Trade Balance Effects of Korea's Foreign Direct Investment into China

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Abstract

Since the late 1980s when Korean firms began to carry out direct investment into foreign countries, China has always been one of the important destinations for Korea's FDI. In particular, China has become the largest recipient of Korea's FDI in recent years, surpassing the U.S..   Generally speaking, the theoretical hypothesis of FDI can easily explain the rising trend of Korea's FDI into China.   China has merits of low labor cost, high growth perspective, and potentially large domestic market.   In addition to that, the geographical and cultural affinities between Korea and China has provided further impetus to the growing trend of Korea's FDI into China.

There have been, however, some worrying concerns behind this trend.   Many have worried that the rising amount of Korea's FDI into China will eventually substitute Korea's export into China.   Also, if there exists technology spill over effect from Korea-affiliated firms in China, there would be so-called 'import boomerang' effect from China to Korea.   If these concerns are realized in the near future, Korea's FDI into China will deteriorate Korea's trade balance with China.   Furthermore, some pundits are even worrying about the possibility of industrial hallow-out as the Japanese and the Taiwanese did in the 1980s and 1990s respectively.

This paper is aimed at reviewing the current situation of Korea's FDI into China as well as examining whether there has been 'substitution' or 'import boomerang' effect. Using the time-series data of Korea's FDI into China, Korea's export into and import from China, and Korea's trade balance with China, this paper tries to figure out the relationship between these variables.   Tentatively, it is concluded that Korea's FDI into China has not substituted Korea's export into China.   Also, based on this results, it is very unlikely that Korea's FDI into China has hallowed-out Korea's domestic investment and employment.   Instead, there existed a positive causal relationship between Korea's FDI into China with Korea's trade balance with China.

1. Introduction and Literature Review

Since the diplomatic normalization between Korea and China was signed in 1992, the trade and investment relationships between the two countries have been deepened very rapidly during the last 10 years.   In particular, Korea's FDI (foreign direct investment) into China has been increased significantly since the mid-1990s as it is shown in Figure 1, and this phenomena has concerned many people in both positive and negative ways.   Some people have endorsed it because they believed that it would eventually improve the competitiveness of the Korean economy, while the other group of people has warned the possibility of hallowing-out effect of Korea's FDI into China. A debate like this is in fact not unheard of to many people.   A similar concern had been raised inside Japan when the Japanese firms began to invest heavily into foreign countries in the mid-1980s.   Also, more recently, many Taiwanese academics and policy makers have had similar worries as more of the Taiwanese firms move their production facilities into China.   The reason we have to single out Chinese case is not simply because of its relative importance out of Korea's total FDI.   One of the major conclusions of Shin (1999) was that the causal relationship between FDI and trade varied a lot across the regions and industries.   Also, Seo and Lee (2002) shows the diversified investment motives and structures of Korean firms across different countries. These findings reflect the necessity of studying country-specific effect of FDI on its bilateral trade with Korea.

The core part of the debate whether the FDI into China would have positive effect on the Korean economy or not depends a lot on its effect on Korea's trade balance with China.   The more Korea's FDI into China substitute Korea's exports to China, the less exports Korea will make to China.   Also, the more Korea-affiliated firms in China export back to Korea, the more imports Korea will have from China.   In this case, FDI into China will eventually deteriorate Korea's trade balance with China, and vice versa. While the effect of FDI on trade balance is rather direct, its effects on investment and employment in Korea are somewhat indirect.   That is to say, it will indirectly affect the investment and employment levels in Korea via its effect on trade.   Of course, if Korea's FDI into China results in the shipment of production facilities from Korea to China, it will directly affect the domestic investment and employment of Korea. However, this extreme case has not occurred yet in Korea, and it is not foreseen to happen in the near future yet.   In particular, the correlation between the trade structure and domestic industrial structure in Korea is so high that the FDI's impact on trade would eventually lead to similar effect on domestic industries.   Therefore, to figure out

the welfare effect of Korea's FDI into China, it is pre-requisite to study its effect on Korea's trade balance with China before we proceed to study anything else.   This is why most of the previous studies have concentrated their analyses on the trade effect of FDI.   For example, Lee, Chang-Soo (2002), Shin (1999), Seo and Lee (2002), Kim and Kim (1997) have analyzed the effect of FDI on Korea's trade, and Wilamoski and Tinkler (1999) has conducted similar study on U.S.'s FDI into Mexico.

The main purpose of this paper, therefore, is to figure out the effect of Korea's FDI into China on its trade balance.   More specifically, this paper has limited its scope of analysis within Korea's FDI into manufacturing industries only. Also, the manufacturing industries have been broadly categorized as light industry and heavy industry.   Furthermore, while most of the previous studies that analyzed the relation between FDI and trade have focused on finding correlative relationship between the two variables, this paper pursues to find causal relationship between the two variables.   For example, studies such as Lee, Chang-Soo (2002), Seo and Lee (2002), Kim and Kim (1997) have used gravity models of trade with a variable representing FDI to figure out how trade is affected by the volume of FDI in Korea.   Also, Wilamoski and Tinkler (1999) has also used a trade gravity model first, and has replaced it with a causality model later.

Another important purpose of this paper is to see whether the general hypotheses that can be drawn from the previous studies can be applied to the bilateral trade and FDI cases between Korea and China.   Generally speaking, it is hypothesized that FDI may initially improve the trade balance of the home country.   However, as the localization of the production is deepened and the import from the host country to the home country increases, it can eventually deteriorate the trade balance of the home country.   This hypothesis can be drawn from Seo and Lee (2002) and also from Wilamoski and Tinkler (1999).   Also, Kim (1997, in Korean) has summarized the results of such major studies, and concluded that initially there would be positive effects of FDI on home country's exports to the host country.   Eventually, however, this initial positive effect will slowly vanish as FDI substitutes home country's export over time. This paper will examine whether this stylized fact is actually happening in Korea's FDI into China as well.   Also, Kim and Kim (1997) and Seo and Lee (2002) concluded that FDI into light industry could deteriorate Korea's trade balance, while FDI into heavy industry could improve it.   If these findings can be applied to the case of Korea's FDI into China, we can suspect that Korea's FDI into China has actually improved Korea's trade balance with China until now.   This paper will try to examine whether this is actually true for Korea's FDI into China.

This paper is composed of four chapters.   The first chapter contains introductory remarks and some literature reviews.   The second chapter explains about the current status of Korea's trade and FDI relationship with China in a descriptive way. The third chapter introduces empirical works and its findings.   The fourth chapter is a concluding chapter that summarizes the findings of this paper.

2. Current Status of Korea's FDI into China

Let us now examine descriptively how the investment relationship between Korea and China has evolved over the last decade.   The following figure and tables show how important China was in the overall FDI regime of Korea.   As it is shown in Figure 1, Korea's FDI into China has increased rapidly since the mid-1990s.   Even though it had been slightly decreased during and immediately after the financial crisis of 1997, it is currently on its way of recovery since 1999.   What is more encouraging than the mere size of Korea's FDI into China is its relevant importance out of Korea's overall FDI in the recent years.   While Korea has reduced its FDI activities into the rest of the world in 2002, its FDI into China has been increased steadily throughout the year.   As of 2002, FDI into China was roughly 1/3 of Korea's total FDI into the world, and China is the fastest growing region in terms of hosting Korea's FDI.

Figure 1. Korea's Overseas Investment into the World and China   (investment base)
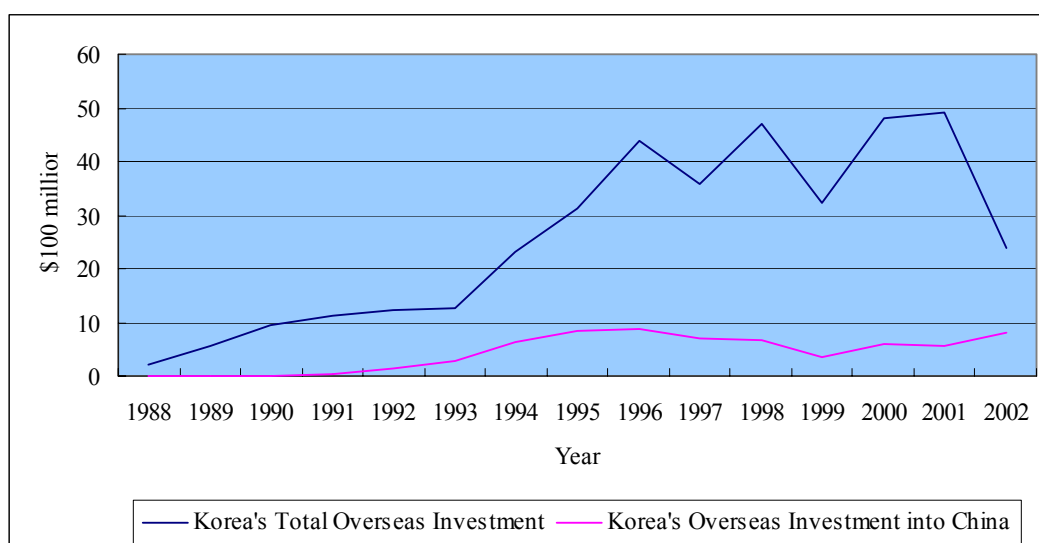
Source: The Export Import Bank of Korea

The following table shows the relative importance of each region in hosting Korea's FDI during the last two decades. Several characteristics can be found from the table. First, it was the advanced countries that had absorbed more than half of Korea's FDI until the mid-1990s. However, this trend had been reversed since the mid-1990s as developing countries such as China and South East Asian countries receive more of Korea's FDI. In particular, the U.S. was the largest host of Korea's FDI as a single nation until very recently. However, as it was shown in Figure 1, the dominant position of the U.S. had been disappeared as China has become the largest recipient of Korea's FDI in 2002. Moreover, Table 1 reveals that Korea's FDI has become very diversified in recent years as it invests more heavily into regions such as Latin America, East Europe and CIS countries.

Table 1. Regional Distribution of Korea's Cumulative FDI   (unit: $100 mn)

	1980	1985	1990	1995	2000	2001
Advanced Countries*	0.4	2.7	12.7	43.8	104.2	125.4
	(30.8)	(57.7)	(55.1)	(42.6)	(38.9)	(43.7)
U.S.A.	0.3	0.9	8.0	27.1	75.6	79.1
	(24.3)	(18.9)	(34.9)	(26.3)	(28.2)	(27.6)
EU	0.04	0.6	0.6	8.3	15.8	32.7
	(3.3)	(12.3)	(2.6)	(8.1)	(5.9)	(11.4)
Japan	0.02	0.1	0.3	2.3	4.5	5.3
	(1.8)	(1.1)	(1.4)	(2.2)	(1.7)	(1.8)
Developing Countries	0.9	1.9	10.3	59.0	163.9	161.4
	(69.2)	(42.3)	(44.9)	(57.4)	(61.1)	(56.3)
China	0.0	0.0	0.2	19.1	46.6	43.9
	(0.0)	(0.0)	(1.0)	(18.6)	(17.4)	(15.3)
East Asia	0.3	0.9	5.9	22.5	50.8	49.3
	(27.1)	(20.3)	(25.8)	(21.9)	(18.9)	(17.2)
Latin America	0.04	0.1	1.5	3.4	26.6	27.1
	(3.5)	(2.1)	(6.6)	(3.3)	(9.9)	(9.5)
CIS and East Europe	0.01	0.03	0.6	5.8	19.9	20.3
	(0.6)	(0.7)	(2.5)	(5.6)	(7.4)	(7.1)
Total	1.3	4.6	23	102.7	268.1	286.9
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Notes: * North America, Western Europe, Japan, New Zealand and Australia

** Numbers in parentheses are % of the total cumulative FDI of the year.

Source: Recited from Seo and Lee (2002).

If we examine the structures of Korea's FDI into China in a further detail, several distinctive features can be found. First, as it was found in Lee and Cheong

(1999) and Cheong and Lee (1999, in Korean), Korea's FDI into China is concentrated in manufacturing industry.   As it is shown in the next table, more than 85% of Korea's annual FDI into China went into the manufacturing sector.   In particular, it is heavily concentrated into labor-intensive industries.   For example, light industries such as textile and footwear and assembling industries such as electric and electronic industries in China have attracted lion's share of Korea's annual FDI.   Regionally speaking, Korea's FDI has been concentrated in the northeastern provinces of China such as Shandong, Tianjin, and Beijing as it is shown in Table 3.   This was due to the geographical and racial affinities of these regions to Korea.   Also, Cheong and Lee (1999, in Korean) had suspected that the Chinese government's policy, which intended to develop these regions with the help of the Korean capital, had implicitly attributed to this regional bias.

Table 2. Industrial Composition of Korea's Annual FDI into China　　(unit: $ mn)

Years	Agriculture, Fishery & Forestry	Manufac-turing	Cons-truction	Retail	Telecommu-nication	Hotels & Restaurants	Real Estates	Etc. (Finance, Logistics)	Total
1990	0.0	15.5	0.0	0.0	0.0	0.2	0.0	0.5	16.2
1991	0.5	41.2	0.0	0.1	0.0	0.5	0.2	0.0	42.5
1992	1.6	117.3	0.0	0.2	0.0	22.0	0.0	0.0	141.1
1993	3.1	251.2	1.7	1.6	0.0	1.0	2.3	2.8	263.7
1994	9.8	581.4	12.3	3.7	0.0	8.3	10.5	7.2	633.1
1995	5.3	713.8	25.9	11.6	0.0	14.8	53.8	16.0	841.1
1996	10.1	709.1	51.7	41.3	5.9	48.9	24.3	5.5	896.8
1997	1.9	492.4	43.9	15.3	39.0	85.1	40.3	6.6	724.6
1998	2.2	585.3	17.9	3.2	31.5	2.6	30.4	4.7	677.9
1999	4.5	287.6	12.5	1.4	1.5	5.3	33.2	2.0	348.0
2000	2.0	460.0	16.3	28.5	17.1	54.4	17.0	16.7	612.1
2001	2.2	532.7	0.7	13.2	0.3	2.8	21.4	1.9	575.1
2002	4.1	771.9	30.2	23.6	0.2	4.2	42.8	4.3	881.4
Total	47.2	5,559.5	213.0	143.9	95.5	250.1	276.2	68.1	6,653.5

Source: The Export Import Bank of Korea

Table 3. Regional Distribution of Korea's Annual FDI into China　　(unit: $ mn)

	Beijing	Jiangsu	Shandong	Liaoning	Tianjin	Shanghai	Total
1990	0.2	0.9	5.741	4.724	1.305	0	16.174
1991	2.052	3.88	14.952	7.333	2.63	0	42.469
1992	27.249	4.835	49.394	15.85	7.97	4.932	141.127
1993	14.448	18.4	87.64	43.807	24.088	4.856	263.682
1994	30.661	56.517	203.587	59.364	108.154	33.704	633.084
1995	70.249	90.467	292.775	75.516	85.083	97.621	841.097
1996	100.504	83.499	241.249	125.672	102.723	106.594	896.833
1997	40.464	130.664	143.051	80.617	42.077	127.06	724.634
1998	30.803	74.635	178.893	29.451	168.396	32.478	677.892
1999	36.837	48.982	61.729	32.081	56.446	39.804	347.953
2000	49.9	15.62	146.487	2.238	49.36	13.735	362.208
2001	12.6	26.209	30.243	5.248	5.569	13.565	806.399
2002	162.214	128.02	210.449	60.59	92.883	58.38	881.36
Total	578.181	682.628	1,666.19	542.491	746.684	532.729	6,634.91

Source: The Export Import Bank of Korea

Now, let us examine the investment motives behind Korea's FDI into China. Generally speaking, both economic factors and policy factors can play determinant roles in inducing FDI into a certain country.　For example, According to Yean (1997), the following factors can induce FDI into a certain country: macroeconomic and political

stability, well-established infrastructure, cheap factors of production (both labor and capital), potentially large domestic market, and pro-FDI and trade policies. Other than these, geographical and cultural affinities and abundant natural resources are frequently cited inductive factors for FDI. Also, Bhagwati (1991) classifies inductive factors for FDI into two categories: The first category is market forces such as cheap factor cost and mutual penetration of investment by multinational companies, and the second category is policy factors such as establishing duty free zones and inviting tariff-jumping FDI. Out of these inductive factors, the biggest merits China has over the other countries in inviting FDI would be cheap labor cost, potentially large domestic market, abundant natural resources and active pro-FDI government policy that provides many incentives to foreign capital. In particular, having a potentially large domestic market is regarded as the most important factor in attracting FDI into China,

Another way of analyzing the determinant variables of FDI is to use a gravity model of FDI, which utilizes cross-country data. Taking variables such as trade volume, openness, GDP size, growth potentials, and pro-FDI policy factors as explanatory variables, various studies have been tried in order to determine the relative importance of each explanatory variable in determining the size of incoming FDI into a certain country. For example, Lee, Doowon (2003) has used a simple form of gravity model to show that trade volume of a country was one of the major determinants of incoming FDI. Wei (2000) has also used a modified gravity model to show that a more corrupted country has less chance of attracting incoming FDI than a less corrupted one. Also, Wei and Choi (2001) has found that there exists a negative relationship between exchange rate volatility and FDI. Similarly, Lee, Chang-Soo (2002) has also used a gravity model of FDI location to show that bilateral trade volume was one of the major determinant factors behind bilateral FDI of two countries.

In order to understand the motives of Korean firms, which have performed overseas FDI into various regions, a survey result cited in Seo and Lee (2002, in Korean) has been recited in the following table. As it has been expected, lower production cost the biggest determinant factor behind Korean firms' investment into China. However, almost equally important motive was to seek for the new market opportunity in the rapidly growing Chinese domestic market. Table 4 shows that Korean firms are viewing the Chinese domestic market as the most important market among all the developing countries. Also, relatively speaking, Korean firms are less motivated to increase their export out of their investment into China vis-à-vis their investment into other regions of the world. From this descriptive survey, we can expect that there would be less of so-called 'import-boomerang' effect out of Korea's

FDI into China.

Table 4. FDI Motives of Korean Firms Surveyed   (unit: %)

	North America	Europe	China	Asia	Latin America	Total
New Market Opportunity	39.8	48.7	36.2	33.0	25.3	36.5
Lower Production Cost	11.4	-	42.8	36.7	32.4	31.2
Easier Access to Inputs	9.7	5.4	5.6	7.5	8.8	7.2
To Increase Export	11.4	10.8	4.9	5.9	2.9	6.9
Technology Transfer	10.2	10.8	0.9	0.5	2.9	4.5
Countering Trade Block	9.1	21.6	3.1	4.2	14.7	5.9
Investment-Attracting Policy	4.0	2.7	3.8	6.4	11.8	4.3
Etc.	4.4	0.0	2.7	5.8	1.2	3.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Recited from Seo and Lee (2002).

3. Effects of FDI (into manufacturing industry) on Korea's Trade Balance

While most of the existing literatures conclude that FDI can have largely positive effect on host country's economy, the effects of FDI on home (or source) country's economy are rather mixed.[1]   In particular, the effects of FDI on home country's trade balance have been studied extensively by various scholars as it had been stated in Chapter 1.   Analyzing the trade balance effect of Korea's FDI into China can be particularly significant considering the fact that China is one of the major sources of Korea's trade surplus in recent years not to mention that China has become Korea's indispensable trading partner.   Table 5 shows the relative importance of China in Korea's total trade and trade balance.   As it is shown in Table 5, China has been continuously increased its absolute and relative importance as Korea's trading partner during the past 10 years.   In 1993, for example, Korea's export to and import from China were merely 6% and 5% of Korea's total export and import.   However, these figures have been continuously increased to be 15% and 11% as of 2002.   More importantly, China has become the major source of Korea's trade surplus along with South East Asian countries.   As it is shown in Table 5, Korea has always enjoyed sizable trade surpluses in its trade with China, and it is currently accounting for 61% of Korea's total trade surplus as of 2002.

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[1]   Heo and DeRouen (2002) has a well-reviewed summary of existing literatures on the effects of FDI on host country's growth.

Table 5. Korea's Export, Import, and Trade Balance with China and World (unit: $ mn)

Years	Korea's Bilateral Trade with China			Korea's Total Trade with World		
	Export	Import	Balance	Export	Import	Balance
1993	5,151	3,929	1,222	82,236	83,800	-1,564
1994	6,203	5,463	740	96,013	102,348	-6,335
1995	9,144	7,401	1,742	125,058	135,119	-10,061
1996	11,377	8,539	2,839	129,715	150,339	-20,624
1997	13,572	10,117	3,456	136,164	144,616	-8,452
1998	11,944	6,484	5,460	132,313	93,282	39,031
1999	13,685	8,867	4,818	143,685	119,752	23,933
2000	18,455	12,799	5,656	172,268	160,481	11,786
2001	18,190	13,303	4,888	150,439	141,098	9,341
2002	23,754	17,400	6,354	162,471	152,126	10,344

Source: Korea International Trade Association

Having said that the trade and investment relationship between Korea and China are ever-increasingly important to Korea's economy, it would be essential to figure out the effects of Korea's FDI into China on its trade balance.   Generally speaking, there are two contrasting effects of FDI on home country's export, which are export substitution and export creation effects.   If home country's firms chose FDI over export as a mean to get access to host country's domestic market, this behavior would eventually substitute FDI for home country's export.   However, it is also possible that home country's FDI into a host country requires intermediate inputs and capital goods produced in home country.   If many of these intermediate inputs and capital goods are firm-specific, they will not be replaced easily by the local production in host country.   In that case, FDI can lead to increased export of intermediate and capital goods from home country to host country.   Eventually, however, they will be replaced by the local firms' production in host country as the localization proceeds. Also, FDI may increase home country's imports from host country as the so-called 'import boomerang' effect takes place.   Home country's FDI into host country can incur technological spill over effect into host country's economy.   Once host country acquires advanced technology spilt from home country's FDI in a certain product, it is possible that host country would gain comparative advantage in that product with lower production cost and export it back to home country.   In particular, a country like China, whose technological catch-up is remarkably rapid in comparison with the other developing countries, this 'import boomerang' effect is likely to take place in the near future.[2]   Summing up discussions stated above, the net trade balance effect of FDI can

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[2]   Refer to Hu and Khan (1997) and Ezaki and Sun (1999) for the relationship between FDI and technological catch-up in China.

be correctly analyzed only when the above stated effects of FDI on home country's export and import are comprehended.

Before we examine the trade balance effect of FDI using rigorous empirical methods, let us take a look at a survey result, which is summarized in Table 6. Table 6 shows how the sales of Korea-affiliated firms in China were composed of in 2000. By examining how much of Korea-affiliated firms' output were sold in the local Chinese market, we can have rough ideas of how much of Korea's export into China had been substituted by Korea's FDI into China. Also, by examining how much of Korea-affiliated firms' output were exported back to Korea, we can roughly guess how big the so-called 'import boomerang' effect would be. According to Table 6, there would be almost no import boomerang effect in industries such as electronics, telecommunication, metals and chemicals, while there would be some import boomerang effect in light industries such as rubber, plastic, leather, shoes and bags. However, from Table 6, it is not clear whether how much of Korea's export to China had been replaced by Korea's FDI into China. For example, in chemical industry, all of its final output was sold in the local Chinese market. Therefore, one might say that FDI had replaced export in chemical industry. However, it would also be possible that Korea-affiliated firms in the Chinese chemical industry had to rely on intermediate and capital inputs, which were exported from Korea to China. In that case, it is not clear how much trade had been replaced and created due to Korea's investment into China in chemical industry.

Table 6. Sales Structure of Korea-Affiliated Firms Surveyed in China, 2000   (unit: %)

	Local Sales inside China	Export to Korea	Export to ROW*
Manufacture Industry Average	45.7	24.9	29.3
Electronics and Telecommunication	33.0	5.0	35.9
Transport Equipment	79.6	20.4	0.0
Metals	97.9	0.0	2.1
Rubber and Plastic	51.2	22.2	26.6
Chemicals	100.0	0.0	0.0
Leather, Shoes and Bags	0.2	20.3	79.5

Note: 'ROW' stands for 'rest of the world'.

Source: Recited from Table 4-3 of Export-Import Bank of Korea (2002. 1.)

Now, let us carry out empirical studies using econometric models. First, the seasonally adjusted time series data of Korea's export, import and FDI into China had been tested to see whether they have a unit root problem. Second, if there is a unit root problem in these time series variables, co-integration test will be performed to determine long-term relationship between variables. Third, if the co-integration test

fails, Granger-causality tests are carried out to find out the causal relationship between two variables.

The data used in this paper are monthly data of Korea's export, import and FDI into China from January 1998 to December 2002. The data used in this paper is the most updated data, which were not used in the existing literatures. Moreover, while the existing literatures have used either annual or quarterly data, this paper has used monthly data to examine the causal relationship in a further detail. The export and import data are obtained from KITA (Korea International Trade Association), and the FDI data are obtained from the Export Import Bank of Korea. As the FDI data are categorized by 11 different industries, whose categorization is inconsistent with those of export and import data, this paper has re-grouped the FDI and trade data in order to make both of them to be in line with the each other. According to this rule, the manufacturing industry had been classified into eight different industries; 1) textile, 2) footwear, 3) rubber, toys and the other miscellaneous light industry goods, 4) electric and electronic goods, 5) machinery, 6) transportation equipment, 7) metal, and 8) chemical products. When the manufacturing industry is decomposed into the above stated eight industries, the first three industries can be grouped as light industry and the remaining five industries can be grouped as heavy industry. From our data, Korea's manufacturing FDI into China is heavily dominated by heavy industry, which is accounting for roughly 80% of Korea's total manufacturing FDI into China during the period considered. Using this data, empirical tests are carried out first to see the relationship between Korea's FDI into the Chinese manufacturing industry and Korea's bilateral trade balance with China. Second, using the industrial level data, further empirical studies are carried out to find out the relationship between FDI into each industry and trade balance in each industry.

First, augmented Dickey Fuller (ADF) test are carried out to examine the existence of unit root in each time series, whose results are shown in the following table. As it is shown in Table 7, all the time series has a unit root at the statistically significant levels of 1%, 5%, and 10% with the time lag of 12.

Table 7. Results of ADF Test with Lag = 12

Korea's FDI into China				
ADF Test Statistics	-0.03075	1% Critical Value*	-2.609	
		5% Critical Value*	-1.9473	
		10% Critical Value*	-1.6192	
Korea's Export to China				
ADF Test Statistics	1.598949	1% Critical Value*	-2.609	
		5% Critical Value*	-1.9473	
		10% Critical Value*	-1.6192	
Korea's Import from China				
ADF Test Statistics	-0.03075	1% Critical Value*	-2.609	
		5% Critical Value*	-1.9473	
		10% Critical Value*	-1.6192	
Korea's Trade Surplus with China				
ADF Test Statistics	1.38511	1% Critical Value*	-2.609	
		5% Critical Value*	-1.9473	
		10% Critical Value*	-1.6192	

Note: '*' implies that it is statistically significant at each % level.

As there exists a unit root problem in each time series, co-integration tests are performed to see whether there exists a long-term relationship between two variables. First, two variables such as FDI and export are picked up, and they are set into the following equation.

(1) Export $(t) = C + \beta \cdot FDI(t) + \varepsilon(t)$

(Where 'C' stands for a constant, and '$\varepsilon(t)$' stands for a residual.)

Second, ADF test is carried out with regard to $\varepsilon(t)$ in order to see whether it follows a stationary path.   If not, $\varepsilon(t)$ still contains a unit root, and it can be said that there does not exist a long-term relationship between the selected two variables of export and FDI.   Table 8 summarizes the results of ADF tests for each residual of this co-integration test.

Table 8. ADF Tests for Residuals of Co-Integration Tests

Residual of the following equation: Export (t) = C + β·FDI (t) + ε (t)			
ADF Test Statistics	-0.81912	1% Critical Value*	-2.609
		5% Critical Value*	-1.9473
		10% Critical Value*	-1.6192
Residual of the following equation: Import (t) = C + β·FDI (t) + ε (t)			
ADF Test Statistics	0.192283	1% Critical Value*	-2.609
		5% Critical Value*	-1.9473
		10% Critical Value*	-1.6192
Residual of the following equation: Trade Balance (t) = C + β·FDI (t) + ε (t)			
ADF Test Statistics	-1.96142	1% Critical Value*	-2.609
		5% Critical Value	-1.9473
		10% Critical Value	-1.6192

Note: '*' implies that it is statistically significant at each % level.

As it is shown in Table 8, there does not exist a co-integrating relationship between two variables selected. Also, similar results are found when Johansen Co-Integration tests were carried out. Therefore, instead of finding out long-term relationship between two variables, let us now carry out Granger causality test to figure out causal relationship between two variables. Table 9 summarizes the results of Granger causality tests with different time lags between FDI and export, FDI and import, and FDI and trade balance.

Table 9. Results of Granger Causality Tests for FDI in Manufacturing Industry and Causal Directions

Lags	Export from Korea to China	Import from China to Korea	Trade Balance with China
1	← **		
2			
3			
4	→ **		
5	→ **	← **	
6	→ **		
7	← , → **		
8	← , → **		→ **
9	← , → ***	← ***	→ **
10	← ***	← **	→ **
11	← **	← **	→ **
12	← **		→ *

Notes: '→' implies that there exists a Granger causal relationship from FDI to each variable.

'←' implies that there exists a Granger causal relationship from each variable to FDI.

'*', '**', and '***' implies that the tests are statistically significant at 10%, 5% and 1% levels.

From the results illustrated in Table 9, we can find the following outcomes. First, there exists a strong correlation between export and FDI. For almost every

period of lag, there existed a causal relationship between the two variables with statistical significance.   In particular, with the lag periods of 7, 8, and 9, there existed bi-directional causality between two variables.   This result coincides with the findings of existing literatures, which also concluded that FDI activities were strongly correlated with export activities.   Second, the so-called 'boomerang effect' of import from China to Korea was not observed in this test.   Instead, the causality relationship between import and FDI was the other way around.   That is to say, the more Korea import from China, the more Korea did FDI into China with a certain time lag.   Finally, the most significant findings can be the causal relationship between Korea's FDI into China and its trade balance with China.   As it was suspected, FDI had Granger caused trade surplus to Korea's favor with a certain time lag.   Therefore, we can conclude, tentatively, that the worries of deteriorating trade balance due to the increased volume of Korea's FDI into China are baseless at least until now.   In line with this conclusion, it would be safe to say that the worries of industrial hallow-out in Korea's domestic industry are baseless as well.

Let us now carry out similar Granger causality tests using industrial level data with time lag of 12.   When the manufacturing industry was decomposed into eight different industries as stated above, it was difficult to find any clear direction of Granger causality except for a few industries.   For example, textile import from China to Korea had Granger caused Korea's FDI into textile industry with 1% level of statistical significance.   Also, Korea's FDI into rubber, toys and the other miscellaneous light industry goods had Granger caused Korea's import of these products from China with 10% level of statistical significance, which enables us to say that there was a slight effect of 'import boomerang' in these products.   Similar effect of 'import boomerang' was found in transportation equipment industry with statistical significance of 5%. However, other than this limited number of industries, no clear causal relationship was found.   Therefore, the eight manufacturing industries have been re-grouped into two broad categories of light industry and heavy industry.   The light industry is composed of the first three industries of our categorization, and the heavy industry is composed of the remaining five industries.   When Granger causality tests are carried out according to this categorization, the following results are found.

Table 10. Results of Granger Causality Tests for FDI in Light and Heavy Industries and Causal Directions (lag = 12)

Industries	Export from Korea to China	Import from China to Korea	Trade Balance with China
Light		← ***	
Heavy	← , → **	→ **	→ ***

Notes: '→' implies that there exists a Granger causal relationship from FDI to each variable.

        '←' implies that there exists a Granger causal relationship from each variable to FDI.

        '*', '**', and '***' implies that the tests are statistically significant at 10%, 5% and 1% levels.

The above table reconfirms out findings from Table 9 to a certain extent. With regard to Korea's FDI into heavy industry, the results of Granger causality are rather similar to those found in Table 9. Considering the fact that Korea's FDI into China is heavily concentrated in heavy industry, this would be a natural result. However, it is rather surprising that there was no effect of 'import boomerang' even in the light industry. This finding reconfirms that the concern about industrial hallow-out is still premature and baseless.

4. Conclusion

As the Chinese economy is growing rapidly during the last two decades, it has attracted huge volume of FDI into its domestic industries. In particular, Korea's FDI into China had soared since the mid-1990s. There have been, however, some worrying concerns behind this trend. Many have worried that the rising amount of Korea's FDI into China will eventually substitute Korea's export into China. Also, if there exists technology spill over effect from Korea-affiliated firms in China, there would be so-called 'import boomerang' effect from China to Korea. If these concerns are realized in the near future, Korea's FDI into China will deteriorate Korea's trade balance with China. Furthermore, some pundits are even worrying about the possibility of industrial hallow-out as the Japanese and the Taiwanese did in the 1980s and 1990s respectively.

This paper was aimed at reviewing the current situation of Korea's FDI into China as well as examining whether there has been 'substitution' or 'import boomerang' effect. Using the 1998 to 2002 monthly time-series data of Korea's FDI into China, Korea's export into and import from China, and Korea's trade balance with China in manufacturing industry, this paper tried to figure out the relationship between these variables. Tentatively, it is concluded that Korea's FDI into China has not substituted Korea's export into China not to mention that there was any visible 'import-boomerang'

effect.   Also, based on these results, it is very unlikely that Korea's FDI into China has hallowed-out Korea's domestic investment and employment yet.   Instead, there existed a positive causal relationship between Korea's FDI into China with Korea's trade balance with China.   Furthermore, these findings did not change much when the manufacturing industry was decomposed into light and heavy industries.

Even though there had been numerous studies with regard to the relationship between FDI and trade, this paper is different from the existing literatures in the following areas.   First, instead of testing the relationship using Korea's trade data with the world, this paper had examined the relationship using the bilateral trade and investment data between Korea and China.   Singling out Korea's trade and investment relationship with China would be meaningful as China is becoming more and more important trade and investment partner of Korea.   Also, instead of figuring out correlative relationship between FDI and trade, this paper tried to find causal relationship between the two variables.   Finally, it had used the most updated data of monthly time series to show the recent trend of trade and investment between the two countries.   Despite these findings and contributions, there are some areas that had to be studied further.   First, it would be more meaningful if a longer time series data were available.   In particular, as it is possible that the FDI behavior of Korean firms before the 1997 financial crisis would be different from that of Korean firms after the crisis, comparing the findings of this paper to those of empirical works carried out using the pre-crisis time series data.   Second, even though it was not tried in this paper, finding out relationship between FDI and domestic investment would be meaningful as well.   Currently, this paper implicitly assumes that FDI would indirectly affect domestic investment via its effect on trade.   Even though this is an assumption largely supported by the existing literatures, it would still be meaningful if actual test were performed between these two variables.

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