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The Causal Relationship between Trade and FDI: Implication for India and East Asian Countries

Choongjae Cho



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> Il Houng Lee President

Korea Institute for International Economic Policy 246 Yangjaedaero, Seocho-Gu, Seoul 137-747, Korea Tel: 02) 3460-1114 / FAX: 02) 3460-1144,1199 URL: http://www.kiep.go.kr

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Choongjae Cho



Korea Institute for International Economic Policy (KIEP)

246 Yangjaedaero, Seocho-Gu, Seoul 137-747, Korea Tel: (822) 3460-1251 Fax: (822) 3460-1144 URL: http://www.kiep.go.kr

Il Houng Lee, President

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EXECUTIVE SUMMARY

This study tries to find the causal relationship between bilateral trade and FDI in India and East Asian countries using macroeconomic data and derive policy implications for regional integration. Since the late 2000s, Korea, Japan and Singapore's trade and FDI with India have been rapidly increasing, but the causal relationship between trade and FDI could not be found, contrary to expectations. The relationship between trade and FDI in the US, the UK and Germany with India showed one-way or two-way causality, respectively. The estimation suggests that the causal relationship between trade and FDI in both countries could be formed by long-term economic exchange rather than a short-term surge in scale.

Keywords: Trade, FDI, Causality JEL Classification: C22, F19, O53

Choongjae Cho is a Research Fellow and Head of South Asia Team at Korea Institute for International Economic Policy (KIEP). Prior to joining KIEP he was a researcher at Daewoo Economic Research Institute and Lotte Economic Research Institute. He also worked for The Seoul Economic Daily as a reporter. He is an expert on Indian Economy and the economic cooperation between Korea an India. He holds a Ph.D in Economics from Hankuk University of Foreign Studies.

Contents

Executive Summary		
I. INTRODUCTION	7	
II. Trend of Trade and FDI between India and East Asia	10	
1. Trade	10	
2. FDI	13	
III. LITERATURE REVIEW AND DISTINCTION	17	
IV. DATA, METHODOLOGY AND ESTIMATION	20	
1. Analyzed Countries and Data	20	
2. Methodology	23	
3. Estimation	25	
V. Conclusion and Policy Implication	30	
References	33	
Appendix	35	

TABLES

Table	1. India's Top-20 Trade Partners in 2000/2001	11
Table	2. India's Top-20 Trade Partners in 2011/2012	12
Table	3. Cumulative Country-wise FDI Inflows from April 2000 to March 2013	13
Table	4. Cumulative Country-wise FDI Inflows from 1991 to 2001	14
Table	5. Cumulative Country-wise FDI Inflows from 1991 to November 2005	15
Table	6. The Basic Descriptions of the Data	21
Table	7. The Correlation Coefficient between Trade and FDI by Countries	23
Table	8. The Results of Augmented Dickey and Filler (ADF) Unit Root Tests	26
Table	The Results of Johansen Cointegration Tests	27
Table	10. The Applied Data and Model by Countries	28
Table [·]	11. The Granger Causality Estimation Results	29

Appendix Figures

Figure A1. Trade and FDI Variables by Countries

The Causal Relationship between Trade and FDI: Implication for India and East Asian Countries*

Choongjae Cho

I. Introduction

Since the 1980s, full-fledged economic liberalization and deregulation have increased the volume of trade and FDI. These have also led to increased economic interdependence, in other words, the economic integration among countries. Volume of trade and FDI among the various countries increased approximately by 9 and 30 times respectively between 1980 and 2011, which in turn led the increase in world GDP by about six folds.¹ Therefore, it is argued that FDI and trade are main drivers of economic growth and economic integration.

^{*} The study was presented at the ADB-KIEP-ICRIER Workshop, held on October 2012 in Seoul. In the workshop, the relationship between Korea and India were analyzed. I would like to thank Dr. Rajat Kathuria from the Indian Council for Research on International Economic Relations (ICRIER), Mr. Ramesh Subramaniam and Dr. Jayant Menon from ADB and Dr. Junkyu Lee, International Economic Advisor for the Ministry of Strategy and Finance, Korea who are made good comments. The analysis target countries are included more and the analytical methods were also reinforced.

¹ The figures were estimated by UNCTAD Handbook of Statistics (2012).

The economic integration between South and East Asia has shown significant progress since the 1980s. In particular, India, the largest country in South Asia, and East Asian countries such as Korea, China, Japan and Singapore, have made great efforts toward for economic integration. India is attractive to these four countries in that she has immense market potential. In addition, as the Indian government emphasized in *the Look East Policy*,² East Asia is strategically very important for India's economic growth and diplomacy. The Indian government has been trying to establish a strong economic relationship with East Asian countries. Now India has FTA agreements with Singapore, Korea, ASEAN and Japan. Each FTA came into force in 2006, 2010 (Korea-India, ASEAN-India) and 2011 respectively.

In fact, FDI between the four East Asian countries to India has led to considerable increases in trade volume. Based on cumulative FDI statistics from April 2000 to March 2013, Singapore and Japan were the first and third largest FDI investors with respect to India.³ From 2002 to 2010, East Asia's share of trade volume in India's total trade increased from 10.9% to 16.2%, while the share of EU and the United States decreased to 15.2% and 7.8% from 21.7% and 14% respectively.⁴

In this context, East Asian countries and India are making efforts to accelerate economic integration between them. This paper is designed to find policy implications for the acceleration of economic integration between India and East Asian countries. Although various studies have been attempted in the past, this

² India's Look East policy represents its efforts to cultivate extensive economic and strategic relations with the nations of East Asia.

³ If Mauritius, a tax-haven country, is included, they would be ranked second and fourth.

⁴ The figures were estimated by data issued from the Ministry of Commerce and Industry, India.

paper focuses on the causal relationship between Trade and FDI between India and East Asian countries since the 2000s. In other words, the purpose of this paper is to examine the causal links (unidirectional, bidirectional or independent) between trade and FDI and its policy implications.

Study of the causal relationship between trade and FDI will help us determine the direction of policy sets, and policy choices and focus. It will help us to predict the effects of FTAs launched from the late 2000s. Lee and Song (2007) argued that identifying causality between trade and FDI is an important issue in order to evaluate the dynamic effect of FTA in the mid and long run.⁵ The dataset employed in this paper includes countries such as USA, UK, Germany and the Netherlands, which have traditionally been major trade and FDI partners to India before the emergence of East Asian countries.

This study consists of five chapters. The first chapter introduces the background and purpose of this study. The trend of trade and FDI between the major East Asian countries and India are presented by comparison with other major countries in the second chapter. Brief review of literature on the relationship between trade and FDI is included in the third chapter. Empirical data, model and analysis are elaborated in the fourth chapter. The last chapter concludes with policy implications.

⁵ Lee and Song (2007), pp. 28-29.

II. Trend of Trade and FDI between India and East Asia

1. Trade

Trade volume between India and East Asian countries has significantly increased since 2000. The performance of China is outstanding because trade volume between India and China has increased sharply by about 30 times from USD 2.3 billion in 2000 to USD 67.8 billion in 2011. In the case of Singapore, the amount of trade with India in 2000 was almost the same as China; but India-Singapore trade also increased by about 10 times and reached USD 21.3 billion by 2011. During the same period the trade volume between Korea and India has increased by thirteen times from USD 1.3 billion to USD 17.7 billion. On the other hand, the trade between Japan and India appeared very prosperous in 2000 with the highest volume among four countries; but the Japan-India trade increased only by about five times since, from USD 3.6 billion in 2000 to USD 18.6 billion in 2011, which represents the lowest figure among the four countries.

In terms of each country's share in India's total trade, the Chinese share has more than doubled from 4.1% in 2002 to 8.9% in 2011. While Singapore's share has increased to 3.7% in 2011 from 2.5% in 2002, Korea's share rose only slightly from 1.9% to 2.1% during the same period. On the other hand, the Japanese ratio decreased by 1% point from 3.3% to 2.3% during the same period.⁶

⁶ Most figures were estimated from the CEIC Data Base.

Looking into India's trade volume vis-à-vis partner countries, Japan, Singapore, China and Korea ranked 5th, 9th, 10th and 17th in 2000 respectively (Table 1). However the rank of Singapore, China and Korea increased to 8th, 2nd and 12th respectively in 2011 (Table 2). Japan actually experienced a drop in its rank, from 5th to 11th over the same period. Meanwhile, the ranks of the traditional trade

Total o	f Top 20 countries	31,256.95	28,298.26	59,555.24	2,958.71
20	INDONESIA	399.75	910.24	1,310.00	-510.49
19	NETHERLANDS	880.09	437.53	1,317.63	442.56
18	SOUTH AFRICA	310.67	1,021.91	1,332.58	-711.24
17	KOREA	450.78	893.76	1,344.54	-442.98
16	RUSSIA	889.01	517.66	1,406.67	371.35
15	SAUDI ARABIA	822.94	621.12	1,444.06	201.82
14	AUSTRALIA	405.87	1,062.76	1,468.63	-656.89
13	FRANCE	1,020.01	640.81	1,660.82	379.2
12	MALAYSIA	608.15	1,176.80	1,784.95	-568.65
11	ITALY	1,308.75	723.58	2,032.33	585.17
10	CHINA	831.3	1,502.20	2,333.50	-670.89
9	SINGAPORE	877.11	1,463.91	2,341.03	-586.8
8	UAE	2,597.52	658.98	3,256.51	1,938.54
7	HONG KONG	2,640.86	852.11	3,492.97	1,788.75
6	SWITZERLAND	437.7	3,160.14	3,597.85	-2,722.44
5	JAPAN	1,794.48	1,842.19	3,636.67	-47.7
4	GERMANY	1,907.57	1,759.59	3,667.15	147.98
3	BELGIUM	1,470.56	2,870.05	4,340.60	-1,399.49
2	U.K	2,298.71	3,167.92	5,466.63	-869.21
1	USA	9,305.12	3,015.00	12,320.12	6,290.12
Rank	Country	Export	Import	Total Trade	Trade Balance
(Unit : USD Million					

Table 1. India's Top-20 Trade Partners in 2000/2001*

Note: * Indian fiscal year criteria (from April 2000 to March 2001).

partners to India, the United States, the United Kingdom and Germany are decreasing sharply. The United States, the immovable number 1 in 2000, dropped to 3rd in 2011. Germany also dropped to 6th from 4th. The United Kingdom, a firm no. 2 by 2000, plunged to 17th in 2011.

(Unit : USD Million)					
Rank	Country	Export	Import	Total Trade	Trade Balance
1	UAE	36,265.15	38,436.47	74,701.61	-2,171.32
2	CHINA	13,503.00	54,324.04	67,827.04	-40,821.04
3	USA	36,152.30	24,343.73	60,496.03	11,808.57
4	SAUDI ARABIA	9,783.81	34,130.50	43,914.31	-24,346.69
5	SWITZERLAND	1,116.98	29,915.78	31,032.76	-28,798.79
6	GERMANY	7,244.63	14,373.91	21,618.54	-7,129.28
7	IRAQ	1,278.13	20,155.94	21,434.07	-18,877.81
8	SINGAPORE	13,608.65	7,754.38	21,363.03	5,854.27
9	HONG KONG	12,278.31	8,078.58	20,356.89	4,199.74
10	INDONESIA	5,331.47	14,774.27	20,105.75	-9,442.80
11	JAPAN	6,099.06	12,514.07	18,613.14	-6,415.01
12	KOREA	4,201.49	13,461.25	17,662.73	-9,259.76
13	KUWAIT	1,060.80	16,569.63	17,630.43	-15,508.83
14	NIGERIA	2,739.41	13,826.02	16,565.43	-11,086.60
15	QATAR	687.05	15,616.58	16,303.63	-14,929.53
16	BELGIUM	5,506.63	10,087.16	15,593.80	-4,580.53
17	U.K	8,611.72	6,553.74	15,165.47	2,057.98
18	IRAN	3,351.07	11,603.79	14,954.86	-8,252.72
19	MALAYSIA	4,442.67	10,435.00	14,877.66	-5,992.33
20	AUSTRALIA	2,348.23	12,026.25	14,374.48	-9,678.02
Total of	f Top 20 countries	175,610.56	368,981.09	544,591.66	-193,370.5
India's	Total	300,274.11	491,945.04	792,215.62	-191,670.93

Table 2. India's Top-20 Trade Partners in 2011/2012*

Note: * Indian fiscal year criteria (from April 2011 to March 2012).

2. FDI

The cumulative FDI flow into India from April 2000 to March 2013 was about USD 193.4 billion. Singapore and Japan were the first and third largest FDI investors to India during the same period. Their cumulative FDI were about USD 19.5 billion and 14.6 billion respectively. The share of Singapore's FDI into India as a share of total FDI into India is about 10%, while that of Japan is 7.5% (Table 3). Especially their annual FDI to India has risen dramatically from 2006 and

Table 3. Cumulative Country-wise FDI Inflows from April 2000 to March 2013							
Rank	Country	FDI Inflows (Rs. Crore *)	FDI Inflows (US\$ million)	Share in Total FDI Inflows			
1	Mauritius	341,124	73,666	38.1			
2	Singapore	90,182	19,460	10.1			
3	U.K	80,458	17,548	9.1			
4	Japan	70,094	14,550	7.5			
5	USA	50,922	11,121	5.8			
6	Netherlands	42,378	8,965	4.6			
7	Cyprus	32,328	6,889	3.6			
8	Germany	25,512	5,480	2.8			
9	France	16,864	3,572	1.9			
10	UAE	11,307	2,422	1.3			
13	Korea	5,821	1,231	0.6			
15	Hong Kong	4,769	1,028	0.5			
19	Indonesia	2,825	610	0.3			
21	Malaysia	2,730	549	0.3			
30	China	1,428	278	0.1			
	Sub-Total	778,742	167,369	86.6			
	Grand Total	896,912	193,403	100.0			

Note: * 10 million Rupees.

2007 respectively. In 2005 Singapore-India Comprehensive Economic Cooperation Agreement and Double Taxation Avoidance Act became effective. Since then, FDI inflows from Singapore to India have soared from USD 321 million in 2005 to USD 4.2 billion in 2011. In 2006 Japan and India upgraded their relationship from Global Partnership to a Global Strategic Partnership, and mutually agreed to establish a Comprehensive Economic Partnership. Since then, as in the case of Singapore, Japanese FDI into India has jumped from USD 116 million in 2006 to USD 3.1 billion in 2011.⁷

However, the total share of Korea's FDI into India is about 0.6% over the same period. The cumulative FDI was about USD 1.2 billion. But during the 1990s, Korea was one of the largest FDI investors into India from East Asia, along with Japan (Table 4). Thus from 1991 to 2001 Korea's share in total FDI

Table 4. Cumulative Country-wise FDI Inflows from 1991 to 2001							
Rank	Country	FDI Inflows (Rs. Crore)	FDI Inflows (US\$ million)	Share in Total FDI Inflows			
1	Mauritius	22,908	5,733	36.8			
2	USA	11,250	2,969	18.1			
3	Japan	4,601	1,187	7.4			
4	Germany	3,166	846	5.1			
5	U.K	2,755	777	4.4			
6	Netherlands	2,847	761	4.6			
7	Korea	2,189	594	3.5			
8	France	1,828	466	2.9			
9	Italy	1,630	402	2.6			
10	Singapore	1,485	399	2.4			

	Table 4. Cumulative	Country-wise	FDI Inflows	from 1991	L to 2001
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Note: * 10 million Rupees.

 $^{^7\,}$ The figures are from the CEIC Data Base.

was 3.5%. Three big conglomerates, such as Samsung, LG and Hyundai, began to invest in India in the mid 1990s. However, during the 2000s, the Korean FDI inflow to India was relatively smaller than Singapore and Japan. From 1991 to 2005 the cumulative share of FDI from Korea decreased to 2.3% (Table 5).

Chinese FDI inflow into India is much smaller compared to other countries. The total share of FDI from China into India was just 0.1% from April 2000 to March 2013. Chinese FDI into India was about USD 52 million during the entire 2000s. Recently, FDI from China into India increased to about USD 50 million in 2011 and USD 138 million in 2012 respectively.

Meanwhile, the United States, Germany and Netherlands have also continued to invest in India, but their status has been decreasing. From 1991, the year of

Table 5. Cumulative Country-wise FDI Inflows from 1991 to November 2005							
Rank	Country	FDI Inflows (Rs. Crore)	FDI Inflows (US\$ million)	Share in Total FDI Inflows			
1	Mauritius	46,794	10,976	37.2			
2	USA	20,023	4,892	15.9			
3	Netherlands	8,457	1,985	6.7			
4	Japan	8,436	2,014	6.7			
5	U.K	7,962	1,910	6.3			
6	Germany	5,408	1,331	4.3			
7	Singapore	3,895	940	3.1			
8	France	3,230	768	2.6			
9	Korea	2,899	749	2.3			
10	Switzerland	2,482	605	2.0			
	Sub-Total	109,586	26,170	87.1			
	Grand Total	151,605	36,704	100.0			

Note: * 10 million Rupees.

Reform, to 2001, they were the first, third and fifth largest FDI contributors to India, respectively. But from 2000 to 2012 the United States and Germany dropped to fourth and seventh respectively. The Netherlands has stayed at no. 5. Only the United Kingdom increased in rank from the fourth to the second in the same period.

III. Literature Review and Distinction

The interaction between FDI and trade has become complicated with the trend of economic integration, while the importance of the relationship between trade and FDI has increased over the years. Although researchers have theoretically and empirically studied the relationship between trade and FDI, it is still under debate.⁸

According to the traditional Hecksher-Ohlin assumption, trade and FDI have a substitute relationship (Mundell 1957). Moreover, some studies (Caves 1957) assume that export and FDI can be mutual alternatives with respect to entering foreign markets, implying that there is a substitutive relationship between export and FDI. Gray (1998) also argued that market-seeking FDI and trade are substitutes, while efficiency-seeking FDI and trade are complementary. In others studies the motives for FDI were divided into three categories; the horizontal motivations (Markusen 1984; Markusen and Venables 1998), the vertical motivations (Helpman 1984; Helpman and Krugman 1985) and the knowledge-capital model (Markusen and Maskus 2001), which combines both the horizontal and vertical models.⁹ Theoretically, horizontal FDI is designed to place production close to foreign consumers and thereby avoid trade costs¹⁰ and is a substitute to trade as

⁸ The studies on the relationship between trade and investment and the relationship between intraindustry trade and investment with industry or company level data were many, but those introduced here are mainly studies on the relationship between trade and investment with macro-economic level data.

⁹ Jang (2011), p. 1, p. 629.

¹⁰ Jang (2011), p. 1, p. 629.

in the relationship between market-seeking FDI and trade. On the other hand, vertical FDI and trade are complementary because vertical FDI is driven by the distance of production costs rather than trade costs.

When these existing theories and hypotheses are applied to the FDI inflow from East Asian countries to India, the horizontal and vertical FDI motivations are working simultaneously. Because of high trade cost such as overall high tariffs, import ban on durable goods with very high tariffs and lower labor cost were especially active in inducing FDI to India. Therefore, to find the relationship between trade and FDI in India-East Asia countries, the approach relying on the nature of FDI would require deeper analysis. But India's FDI statistics as well as the country-specific statistics by FDI motivations are very limited, which is why we try to find the causality between trade and FDI in this paper. Instead, this study includes the western countries, traditional economic partners to India, in the dataset because it brings greater clarity in understanding the relationship between trade and FDI between India and the East Asian Countries. And that would help us decipher the effect of the quantitative expansion of India-East Asia trade and FDI since the late 2000s and find the policy implications of accelerating economic integration between both.

The literature on the causal relationship between trade and FDI include Hsiao and Hsiao (2006), who argued that FDI caused exports, in turn leading to economic growth in the eight East and Southeast Asian countries (China, Korea, Taiwan, Hong Kong, Singapore, Malaysia, Philippines and Thailand) from 1986 to 2004. Likewise, Min (2003) also supported that FDI inflows stimulated exports in Malaysia.

However, Liu *et al.* (2001) found different results in the case of China with nineteen countries from 1984 to 1998. They found that the growth rate of Chi-

na's imports caused the growth in inward FDI from home countries, which in turn, caused the growth of exports from China to the home country.

In the case of Mexico, Pacheco-Lopez (2005) found bi-directional Granger causality between exports and FDI, and between imports and FDI. She interpreted the result as liberalization of FDI easing access of multinational corporations to the country and promoting exports. In addition, an increase in exports led to an increase in import in the case of Mexico.

And there are few studies on the causal relationship between trade and FDI in the case of India. Jayachandran and Seilan (2010) performed a causality test among trade, FDI and economic growth in India from 1970 to 2007 but did not find a significant connection between trade and FDI.

In Korea, the results by Lee and Song (2008) were almost unique; applying the Granger causality test method and employing annual data from 1970 to 2004. They found that trade led to FDI between Korea and the United States, and Korea and China, while FDI caused trade between Korea and Japan.

IV. Data, Methodology and Estimation

1. Analyzed Countries and Data

The eight countries employed for analysis include; four East Asia countries like Korea, Japan, Singapore, China and the other four countries such as the US, UK, Germany and the Netherlands. All of these are the top countries in terms of trade and FDI with India.

Among top trade partners to India, oil-importing countries like UAE, Saudi Arabia, Iraq and a gold-importing country, Switzerland, were excluded. Also among top FDI partners to India, the tax-haven countries like Mauritius, Cyprus and the other countries, with cumulative FDI inflow of less than \$1 billion by March 2013, were also excluded.

In this study, bilateral trade and FDI volume data are used. From the third quarter of 2004 to the fourth quarter of 2012, quarterly data were utilized. All of the data came from the Ministry of Commerce and Industry in India and were obtained through the CEIC database. The reason that this study could not cover the data before 2004 is that there is no continuous FDI data by countries before 2004 because the Government of India changed the FDI estimation criteria two or three times since. As a result, there was disconnection with respect to data before 2004.

In this study, trade data included bilateral export and import, but FDI data included inflow to India from each country. FDI inflow from India to each country was too small and sporadic to be included in this study.

The following table is the basic description of the data used in this study. Both trade and FDI data have a positive value. Skewness and kurtosis values for each of the data show that they are not normally distributed. Most of the data distribution have a skewed right and more or less-peck rather than a normal distribution. As a result, the values of Jarque-Bera are not significant.

Looking to trade and FDI graph (Figure 1),¹¹ the trade data show a generally increasing trend. That means trade of all individual countries with India increased over time. However, there exists a generally upward trajectory for FDI, though the level is lower and more irregular than trade. Therefore the primary integral data or the first difference integral data should be used in this study.

	КТ	JT	СТ	ST	UST	UKT	GET	NET
Mean	2912.89	2903.26	11067.57	3911.29	10003.1	2986.73	4055.48	1976.70
Median	2982.12	2646.62	10569.26	3744.31	9253.985	2859.57	4114.25	1951.99
Maximum	5188.63	5340.46	21084.5	8426.34	15399.26	4465.81	6438.37	3972.12
Minimum	1170.47	1358.57	3226.41	1711.55	5067.01	1699.94	1732.26	634.85
Std. Dev.	1148.74	1178.876	5231.77	1506.386	3295.585	698.0934	1305.82	931.2171
Skewness	0.110011	0.528781	0.249807	0.774205	0.39918	0.352515	-0.02001	0.257637
Kurtosis	1.77407	2.162149	1.952326	3.519314	1.883065	2.111449	1.902606	2.125693
Jarque-Bera	2.197695	2.578946	1.908582	3.778621	2.67031	1.822668	1.708324	1.459054
Probability	0.333255	0.275416	0.385085	0.151176	0.263117	0.401988	0.42564	0.482137
Sum	99038.56	98711.08	376297.5	132984.1	340105.5	101549.1	137886.6	67208.12
Sum Sq. Dev.	43547528	45861707	9.03E+08	74883534	3.58E+08	16082035	56270510	28616457
Observations	34	34	34	34	34	34	34	34

Table 6. The Basic Descriptions of the Data

¹¹ See appendix.

Table 6. continued

	KI	JI	CI	SI	USI	UKI	GEI	NEI
Mean	33.86	280.00	8.17	563.76	271.74	279.45	145.16	227.78
Median	22.8	160.28	0.585	424.655	233.655	125.365	66.365	197.59
Maximum	135.96	1234.19	105.85	2671.44	867.29	2476.89	1255.18	543.05
Minimum	0.64	12.82	0	4.9	57.12	6.56	17.73	6.5
Std. Dev.	32.84653	301.3317	20.15392	559.4996	184.8313	488.415	219.6597	170.3706
Skewness	1.471411	1.483816	3.691328	1.81869	1.70787	3.38118	3.951758	0.275566
Kurtosis	4.750801	4.760423	17.58002	7.186454	5.994206	14.41875	20.43918	1.751398
Jarque-Bera	16.61112	16.86674	3.78E+02	43.57233	2.92E+01	2.49E+02	519.3366	2.638903
Probability	0.000247	0.000217	0	0	0	0	0	0.267282
Sum	1151.39	9520.33	278	19168.16	9239.48	9501.36	4935.47	7744.59
Sum Sq. Dev.	35603.52	2996426	13403.96	10330312	1127367	7872123	1592262	957862.3
Observations	34	34	34	34	34	34	34	34

Note: KT and KI represents Korea-India trade volume and FDI inflow to India from Korea. JT, JI, CT, CI, ST, SI, UST, USI, UKT, UKI, GET, GEI, NET, NEI shows Japan-India trade volume and FDI inflow to India from Japan, China-India trade volume and FDI inflow to India from China, Singapore-India trade volume and FDI inflow to India from Singapore, USA-India trade volume and FDI inflow to India from USA, UK-India trade volume and FDI inflow to India from USA, UK-India trade volume and FDI inflow to India from Germany, Netherland-India trade volume and FDI inflow to India from the Netherlands.

Since now the case of China-India is excluded in the analysis due to problems in China's FDI inflow data. In the 34 quarters, the volume of FDI is zero in 4 quarters and 7 quarters had FDI less than USD 100,000.¹²

Meanwhile, the trade and FDI show positive correlation coefficients. In particular coefficients for the Netherlands, Singapore and Japan are very high, at more than 68%. The coefficient of Korea is over 46%. Germany and the United Kingdom's coefficients are about 37%, 36% respectively. The United States is unique, with very little correlation between trade and investment.

 $^{^{12}\,}$ See the graph CI in the appendix 5 $\,$

Table 7. The Correlation Coefficient between Trade and FDI by Countries					
Countries	Coefficient				
Korea-India	0.461145				
Japan-India	0.682405				
Singapore-India	0.695252				
USA-India	0.008990				
UK-India	0.366477				
Germany-India	0.389577				
Netherlands-India	0.717258				

Correlation and causation are conceptually and theoretically different. High correlation does not equal causation. Although the correlation is high, causal relationship could be low or missing. This is why this study tests for Granger causality between bilateral trade and FDI by countries.

2. Methodology

To figure out the causal relationship between FDI and trade, a bivariate vector autoregression(VAR) format was employed. VAR Granger causality test, designed and developed by Granger(1969), Engel and Granger(1987) and Johansen(1991) etc. suggests researchers to follow the three-stage procedure for the estimation.

The first-step is to determine whether each time series data are stationary. The natural logarithm conversion data and the first-difference natural logarithm conversion data are tested through Augmented Dickey and Filler (ADF) statistics.

The second step is to investigate the bivariate cointegration between each trade and FDI data converted to the natural logarithm and the first-difference natural logarithm data using Johansen's cointegration test. Above two steps provides the proper data and analysis method. Engel and Granger (1987) and Johansen (1991) recommend that when each time series data are stationary and there is the presence of cointegration between both data, the natural logarithm conversion data as a level data are better for the unrestricted VAR Granger causality test. They also recommended when each time series data are not stationary, but there is the presence of cointegration between both, the natural logarithm conversion data (level data) could be used with vector error correction VAR Granger causality test. The reason is that the possibility of spurious regression is low in that case.

Relying on the method above three estimation equations could be established as follows. Let X_t , Y_t be a stationary time series with zero means respectively($u_t=0$, $v_t=0$). The simple causal equation is (1). The definition Granger causality is as follows: If Y_t is causing X_t provided some γ_j is not zero. Similarly X_t is causing Y_t if some c_j is not zero. If both of these events occur, there is said to be a feedback relationship between X_t and Y_t (Granger 1969, p. 431).

In this study,13 if the level data of X_t and Y_t are stationary and have cointegration, an unrestricted VAR Granger equation 1 is applied.

$$X_{t} = \sum_{i=1}^{m} \beta_{i} X_{t-i} + \sum_{j=1}^{n} \gamma_{j} Y_{t-j} + u_{t}$$
(Equation 1)
$$Y_{t} = \sum_{i=1}^{q} b_{i} Y_{t-i} + \sum_{j=1}^{r} c_{j} X_{t-j} + v_{t}$$

Secondly, if the level data of X_t and Y_t are not stationary but have cointegration, an error correction VAR Granger Equation 2 is applied.

¹³ Ghosh (2006) also applied three models, as in this study.

$$X_{t} = \alpha + \sum_{i=1}^{m} \beta_{i} X_{t-i} + \sum_{j=1}^{n} \gamma_{j} Y_{t-j} + \delta \text{ECM}_{t-1} + u_{t} \qquad (\text{Equation } 2)$$
$$Y_{t} = a + \sum_{i=1}^{q} b_{i} Y_{t-i} + \sum_{j=1}^{r} c_{j} X_{t-j} + d \text{ECM}_{t-1} + v_{t}$$

Thirdly, if the level data of X_t and Y_t are stationary but have no cointegration, instead of level data the first-difference data with an unrestricted VAR Granger Equation 3 is applied.

$$\Delta X_t = \sum_{i=1}^m \beta_i \, \Delta X_{t-i} + \sum_{j=1}^n \gamma_j \, \Delta Y_{t-j} + u_t \qquad (\text{Equation 3})$$
$$\Delta Y_t = \sum_{i=1}^q b_i \Delta Y_{t-i} + \sum_{j=1}^r c_j \Delta X_{t-j} + v_t$$

Through the equation 1, 2 or 3, if the null hypothesis could be rejected unilaterally, Y_t or X_t Granger causes X_t or Y_t respectively. If the null hypothesis could be rejected simultaneously, Y_t and X_t Granger causes each other.

3. Estimation

A. Unit Root and Cointegration Test

To examine whether the data are stationary, the Augmented Dickey and Filler (ADF) unit root test was conducted. Table 8 presented the results of the ADF test on the natural logarithms conversion data and the first-difference of the natural logarithms conversion data. As a level data, Korea-India, Singapore-India and Netherland-India data were stationary at 10% significance level at least. The data

Table 6. The results of Augmented Blokey and Thier (ABF) one root rests						
		Log (level)	Log First-Difference			
Karaa India	Trade	-3.397 *	-7.202 ***			
Kulea-Inula	FDI	-5.565 ***	-8.347 ***			
lonon India	Trade	-2.977	-6.515 ***			
Japan-India	FDI	-4.610 ***	-5.041 ***			
Cingonara India	Trade	-3.963 **	-2.198			
Singapore-India	FDI	-5.646 ***	-12.615 ***			
	Trade	-3.706 **	-5.981 ***			
UAE-India	FDI	-4.149 **	-5.829 ***			
	Trade	-2.701	-5.595 ***			
USA-Inula	FDI	-1.579	-5.462 ****			
	Trade	-2.927	-6.593 ***			
UK-India	FDI	-5.840 ***	-6.376 ***			
Cormony India	Trade	-2.217	-5.832 ***			
Germany-India	FDI	-6.340 ***	-6.825 ***			
Notharlanda India	Trade	-3.770 **	-6.534 ***			
nemenands-mola	FDI	-6.836 ***	-5.985 ***			

Table 8. The Results of Augmented Dickey and Filler (ADF) Unit Root Tests

Note: *, **, *** mean statistically significant at 10%, 5% and 1% respectively.

of Japan-India, UK-India and Germany-India had one side stationary in trade or FDI. In the case of USA-India, the trade and FDI level data are not stationary at any significant level. But every first-difference data were stationary at 1% significance except just one data series, Singapore-India trade.

Next, Johansen cointegration tests were conducted to determine unrestricted VAR Granger causality or error correction Granger causality with level data. This is to check the existence of cointegration between trade and FDI level data. To find each optimal lag interval, Akaikie Information Criterion(AIC) was performed before the Johansen cointegration tests. In the Johansen cointegration test, constant and trend option was applied.

	Hypothesized No. of CE(s)	Eigenvalues	Trace Statistic	Max-Eigen Statistic
Korea-India	None	0.56	31.78(23.34) *	20.63(17.23) *
	At most 1	0.35	11.14(10.66) *	11.14(10.66) *
Japan-India	None	0.84	51.20(23.34) *	46.04(17.23) *
	At most 1	0.18	5.15(10.66)	5.15(10.66)
Singapore-India	None	0.30	17.07(23.34)	11.42(17.23)
	At most 1	0.16	5.65(10.66)	5.65(10.66)
USA-India	None	0.67	35.54(23.34) *	27.80(17.23) *
	At most 1	0.26	7.73(10.66)	7.73(10.66)
UK-India	None	0.54	32.53(23.34) *	25.14(17.23) *
	At most 1	0.20	7.39(10.66)	7.39(10.66)
Germany-India	None	0.81	46.70(23.34) *	42.10(17.23) *
	At most 1	0.16	4.60(10.66)	4.60(10.66)
Netherlands- India	None	0.57	39.10(23.34) *	27.09(17.23) *
	At most 1	0.31	12.01(10.66) *	12.01(10.66) *

Table 9. The Results of Johansen Cointegration Tests

Note: () is 0.1 critical value, * denotes rejection of hypothesis at the 0.1 level

Korea-India, Japan-India, USA-India and Germany-India were applied 8 lag, Singapore-India, UK-India and Netherland-India were applied 1 lag.

Table 9 showed the results of both the trace test and the maximum eigenvalue test. The level data of Korea-India and Netherlands-India had one more cointegration at 0.1% significance level. And Japan-India, USA-India, UK-India and Germany-India had a cointegration between each of their trade and FDI level data. But only the level data of Singapore-India were unclear in regards to the existence of cointegration.

B. Granger Causality Test

According to the results of the ADF and Johansen cointegration tests, the

Data / Model	Destination Countries
Level data with Unrestricted VAR Granger Model (Equation 1)	Korea-India, Netherlands-India
Level data with Vector Error Correction VAR Granger Model (Equation 2)	Japan-India, USA-India, UK-India, Germany-India
The first-difference data with Unrestricted VAR Model (Equation 3)	Singapore-India

Table 10. The Applied Data and Model by Countries

appropriate Granger causality equations and data are as follows. In the cases of Korea-India and Netherlands-India, the level data with unrestricted VAR Granger Causality test (Equation 1) could be applied because their level data are stationary and cointegrated. And in the cases of Japan-India, USA-India, UK-India and Germany-India, the level data with a vector error correction VAR Granger test (Equation 2) could be applied because their level data are not stationary but have cointegration. Only the Singapore-India case, in which the level data are stationary but has no cointegration, could be applied by the unrestricted VAR model with log first difference data in this analysis (Equation 3).

In general, 1 or 2 years lag was utilized in many Granger causality analyses between trade and FDI. In this study 2 years (8 quarters) lag interval was also applied. The results of estimation were Table 11. The estimation results show that India and East Asia countries such as Korea, Japan and Singapore had no causality between trade and FDI. However India and non-East Asia countries like the USA, UK and Germany had causal relations between trade and FDI. UK-India had a bi-directional relation between trade and FDI. In the case of USA-India and Germany-India, trade and FDI were uni-directional, with causality running from FDI to trade and trade to FDI respectively.

	Null Hypothesis	Chi-Sq.	Prob.	Results
Korea-India	FDI does not cause trade.	10.535	0.229	Not Rejected
	Trade does not cause FDI	8.924	0.348	Not Rejected
Japan-India	FDI does not cause trade.	12.649	0.124	Not Rejected
	Trade does not cause FDI	4.111	0.846	Not Rejected
Singapore- India	FDI does not cause trade.	6.310	0.612	Not rejected
	Trade does not cause FDI	5.805	0.669	Not rejected
USA-India	FDI does not cause trade.	26.427	0.000	Rejected ***
	Trade does not cause FDI	2.211	0.973	Not Rejected
UK-India	FDI does not cause trade.	21.773	0.005	Rejected **
	Trade does not cause FDI	28.148	0.000	Rejected ***
Germany-India	FDI does not cause trade.	4.871	0.771	Not Rejected
	Trade does not cause FDI	22.044	0.004	Rejected **
Netherlands- India	FDI does not cause trade.	6.886	0.548	Not Rejected
	Trade does not cause FDI	6.994	0.537	Not Rejected

Table 11. The Granger Causality Estimation Results

Note: All were given 8 lag.

*, **, *** mean statistically significant at 10%, 5% and 1% respectively

V. Conclusion and Policy Implication

As we have seen earlier, since the late 2000s the economic exchange between India and East Asia have become increasingly active. The trade and FDI of major East Asian countries such as Korea, China, Japan and Singapore with India appear to be more active than the western countries such as the United States, the United Kingdom, Germany and the Netherlands who were major trade and FDI partners for India previously. The correlation coefficients between trade and FDI in cases of India-East Asian countries were much higher than for India-western countries.

However, the causal relationship between bilateral trade and FDI for India and the East Asian countries elicited results contrary to our expectations. In Korea-India, Japan-India and Singapore-India bilateral relationships, the causality between trade and FDI could not be found. In contrast, for the cases of USA-India, UK-India and Germany-India, while their bilateral trade and FDI was relatively poor in the late 2000s, the relationship showed the two-way or one-way causality respectively.

The estimation results raise new research questions such as the effect of the exchange term or scale and the motives for FDI on the relationship between trade and FDI. But those questions could not be answered clearly in this study because of limitations in data and the analytical model.

Yet in spite of the limitations, the estimation results could provide us with policy implications to the effect that bilateral trade and FDI causal relationship is growing by long-term economic exchange rather than a short-term increase of quantity in trade or FDI. In other words, the UK, USA and Germany are old and established economic partners for India just as USA, Japan and China are the major (and established) economic partners for Korea. East Asian countries, namely Korea, Japan and Singapore, have a relatively short history of economic exchange in comparison to western countries such as the UK, USA and Germany. The context of this study is similar with Lee and Song (2008) that showed the causal relationship between bilateral trade and FDI in USA, Japan and China with Korea, which appeared to be unidirectional.

In fact, before the 1991 reform in India, these Western countries engaged in much economic exchanges with India. According to India's Investment Center, from 1981 to 1990 the total FDI inflow from the west was about USD 9.5 billion. Among them, the United States (25%), Germany (16%) and the United Kingdom (7%) accounted for 48% while they mainly invested in chemicals (34%), electronics (19%) and machinery (4%) sectors.¹⁴ In terms of the number of joint ventures in 1984, among the total of 412 companies, 189 companies belonged to United Kingdom (46%), 90 and 47 companies were from the United States (22%) and Germany (11%) respectively.¹⁵

In this situation, the question of the effectiveness of FTA which was signed and went into force between India and each East Asian country like Korea, Japan and Singapore may be raised. On the other hand, and paradoxically, the FTA may contribute to enhanced interrelationship between trade and FDI although the causal relationship has not been found yet.

Even with the uncertainty of the causal relationship between bilateral trade

¹⁴ Akhtar (2013), Table 3 and Table 4 were calculated.

¹⁵ Dhar (1988), Annexure I was numbered and calculated.

and FDI, India and East Asian countries will eventually have to promote trade and FDI simultaneously rather than to focus on one or the other. From this perspective, more measures for investment as well as trade have to be deployed in future FTA upgrade negotiations between India and East Asia included. Furthermore, the two governments should further strengthen bilateral efforts to create a production division in the global supply chain through trade and FDI. These efforts will make it possible to compensate for the relatively low trade-FDI relationship and the short history of economic exchange between India and East Asian Countries.

While this study focuses on the analysis of the causal relationship between bilateral trade and FDI, it had its limitations especially in terms of data employment and operation. The limitations of statistical data on Indian FDI inflow prevented us from making a more detailed analysis. For example, the study could not reflect on the fact that each country differs in its history and pattern regarding its trade and FDI with India. If those facts had been taken into account and then analyzed, the policy implications would be much clearer. In addition, inclusion of variables, such as industry or business level, may have increased the validity of the model.

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Appendix



Figure A1. continued



Note: KT and KI represent Korea-India trade volume and FDI inflow to India from Korea. JT, JI, CT, CI, ST, SI, UST, USI, UKT, UKI, GET, GEI, NET, NEI represent Japan-India trade volume and FDI inflow to India from Japan, China-India trade volume and FDI inflow to India from China, Singapore-India trade volume and FDI inflow to India from Singapore, USA-India trade volume and FDI inflow to India from USA, UK-India trade volume and FDI inflow to India from UK, Germany-India trade volume and FDI inflow to India from Singapore, USA-India trade volume and FDI inflow to India from USA, UK-India trade volume and FDI inflow to India from UK, Germany-India trade volume and FDI inflow to India from Sermany and Netherlands-India trade volume and FDI inflow to India from Netherlands.

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Nakgyoon Choi

국문요약

본 연구는 중국과 함께 주요 경제협력 대상국가로 부상하고 있는 인도와 최근 인도와 경제협력을 가속화하고 있는 한국, 일본, 상가포르의 양자간 교역과 투자의 인과관계 를 분석하였다. 2000년대 후반 이후 이들 동아시아 국가들과 인도의 양자간 교역과 투자는 다른 나라들에 비해 훨씬 빠른 속도로 중가하였다. 하지만 분석 결과, 이들 국가 와 인도의 양자간 교역과 투자 사이에는 그랜저 인과관계(Granger Causality)가 없는 것으로 추정되었다. 반면 인도의 오랜 경제협력 대상국이었지만 최근 동아시아 국가 에 비해 상대적으로 둔화된 영국, 미국, 독일과 인도의 교역과 투자 사이에는 각각 쌍 방향(two-way causality) 혹은 일방향(one-way causality) 인과관계가 있는 것으로 나 타났다. 이러한 추정 결과는 양국간 교역과 투자 관계는 단기적인 양적 중가보다 장기 간에 걸쳐 형성됨을 시시한다. 이것은 또한 인도와 동아시아 각국은 양자간은 물론 글 로벌 생산분업 체제 편입을 위한 산업협력을 더욱 강화해야 함을 시시한다.

핵심용어: 교역, 투자, 인과관계, 인도

조충제(趙忠濟)

부산대학교 경제학과 졸업 한국외국어대학교 경제학 박사 대외경제정책연구원 신흥지역연구센터 인도남아시아팀장 (現, E-mail: cjcho@kiep.go.kr)

『인도 주별 성장패턴 전망과 정책시시점』 (2011, 공저)

『아시아 주요국의 대인도 경제협력 현황과 시사점』 (2012, 공저) 외

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Choongjae Cho

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246 Yangjaedaero, Seocho-gu, Seoul 137-747, Korea P.O.Box 235, Seocho, Seoul 137-602, Korea Tel 02-3460-1001, 1114 / Fax 02-3460-1122, 1199 http://www.kiep.go.kr



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