Industrial Structure, Regional Trade Bias, and China's FTA with Korea and Japan

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This paper investigates the potential for China's FTA with Korea and Japan. We examine the similarities of industrial structures and regional trade biases among the three countries as indictors for establishing a China-Korea-Japan FTA. Even though the three countries are at very different developmental stages, their industrial structures will converge over time and their regional trade bias is high. Regression results of the gravity equation show that the trade volume among the three countries will increase. Based on our analysis of industrial similarities, we suggest a step-by-step procedure for the economic integration of Northeast Asia. A successful China-Korea-Japan FTA can be realized through the initial establishment of Korea-Japan and China-Korea FTAs, followed by subsequent negotiations between these two FTAs.

Keywords: China, Industrial structure, Regional trade bias, FTA

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I. Introduction

As membership of the WTO grows over time, the organization for multilateral trade liberalization has become less efficient, especially

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regarding negotiations. Bilateral trade agreements that were permitted by Article XXIV of GATT have become more and more active since the 1990s. Though it remains controversial whether regional trade agreements (RTAs) will lead international trade in the direction of greater liberalization or protection, we consider that they complement multilateralism since world trade volume has grown rapidly with the increasing number of RTAs, while tariff barriers have not risen against non-members of RTAs.

The economic integrations in Europe and North America, that is, the EU and the NAFTA, have evolved into successful examples of RTAs. Meanwhile, the steps of economic integration in East Asia have fallen behind. During the whole 1990s, the only example of a free trade agreement (FTA) in practice in East Asia was the ASEAN FTA (AFTA), launched in 1992. However, a tide of economic integration arose in East Asia after the turning of the millennium. The completion of the China-ASEAN FTA (CAFTA) on July 1^{st}, 2005 was a big step toward East Asian economic integration.

With the successful development of CAFTA, a new issue at the center of East Asian economic integration has become the potential economic integration of China, Korea, and Japan. The focus of this paper is the possible involvement of China into the integration and the steps through which such integration should proceed.

The common standards for selecting RTA partners include the structure of comparative advantages, income level, level of outstanding trade barriers, market size, geographical proximity, intra-industry trade (IIT), and intra-regional trade share. This paper mainly focuses on the industrial structure similarities and regional trade bias of the three countries. It is generally considered that the evolution of IIT increases total trade volume. If so, FTAs between partners that have higher IIT indices should bring more potential gains than those between partners that have lower IIT indices. Moreover, similarities in industrial structure and high regional trade bias will tend to ease economic integration.

The remainder of the paper is organized as follows. In chapter II, we explain theoretical background and present an overview of economic relationship among China, Korea, and Japan. Chapter III compares the industrial structures among China, Korea, and Japan. In chapter IV, we examine the regional trade bias among the three, using regional trade coefficients and the gravity equation, which estimates the determinants of bilateral trade volume. Chapter

V discusses the possibility of a China-Korea-Japan FTA, and conclusions are presented in chapter VI.

II. Theoretical Background and Overview

A. Theoretical Background

The distinction between trade creation and trade diversion, which were firstly suggested by Viner (1950), remained central to analysis on the effects of economic integration. In Viner's opinion, a trade-creating FTA not only improves the welfare of its members, but also benefits the rest of the world. On the contrary, a trade-diverting FTA is just a device for making tariff protection more effectively. Lipsey (1957) found that countries might gain from trade-diverting FTA when consumption effects are allowed. That is, if losses from trade diversion were sufficiently small, the consumer welfare gain could outweigh the higher real costs of imports caused by trade diversion.

Bhagwati (1971) made alternative models to show that trade-diverting FTA might improve members' welfare. But the world's welfare as a whole will be deteriorated because trade will be diverted from more efficient suppliers to less efficient suppliers. There are many criticisms on the FTAs because of the possible trade diversion effect, but Kemp and Wan (1976) showed that if formation of a FTA kept trade volume with the rest of the world at least at the prior level, welfare of all parties could increase.

In all analyses, trade creation is welfare-increasing, while trade diversion is welfare-reducing. Trade creation takes place when a member country's domestic production of an item is displaced by low-cost production from a partner country. Trade diversion takes place when a member country replaces imports from the rest of the world with imports from the higher-cost partner country because of the elimination of tariffs only to the partner country.

This paper uses trade creation and trade diversion framework. It is difficult to draw theoretical generalizations about the conditions that may result in trade creation after forming FTA. One of the most successful economic integrations is European Union (EU). The success of EU can be explained mainly by two things; they have high trade share among them, and their economic structures are very similar each other compared to other economic integrations. It implies that trade creation effects will be higher in a FTA, which consists of countries with larger regional trade share and more similar industrial structures among them. Thus this paper considers two things as conditions for getting trade creation of a FTA; regional trade bias and industrial similarities.

Krueger (1997) argues that it is generally accepted that the larger the share of trade preexisting among FTA partners, the more likely there is to be net trade creation after formation of a FTA. Likewise, when preexisting tariffs are very high (so that there is little trade to divert) or very low (so that the costs of trade diversion are low), welfare is more likely to improve with the formation of a FTA.

Greenaway and Chris (1986) suggests that intra-industry trade is greater in the trade of countries subject to some kind of economic integration than in the trade of non-integrated countries. Moreover, the higher the IIT index, the more benefits can countries get from economic integration.[1] Trade theory shows that the share of intra-industry trade is higher in trade between similar countries. Therefore, we can say that trade creation will increase in a FTA among similar counties.[2] Verdoorn (1960) and Balassa (1965) found evidences of increasing intra-industry specialization in the decade following the formation of the European Economic Community.[3]

B. Overview of China, Korea, and Japan

After the growth of Korea, Singapore, Hong Kong, and Taiwan, which are known as the four Asian "tigers," China has become another Asian economic miracle. Growing at an average rate of more than 9% annually since 1978, the year that it commenced reform with the opening policy, China has become more and more influential in the world economy. The rapid development of China

[1] Okuda (2004) adopted the IIT index as a working indicator for measuring the interdependence between trading partners and sequencing Japan's FTA partners.

[2] Elliott and Ikemoto (2003) shows that trade volume becomes larger among countries with different trade structures using complementary index in a gravity equation. However, it does not mean that trade creation will be larger when a FTA is formed among countries with dissimilar industrial structures.

[3] Balassa (1967) showed that even if there were trade diversion in European Common Market, trade creation effects outweighed trade diversion effects.

TABLE 1

MAJOR ECONOMIC INDICATORS OF CHINA, KOREA, AND JAPAN, 2003

	China	Korea	Japan
GDP (Million $)	1,416,593	608,124	4,300,858
GNI *per capita* ($)	1,100	12,050	34,190
Openness (%)	60.05	61.56	19.87
FDI/GDP (%)	3.78	0.53	0.15
High-Technology Exports (% of manufactured exports)	27.1	32.15	24.06
Trade Share with Other Two Countries (%, Year 2000)	21.5	26.05	16.69

Source: World Development Indicator (World Bank 2005), UN-NBER Trade Dataset (Feenstra *et al.* 2004).

has shortened the distance between China and its richer neighbors-Korea and Japan, and offered possibilities and opportunities for deeper economic integration, which in turn may present more potential developments for each country in the era of regionalism.

In Table 1, we list the major economic indicators of China, Korea, and Japan. The size of the Chinese economy ranked in between Korea and Japan, at 1,649 billion US Dollars in 2004. Although the *per capita* income of China remains quite low, it is steadily increasing along with China's rapid economic development and continuous efforts at population control.

Regarding openness, the Chinese government reduced its tariff rates for imported commodities nine times in the decade 1992-2001. After China's accession to the World Trade Organization (WTO), a series of tariff reductions were also carried out in accordance with its promises to the WTO. In 2005, Chinese tariff levels were reduced to an average level of 9.9%. Table 1 also lists the overall "openness" of the three countries as measured by the trade-to-GDP ratio. China has grown into an economy with a similar degree of "openness" as Korea. Japan's relatively low degree of "openness" may be mainly because of its relatively large domestic economy.

The increasing openness, abundant labor resources, low wages, and series of preferential treatments for foreign investors have made China one of the most attractive destinations for investments in the world. The net inflow of FDI reached 3.78% of China's GDP in 2003, in contrast with the levels of 0.53% for Korea and 0.15%

for Japan. As it is commonly known, one of the most important benefits of FDI to a country is technology spillover. The large flow of FDI into China will increase the progress of its technology level. According to World Bank statistics, high-technology exports represented 27.1% of China's manufactured exports in 2003.

To examine the economic relationship between China, Korea, and Japan, we calculated each country's trade share with the other two in its total trade, and concluded that they are highly important trade partners for each other. This inter-trade with the other two members of the triad was 21.5% of China's total trade volume, 26.05% of Korea's total trade, and 16.69% of Japan's total trade in 2003. It shows that each of the three countries has a strong trade bias toward the other two. Despite the variance in their development stages, their economic relationships are both close and strong.

III. Converging Industrial Structure among China, Korea, and Japan

A. Measurement of Trade Structure

The trade data we use in the analyses below mainly come from the NBER-UN trade data (Feenstra *et al.* 2004). The time series we adopt runs from 1990 (since the bilateral trade records between China and Korea started lately from 1989) to 2000, which was the most recent data obtainable from the dataset. We chose 42 economies to form an economic group, which is hereafter called the G42.[4] The total trade volume of 42 economies was more than 91% of world trade in 2000.

According to STAN indicators' industry list,[5] four categories of industries are classified basing on different technology levels: a) High-technology industries, b) Medium-high-technology industries, c) Medium-low-technology industries, and d) Low-technology industries.[6]

In order to determine the relative competitiveness of each industry, we used the net export index. The net export index is defined as follows.

[4] More detailed information of the G42 can be seen in Appendix Table 2.
[5] STAN indicators database, OECD, http://www.oecd.org/document/
[6] See Appendix Table 1 to get more detailed information about the industrial categories basing on different technology levels.

$$A_j = \frac{X_j - M_j}{X_j + M_j} \tag{1}$$

where X_j and M_j are exports and imports of industry j, respectively. A_j can be seen as the index of comparative advantage. It is, however, affected by the country's overall trade balance.[7] In order to adjust for this trade balance effect, we assume that trade imbalance is equiproportional to all industries.[8] Then the net export index adjusted for trade imbalance is defined as:

$$A_j^e = \frac{X_j^e - M_j^e}{X_j^e + M_j^e} \tag{2}$$

where $X_j^e = (1/2)X_j[\sum_{j=1}^{n}(X_j + M_j)/\sum_{j=1}^{n}X_j]$, and

$$M_j^e = (1/2)M_j[\sum_{j=1}^{n}(X_j + M_j)/\sum_{j=1}^{n}M_j]$$

X_j^e and M_j^e are adjusted exports and adjusted imports of industry j, respectively. Since there were obvious bilateral trade imbalances between China and its major trading partners, we decided to adopt the adjusted net export index in the analyses below. Moreover, we used weighted averages to account for the relative importance of each industry, where the weights are the trade volume of the industry.

Nowadays, intra-industry trade (IIT) plays a particularly large role in the trade of manufactured goods among advanced countries. However, the rapid increase of IIT has also been observed among developing countries, especially among a number of newly industrializing countries (NICs). Kim (1992) and Kim and Kim (1998) examined the deepening levels of IIT of Korea. The simple average levels of IIT in Korea rose from 19.8% during the period of 1962-65 to 50.5% during the period of 1991-95. Furthermore, Korea carried on more IIT with other Asian NICs than with its other major trading partners.

[7] NBER-UN trade data (Feenstra *et al.* 2004) showed large trade imbalances in most of countries. It is caused by the fact that bilateral trade data were collected by import data only. If there are trade imbalances between countries, net export index is overestimated.

[8] This methodology was suggested by Aquino (1978).

For the measurement of actual IIT, the bulk of the empirical studies use the index proposed by Grubel and Lloyd (1975). The GL index (B_j) is defined as follows.

$$B_j = 1 - \frac{|X_j - M_j|}{(X_j + M_j)} \tag{3}$$

The IIT index (B_j) ranges from 0 to 1. When B_j equals 0, there is no overlap of imports and exports in industry j, that is, only inter-industry trade takes place. Alternatively, when B_j equals 1, there is complete IIT. However, if the total trade of a country is not balanced, the GL index underestimates IIT. Thus, we adopted the Aquino (1978) index to adjust for the trade imbalance effect.

$$Q_j = 1 - \frac{|X_j^e - M_j^e|}{(X_j^e + M_j^e)} \tag{4}$$

where X_j^e and M_j^e refer to the adjusted exports and imports of industry j, respectively, as defined in Equation (2).

B. The "Pot-Shaped" Industrial Structure of China

The weighted averages of adjusted net export indices for different industrial categories were calculated between China and G42 for the period 1990-2000. These net export indices show that China continued to be a net importer of medium-low and medium-high technological products, while a net exporter of low technological products. And China changed to a net exporter of high technological products after 1992.

We also calculated the shares of different industrial categories in total trade with G42 from 1990 to 2000. The shares of low technology industries tended to drop from 37.3% in 1990 to 24.21% in 2000. On the contrary, the shares of high technology and medium-high technology industries tended to increase. The share of high and medium-high technology industries rose from only 5% and 28.58% in 1990 to 11.26% and 35.22%, respectively, in 2000. Meanwhile, the share of medium-low technology industries barely changed over the 10-year period.

China's net export indices of year 2000 demonstrated that China had comparative advantage in high-technology and low-technology

High ← Competitiveness → High

Note: Values in the figure are in percentages.

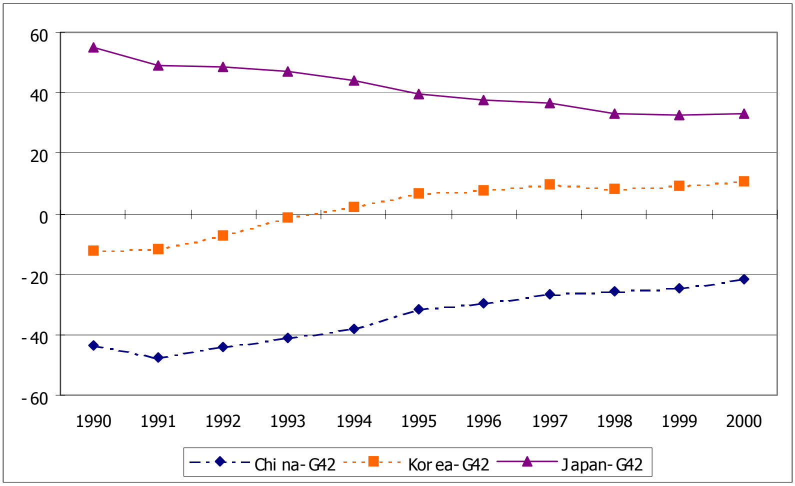
FIGURE 1

THE "POT-SHAPED" INDUSTRIAL STRUCTURE OF CHINA, 2000

industries, while she had weakness in medium-technology industries. It implies that China's industrial structure resembles a "pot," with the medium-technology industries as the "pot neck."

China's "industrial pot" is presented in Figure 1, in which the horizontal axis represent the net export index (which measures competitiveness) and vertical axis represent trade share of each industry category. First, the right side of the pot is drawn according to the net export indices and trade shares of China's different technology levels of industries, after which the left side is obtained by symmetry.

The potential growth of high-technology industries in China deserves special attention. For the first time in its 10-year history, *Science, Technology, and Industry Scoreboard* (OECD 2003) included the state of affairs in the fields of R&D expenditures, human resources in science and technology for a number of important non-OECD economies, such as China, India, and Brazil, and it generated considerable attention for China in particular. Schaaper (2004) compared the indicators of OECD database for China with



Notes: 1) The net export indices are adjusted net export indices, by weighted average, on a multilateral basis.
2) The definition of high- and medium-high-technology industries is the same as that used in Appendix Table 1.

Source: UN-NBER data (Feenstra *et al.* 2004); by author's calculation.

FIGURE 2

NET EXPORT INDICES OF CHINA, KOREA, AND JAPAN WITH G42 IN THE HIGH- AND MEDIUM-HIGH-TECHNOLOGY INDUSTRIES, 1990-2000, IN PERCENTAGES

those for other developed countries. He concluded that China is catching up rapidly with other dynamic Asian economies and OECD economies on a score of technology indicators.

C. Converging Industrial Structure among China, Korea, and Japan

To compare the industry structures of China, Korea, and Japan, we focus on the high- and medium-high technology level of industries, and consider them as a group, since those industries are generally R&D intensive industries.

Since the G42 represents more than 91% of the total world trade, we can also use it to approximate "the rest of the world." Figure 2 compares the net export indices of the high- and medium-high-technology industries of China, Korea, and Japan. In this figure, China continued to be a net importer of the high- and

TABLE 2
DEEPENING INTRA-INDUSTRY TRADE OF CHINA, KOREA, AND JAPAN, 1990-2000, IN PERCENTAGES

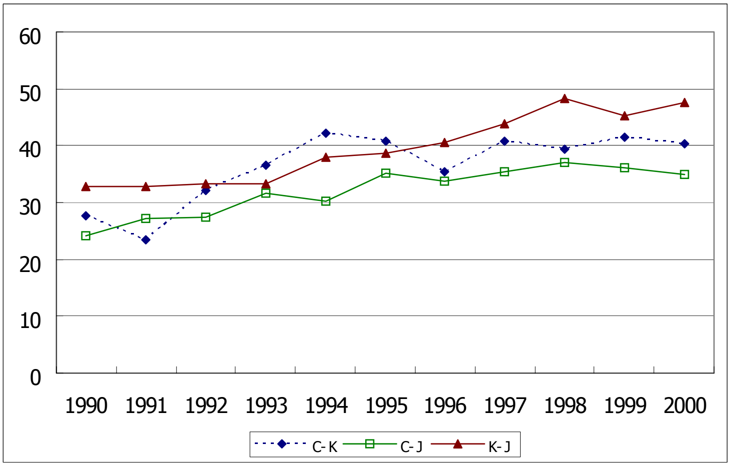
Year	China-G42	Korea-G42	Japan-G42	China-Korea	China-Japan	Korea-Japan
1990	12.36	14.69	21.25	28.83	27.48	39.84
1991	13.54	15.77	22.52	26.88	29.64	40.36
1992	14.49	16.56	21.78	32.17	30.90	39.91
1993	16.06	16.20	21.88	36.26	33.60	39.03
1994	16.84	17.89	22.10	39.66	33.06	41.70
1995	18.02	18.39	22.73	41.35	36.33	41.09
1996	19.16	19.37	23.57	38.56	34.57	42.81
1997	19.76	20.28	24.59	40.55	37.13	46.61
1998	20.19	18.74	24.44	40.37	37.72	48.58
1999	21.46	20.76	24.46	41.70	36.46	46.78
2000	22.10	21.33	25.07	41.08	35.14	49.67

Note: The IIT indices are the unweighted average level of Aquino indices, on a bilateral basis.
Source: UN-NBER data (Feenstra *et al.* 2004); by author's calculation.

medium-high-technological products, while Japan continued to be a net exporter. The net export indices of those Korean industries were located between China and Japan. Before 1994, Korea was a net importer of high- and medium-high-technology products, but it has transformed into a net exporter of those products since 1994. The figure shows that the net export indices of Japan tended to reduce, while those of China and Korea tended to increase. Although China's competitiveness in the high- and medium-high-technological industries has remained lower than that of Korea and Japan, the three countries have demonstrated a converging tendency.

Furthermore, the IIT indices of China, Korea, and Japan also indicated a deepening and converging trend. In 1990, the average bilateral IIT index between China and the G42 was 12.36% and that between Korea and the G42 was 14.69%, whereas that between Japan and the G42 was 21.25%. However, by 2000 the average bilateral IIT indices for the three countries had all converged to be within the range from 21% to 26% (Table 2).

We also calculated the bilateral IIT indices between China, Korea, and Japan. The bilateral IIT indices among China, Korea, and Japan were about two times larger than the IIT indices of each



Note: The IIT indices are the unweighted average level of Aquino indices, on a bilateral basis.
Source: UN-NBER data (Feenstra *et al.* 2004); by author's calculation.

FIGURE 3

BILATERAL IIT INDICES OF CHINA, KOREA, AND JAPAN IN HIGH- AND MEDIUM-HIGH-TECHNOLOGY INDUSTRIES, 1990-2000, IN PERCENTAGES

country with the G42 throughout the 10-year period from 1990 to 2000. This indicates that the IIT among China, Korea, and Japan was around twice as large as their trade with the rest of the world.

Although bilateral trade between China and Korea started late, both trade volumes and IIT grew rapidly. Bilateral IIT indices between them rose from nearly 29% in 1990 to over 41% in 2000. The IIT indices between China and Japan were the lowest among the three sets of bilateral trade, whereas those between Korea and Japan were the highest among the three pairs of NEA economies.

To take a more detailed look, we examined the IIT of the high- and medium-high-technology industries between China, Korea, and Japan. The results, presented in Figure 3, show a similar story to those of Table 2. In the area of the high- and medium-high-technology industries, the IIT indices between Korea and Japan were the highest in most of the years, followed by those between China and Korea and finally by those between China and Japan. However, all showed an increasing trend. Increasing IIT among three countries implies that their industrial structures have become similar over time since the share of IIT is higher between countries with similar industrial structures.[9]

IV. Regional Trade Bias among China, Korea, and Japan

A. Regional Trade Bias

Trade diversion effects of economic integration can be reduced when there is larger intra-regional trade among member countries before establishing an FTA. To determine the degree of inter-dependence among China, Korea, and Japan, we estimate the regional trade coefficient based on Sautter (1974).

$$K_r = \frac{T_{rr}/T_{rw}}{T_{rw}/T_{ww}} \quad (5)$$

Where,

T_{rr} : Intra-Regional Total Trade
T_{rw} : Region's Total Trade
T_{ww}: World's Total Trade

When $K=1$, there is no regional bias; when $K>1$, the region shows regional bias; while when $K<1$, the region is less inter-dependence.

The regional trade coefficients for China-Korea-Japan, NAFTA, and the EU are given in Table 3. Even though the China-Korea-Japan region showed the lowest regional bias, the regional coefficients of the China-Korea-Japan region were larger than one, which confirms that China, Korea, and Japan had regional trade biases compared with the rest of the world, as we noted in section III-*B* above. Regional coefficients of NAFTA were the highest among the three regions. Although intra-regional trade shares of the EU were high at around 60-70% in the 1990s, its regional trade coefficients were nonetheless lower than those of NAFTA.

[9] IIT can be decomposed into horizontal IIT (IIT of similar quality goods) and vertical IIT (IIT of different quality goods). We think that vertical IIT takes a large portion of in trade between three countries, because their technology levels are relatively different each other.

TABLE 3
REGIONAL BIAS COEFFICIENTS, CHINA-KOREA-JAPAN, NAFTA AND THE EU, 1990-2000

Year	China-Korea-Japan	NAFTA	EU
1990	1.10	2.08	1.40
1991	1.11	2.07	1.52
1992	1.13	2.15	1.57
1993	1.16	2.05	1.65
1994	1.25	2.07	1.66
1995	1.32	2.14	1.64
1996	1.39	2.19	1.67
1997	1.38	2.10	1.70
1998	1.39	2.09	1.63
1999	1.43	2.07	1.68
2000	1.39	2.10	1.73

Source: UN-NBER data (Feenstra *et al.* 2004), by author's calculation.

B. The Gravity Equation

Frankel and Romer (1999) argued that countries' geographic characteristics have important effects on trade, and are plausibly uncorrelated with other determinants of income. According to Frankel *et al.* (1997), there are at least three reasons why the role of distance is important in bilateral patterns of trade. First, distance leads to regional agglomeration. Second, distance between a pair of countries is an important natural determinant of the volume of trade between them. Third, countries that are located closely together constitute a natural trading bloc and for these countries a reduction in trade barriers can be economically beneficial. Thus, when looking at trade data, adjusting bilateral data for distance is a helpful way of explaining trade patterns or trade volumes.

Since our plan is to examine data on bilateral trade between pairs of economies in order to determine the influence of geographical proximity *versus* preferential trading policies in creating regional concentration in trade, the natural framework to explore this issue is the gravity model of bilateral trade.[10]

[10] Related researches are Helpman and Krugman (1985), Bergstrand (1990), Frankel *et al.* (1997), and Deardorff (1998). According to Krueger (1999), the theoretical foundations for gravity models are not strong, but these models perform well empirically and are useful for estimating changes

The basic form of the gravity model states that trade between countries i and j is proportional to the product of GDP_i and GDP_j and inversely related to the distance between them. The gravity model of bilateral trade flow in our test is:

$$\mathrm{Log}VT_{ij}=\beta_0+\beta_1\log GDP_{ij}+\beta_2 DIST_{ij}+\log\beta_3\log FDI_{ij}+\beta_4\log IIT_{ij}+\beta_5\log GPCGAP_{ij}+\gamma_1 EU_{ij}+\gamma_2 NAFTA_{ij}+\gamma_3 NEA_{ij}+\varepsilon \quad (6)$$

where,

$\mathrm{Log}VT_{ij}$ = log value of bilateral trade between economies i and j

$\mathrm{Log}GDP_{ij}$ = log $(GDP_i{*}GDP_j)$, where GDP is gross domestic product

$\mathrm{Log}DIST_{ij}$ = log value of bilateral distance between economies i and j

$\mathrm{Log}FDI_{ij}$ = log$(FDI_i{*}FDI_j)$, where FDI is net flow of foreign direct investment

$\mathrm{Log}IIT_{ij}$ = log value of bilateral IIT index between economies i and j in manufacturing products

$\mathrm{Log}GPCGAP_{ij}$ = log value of GDP *per capita* difference between economies i and j

EU_{ij}: equals 1 when both economies (i and j) in the pair belong to EU, else 0

$NAFTA_{ij}$: equals 1 when both economies in the pair belong to NAFTA, else 0

NEA_{ij}: equals 1 when both economies in the pair belong to the NEA region.

Trade data comes from the NBER-UN trade data (Feenstra *et al.* 2004), and GDP and FDI data are from World Development Indicators (World Bank 2005). Data for bilateral distance between economies are from Gleditsch and Ward (2001).

The results are shown in Table 4. Most of the coefficients were estimated to be significant, and the estimated signs generally matched our expectations. As anticipated, the GDP variable was estimated to significantly affect bilateral trade flows. The summary showed that when GDP increased by 1%, bilateral trade increased by 0.395% in general. As expected, bilateral distance had a significant and negative effect on bilateral trade. A one percent increase of distance between trading partners tended to reduce bilateral trade flows by 0.36% generally.

in the trading relationships among countries.

TABLE 4
DETERMINANTS OF BILATERAL TRADE FLOWS

Variable	Expected Sign	Year 1990-2000	Year 1990	Year 2000
Intercept		2.412*** (7.52)	1.702 (1.49)	3.436*** (3.71)
LogGDP_{ij}	+	0.395*** (48.67)	0.248*** (7.81)	0.455*** (15.38)
Log$DIST_{ij}$	–	-0.360*** (-15.41)	-0.261*** (-2.91)	-0.445*** (-6.33)
LogFDI_{ij}	\	-0.073*** (-9.27)	0.051 (1.55)	-0.121*** (-4.81)
LogIIT_{ij}	+	0.970*** (52.54)	0.972*** (15.45)	0.996*** (16.35)
Log$GPCGAP_{ij}$	\	-0.013 (-1.28)	0.004 (0.11)	-0.027 (-0.86)
EU_{ij}	+	-0.348*** (-6.69)	-0.337* (-1.77)	-0.288* (-1.76)
$NAFTA_{ij}$	+	1.355*** (7.67)	1.068* (1.81)	1.629*** (2.79)
NEA_{ij}	+	0.964*** (5.88)	0.804 (1.35)	1.369*** (2.99)
F Value		718.54	109.13	161.55
R Square		0.6843	0.6778	0.6733
Observation		5985	423	635

Notes: 1) Asterisks (*) marks attached to each estimated coefficient signify the following degree of statistical significance: *** (1% or less); ** (5% or less); * (10% or less).
2) Year dummy variables were used to the regression for year 1990-2000. However, the results of the year dummies are not listed in this table to save space.

We considered the effects of FDI on the bilateral trade to be ambiguous since FDI may be either a complementary or competitive source of international trade, depending largely on the motive of the foreign investor. If the target of the investment is to enlarge market share in the hosting country, FDI will have a negative effect on international trade, whereas if the target is the investor's domestic market or other third markets, FDI tends to increase international trade, in both intermediate goods and finished products simultaneously. In our summary result, FDI flows had significantly negative effects on bilateral world trade. A one percent increase in FDI flow tended to reduce bilateral trade by 0.073%.

The IIT index was always highly significant to the bilateral trade in our regression results. A one-percent increase in bilateral IIT tended to raise bilateral trade flow by 0.97% in general. However, one should note that the bilateral IIT variables might cause multicollinearity with other explanatory variables such as the FDI-related variables.[11]

NAFTA, the EU and the China-Korea-Japan region (NEA) were adopted as dummy variables in our gravity equation. When both parties in the pair entered the same trading bloc, the dummy variable was assigned the value of one, or otherwise zero. We expected that countries in the same trading blocs would trade more with each other than with outsiders, so we expected these dummy variables to exhibit positive values. The NAFTA variable continued to be significantly positive, while the effects of the two other trading blocs were more complex. The negative sign of the EU dummy variable may mean that considering all the factors mentioned above (distance and culture similarity), the member countries should have traded more than they actually did. On the contrary, the NEA dummy variable was significantly positive in general. The coefficient of the NEA dummy was insignificantly positive for 1990, but by 2000 its magnitude had increased to a significant level. The results indicate the increasing importance of the inter-trade between China, Korea, and Japan.

The regression results in our analyses suggested that IIT tended to boost bilateral trade flows. Therefore, the forecasted increase of IIT is anticipated to raise total trade volume at a higher rate, even with all the other variables fixed. Moreover, China, Korea, and Japan showed a significant trend of increasing bilateral inter-trade. Arranging a freer trade environment among them should bring potential benefits.

V. Possibility of the China-Korea-Japan FTA

The establishment of a China-Korea-Japan FTA is critical to full East Asian economic integration, since it contains the three most

[11] Ishido (2003) pointed out a correlation between bilateral FDI and vertical IIT indices.

important economies in East Asia. The regionalization coefficients and regression results suggested that the three major NEA economies have a large intra-regional trade bias. However, significant difficulties in establishing a China-Korea-Japan FTA remain, with the biggest barrier being the relationship between China and Japan.

As well as the political and historical problems (highly important though, not factored in our discussion), the great difference in economic developments can be another obstacle between these nations. China is a developing country, Korea is rapidly approaching developed status, and Japan is a highly developed country. The IIT indices between China and Japan were the lowest among the three bilateral indices because of their greatest divergence of developmental level.

However, difference does not mean an absence of possibilities and profits in bilateral FTAs. Various indicators show that the economic integration among China, Korea, and Japan is similar to that among the three members of NAFTA. Mexico and the USA are also in greatly different developmental levels. NAFTA's successful economic integration can form a guidance template for similar integration among the three NEA economies. While similarities of industrial structures between Korea and Japan are the highest among the three countries, industrial similarities between China and Korea, and those between China and Japan have increased over time. Therefore, based on our analyses of industrial similarities and regional trade bias, we can suggest that the possible economic integration in NEA can proceed in the order of a Korea-Japan FTA, followed by a Korea-China FTA, leading finally to the birth of the NEA FTA. However, we cannot expect that formation of FTA among three countries follow this order in the real world, since FTA negotiations depend on economic as well as political reasons.

Various studies have tried to calculate the potential welfare effects that the China-Korea-Japan FTA will bring to its member countries. Table 5 compares the results in five studies. Two of the studies concluded that China would get the most benefits from an NEA FTA, while the other three suggested that Korea would be the biggest winner. Japan, due to its high existing income level, would not experience income growth as rapid as that of China and Korea in the potential China-Korea-Japan FTA. However, all the study results showed that the potential FTA would bring positive effects

TABLE 5
INCOME EFFECTS OF THE CHINA-KOREA-JAPAN FTA, IN PERCENTAGES

	Lee *et al.* (2004)	Cheong (2002)	Park (2001)	Scollay and Gilber (2001)	Cabinet of Japan (2001)
China	1.71-3.08	0.03-1.05	0.89	2.09	1.3
Korea	3.1-5.15	1.29-4.73	0.2	0.8	3.2
Japan	0.75-1.43	0.03-0.16	0.03	0.25	0.2

Note: The figures are expected *per capita* GDP growth rates.

to all three member countries' income level.

These reported potential gains confirm the need for the three major NEA economies to drive for closer economic integration. With Korea's intermediary position geographically and economically, and arguably also politically, it can act as a bridge in the three-party negotiations. The successful instigation of the China-ASEAN FTA should give China much relevant experience for its future dealing with the China-Korea-Japan economic integration. China can also take an active part in the NEA economic integration as it has done with the establishment of the China-ASEAN FTA.

Some powerful regional blocs such as the EU are going to expand. Enlargement has become a trend of regionalism in the world economy. The potential China-Korea-Japan FTA is the key to the eventual creation of an enlarged East Asian FTA. Arguments have been presented as to who should lead the East Asian economic integration: Japan, China, or ASEAN. However, in our opinion, economic integration as a step toward a freer East Asia will proceed best with the existing China-ASEAN FTA and a future China-Korea-Japan FTA operating in harmony as the left and right hands of regional development, preferably in the near future.

VI. Conclusion

In this paper, we have examined the industrial structure of China and compared it with that of Korea and Japan. With its rapid growth, China has become an increasingly open and important economy in the world. Although low-technology industries still dominate China's international trade competitiveness, high-technology industries have grown rapidly in China. Since the early 1990s, China has become a net exporter of high-technology products and the share of high-technology exports in China's total manufactured exports reached 27.1% in 2003. However, China continued to be a net importer in the medium-technology industries. It shows that China's industrial structure was somewhat like "pot-shaped." When we regrouped the high- and medium-high-technology industries together, clear gaps appeared between China, Korea, and Japan. Nevertheless, a converging tendency was also discerned because of the on-going rapid economic development of China and Korea.

IIT is used as a measure of similarities in industrial structures among countries. We thus adopted the IIT index as a working indicator in sequencing trading partners to form free trade areas. In the three pairs of bilateral IIT indices among three countries, Korea and Japan shared the highest bilateral IIT indices, while China and Japan shared the lowest bilateral IIT indices. However, the bilateral IIT indices among the three countries were approximately double those with the rest of the world, indicating the clear benefits of a China-Korea-Japan FTA.

Regional trade bias was higher than one in the China-Korea-Japan region, though still lower than that of NAFTA and the EU. Our regression analysis of gravity equation proved that IIT tended to boost bilateral trade flows, *i.e.*, China, Korea, and Japan tended to trade more heavily among themselves than with the rest of the world. Moreover, this tendency tended to become stronger and more significant.

Based on the above analyses, we suggest a step-by-step strategy for the economic integration of East Asia in which a China-Korea-Japan FTA can be realized through the initial establishment of Korea-Japan and China-Korea FTAs, followed by subsequent negotiations between these two FTAs. The successful development of such a China-Korea-Japan FTA, in tandem with the China-ASEAN FTA, should ensure the progress of a freer East Asia.

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Appendix

APPENDIX TABLE 1
INDUSTRY CATEGORIES BASED ON DIFFERENT TECHNOLOGY LEVELS

Industry Classification	ISIC rev.3	SITC
High Technology Manufactures	2423	541, 542
	30	751, 752, 759
	32	761-764
	33	871, 872, 874, 88
	353	792
Medium-High Technology Manufactures	29	714, 712, 713, 718, 72, 73, 741-748, 951
	31	716, 76, 77
	34	713, 714, 78, 79
	24 less 2423	266, 51, 52, 53, 56, 58, 591, 533, 55, 57, 592, 598, 882
	352	791
	359	78
Medium-Low Technology Manufactures	23	334, 335, 323
	25	62, 893
	26	661, 662, 663
	351	793
	27	67, 68
	28	677, 69, 711
Low Technology Manufactures	15	01-09, 211, 291, 4, 11
	16	12
	17	261, 263, 268, 65, 846
	18	842, 843, 844, 845, 847, 848
	19	61, 831
	20	248, 63
	21	251, 641, 642
	22	892
	36	82
	37	

Sources: Kim and Chang (2002), OECD STAN Indicators Documentation (Haveman 2005, http://www. haveman.org).

APPENDIX TABLE 2
THE G42 ECONOMIES

USA, Germany, Japan, China, UK, France, Canada, Italy, Netherlands, Mexico, Korea, Belgium, Luxembourg, China HK SAR, Spain, Taiwan Province of China, Singapore, Malaysia, Switzerland, Saudi Arabia, Russian Fed, Sweden, Australia, Thailand, Ireland, Austria, Brazil, Indonesia, Norway, Denmark, Turkey, Philippines, Finland, Poland, Israel, United Arab Emirate, South Africa, Portugal, Iran, Czech Rep, Hungary, Argentina

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