | 1985 | 14.0%     | 35.8% |       | 11.9% | 2.1%   | 14.6%      | 16.5% |
|             | 1995 | 32.6%     | 22.0% |       | 28.1% | 4.5%   | 14.2%      | 16.1% |
|             | 2003 | 42.2%     | 18.0% |       | 27.6% | 8.4%   | 9.3%       | 12.8% |
|             | 2006 | 43.9%     | 14.6% |       | 25.9% | 8.7%   | 8.5%       | 11.0% |
| Thailand    | 1985 | 23.4%     | 26.5% | 2.4%  | 13.7% | 7.2%   | 12.6%      | 16.1% |
|             | 1995 | 24.7%     | 30.7% | 3.0%  | 15.3% | 6.4%   | 12.7%      | 15.9% |
|             | 2003 | 33.4%     | 24.1% | 8.0%  | 13.8% | 11.6%  | 10.0%      | 10.0% |
|             | 2006 | 36.3%     | 20.1% | 10.6% | 13.6% | 12.1%  | 7.1%       | 8.4%  |
| Malaysia    | 1985 | 31.0%     | 23.2% | 2.1%  | 22.4% | 6.6%   | 16.4%      | 16.1% |
|             | 1995 | 31.0%     | 28.1% | 2.3%  | 23.7% | 5.0%   | 17.1%      | 15.6% |
|             | 2003 | 45.9%     | 17.2% | 8.8%  | 25.1% | 12.0%  | 16.0%      | 11.8% |
|             | 2006 | 49.7%     | 13.2% | 12.1% | 25.2% | 12.5%  | 13.0%      | 11.1% |
| Philippines | 1985 | 30.6%     | 14.4% | 5.4%  | 13.7% | 11.5%  | 25.9%      | 9.3%  |
|             | 1995 | 29.2%     | 22.1% | 2.3%  | 21.0% | 5.9%   | 19.9%      | 10.7% |
|             | 2003 | 35.5%     | 13.0% | 9.1%  | 20.8% | 10.2%  | 9.3%       | 10.9% |
|             | 2006 | 43.4%     | 9.0%  | 10.9% | 23.9% | 11.3%  | 7.8%       | 9.7%  |
| Indonesia   | 1985 | 17.2%     | 25.8% | 2.4%  | 13.5% | 1.2%   | 18.7%      | 19.0% |
|             | 1995 | 24.6%     | 22.7% | 3.7%  | 17.0% | 3.9%   | 13.7%      | 20.1% |
|             | 2003 | 40.1%     | 19.5% | 4.6%  | 21.5% | 9.4%   | 22.4%      | 8.1%  |
|             | 2006 | 46.0%     | 14.2% | 7.2%  | 26.2% | 10.0%  | 16.6%      | 8.3%  |
| N. America  | 1985 | 13.9%     | 17.7% | 1.0%  | 10.2% | 2.7%   | 27.9%      | 19.9% |
|             | 1995 | 20.4%     | 14.6% | 5.6%  | 9.8%  | 5.1%   | 27.5%      | 16.4% |
|             | 2003 | 22.6%     | 8.5%  | 11.4% | 6.8%  | 4.4%   | 24.3%      | 18.1% |
|             | 2006 | 24.4%     | 7.3%  | 14.8% | 5.5%  | 4.1%   | 22.2%      | 16.3% |
| EU 15       | 1985 | 3.0%      | 3.5%  | 0.4%  | 1.7%  | 0.9%   | 8.4%       | 56.2% |
|             | 1995 | 6.4%      | 4.1%  | 1.7%  | 3.0%  | 1.6%   | 8.1%       | 61.5% |
|             | 2003 | 8.4%      | 3.1%  | 4.1%  | 2.5%  | 1.8%   | 7.2%       | 58.5% |
|             | 2006 | 9.8%      | 2.4%  | 5.7%  | 2.5%  | 1.5%   | 6.4%       | 53.9% |

Source: Compiled from UN Comtrade database  
Author's calculation

Table 1.b The Geographic Destinations of East Asian Exports: 1985, 1995, 2003, 2006

|             |      | East Asia | Japan | China | NIEs  | ASEAN4 | N. America | EU15  |
|-------------|------|-----------|-------|-------|-------|--------|------------|-------|
| East Asia   | 1985 | 25.5%     | 16.9% | 4.7%  | 15.1% | 5.7%   | 29.4%      | 11.4% |
|             | 1995 | 38.0%     | 12.9% | 8.7%  | 20.9% | 8.4%   | 21.1%      | 13.9% |
|             | 2003 | 41.0%     | 10.6% | 12.6% | 20.1% | 8.3%   | 19.4%      | 14.2% |
|             | 2006 | 40.7%     | 8.9%  | 13.1% | 19.7% | 7.9%   | 17.9%      | 14.2% |
| Japan       | 1985 | 24.1%     |       | 7.1%  | 12.8% | 4.2%   | 40.2%      | 13.2% |
|             | 1995 | 42.0%     |       | 5.0%  | 25.0% | 12.1%  | 28.9%      | 15.9% |
|             | 2003 | 44.9%     |       | 12.2% | 23.5% | 9.2%   | 26.5%      | 15.3% |
|             | 2006 | 45.7%     |       | 14.3% | 23.2% | 8.1%   | 24.3%      | 13.6% |
| Korea       | 1985 | 10.8%     | 15.0% | 0.0%  | 7.4%  | 3.4%   | 39.7%      | 11.7% |
|             | 1995 | 31.1%     | 13.7% | 7.5%  | 15.9% | 7.7%   | 21.3%      | 13.3% |
|             | 2003 | 38.3%     | 8.9%  | 18.1% | 13.6% | 6.6%   | 19.2%      | 12.9% |
|             | 2006 | 39.7%     | 8.2%  | 21.3% | 12.7% | 5.6%   | 14.8%      | 12.5% |
| Taiwan      | 1985 | 15.1%     | 11.3% | 0.0%  | 12.0% | 3.1%   | 51.4%      | 9.4%  |
|             | 1995 | 38.5%     | 11.8% | 0.3%  | 29.6% | 8.5%   | 25.0%      | 13.1% |
|             | 2003 | 51.0%     | 8.6%  | 15.9% | 28.3% | 6.8%   | 19.4%      | 13.1% |
|             | 2006 | 57.3%     | 7.6%  | 24.3% | 25.2% | 7.7%   | 16.0%      | 10.4% |
| Hong Kong   | 1985 | 36.6%     | 4.2%  | 26.0% | 7.0%  | 3.6%   | 33.2%      | 13.6% |
|             | 1995 | 44.0%     | 6.1%  | 33.3% | 7.1%  | 3.6%   | 23.3%      | 15.0% |
|             | 2003 | 52.1%     | 5.3%  | 41.7% | 7.0%  | 3.4%   | 19.5%      | 13.7% |
|             | 2006 | 55.8%     | 4.8%  | 46.3% | 6.2%  | 3.2%   | 15.9%      | 13.7% |
| Singapore   | 1985 | 31.4%     | 9.4%  | 1.5%  | 9.3%  | 20.6%  | 21.9%      | 11.0% |
|             | 1995 | 44.2%     | 7.8%  | 2.3%  | 15.4% | 26.5%  | 18.8%      | 13.4% |
|             | 2003 | 53.4%     | 6.1%  | 6.3%  | 17.1% | 30.0%  | 13.1%      | 12.1% |
|             | 2006 | 54.7%     | 5.5%  | 9.7%  | 16.7% | 28.2%  | 10.5%      | 10.6% |
| China       | 1985 | 36.4%     | 22.2% |       | 33.7% | 2.7%   | 9.4%       | 9.2%  |
|             | 1995 | 36.8%     | 19.1% |       | 33.1% | 3.7%   | 17.7%      | 12.9% |
|             | 2003 | 30.1%     | 13.6% |       | 26.1% | 4.0%   | 22.4%      | 16.5% |
|             | 2006 | 29.1%     | 9.5%  |       | 25.2% | 4.0%   | 22.7%      | 17.5% |
| Thailand    | 1985 | 25.6%     | 13.4% | 3.8%  | 15.4% | 6.3%   | 20.9%      | 19.8% |
|             | 1995 | 30.9%     | 16.8% | 2.9%  | 23.0% | 4.9%   | 18.9%      | 15.1% |
|             | 2003 | 34.7%     | 14.2% | 7.1%  | 17.9% | 9.7%   | 18.2%      | 14.7% |
|             | 2006 | 35.3%     | 12.7% | 9.0%  | 16.6% | 9.6%   | 16.0%      | 13.0% |
| Malaysia    | 1985 | 36.4%     | 23.8% | 1.1%  | 29.1% | 6.3%   | 13.7%      | 14.9% |
|             | 1995 | 40.4%     | 12.7% | 2.7%  | 31.6% | 6.2%   | 21.5%      | 14.2% |
|             | 2003 | 43.0%     | 10.7% | 6.5%  | 28.7% | 7.8%   | 20.2%      | 12.1% |
|             | 2006 | 43.1%     | 8.9%  | 7.2%  | 26.7% | 9.2%   | 19.4%      | 12.1% |
| Philippines | 1985 | 20.6%     | 18.9% | 1.6%  | 12.9% | 6.1%   | 37.5%      | 16.2% |
|             | 1995 | 24.6%     | 15.9% | 1.2%  | 16.2% | 7.2%   | 37.4%      | 16.9% |
|             | 2003 | 42.4%     | 22.3% | 6.2%  | 21.5% | 7.7%   | 12.7%      | 13.1% |
|             | 2006 | 41.3%     | 21.6% | 8.3%  | 20.9% | 8.2%   | 11.7%      | 11.5% |
| Indonesia   | 1985 | 18.4%     | 46.2% | 0.5%  | 16.1% | 1.9%   | 22.0%      | 6.4%  |
|             | 1995 | 31.0%     | 27.1% | 3.8%  | 22.2% | 5.0%   | 14.7%      | 14.9% |
|             | 2003 | 35.4%     | 15.9% | 5.9%  | 25.5% | 11.0%  | 21.0%      | 16.3% |
|             | 2006 | 37.3%     | 16.7% | 9.8%  | 22.4% | 9.1%   | 18.9%      | 18.0% |
| N. America  | 1985 | 9.1%      | 8.8%  | 1.6%  | 5.9%  | 1.6%   | 37.9%      | 18.9% |
|             | 1995 | 15.3%     | 9.5%  | 1.9%  | 10.2% | 3.3%   | 35.9%      | 17.5% |
|             | 2003 | 13.6%     | 5.8%  | 3.2%  | 7.6%  | 2.9%   | 40.5%      | 16.6% |
|             | 2006 | 14.0%     | 4.8%  | 4.3%  | 7.3%  | 2.3%   | 38.4%      | 16.3% |
| EU 15       | 1985 | 3.0%      | 1.2%  | 0.8%  | 1.5%  | 0.7%   | 10.8%      | 57.8% |
|             | 1995 | 5.7%      | 2.1%  | 1.0%  | 3.2%  | 1.6%   | 7.3%       | 61.8% |
|             | 2003 | 4.7%      | 1.6%  | 1.6%  | 2.2%  | 0.9%   | 9.7%       | 60.9% |
|             | 2006 | 4.9%      | 1.3%  | 1.9%  | 2.1%  | 0.8%   | 9.0%       | 59.1% |

Source: Compiled from UN Comtrade database  
Author's calculation

East Asian imports also declined, however by lower intensity relative to the Japanese experience.

Increased dependence on regional trade can be seen for all East Asian countries, although sizeable differences regarding the extent of the dependency exist among those countries. For example, from the share of East Asia in Philippines' imports increased by 12.8%, whereas the corresponding figures for Indonesia and China are both 29.9%. At the same time, the dependency on North America and EU 15 as an import source declined for all East Asian countries.

The increased importance of China as an import source country can be seen in all East Asian countries, particularly for more advanced nations such as Japan, Korea, Taiwan and Hong Kong. China has also become an increasingly important factor for non-regional markets. The increase in the share of China in the imports of North America between 1985 and 2006 was 13.8%. In spite of the fact that intra-regional imports dominate in EU15 accounting for 53.9% in 2006, China managed to gain its share by 5.3% since 1985. For both regions, China accounts for approximately 60% of their imports from the East Asia in 2006.

The table shows that there have been significant changes in the pattern of China's imports as well. In 1985, more than one third of its imports originated from Japan. Two decades later, its reliance on Japan has declined to 14.6%. On the other hand, a large increase in the share of intra-regional imports from 14% in 1985 to 43.9% in 2006 is witnessed. The rise is largely from the increase in the share of the NIEs in China's imports.

On the export side, on average, the share of intra-regional exports increased from 25.5% to 40.7%. Of all countries examined, significantly higher increase in the share of intra-regional exports is reported for Taiwan by almost 42.2% and Korea by 28.9% followed by Singapore, Japan and Hong Kong by 23.4%, 21.6% and 19.2%, respectively. The increase in the share of intra-regional exports in all countries is largely attributed to China. Increased dependency on regional trade is evidenced for all other Asian countries except China. The share shrank from 36.4% to 29.1%.

While over 36% of Chinese goods destined to other East Asian countries in 1985, the figure declined to 29.1% in 2006. In contrast, much higher portion of Chinese goods

is absorbed by both North America and to lesser extent by EU15 in 2006. As we have shown in the import side, the reliance on North America declined for all other East Asian countries except China and Malaysia. The decline in the reliance appears to be even larger on the export side. Taiwan in particular, the share of North America declined from 51.4% in 1985 to 16.0% in 2006.

## 2.2 Composition of trade by stage of production in East Asia

The above section leads to the conclusion that East Asian countries have generally become increasingly interdependent in trade. This section considers composition of trade by stage of production in East Asia.

Table 2

Average growth rate of total manufactured goods, intermediate goods and final goods, 1998-2007

|               | Imports |                    |             | Exports |                    |             |
|---------------|---------|--------------------|-------------|---------|--------------------|-------------|
|               | Total   | Intermediate Goods | Final Goods | Total   | Intermediate Goods | Final Goods |
| Asia Nations  | 12.4%   | 13.6%              | 10.2%       | 12.7%   | 13.3%              | 12.0%       |
| Japan         | 8.0%    | 10.2%              | 5.8%        | 7.1%    | 7.9%               | 6.1%        |
| Japan         | 8.0%    | 10.2%              | 5.8%        | 7.1%    | 7.9%               | 6.1%        |
| EastAsia      | 13.7%   | 14.4%              | 12.1%       | 14.8%   | 15.5%              | 14.2%       |
| China         | 22.1%   | 21.6%              | 23.5%       | 24.1%   | 26.8%              | 22.6%       |
| Hong Kong     | 8.1%    | 10.6%              | 5.1%        | 8.3%    | 11.9%              | 4.8%        |
| Indonesia     | 10.7%   | 10.3%              | 11.6%       | 11.9%   | 13.3%              | 9.2%        |
| Malaysia      | 10.5%   | 10.8%              | 10.0%       | 9.8%    | 10.3%              | 9.2%        |
| Philippines   | 2.4%    | 2.1%               | 4.7%        | 1.8%    | 1.6%               | 2.8%        |
| Rep. of Korea | 16.2%   | 14.6%              | 21.1%       | 12.4%   | 12.0%              | 13.1%       |
| Singapore     | 9.8%    | 11.2%              | 7.2%        | 10.8%   | 14.1%              | 4.9%        |
| Thailand      | 13.5%   | 14.2%              | 12.1%       | 12.2%   | 13.7%              | 11.0%       |
| EU15          | 8.9%    | 9.0%               | 8.8%        | 8.7%    | 8.8%               | 8.5%        |
| North America | 7.4%    | 6.8%               | 7.9%        | 6.0%    | 6.0%               | 5.9%        |
| Others        | 11.5%   | 11.3%              | 11.8%       | 12.2%   | 13.2%              | 11.1%       |
| World         | 9.8%    | 10.1%              | 9.4%        | 9.9%    | 10.3%              | 9.5%        |

Source: Compiled from UN Comtrade database  
Author's calculation

Table 2 examines the annual growth rate of trade in total manufactured goods and compares them with the rate of trade in finished and intermediate goods. The table provides strong evidence that trade in intermediate goods resulting from the international fragmentation of production has been the engine driving Asian trade during recent years.

Between 1998 and 2007, exports of intermediate goods grew at a rate of 13.3 % among Asian nations on average, which is faster than the growth rate of 12.0% for exports of final goods. On the import side, trade in intermediate goods grew over 3% faster than trade in final goods. Compared with other parts of the world, the growth rate in intermediate goods is much faster among Asian nations, both for exports and imports. The growth rate of exports of intermediate goods for the world, European Union 15 and North America was 10.3%, 8.8% and 6.0%, respectively while that of imports was 10.1%, 9.0% and 6.8%, respectively. This reflects the fact that international fragmentation of production has prevailed more among the countries of East Asia relative to other regions of the world.

Table 3 further distinguishes different types of intermediate goods, i.e., parts and components (IMPC) and semi-finished goods (IMSF). Finished goods are also further classified into consumption goods (FC) and capital goods (FCA). Primary goods (P) form the last category. This classification by different stages of production is useful in showing how each nation of East Asia is involved in production fragmentation and to what extent they differ from other regions of the world. The classification is explained in annex 1.

The most notable difference between the world and the East Asian nations can be found in the trade pattern of parts and components. At the global level, approximately one fifth of both imports and exports comprise the exchange of parts and components. That share remained relatively stable between 1998 and 2006 although both import and export share show a slight decline during the most recent years. Table 3 shows very different trends for different regions. For example, North America experienced declines of 6.0% and 4.2 %, respectively, in its import and export shares of parts and components from 1998 to 2006. The European Union 15 also experienced a similar declining trend in its parts and components trade, although more moderately relative to North America. The trend in East Asia contrasts markedly with the other regions, with the share of the parts and components trade increasing during the same period. It accounted for 27.0% of imports in 2006 which was 3.7% higher than the share in 1998. The upward trend can also be found, although to a lesser extent, on the export side, the share of which increased from 24.6% in 1998 to 26.4% in 2006.

For finished products, the most distinguishing difference between the world and

Table 3  
Trade patter by stage of production 1998-2006

| Imports |      | China | China, Hong Kong SAR | Indonesia | Japan | Malaysia | Philippines | Rep. of Korea | Singapore | Thailand | Asia  | North America | European Union 15 | World |
|---------|------|-------|----------------------|-----------|-------|----------|-------------|---------------|-----------|----------|-------|---------------|-------------------|-------|
| 1998    | FC   | 4.4%  | 32.9%                | 6.1%      | 28.3% | 6.2%     | 8.6%        | 5.0%          | 12.7%     | 8.3%     | 18.3% | 29.5%         | 27.4%             | 24.8% |
|         | FCA  | 19.4% | 15.6%                | 21.5%     | 12.7% | 18.2%    | 10.4%       | 12.0%         | 21.0%     | 17.3%    | 15.8% | 18.1%         | 16.1%             | 17.0% |
|         | IMPC | 21.8% | 19.2%                | 16.3%     | 13.2% | 46.1%    | 46.7%       | 24.3%         | 39.7%     | 26.7%    | 23.3% | 21.1%         | 17.6%             | 18.9% |
|         | IMSF | 44.5% | 28.6%                | 37.5%     | 23.6% | 21.7%    | 24.7%       | 33.0%         | 16.4%     | 34.6%    | 28.6% | 20.1%         | 27.7%             | 27.1% |
|         | P    | 8.2%  | 2.1%                 | 12.6%     | 19.1% | 3.7%     | 9.5%        | 22.7%         | 6.0%      | 11.2%    | 11.4% | 6.4%          | 7.7%              | 8.3%  |
| 1999    | FC   | 4.6%  | 33.0%                | 8.5%      | 28.8% | 7.3%     | 8.7%        | 6.1%          | 12.5%     | 7.7%     | 18.1% | 29.5%         | 27.7%             | 24.9% |
|         | FCA  | 19.2% | 14.7%                | 12.9%     | 13.1% | 14.7%    | 9.3%        | 13.7%         | 19.3%     | 15.3%    | 15.1% | 18.2%         | 16.7%             | 17.0% |
|         | IMPC | 23.5% | 21.0%                | 12.1%     | 13.5% | 47.3%    | 45.3%       | 25.6%         | 41.6%     | 27.9%    | 24.3% | 21.1%         | 17.8%             | 19.4% |
|         | IMSF | 41.6% | 27.5%                | 39.7%     | 22.9% | 23.2%    | 25.0%       | 30.9%         | 15.3%     | 34.0%    | 27.7% | 19.2%         | 26.1%             | 25.8% |
|         | P    | 8.7%  | 2.1%                 | 18.0%     | 18.3% | 3.8%     | 11.7%       | 20.9%         | 5.7%      | 12.1%    | 11.6% | 6.8%          | 7.7%              | 8.6%  |
| 2000    | FC   | 4.2%  | 30.2%                | 6.0%      | 26.3% | 6.6%     | 7.4%        | 6.5%          | 11.2%     | 6.8%     | 16.1% | 28.1%         | 24.9%             | 22.8% |
|         | FCA  | 17.5% | 15.4%                | 14.1%     | 12.6% | 14.9%    | 9.6%        | 15.7%         | 18.4%     | 14.2%    | 15.0% | 18.1%         | 16.2%             | 16.6% |
|         | IMPC | 24.2% | 24.5%                | 13.7%     | 14.5% | 48.6%    | 46.1%       | 23.9%         | 42.8%     | 31.1%    | 25.5% | 20.1%         | 17.4%             | 19.5% |
|         | IMSF | 38.1% | 26.3%                | 39.1%     | 22.9% | 21.2%    | 22.6%       | 27.8%         | 14.0%     | 31.1%    | 26.4% | 18.9%         | 25.2%             | 25.1% |
|         | P    | 13.5% | 1.9%                 | 16.7%     | 19.9% | 4.4%     | 13.0%       | 22.9%         | 7.3%      | 14.3%    | 13.5% | 9.1%          | 9.7%              | 10.7% |
| 2001    | FC   | 4.4%  | 30.4%                | 5.6%      | 27.6% | 7.3%     | 7.5%        | 8.3%          | 11.8%     | 7.1%     | 16.6% | 30.2%         | 26.8%             | 24.3% |
|         | FCA  | 20.1% | 16.8%                | 15.3%     | 12.3% | 16.3%    | 8.6%        | 14.2%         | 19.1%     | 17.2%    | 15.8% | 17.6%         | 15.9%             | 16.5% |
|         | IMPC | 25.1% | 24.5%                | 14.1%     | 13.9% | 44.8%    | 47.6%       | 22.1%         | 40.3%     | 28.4%    | 24.6% | 18.2%         | 17.2%             | 18.7% |
|         | IMSF | 35.8% | 24.8%                | 37.6%     | 22.9% | 21.8%    | 22.5%       | 28.9%         | 14.5%     | 30.6%    | 26.3% | 19.1%         | 25.6%             | 25.4% |
|         | P    | 12.2% | 2.0%                 | 19.2%     | 19.5% | 5.4%     | 12.6%       | 23.1%         | 7.2%      | 14.6%    | 13.3% | 8.9%          | 9.2%              | 10.2% |
| 2002    | FC   | 4.5%  | 29.6%                | 6.6%      | 27.7% | 7.6%     | 6.9%        | 9.8%          | 11.9%     | 7.6%     | 16.1% | 32.1%         | 28.8%             | 25.3% |
|         | FCA  | 21.0% | 16.0%                | 14.0%     | 12.3% | 15.0%    | 7.0%        | 14.5%         | 17.2%     | 17.5%    | 15.8% | 17.4%         | 14.9%             | 16.1% |
|         | IMPC | 27.4% | 26.9%                | 13.8%     | 14.4% | 47.0%    | 55.5%       | 22.7%         | 41.4%     | 27.1%    | 26.4% | 17.4%         | 16.5%             | 18.5% |
|         | IMSF | 34.7% | 24.2%                | 35.6%     | 22.5% | 20.8%    | 19.4%       | 29.5%         | 14.7%     | 31.6%    | 26.2% | 19.0%         | 25.7%             | 25.3% |
|         | P    | 10.6% | 2.0%                 | 19.5%     | 19.3% | 4.7%     | 9.5%        | 20.2%         | 7.0%      | 14.3%    | 12.3% | 8.7%          | 9.1%              | 10.0% |
| 2003    | FC   | 4.5%  | 27.3%                | 7.4%      | 26.4% | 7.7%     | 7.1%        | 9.2%          | 11.7%     | 7.7%     | 14.8% | 31.7%         | 29.1%             | 24.9% |
|         | FCA  | 21.6% | 15.2%                | 12.5%     | 12.1% | 13.3%    | 7.1%        | 15.0%         | 16.8%     | 17.3%    | 16.0% | 17.1%         | 14.4%             | 15.9% |
|         | IMPC | 28.4% | 29.9%                | 13.4%     | 14.3% | 48.3%    | 52.9%       | 22.4%         | 41.9%     | 26.7%    | 27.0% | 16.4%         | 16.1%             | 18.2% |
|         | IMSF | 32.0% | 24.1%                | 34.6%     | 23.2% | 20.4%    | 20.9%       | 29.9%         | 14.2%     | 31.4%    | 26.0% | 19.0%         | 25.4%             | 25.4% |
|         | P    | 11.8% | 2.0%                 | 21.1%     | 20.2% | 5.3%     | 9.8%        | 20.0%         | 7.0%      | 14.7%    | 12.8% | 10.3%         | 9.2%              | 10.5% |
| 2004    | FC   | 4.0%  | 25.0%                | 7.3%      | 25.0% | 7.6%     | 7.1%        | 8.0%          | 10.5%     | 7.3%     | 13.3% | 29.8%         | 28.3%             | 23.6% |
|         | FCA  | 21.1% | 15.2%                | 14.5%     | 11.8% | 14.7%    | 6.2%        | 15.6%         | 17.0%     | 15.6%    | 16.1% | 17.0%         | 14.7%             | 16.1% |
|         | IMPC | 28.6% | 32.4%                | 13.0%     | 14.5% | 44.0%    | 52.4%       | 20.6%         | 42.0%     | 25.5%    | 27.1% | 16.3%         | 15.6%             | 18.1% |
|         | IMSF | 29.3% | 23.7%                | 37.5%     | 23.5% | 22.7%    | 20.8%       | 31.2%         | 13.9%     | 33.0%    | 25.9% | 20.1%         | 25.6%             | 25.7% |
|         | P    | 15.0% | 1.9%                 | 17.0%     | 21.3% | 5.6%     | 9.5%        | 21.3%         | 8.0%      | 16.4%    | 14.2% | 11.3%         | 9.9%              | 11.4% |
| 2005    | FC   | 4.0%  | 23.6%                | 6.1%      | 23.1% | 7.5%     | 7.6%        | 8.1%          | 10.1%     | 7.4%     | 12.4% | 28.1%         | 27.4%             | 22.6% |
|         | FCA  | 19.4% | 15.7%                | 13.8%     | 11.5% | 14.6%    | 6.4%        | 15.1%         | 13.9%     | 15.8%    | 15.3% | 16.7%         | 14.6%             | 15.8% |
|         | IMPC | 29.5% | 34.2%                | 12.2%     | 13.7% | 43.1%    | 50.3%       | 19.2%         | 42.2%     | 22.9%    | 26.8% | 15.6%         | 15.0%             | 17.6% |
|         | IMSF | 28.2% | 22.4%                | 31.9%     | 22.9% | 22.5%    | 20.1%       | 30.3%         | 14.4%     | 32.1%    | 25.1% | 20.0%         | 25.5%             | 25.4% |
|         | P    | 17.0% | 1.9%                 | 17.7%     | 24.7% | 6.5%     | 11.5%       | 24.2%         | 10.1%     | 19.0%    | 16.4% | 13.2%         | 11.5%             | 12.9% |
| 2006    | FC   | 4.2%  | 21.6%                | 6.5%      | 20.8% | 7.5%     | 7.7%        | 8.3%          | 9.0%      | 7.7%     | 11.4% | 27.9%         | 25.8%             | 21.5% |
|         | FCA  | 19.2% | 16.1%                | 14.6%     | 11.0% | 14.4%    | 6.6%        | 14.6%         | 14.6%     | 14.3%    | 15.2% | 16.4%         | 14.2%             | 15.5% |
|         | IMPC | 30.5% | 36.2%                | 10.5%     | 13.7% | 41.4%    | 48.4%       | 17.6%         | 40.7%     | 22.9%    | 27.0% | 15.1%         | 14.5%             | 17.3% |
|         | IMSF | 26.0% | 21.5%                | 31.3%     | 23.5% | 22.9%    | 19.6%       | 30.3%         | 14.3%     | 32.0%    | 24.4% | 20.3%         | 26.1%             | 25.2% |
|         | P    | 17.9% | 2.1%                 | 19.2%     | 26.8% | 7.6%     | 13.2%       | 26.1%         | 9.3%      | 20.3%    | 17.6% | 14.0%         | 12.1%             | 13.5% |

Table 3 (Continued)

| Exports |      | China | China, Hong<br>Kong SAR | Indonesia | Japan | Malaysia | Philippines | Rep. of<br>Korea | Singapore | Thailand | Asia  | North<br>America | European<br>Union 15 | World |
|---------|------|-------|-------------------------|-----------|-------|----------|-------------|------------------|-----------|----------|-------|------------------|----------------------|-------|
| 1998    | FC   | 47.9% | 42.6%                   | 20.5%     | 20.0% | 14.0%    | 17.7%       | 19.2%            | 10.9%     | 37.4%    | 27.0% | 16.6%            | 27.2%                | 24.9% |
|         | FCA  | 15.0% | 12.3%                   | 4.1%      | 27.4% | 18.5%    | 12.2%       | 20.2%            | 28.4%     | 13.0%    | 20.1% | 21.3%            | 19.2%                | 17.9% |
|         | IMPC | 9.8%  | 17.6%                   | 4.7%      | 29.6% | 36.5%    | 59.6%       | 22.0%            | 37.4%     | 24.8%    | 24.6% | 26.3%            | 17.9%                | 19.4% |
|         | IMSF | 22.9% | 24.9%                   | 36.3%     | 19.4% | 23.9%    | 9.0%        | 34.5%            | 13.9%     | 18.8%    | 22.6% | 24.1%            | 28.3%                | 26.5% |
|         | P    | 3.8%  | 1.5%                    | 17.5%     | 0.4%  | 5.3%     | 1.5%        | 0.8%             | 0.8%      | 4.0%     | 2.3%  | 6.8%             | 3.1%                 | 7.0%  |
| 1999    | FC   | 46.8% | 42.1%                   | 24.3%     | 20.5% | 12.5%    | 14.0%       | 19.7%            | 9.4%      | 35.5%    | 26.5% | 17.0%            | 27.6%                | 24.6% |
|         | FCA  | 15.9% | 12.8%                   | 4.3%      | 26.4% | 17.9%    | 13.4%       | 22.0%            | 26.6%     | 13.3%    | 20.1% | 21.0%            | 19.1%                | 17.7% |
|         | IMPC | 11.6% | 19.0%                   | 6.4%      | 30.2% | 41.0%    | 64.3%       | 24.9%            | 40.1%     | 25.4%    | 26.6% | 27.0%            | 18.1%                | 20.0% |
|         | IMSF | 21.8% | 24.0%                   | 42.2%     | 19.3% | 21.2%    | 6.8%        | 29.1%            | 14.4%     | 18.3%    | 21.6% | 23.8%            | 27.3%                | 25.3% |
|         | P    | 3.3%  | 1.5%                    | 18.8%     | 0.3%  | 5.4%     | 1.4%        | 0.4%             | 0.7%      | 3.5%     | 2.2%  | 6.3%             | 3.3%                 | 7.8%  |
| 2000    | FC   | 43.8% | 39.3%                   | 22.4%     | 18.7% | 12.4%    | 14.4%       | 18.2%            | 8.2%      | 32.0%    | 24.8% | 16.0%            | 25.8%                | 22.6% |
|         | FCA  | 17.3% | 13.5%                   | 8.1%      | 26.5% | 18.9%    | 15.7%       | 21.6%            | 24.1%     | 13.2%    | 20.3% | 20.3%            | 19.0%                | 17.2% |
|         | IMPC | 12.8% | 22.2%                   | 8.7%      | 31.7% | 40.0%    | 60.3%       | 27.7%            | 44.2%     | 27.0%    | 28.1% | 27.4%            | 17.9%                | 20.2% |
|         | IMSF | 21.4% | 23.2%                   | 40.5%     | 19.1% | 20.0%    | 7.1%        | 26.9%            | 12.7%     | 19.2%    | 21.0% | 24.0%            | 27.0%                | 24.5% |
|         | P    | 3.7%  | 1.5%                    | 17.7%     | 0.3%  | 6.0%     | 1.3%        | 0.3%             | 0.6%      | 3.9%     | 2.3%  | 7.1%             | 3.7%                 | 9.7%  |
| 2001    | FC   | 42.3% | 38.4%                   | 23.1%     | 20.2% | 13.4%    | 16.2%       | 19.8%            | 8.6%      | 34.1%    | 26.2% | 16.9%            | 27.6%                | 24.2% |
|         | FCA  | 18.4% | 14.0%                   | 6.8%      | 24.8% | 21.2%    | 16.6%       | 24.8%            | 23.2%     | 12.8%    | 20.2% | 19.8%            | 19.1%                | 17.2% |
|         | IMPC | 14.0% | 23.4%                   | 8.8%      | 30.2% | 35.6%    | 57.7%       | 22.3%            | 42.4%     | 25.1%    | 26.2% | 26.1%            | 17.6%                | 19.2% |
|         | IMSF | 20.9% | 22.4%                   | 39.6%     | 20.0% | 21.4%    | 7.4%        | 27.4%            | 14.2%     | 19.2%    | 21.4% | 24.0%            | 27.0%                | 24.7% |
|         | P    | 3.4%  | 1.5%                    | 19.5%     | 0.6%  | 5.1%     | 1.3%        | 0.3%             | 0.6%      | 3.7%     | 2.5%  | 7.6%             | 3.2%                 | 9.3%  |
| 2002    | FC   | 40.2% | 35.9%                   | 20.8%     | 22.4% | 12.7%    | 14.8%       | 19.4%            | 8.5%      | 33.1%    | 26.3% | 17.6%            | 29.2%                | 25.1% |
|         | FCA  | 20.0% | 14.7%                   | 8.2%      | 23.0% | 18.8%    | 17.0%       | 26.2%            | 22.0%     | 14.9%    | 20.1% | 18.9%            | 18.3%                | 16.7% |
|         | IMPC | 15.6% | 25.5%                   | 8.7%      | 29.6% | 38.2%    | 59.3%       | 24.3%            | 42.8%     | 23.3%    | 26.7% | 25.7%            | 17.1%                | 19.0% |
|         | IMSF | 20.3% | 22.2%                   | 40.4%     | 20.2% | 22.2%    | 6.5%        | 25.9%            | 15.1%     | 19.9%    | 21.3% | 24.4%            | 27.0%                | 24.8% |
|         | P    | 2.9%  | 1.4%                    | 19.5%     | 0.4%  | 5.1%     | 1.4%        | 0.3%             | 0.7%      | 4.5%     | 2.4%  | 7.5%             | 3.4%                 | 8.9%  |
| 2003    | FC   | 37.4% | 33.0%                   | 20.1%     | 21.6% | 11.9%    | 15.0%       | 19.2%            | 8.1%      | 31.0%    | 25.2% | 17.7%            | 29.4%                | 24.9% |
|         | FCA  | 23.3% | 14.3%                   | 6.5%      | 22.9% | 17.8%    | 14.4%       | 26.1%            | 20.2%     | 15.7%    | 20.6% | 18.1%            | 17.4%                | 16.3% |
|         | IMPC | 16.0% | 28.4%                   | 9.1%      | 30.2% | 36.8%    | 60.0%       | 25.2%            | 42.3%     | 23.5%    | 27.0% | 24.7%            | 16.8%                | 18.6% |
|         | IMSF | 19.6% | 22.4%                   | 41.8%     | 20.5% | 24.3%    | 7.6%        | 25.6%            | 17.4%     | 20.8%    | 21.5% | 24.9%            | 27.1%                | 25.1% |
|         | P    | 2.6%  | 1.7%                    | 19.9%     | 0.5%  | 6.0%     | 1.4%        | 0.4%             | 0.7%      | 5.5%     | 2.4%  | 8.9%             | 3.4%                 | 9.4%  |
| 2004    | FC   | 34.2% | 30.3%                   | 21.8%     | 20.0% | 11.5%    | 13.4%       | 18.0%            | 7.5%      | 29.8%    | 23.6% | 17.2%            | 28.5%                | 23.9% |
|         | FCA  | 25.2% | 13.9%                   | 7.1%      | 23.9% | 19.2%    | 18.8%       | 26.2%            | 18.7%     | 16.0%    | 21.6% | 18.3%            | 17.4%                | 16.5% |
|         | IMPC | 16.7% | 31.6%                   | 9.5%      | 30.0% | 33.4%    | 56.8%       | 26.3%            | 43.2%     | 23.1%    | 27.1% | 23.7%            | 16.6%                | 18.4% |
|         | IMSF | 21.2% | 22.4%                   | 39.2%     | 21.0% | 25.2%    | 8.2%        | 25.2%            | 17.4%     | 21.8%    | 22.0% | 25.9%            | 27.4%                | 25.6% |
|         | P    | 1.9%  | 1.6%                    | 19.8%     | 0.7%  | 6.9%     | 1.8%        | 0.4%             | 0.7%      | 5.8%     | 2.2%  | 9.3%             | 3.8%                 | 9.7%  |
| 2005    | FC   | 32.6% | 28.8%                   | 18.2%     | 19.9% | 11.3%    | 13.4%       | 16.2%            | 7.4%      | 28.7%    | 22.9% | 17.1%            | 28.0%                | 22.9% |
|         | FCA  | 26.4% | 14.6%                   | 6.4%      | 22.6% | 19.8%    | 18.1%       | 26.3%            | 16.9%     | 17.8%    | 21.7% | 18.2%            | 17.7%                | 16.3% |
|         | IMPC | 16.9% | 34.8%                   | 8.4%      | 29.6% | 32.3%    | 56.1%       | 26.9%            | 42.9%     | 21.3%    | 26.8% | 22.8%            | 16.6%                | 17.8% |
|         | IMSF | 21.1% | 20.1%                   | 41.2%     | 22.1% | 24.5%    | 8.8%        | 24.9%            | 16.8%     | 22.5%    | 22.0% | 25.9%            | 27.7%                | 25.3% |
|         | P    | 1.9%  | 1.4%                    | 23.6%     | 0.8%  | 7.9%     | 2.2%        | 0.4%             | 0.6%      | 5.8%     | 2.5%  | 10.0%            | 4.0%                 | 11.3% |
| 2006    | FC   | 31.1% | 26.5%                   | 17.1%     | 20.6% | 10.6%    | 13.2%       | 14.8%            | 7.7%      | 27.2%    | 22.4% | 16.6%            | 26.8%                | 22.1% |
|         | FCA  | 26.8% | 14.9%                   | 5.8%      | 22.1% | 20.4%    | 15.6%       | 27.6%            | 14.4%     | 17.9%    | 21.8% | 18.9%            | 18.2%                | 16.6% |
|         | IMPC | 17.4% | 36.4%                   | 7.1%      | 28.5% | 30.9%    | 53.7%       | 25.9%            | 44.4%     | 21.3%    | 26.4% | 22.1%            | 16.3%                | 17.6% |
|         | IMSF | 22.2% | 20.3%                   | 41.8%     | 22.5% | 25.3%    | 12.6%       | 25.1%            | 16.1%     | 22.6%    | 22.5% | 26.1%            | 28.1%                | 25.7% |
|         | P    | 1.4%  | 1.6%                    | 25.5%     | 0.9%  | 8.4%     | 2.5%        | 0.5%             | 0.7%      | 6.6%     | 2.6%  | 10.2%            | 4.2%                 | 11.3% |

Source: Compiled from UN Comtrade database  
Author's calculation

the Asian countries can be found in the trade pattern of consumption goods, particularly on the import side. Approximately 22% of world imports take the form of consumption goods. In the case of North America, the share is almost 28%. Among the East Asian nations, the corresponding share only amounts to 11.4% in 2006, which was a decline of

more than 6.9% from 1998.

Another interesting point to note is the gradual decline in import share of capital goods which can be seen in all Asian countries examined except Hong Kong and Korea. However, one must use caution about BEC classification for capital goods. Capital goods (41) include producers' goods that are defined in the System of National Accounts (SNA) as part of fixed capital formation. However, there are goods in capital goods (41 and 51) that can be used as intermediate products in the related industry. Examples include motors, diesel and semi-diesel engines, generators, transformers, radiators, rectifiers, and so on.

Furthermore, there is considerable variation in the trade patterns across East Asian countries. A general picture of the division of production processes in East Asia can be drawn from table 4 as follows: China's trade structure can be characterized by a larger import share of parts and components and semi-finished products, and by a large export share of consumption goods as well as capital goods. This reflects China's role in production fragmentation as a processing and assembly base for finished products destined for the world market.

The general feature of three ASEAN countries, Malaysia, the Philippines and Indonesia is a large share of intermediate goods among both imports and exports. The decomposition of intermediate goods shows that while parts and components account for a large share of imports and exports in Malaysia and the Philippines, semi-finished goods account for a large share in Indonesia. The import structure of Thailand is similar to the above-mentioned three ASEAN countries; however, the distinctive difference can be found in its export structure, i.e., a much larger share of exports of consumption goods. In this comparison, Singapore is treated separately from the four other ASEAN countries due to its relatively high wages, and is discussed in later paragraphs.

Japan's trade structure is quite a contrast compared to those of the developing Asian countries. Japan is a large supplier of parts and components, reflecting Japanese industries turning to other countries of the region for the assembly of Japanese products (Jones et al, 2004). The trend is also marked by a small export share of consumption goods. Table 3 also indicates that capital goods hold a large share of Japan's exports, which reflects in part large foreign direct investment (FDI) outflows from Japan.

Production fragmentation has been facilitated greatly by multinational corporations and consequent FDI, which has had a significant impact on exports from investing countries to host countries. This may be due to the fact that new production facilities need to be equipped using capital goods from the investing country or because new capital goods are required for expanding existing production capacities.

A large share of parts and components trade can also be found in countries such as Singapore and Hong Kong, China where wage costs are much higher relative to other developing countries of East Asia. In Singapore, parts and components make up a substantial share of its imports and exports. Over 40% of both imports and exports are induced by the need for parts and components. This represents Singapore's pivotal role as an outsourcing centre in East Asia, particularly high-tech manufacturing, and as a hub for many leading international firms. Singapore's superior logistics sector as well as finance industry helps to form world-class supply chains in the region.

Hong Kong as a trading hub for electronic parts and components in Asia hosts a number of multinational manufacturers which source parts of key components and take advantage of its free port status. At the same time, the Hong Kong, China electronics industry is characterized by the heavy dependence on imported parts of key components. Local firms source worldwide as well as from Chinese firms on the mainland. Hong Kong's import share of parts and components increased dramatically from 19.2% in 1998 to 36.2% in 2006. On the export side, electronics industry is the largest export industry, accounting for nearly 50% of Hong Kong, China's total exports in 2006. Furthermore, two-thirds of Hong Kong, China's electronics exports comprise parts and components. What contributes to the large amount of parts and components exports is Hong Kong, China's involvement in outward processing production in China. This led to an increase in Hong Kong, China's export share from 17.6 per cent in 1998 to 36.4% in 2006.

### **3. Foreign direct investment in East Asia**

#### **3.1 General Trend in FDI inflow in East Asia**

Table 4 shows that although global FDI inflow continued to be dominated by the EU15 since 1980, East Asia (without Japan) has gained in importance as recipients of FDI over time until mid-1990s in terms of both the volume of inward flows and their

world share. Total value of inflows of FDI into eight East Asian economies that amounted to US\$ 4.5 billion in 1985 increased to US\$ 71.8 billion in 1995. Their share in total world inflows rose from 7.7 per cent in 1985 to 22.9 per cent in 1995. The surge of FDI came to a halt however in 1997 with the Asian financial crisis. The swift recovery from the crisis in terms of FDI volume in 1998 was only followed by another sharp downturn in 2001. Since 2003, FDI inflow to the region has been on a rise again. It reached US\$ 127.49 billion in 2004, a 50 per cent increase over 2003 with a backdrop of improved economic performance, a more favorable FDI policy environment and a rise in merger and acquisition activities in the region. Considering 27 per cent increase in global FDI inflow in 2004, a gain in the region's FDI inflow is spectacular. It continued to grow in 2005 reaching US 151.26 billion which was up almost thirty four-fold from 1985. The region accounted for over one fifth of global FDI inflow in 2005.

The largest contributor to the region's rising share in global FDI inflow has been China. FDI inflow to China has grown dramatically over the past two decades since China initiated its "open-door" policy in 1978. It was in the mid-1980s when FDI inflows surged and marked the beginning of China's ride on the wave of globalization. After it achieved unprecedented growth during the early 1990s, however, FDI inflow started to decline. This downturn continued until the next wave of FDI inflow hit China in 2000. Despite the widespread decline in global FDI inflow between 2000 and 2002, China was able to increase FDI inflow with expectations of further deregulation and opening up following that country's accession to WTO. In 2005, FDI in China was 37 times higher than in 1985, accounting for 7.9 per cent of global FDI inflow and almost 48 per cent of aggregate FDI inflow to East Asia.

ASEAN 5 experienced a significant increase in FDI inflow during the early 1990s, accounting for 7.4 per cent of global FDI inflow in 1995. The Asian financial crisis in 1997 triggered a sharp overall decline in the region's FDI inflow of 40 per cent during 1998, although individual national performances varied greatly. In order to enhance the attractiveness of the region for FDI inflow, the ASEAN Investment Area was established in 1998 and required the member countries to reduce or eliminate investment regulations and conditions that might impede investment flows. This provided a new impetus for economic integration among ASEAN member countries. The ASEAN Free Trade Area

(AFTA) became fully operational on 1 January 2003 and this added momentum to economic integration in the region. FDI inflows to the ASEAN 5 continued to increase for two consecutive years, reaching US\$ 34 billion in 2005.

Among the ASEAN 5, Singapore has been a leader in attracting FDI, which has

Table 4  
Inward FDI and the share in World Inward FDI, 1985-2005

| US\$ million             | 1985     | 1990      | 1995      | 2000        | 2001      | 2002      | 2003      | 2004      | 2005      |
|--------------------------|----------|-----------|-----------|-------------|-----------|-----------|-----------|-----------|-----------|
| Japan                    | 642.0    | 1,753.0   | 41.5      | 8,322.7     | 6,241.3   | 9,239.3   | 6,324.3   | 7,815.7   | 2,775.0   |
| Republic of Korea        | 218.0    | 759.0     | 1,250.0   | 8,591.0     | 3,692.0   | 2,975.0   | 3,785.0   | 7,687.0   | 7,198.0   |
| Taiwan Province of China | 342.0    | 1,330.0   | 1,559.0   | 4,928.0     | 4,109.0   | 1,445.0   | 453.0     | 1,898.0   | 1,625.0   |
| Hong Kong, China         | -267.2   | 3,275.1   | 6,213.4   | 61,924.1    | 23,776.5  | 9,681.9   | 13,623.6  | 34,034.7  | 35,897.0  |
| China                    | 1,956.0  | 3,487.1   | 37,520.5  | 40,714.8    | 46,877.6  | 52,742.9  | 53,505.0  | 60,630.0  | 72,406.0  |
| Singapore                | 1,046.8  | 5,574.7   | 11,591.3  | 16,484.5    | 14,121.6  | 5,821.5   | 9,330.8   | 16,059.8  | 20,083.0  |
| Thailand                 | 160.0    | 2,575.0   | 2,070.0   | 3,350.0     | 3,886.0   | 947.0     | 1,952.0   | 1,064.0   | 3,687.0   |
| Malaysia                 | 694.7    | 2,611.0   | 5,815.0   | 3,787.6     | 553.9     | 3,203.4   | 2,473.2   | 4,624.2   | 3,967.0   |
| Phillipines              | 12.0     | 550.0     | 1,459.0   | 1,345.0     | 899.0     | 1,792.0   | 347.0     | 469.0     | 1,132.0   |
| Indonesia                | 310.0    | 1,092.0   | 4,346.0   | -4,550.0    | -2,978.4  | 145.0     | -596.9    | 1,023.0   | 5,260.0   |
| E. Asia                  | 4,472.2  | 21,253.9  | 71,824.2  | 136,575.0   | 94,937.2  | 78,753.7  | 84,872.6  | 127,489.7 | 151,255.0 |
| ASEAN 5                  | 2,223.5  | 12,402.7  | 25,281.3  | 20,417.1    | 16,482.1  | 11,908.9  | 13,506.0  | 23,240.0  | 34,129.0  |
| N. America               | 21,862.0 | 56,004.0  | 68,027.0  | 380,788.0   | 187,144.0 | 96,608.0  | 60,761.0  | 123,910.0 | 133,265.0 |
| EU15                     | 15,965.0 | 89,459.0  | 116,324.0 | 674,278.0   | 362,418.0 | 283,863.0 | 240,572.0 | 185,227.0 | 387,858.0 |
| World                    | 57,959.0 | 201,614.0 | 340,336.0 | 1,409,568.0 | 832,248.0 | 617,732.0 | 557,869.0 | 710,755.0 | 916,277.0 |
| %                        | 1985     | 1990      | 1995      | 2000        | 2001      | 2002      | 2003      | 2004      | 2005      |
| Japan                    | 1.1%     | 0.9%      | 0.0%      | 0.6%        | 0.7%      | 1.5%      | 1.1%      | 1.1%      | 0.3%      |
| Republic of Korea        | 0.4%     | 0.4%      | 0.4%      | 0.6%        | 0.4%      | 0.5%      | 0.7%      | 1.1%      | 0.8%      |
| Taiwan Province of China | 0.6%     | 0.7%      | 0.5%      | 0.3%        | 0.5%      | 0.2%      | 0.1%      | 0.3%      | 0.2%      |
| Hong Kong, China         | -0.5%    | 1.6%      | 1.8%      | 4.4%        | 2.9%      | 1.6%      | 2.4%      | 4.8%      | 3.9%      |
| China                    | 3.4%     | 1.7%      | 11.0%     | 2.9%        | 5.6%      | 8.5%      | 9.6%      | 8.5%      | 7.9%      |
| Singapore                | 1.8%     | 2.8%      | 3.4%      | 1.2%        | 1.7%      | 0.9%      | 1.7%      | 2.3%      | 2.2%      |
| Thailand                 | 0.3%     | 1.3%      | 0.6%      | 0.2%        | 0.5%      | 0.2%      | 0.3%      | 0.1%      | 0.4%      |
| Malaysia                 | 1.2%     | 1.3%      | 1.7%      | 0.3%        | 0.1%      | 0.5%      | 0.4%      | 0.7%      | 0.4%      |
| Phillipines              | 0.0%     | 0.3%      | 0.4%      | 0.1%        | 0.1%      | 0.3%      | 0.1%      | 0.1%      | 0.1%      |
| Indonesia                | 0.5%     | 0.5%      | 1.3%      | -0.3%       | -0.4%     | 0.0%      | -0.1%     | 0.1%      | 0.6%      |
| E. Asia                  | 7.7%     | 10.5%     | 21.1%     | 9.7%        | 11.4%     | 12.7%     | 15.2%     | 17.9%     | 16.5%     |
| ASEAN 5                  | 3.8%     | 6.2%      | 7.4%      | 1.4%        | 2.0%      | 1.9%      | 2.4%      | 3.3%      | 3.7%      |
| N. America               | 37.7%    | 27.8%     | 20.0%     | 27.0%       | 22.5%     | 15.6%     | 10.9%     | 17.4%     | 14.5%     |
| EU15                     | 27.5%    | 44.4%     | 34.2%     | 47.8%       | 43.5%     | 46.0%     | 43.1%     | 26.1%     | 42.3%     |

Source: World Investment Report, various years

Note: East Asia excludes Japan

played a pivotal role in that country's economy. A liberal open-door policy and extensive FDI promotion policies towards foreign investors attracted a massive amount of FDI. In 2005, Singapore retained its position as third-largest recipient in East Asia, attracting US\$ 20 billion, which accounted for approximately 59 per cent of total FDI inflow to the ASEAN 5.

FDI inflows to the East Asian "Tigers" (Hong Kong, China, the Republic of Korea and Taiwan Province of China) began to increase rapidly in the early 1990s against the backdrop of strong economic growth and the liberalization of investment regimes. The

slowdown of the domestic economy and the regional economic situation as a result of the Asian financial crisis prompted the sharp decline of FDI inflows to Taiwan Province of China in 1998. As a result, the share of the East Asian “Tigers” in global FDI declined to 2.8% during the year. Since then, the share of these economies has quickly picked up and has reached at 5.4% in 2000. Their share in global FDI inflow peaked at 6.1 per cent in 2004 before declining slightly to 4.9 per cent in 2005.

Hong Kong, China experienced an unprecedented FDI boom in 1999 after it recovered from the turmoil of the Asian financial crisis. The surge reflected Hong Kong, China’s role as a financial hub for business in the region, particularly in China. Hong Kong, China is by far the largest foreign investor in China, and its investments have increased dramatically since early 1980s. A significant portion of the investment originates from China itself. Much of China’s capital outflow that takes place either through legal or illegal channels to Chinese firms located in Hong Kong, China finds its way back to China as FDI. This type of “round tripping” of funds is mostly used to escape regulations such as barriers to trade or to gain eligibility for incentives available only to foreign investors (e.g., tax concessions). Hong Kong, China is also used as a stepping stone for investment to China. A large number of foreign firms use affiliates in Hong Kong, China to invest in China on their behalf. In addition, many overseas companies have regional offices as well as regional headquarters in Hong Kong.

Hong Kong, China has been experiencing another surge in FDI inflows during recent years. This partly reflects the Closer Economic Partnership Arrangement (CEPA) signed between Hong Kong, China and China, which opened up new opportunities not only for firms in Hong Kong, China but also for foreign investors. In 2005, Hong Kong, China attracted almost 25 per cent of the FDI inflow into the region, and accounting for 3.9 per cent of global FDI inflow.

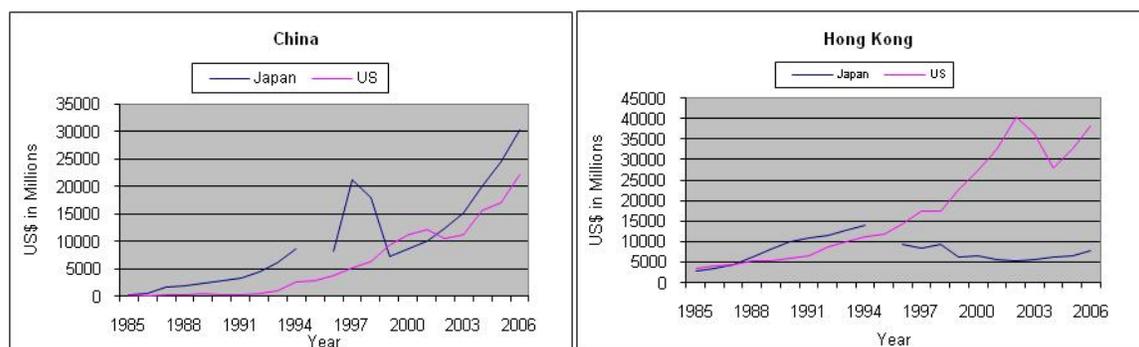
Since the 1997 Asian financial crisis, the Republic of Korea has adopted extensive policy reforms in favor of FDI such as simplifying the approval procedure, the removal of various restrictions on foreign ownership, strengthening tax incentive systems and financial support for foreign investors, among others. As a result, FDI inflows began to surge in 1997 and maintained strong growth until 2000. In 2004, the inflows picked up once again and the Republic of Korea absorbed more than 1 per cent of global FDI inflow.

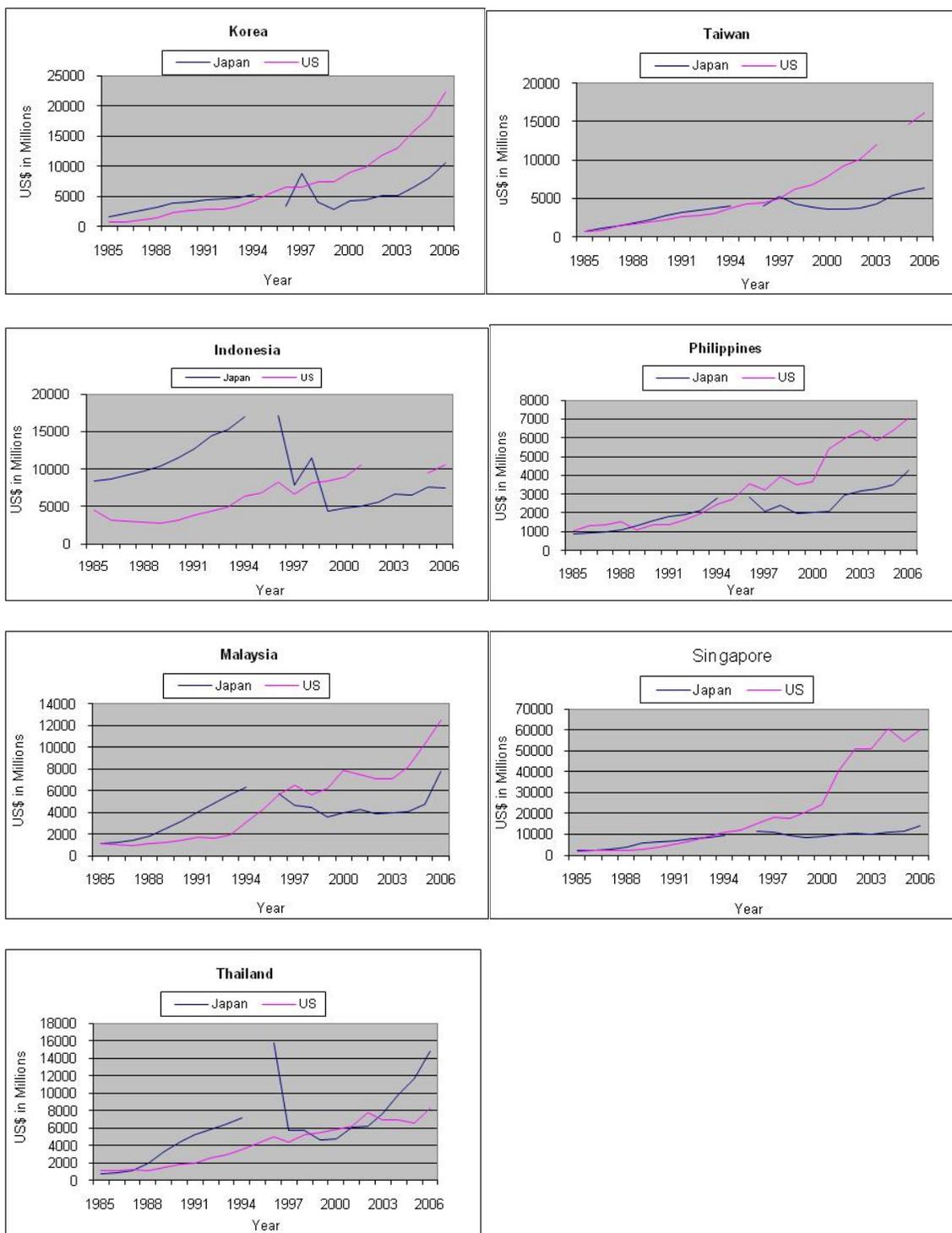
The inflow of FDI to Taiwan Province of China grew rapidly, particularly towards the end of the 1990s, due to a large-scale reform of various laws and regulations on FDI inflows as well as further opening up of the financial sector. However, after 2001, the absolute magnitude of FDI in Taiwan Province of China has been small, which is a clear contrast to the recent surge in FDI inflow in the Republic of Korea.

### 3.2 Inward FDI in East Asia from Japan, U.S. and South Korea

Figure 1 show the stock of Japanese and U.S. direct investment in the individual countries within East Asia between 1985 and 2006. A relatively stable increase in the FDI stock from both countries can be seen in all countries until 1997 when the Asian economic crisis hit. In contrast to the relatively similar FDI developments displayed by Japan and the U.S. until the crisis, the FDI stock of those two countries appears to have begun to follow the different path immediately after the crisis. Japanese direct investment outflows to the crisis-stricken economies declined sharply after the crisis. The pace of Japanese FDI outflows has moderated due to the severe economic slowdown in Japan as well. The total dollar amount of Japanese direct investment in all nine countries combined continued to stay below 1997 level until 2005, although the size and the duration of the decline varies among those countries. The sharpest and lasting drop hit Indonesia and to a lesser extent Thailand. Consequently, as of 2006, the stock of Japanese investment has not recovered the pre-crisis level in those two countries. In contrast, in China, although Japanese investment position plummeted in 1997 and 1998, it made a swift recovery relative to other East Asian economies.

Figure 1 U.S. and Japanese FDI Stock in Asia





Although Japan was more dominant in its direct investment position in East Asia in 1997, the stock of U.S. investment as of 2006-end became greater than Japan's in all countries examined here except China and Thailand. Singapore and Hong Kong are the most important U.S. investment market in the region during the period examined. U.S.

international investment position as of 2006-end stood at over US\$60 billion and US\$38 billion in Singapore and Hong Kong, respectively. In contrast, although the amount of US direct investment to many of these economies shrank during the next couple of years after the crisis, the overall upward trend of investment position was recovered shortly.

Table 5  
Stock of Direct Investment from Korea (US\$ millions)

|      | China     | Hong Kong | Indonesia | Japan    | Malaysia | Philippines | Singapore | Thailand |
|------|-----------|-----------|-----------|----------|----------|-------------|-----------|----------|
| 1998 | 4,328.54  | 1,309.56  | 1,641.24  | 390.89   | 395.17   | 369.69      | 265.92    | 520.44   |
| 1999 | 4,680.20  | 1,659.60  | 1,771.94  | 422.11   | 409.23   | 456.10      | 442.39    | 526.40   |
| 2000 | 5,401.71  | 1,929.20  | 1,867.30  | 516.32   | 417.96   | 600.67      | 550.43    | 559.14   |
| 2001 | 6,051.82  | 2,030.96  | 2,041.47  | 605.25   | 437.67   | 657.77      | 591.65    | 590.07   |
| 2002 | 7,103.58  | 2,259.82  | 2,114.03  | 686.97   | 446.24   | 684.70      | 650.14    | 624.26   |
| 2003 | 8,849.98  | 2,366.76  | 2,199.08  | 738.50   | 456.61   | 701.32      | 884.70    | 656.03   |
| 2004 | 11,177.74 | 2,599.32  | 2,256.18  | 1,027.51 | 494.27   | 720.49      | 1,053.68  | 702.10   |
| 2005 | 13,949.93 | 2,874.48  | 2,355.95  | 1,180.36 | 509.57   | 761.12      | 1,179.69  | 753.69   |
| 2006 | 17,295.47 | 3,718.50  | 2,503.27  | 1,426.36 | 559.08   | 821.98      | 1,483.54  | 827.86   |

Source: The Export-Import Bank of Korea

Korea's outward FDI South Korea's investment in Asia in recent years has been primarily in China (Table 5). Korea achieved the dramatic entry to China during the 1990's. Korea's direct investment in China has exploded since the normalization of diplomatic relations in 1992. In the latter half of the 1990s, the major corporations such as Hyundai, Samsung and LG made their advances into China. Korea's direct investment activities slowed down after the financial crisis in 1997 and their investment in China was no exception. Entering 2000, however, the trend was reversed. Korea's direct investment in China began to increase again. In fact, China has replaced the U.S. to become the largest investment destination for Korean direct investment since 2002.

#### 4. Gravity equation

##### 4.1. Model specification and estimation method

The gravity model has been widely applied in various studies of international trade and FDI (Feenstra et al. 2001). The gravity equation in international trade using cross-country data is commonly written as:

$$X_{ij} = f(GDP_i, GDP_j, F_{ij}) \quad (1)$$

where  $X_{ij}$  is the value of the trade flow of goods from country  $i$  to country  $j$ ,  $GDP_i$  and  $j$

are the GDP in country  $i$  and  $j$ , respectively, and  $F_{ij}$  is a vector of factors that influence the trade flow. The factors commonly used include the physical distance between the two countries  $i$  and  $j$ , which is used as a proxy for transportation costs, a dummy variable that assumes the value 1 if  $i$  and  $j$  share a common language and 0 otherwise, a binary variable assuming the value 1 if  $i$  and  $j$  share a common land border and 0 otherwise, and a dummy variable assuming the value 1 if  $i$  and  $j$  have a free trade agreement and 0 otherwise.

The model specification is augmented in order to examine the economic impact of FDI inflow on the host country's trade. China, Hong Kong, China, Singapore, the Republic of Korea, Thailand, Malaysia, the Philippines, Indonesia and Japan are included in the estimation here for 1998-2004. Of particular interest is the impact of FDI on the various forms of trade in East Asia. One possible specification issue for including FDI in the gravity analysis is the endogeneity problem. More specifically, the causal relationship between FDI and trade may be driven by unobserved common factors such as variation in government policy, technology, tastes etc. The strategy adopted here to deal with this issue is to estimate FDI at the first stage using various instrumental variables while in the second stage, bilateral trade is estimated with the predicted value of FDI as the additional independent variable. The error term in the FDI equation then is uncorrelated with the error term in the trade equation.

The model predicts that FDI flow and bilateral trade flows between any two countries as:

$$FDI_i = \alpha_0 + \beta_1 DIFPGDP_{ij} + \beta_2 DIFWAGE_{ij} + \beta_3 DUTY_i + \beta_4 CTAX_i + \beta_5 CORRUPT_i + \beta_6 GSTAB_i + \beta_7 LAW_i + \beta_8 TEL_i + \varepsilon_{ij} \quad (2)$$

$$T_{ij} = \gamma_0 + \rho_1 GDP_i + \rho_2 GDP_j + \rho_3 DIST_{ij} + \rho_4 DMB_i + \rho_5 FDI_i + \delta_{ij} \quad (3)$$

where subscripts  $i$  and  $j$  refer to the reporting country and the partner country. The definition of the variables in the above equation is listed below. Annual data for eight countries from 1998 to 2004 are used in the estimation. Equation (3) is run on parts and components and capital goods separately. In addition, the impact of an each explanatory

variable on bilateral import flows and export flows are examined separately.

- $FDI_i$  – the level of FDI stock in the reporting country.
- $DIFPGDP_{ij}$  – the absolute value of the difference in per capita GDP between  $i$  and  $j$ .
- $DIFWAGE_{ij}$  – the absolute value of the difference in wages between  $i$  and  $j$ .
- $DUTY_i$  – import tariff of the host country.
- $CTAX_i$  – corporate tax rate of the host country.
- $CORRUPT_i$  – an index of corruption in the host country.
- $GSTAB_i$  – an index of government stability in the host country.
- $LAW_i$  – an index of rule of law in the host country.
- $TEL_i$  – the number of telephone main lines per 1,000 people in the host country.
- $DIST_{ij}$  – the geographical distance between the most important cities in  $i$  and  $j$ .
- $T_{ij}$  – the volume of exports or imports by country  $i$  to or from  $j$  in total trade, intermediate or final products.
- $GDP$  – gross domestic product.
- $DMB_{ij}$  – a dummy variable that is 1 if  $i$  and  $j$  share a common border and 0 otherwise.

The independent variables included in equation (2) are believed to exert an influence on inward foreign direct investment in each country of East Asia by changing the investment environment through institutional and policy changes, and economic conditions.

Two variables have been incorporated in this analysis that may influence the level of foreign production – the absolute difference of per capita GDP ( $DIFPGDP$ ) and wages ( $DIFWAGE$ ). The gap in per capita GDP and wages between a reporting country and a partner country should have a positive influence on FDI of the vertical type.<sup>3</sup> Trade in intermediate goods can be very sensitive to cost differences between two countries. For production fragmentation to take place, additional coordination costs must be offset by a reduction in the total production costs. Factor price differentials between countries allow at least one fragment to be produced more cheaply in another country (Deadorff, 2001).

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<sup>3</sup> For a very interesting study on how vertical intra-industry trade helps integrate East Asia, see Wakasugi (2007).

The gap in production costs between the two countries must be sufficiently large in order for production fragmentation to occur.

Policy-related variables, tariff barriers proxied by import duty and corporate tax rates have also been incorporated. MNEs, which set up vertical production networks, may be encouraged to invest in a country with relatively low tariff barriers due to lower costs of their imported intermediate products. Under such an arrangement, goods-in-process may cross multiple borders while they are being produced. Since a tariff may be imposed each time these goods-in-process cross a border, the effect of the lower tariff rate on the reduction in the cost of production of these goods can be magnified.

Another policy-related variable that can influence a host country's location advantage is the host country's corporate or other tax rates. As global profit maximizers, MNEs can be assumed to be sensitive to tax factors, since such factors have a direct effect on their profits. Evidence of significant negative influence from corporate tax rates on FDI have been reported in previous studies by Wei (1997), Gastanaga and others (1998) and Hsiao (2001).

Also included in equation (2) are institutional factors, the level of corruption, the stability of each government and the rule of law. Corruption can discourage FDI by inducing a higher cost of doing business. Hines (1995) showed that FDI from the United States grew more rapidly in less corrupt countries than in more corrupt countries after 1977. Wei (1997) presented an alternative explanation of the negative and significant effect of corruption on FDI. Unlike taxes, corruption is not transparent and involves many factors that are more arbitrary in nature. An agreement between a briber and a corrupt official is difficult to enforce and it creates more uncertainty over the total questionable payments or the final outcome. Wei demonstrated the fact that this type of uncertainty induced by corruption leads to a reduction in FDI. Political stability of a government and the sound rule of law can also be important factors in the inflow of FDI. Uncertain political environments and their related risks can impede FDI inflows despite favorable economic conditions.

The last variable, TEL, included in equation (2) is a proxy for quality of infrastructure. On the other hand, as theorized by Jones and Kierzkowski (1990), such fragmentation is not costless. Unlike final goods, the intermediate goods produced among

network member countries may cross multiple international borders. This incurs additional costs of transportation as well as costs of a wide variety of services associated with coordinating production, shipments, sales of final goods etc.

We now turn to equation (3). The volume of trade in both intermediate and final products is expected to be positively related the market size of the two countries concerned. The variable GDP captures the idea that larger countries trade more than small countries as they can offer more differentiated products to satisfy a wide variety of consumers. At the same time, for producers of both intermediate products as well as capital goods, the larger the market size of both exporting and importing countries due to the presence of economies of scale, the larger the volume of trade. According to the theory of fragmentation outlined by Jones and others (2004), scale of production would determine the lengths to which the division of labor can proceed since the level of the workers' specialization increases as the scale of production rises. As Grossman and Helpman (2005) proposed, the variable can also be treated as a proxy for the "thickness" of the markets; this has a positive impact on the location of outsourcing, as the likelihood of the firms finding an appropriate partner in their search increases as the size of a country increases.

The distance variable is considered to be a crucial factor in explaining international trade since distance increases transportation costs, which is a trade-resistance factor that negatively influences the bilateral trade volume. In particular, transportation costs are considered to have a larger impact on decisions concerning production fragmentation, as each intermediate product that belongs to the same value-added chain may cross national boarder multiple times. Geographical proximity, on the other hand, promotes bilateral trade flows as it reduces transportation needs, information costs, cultural unfamiliarity etc. Therefore, the expected sign of the variable is negative. In this study, the great circle distance between the capital cities of the reporting country and the partner country is used.

The final variable is a dummy variable with regard to whether the importing country and exporting country are adjacent. The dummy variables may capture various factors that lead to reduced business transaction costs. For example, firms in adjacent countries are likely to have a better understanding of business practices than firms from a

different business environment. This familiarity certainly helps to reduce the cost involving uncertainty. The familiarity with the business environment also helps to reduce the difficulty of finding an appropriate outsourcing partner in production networks. As the variable is assumed to capture additional proximity between trading partners that facilitate trade, it is expected to be positively related to the level of trade.

Except for the dummies, all variables are log-linearized. Sources for the variables are listed in Appendix 2.

## 4.2 Estimation results

Table 6 represents the results of the estimations by random effect model.

Table 6  
Regression Results

| Explanatory variables | Export                |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                       | Japan                 |                       | US                    |                       | Korea                 |                       |
|                       | PC Coefficient        | CA Coefficient        | PC Coefficient        | CA Coefficient        | PC Coefficient        | CA Coefficient        |
| GDP, reporter         | 0.715 ***<br>(0.059)  | 0.791 ***<br>(0.059)  | 0.758 ***<br>(0.061)  | 0.912 ***<br>(0.061)  | 0.713 ***<br>(0.063)  | 0.920 ***<br>(0.067)  |
| GDP, partner          | 0.747 ***<br>(0.056)  | 0.703 ***<br>(0.056)  | 0.751 ***<br>(0.061)  | 0.734 ***<br>(0.062)  | 0.764 ***<br>(0.060)  | 0.808 ***<br>(0.065)  |
| DIST                  | -1.194 ***<br>(0.201) | -0.949 ***<br>(0.178) | -1.183 ***<br>(0.224) | -0.987 ***<br>(0.198) | -1.262 ***<br>(0.234) | -1.124 ***<br>(0.220) |
| DB                    | -0.225<br>(0.526)     | 0.394<br>(0.464)      | -0.219<br>(0.585)     | 0.329<br>(0.516)      | -0.268<br>(0.615)     | 0.216<br>(0.577)      |
| FDIHAT                | 0.613 ***<br>(0.098)  | 1.094 ***<br>(0.109)  | 0.371 ***<br>(0.070)  | 0.485 ***<br>(0.076)  | 0.444 ***<br>(0.066)  | 0.372 ***<br>(0.077)  |
| LM                    | 1%                    | 1%                    | 1%                    | 1%                    | 1%                    | 1%                    |
| # of obs.             | 643                   | 643                   | 643                   | 643                   | 643                   | 643                   |
| Explanatory variables | Import                |                       |                       |                       |                       |                       |
|                       | Japan                 |                       | US                    |                       | Korea                 |                       |
|                       | PC Coefficient        | CA Coefficient        | PC Coefficient        | CA Coefficient        | PC Coefficient        | CA Coefficient        |
| GDP, reporter         | 0.879 ***<br>(0.059)  | 0.833 ***<br>(0.058)  | 0.875 ***<br>(0.063)  | 0.820 ***<br>(0.061)  | 0.893 ***<br>(0.062)  | 0.891 ***<br>(0.064)  |
| GDP, partner          | 0.641 **<br>(0.063)   | 0.707 ***<br>(0.061)  | 0.701 ***<br>(0.064)  | 0.787 ***<br>(0.061)  | 0.696 **<br>(0.065)   | 0.858 ***<br>(0.067)  |
| DIST                  | -1.080 ***<br>(0.228) | -0.811 ***<br>(0.185) | -1.080 ***<br>(0.244) | -0.805 ***<br>(0.196) | -1.162 ***<br>(0.250) | -0.956 ***<br>(0.218) |
| DB                    | -0.301<br>(0.599)     | 0.272<br>(0.483)      | -0.314<br>(0.638)     | 0.261<br>(0.511)      | -0.376<br>(0.660)     | 0.123<br>(0.573)      |
| FDIHAT                | 0.619 ***<br>(0.098)  | 0.858 ***<br>(0.110)  | 0.332 ***<br>(0.071)  | 0.475 ***<br>(0.075)  | 0.322 ***<br>(0.067)  | 0.250 ***<br>(0.076)  |
| LM                    | 1%                    | 1%                    | 1%                    | 1%                    | 1%                    | 1%                    |
| # of obs.             | 643                   | 643                   | 643                   | 643                   | 643                   | 643                   |

It reveals a positive and statistically significant influence of all Japanese, the U.S. and Korean direct investment on trade in parts and components as well as capital goods, indicating a complementary relationship between trade and FDI in East Asia. However, a large variation exists in the magnitude of the impact of the variable between the U.S. and Japan, and across the two types of disaggregated data.

With regard to trade in parts and components, the results suggest a strong two-

way trade expansion effect from production fragmentation by Japanese, the U.S. and Korean MNEs, reflecting the supply of these intermediate goods by network member countries to each other. However, the magnitude of the coefficient is far from homogenous among three countries. Japanese direct investment appears to have a much larger effect relative to the U.S. or Korean direct investment. On the export side, it shows that 1% increase in Japanese direct investment inflow leads to 0.61% increase in intra-regional bilateral exports, whereas that in the U.S. and Korean direct investment inflow only leads to 0.37% increase and 0.44%, respectively, in intra-regional bilateral exports. The impact of Japanese direct investment exerted on regional bilateral exports of parts and components is approximately 1.7 times as large as that of the U.S. direct investment and 1.4 times as large as that of Korean direct investment. On the import side, the similar difference exists between FDI from two countries. The coefficient for Japan is approximately 1.8 and 1.9 times as large as that for the U.S and Korea, respectively.

Electrical industries as well as automobile industries consist of layers of subcontractors in Japan. Small and Medium Enterprises (SMEs) as subcontractors to larger multinationals function as suppliers of intermediate goods. After large Japanese manufacturers shifted their production site from Japan to various Asian countries seeking low-cost assembly sites for labor-intensive production processes in 1970's and 80's, SMEs as well established their overseas production to extend the long-term close business ties they have created with them back home. A large part of FDI by Japanese MNEs is undertaken by SMEs, which is a distinctive characteristic of Japanese FDI. Those SMEs which produce parts and machinery for the large manufacturers established support industries in the East Asian countries. Japanese manufacturing industries over time concentrated production by product and part through their business networks in East Asia in order to achieve economies of scale. During the process, a cross-border division of labor by Japanese MNEs started to expand from between Japan and East Asia to between the East Asian countries not including Japan (METI 2008). The large impact of Japanese direct investment on the intra-regional trade of parts and components may be attributed to this distinctive characteristic of Japanese direct investment.

The results also indicate that FDI by Japan, the U.S. and Korea all cause both intra-regional bilateral exports and imports of parts and components to increase among

the Asian countries. Thus inward FDI and trade are complementary. Furthermore, the predicted impact on exports is insignificantly different from the predicted impact on imports of parts and components for Japan and U.S. This indicates that increased levels of Japanese the U.S. FDI have insignificant impact on the trade balance of parts and components of these Asian countries. In contrast, Korean FDI has larger impact on intra-regional bilateral export of these countries than their imports, leading to positive impact on the trade balance of parts and components of those economies.

A significantly positive impact of FDI inflow is found on trade in capital goods for all FDI source countries. On the import side, the result may be attributed to various trade liberalization policies and institutional changes that many East Asian economies pursued during the 1990s to help generate greater openness for trade. For example, many East Asian economies unilaterally eliminated their tariffs on capital and intermediate goods. In addition, duties on trade in information technology products were completely eliminated due to the completion of the Information Technology Agreement (ITA) in 1996. This is important because among the commodities actively traded in the East Asian region (excluding Japan) the leading category is information technology products. Regarding institutional changes, the establishment of Export Processing Zones (EPZ), where manufacturers can enjoy import duty exemption on imported inputs as well as extensive usage of a duty drawback system on the imported parts and components used for the production of exports, effectively reduces the impact of tariff barriers on trade.

More interestingly however, the size of the impact of Japanese direct investment is 2.3 times and 2.9 times as large as that of the U.S. and Korean direct investment, respectively on the export side. An equally large difference in the size of coefficient can also be found on the import side. The coefficient for Japan is 1.8 times and 3.4 times as large as those for the U.S. and Korea, respectively. The stark difference can partly be due to an extensiveness of Japanese machinery production in Asia and the fact that a wide range of goods that can be used as intermediate inputs in related industries being classified as “Capital Goods” in BEC as we discussed in previous section.

The overseas structure of Japanese general machinery industry is characterized by continual expansion in the number of production and bases around the world. The geographical spread of general machinery affiliates is diverse, but reflects the locations of

electrical, electronics and automotive industries which are supplied by firms in the general machinery industry (Farrell 2008). In 2003, 18 per cent of general machinery industry affiliates were located in China, 16 per cent in North America, 15 per cent in ASEAN and 8 per cent in the NIEs3 economies (JBIC, 2004). Furthermore, with the assistance of the Keiretsu system and the assistance of local Japanese government in deploying overseas operation for SMEs (at the prefecture and the ward level), very strong intra- and inter- industry relationships that originate from Japan exists. In particular, close working relationships of these firms in overseas locals develop into almost a “brotherhood” with respect to other foreign presences at a given local or regions. Over time, these working and sometimes personal relationships of “fellow Japanese” developed into a valuable trust that allows further intra and inter industrial co-operations that otherwise would not have existed.

Another key aspect of Japanese machinery industries is that they possess strong, leading history in post WWII machinery industry. Japanese were the early adaptors and developers of then new Numeric Control technology (NC), which they aggressively applied to their products with continual improvements. This effort resulted in high valuation and world wide acceptance of their machineries in the latter half of ‘70s. In 1982, Japan has become world largest machine tool producer of the world. At their peak production in 1990, Japan recorded \$13 billion USD. Since then Japan has continued to lead the industry to this day.

Japanese industry as a whole, not just the machinery industry, has also expanded in their offerings to the world as well as to themselves. Ranging from common and relatively low-tech components, to household electric/electronic goods, to automobiles, to NC machineries to, high-tech machineries, to aerospace components and finish goods. In contrast, US, German, Chinese, Taiwanese and Korean industries produce narrower selections at the different levels of development.

A large impact of Japanese direct investment on the bilateral intra-regional trade in Asia can be best understood by the wide range of offerings from Japan and from their affiliates in Asia many of which fall into “Capital Goods” classification.

An another point to make is that the impact of FDI from all three countries have a larger impact on exports than on imports indicating the positive effect on the trade

balance of capital goods among the Asian countries.

The coefficients for the two standard variables, the market size of both reporting and partner countries and the distance have expected signs and are statistically significant at the 1% level for intermediate goods and final goods. The overall results for GDP are consistent with the hypothesis that larger countries with a large production capacity are more likely to enjoy economies of scale and to export more, while at the same time importing more due to a higher capability of absorption.

Distance is found to be an important resistance factors for trade flows of both exports and imports of both types of trade. Distance is likely to represent not only transportation costs, but also other costs incurred in delivering a good to the final user, such as telecommunications, local distribution, and regulatory costs. Lowering the costs of these service links that connect the two production blocks is crucial for countries to successfully be an integral party of production networks. The relatively large impact of the distance variable found in this study implies that high potential benefits for East Asian countries can accrue by reducing the level of trade costs.

The adjacency dummy included to capture additional advantages arising from geographical proximity is not found to have significant influence on regional bilateral trade.

## **5. CONCLUSION**

In this paper we document the growing importance of intra-East Asian trade of parts and components. Antras (2005) provides a theoretical framework of the various stages of offshoring or international production fragmentation. Stage I consists of firms producing parts within the home countries. Stage II refers to the situation when the firms invest abroad and the affiliates source their more standardized parts from developing countries. This is the stage when FDI plays an important role. During Stage III, the multinational firms procure from the localized firms and leave much of the production chain to the developing countries. The set of variables that affect the progression of the stages include the quality of the institutions in the developing countries, the relative wages as well as the degree of standardization of the parts.

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Our empirical analysis shows that FDI does play an important and *independent* or *exogenous* role in facilitating the trade of parts and components in East Asia. This is true for aggregate FDI as well as FDI from individual countries, including investment from the United States, Japan and South Korea. Using Antras' basic taxonomy, East Asia remains at Stage II of the product cycle of offshoring. If we adopt Antras' framework, this implies that institutional quality, particularly intellectual property rights protection, remains a concern for the decision to localize the production chain in the host economies.

Does the source of FDI matter for the linkages between FDI and the various modes of trade? Our empirical studies show that FDI from Japan has a particularly strong influence on both trade in parts and components as well as trade in capital goods. With respect to capital goods, it is fairly well-known that the Japanese engineering and machinery sector has a long and distinguished history and continues to be a strong sector of the economy. It seems likely that Japanese affiliates are set up abroad to import machinery from Japan or to manufacture and export some of the capital goods to other Asian economies. Such capital goods are used to produce and export parts and components. Thus for the case of Japan, trade in capital goods and trade in parts are both facilitated by Japanese investment and the two modes of trade are positively correlated. In addition, FDI rather than local supply is needed both because of the quality of the machinery as well as the importance of safeguarding the intellectual content of such capital goods. Other complementary explanations of the significant influence of Japanese FDI on modes of intra-East Asian trade include the activities of the small and medium enterprises as well as other *keiretsu* suppliers that follow the Japanese multinationals when they go abroad. In contrast, investments from the U.S. and Korea also facilitate trade in parts and components as well as capital goods but they lack the focused activities of their machinery sectors. They may also use local suppliers as well as supplies from other non-U.S. and non-Korean foreign affiliates.

There are several implications from our studies. First, there are other Asian economies which so far have been outside of the Asian production network, including much of South Asia. It is clear that to promote trade in parts and components, these economies will need to adopt policies that are friendly not only to trade, but also to FDI. A set of policies that are of importance to both trade and FDI will be the improvement of

infrastructure, including ports, highways, airports, etc. However, both our empirical work as well as existing theoretical studies show that the quality of institutions (rule of law, corruption, intellectual property rights protection, etc.) will be important to attract FDI, which then will facilitate the formation of the production network.

Finally, there may be particular reasons that East Asian economies should focus on deepening its production network that is facilitated by FDI from other Asian countries and more centered on Asian consumptions. U.S. consumers may increase their savings and alter their consumption patterns. Future increases of fuel and shipping costs may also disrupt long-distance supply chain activities. Production and trade networks that are more centered in Asia and hopefully more catered towards Asian consumers and Asian government purchases may be more stable and less likely to face sudden sharp declines, as we have witnessed in the most recent global slowdown.

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## **Appendix 1**

### **Commodity Code**

|     |   |
|-----|---|
| 1   | Food and beverages  |
| 11  | Food and beverages, primary   |
| 111 | Food and beverages, primary, mainly for industry (P)                  |
| 112 | Food and beverages, primary, mainly for household consumption (F-C)   |
| 12  | Food and beverages, processed   |
| 121 | Food and beverages, processed, mainly for industry (IM-SF)            |
| 122 | Food and beverages, processed, mainly for household consumption (F-C) |

|     |   |
|-----|---|
| 2   | Industrial supplies nes   |
| 21  | Industrial supplies nes, primary (P)  |
| 22  | Industrial supplies new, processed (IM-SF)                                    |
| 3   | Fuels and lubricants  |
| 31  | Fuels and lubricants, primary (P)   |
| 32  | Fuels and lubricants, processed   |
| 321 | Fuels and lubricants, processed, motor spirit                                 |
| 322 | Fuels and lubricants, processed (other than motor spirit) (IM-SF)             |
| 4   | Capital goods (except transport equipment), and parts and accessories thereof |
| 41  | Capital goods (except transport equipment) (F-CA)                             |
| 42  | Parts and accessories of capital goods (except transport equipment) (IM-PC)   |
| 5   | Transport equipment, and parts and accessories thereof                        |
| 51  | Transport equipment, passenger motor cars (F-C)                               |
| 52  | Transport equipment, other  |
| 521 | Transport equipment, other, industrial (F-CA)                                 |
| 522 | Transport equipment, other, non-industrial (F-C)                              |
| 53  | Parts and accessories of transport equipment (IM-PC)                          |
| 6   | Consumption goods nes   |
| 61  | Consumption goods nes, durable (F-C)  |
| 62  | Consumption goods nes, semi-durable (F-C)                                     |
| 63  | Consumption goods nes, non-durable (F-C)                                      |
| 7   | Goods nes   |

Note:

P: Primary goods

IM-SF: Semi-finished goods under Intermediate goods

IM-PC: Parts & components under Intermediate goods

F-CA: Capital goods under Final goods

F-C: Consumption goods under Final goods

321 and 7 are treated as “others”

## **Appendix 2. Source of variables**

FDI: Aggregate FDI inflows of each country, aggregate FDI inflows to East Asia, and aggregate FDI to the world are from UNCTAD.

CORRUPT: An index of corruption from the International Country Risk Guide by the PRS Group. It ranges from 0 to 6, with a higher number indicating a lower level of corruption.

GSTAB: An index of government stability from the International Country Risk Guide by the PRS Group. The range is from 0 to 12. A higher score means higher stability of a government.

Law: An index of Law and Order from the International Country Risk Guide by the PRS Group. It ranges from 0 to 6, where a higher number indicates a better system of law and order.

DUTY: Import duties are from the International Monetary Fund's Government Finance Statistic Yearbook.

WAGE: Average wages in manufacturing from the United Nations Common Database, LABORSTA and official country websites.

CPTAX: Corporate income tax rate, measured in percentage points, from *Worldwide Summary* by PricewaterhouseCoopers website.

TEL: Telephone mainlines (per 1,000 people) from World Development Indicators.

GDP: GDP in United States dollars are from EconStats.

PGDP: Per capita GDP are from EconStats.

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