

INTRA-INDUSTRY FOREIGN DIRECT INVESTMENT AND INTRA-INDUSTRY TRADE IN KOREA

This paper examines the relationship between international trade and foreign direct investment (FDI). In particular, it explores the impact of FDI on the pattern of trade in Korea during the 1990s. There were relatively rapid increases in outward and inward FDI flows; however, for manufacturing industries, the overall relationship between intra-industry trade and intra-industry FDI seems to be weak, though mainly positive. This finding suggests that globalisation of the Korean economy has so far resulted from intra-industry trade rather than international production through FDI.

Introduction

In the trade literature, the connection between foreign direct investment (FDI) and international trade has been described mainly as one where FDI substitutes for or complements international trade. In trade theories based on standard factor endowments, trade barriers such as distance, tariffs and quotas are seen as inducing FDI in the form of capital movements. FDI usually moves from a capital-rich home country to a capital-deficient host country to take advantage of a difference in returns to capital (Mundell 1957). As a result of FDI, factor prices – and subsequently goods prices – are equalised, and there is no need for trade or further factor movements because FDI substitutes for trade.

The substitution hypothesis has been challenged by the ‘new’ trade theory,¹ which is based on product differentiation, scale economies and imperfect market structure. The theory demonstrates that endowment differences are not the only source of international trade and it provides a basis for observable intra-industry trade. In the new trade theory, multinational enterprises (MNEs)² exist as an equilibrium phenomenon and export headquarters services such as R&D activities, which depend on factor endowments, to host countries. The new trade theory favours a complementarity relationship between trade and MNEs. The pattern of trade is one where intra-industry trade and inter-industry trade coexist. Intra-industry trade occurs where the home country exports intermediate products (headquarters services) and imports differentiated products (usually final products) from the host country.³ In this theory, all MNEs are vertical because frictionless trade is assumed.

More recent models – Markusen (1995); Markusen and Vernables (1998, 2000) – include horizontal MNEs in a general equilibrium framework, with positive trade costs. Intra-industry and inter-industry trades coexist, but MNEs can displace trade in certain situations.⁴ Baldwin and Ottaviano (2001) argue that in the new trade theory FDI substitutes for international trade.⁵ A general conclusion arising from these new developments is that intra-industry trade and intra-industry affiliates' sales are higher in countries with more similar relative factor endowments and sizes than in countries where these characteristics are less similar. Markusen and Maskus (2002) provide an empirical study confirming this hypothesis. However, these models do not explicitly take account of any causal relationship between FDI and intra-industry trade. What is implicit in them is that, to a certain extent, MNE production and sales can negatively influence intra-industry trade. Such a negative implication arises only when MNEs completely dominate national firms. Note that the models incorporate an empirical observation that firms in industries with high intra-industry trade are more likely to be MNEs than firms in industries with lower intra-industry trade. This seems to contradict the casual observation of a positive relationship between FDI and intra-industry trade.⁶

Markusen (1995) succinctly summarises the empirical observations on international trade and FDI. He makes three main points. First, FDI may take place between industrialised countries, such as the United States and the European Union (EU). Moreover, FDI is a two-way phenomenon, especially between similar countries. For example, firms in the United States invest in EU markets, and firms in the EU also invest in US markets. Second, a large proportion of world trade is between industrialised countries, and a significant amount is intra-firm trade. According to Dunning (1993) and others, the intra-firm trade is likely to be intra-industry trade, due to firm-specific ownership advantages. This implies that foreign affiliates' production and sales are closely and positively related to intra-industry trade. Third, there is anecdotal evidence that industries with a high level of intra-industry trade show a relatively high level of intra-industry FDI. Recently, Greenaway et al. (2001), using US data in an attempt to measure 'aggregate' supply by different modes in a market, showed that there is a positive correlation between intra-industry trade and intra-industry FDI, as measured by foreign affiliate sales.

FDI in the Asia Pacific region has been explained primarily by reference to the Japanese experience: cheap production costs, especially cheap wages, are assumed to be the major determinant for FDI flows in the region (Kojima 1975, 1985).⁷ Some scholars have suggested different determinants for recent flows of FDI in the Asia Pacific region. During the 1990s, newly industrialising economies (NIEs) such as Korea, Taiwan, Hong Kong and Singapore emerged as

major sources of FDI in the region (Petri 1995; Simon and Jun 1995; UNCTAD 1997). Some authors have suggested that new determinants of FDI in the region are more similar to those in the Western hemisphere. For example, while explaining a 'new wave'⁸ of FDI in the Asia Pacific region, Suh and Seo (1998) argued that market size and market access had become important determinants for FDI flows in the region.

Despite the theoretical changes outlined above, very few empirical studies have explored the connection between FDI and intra-industry trade, and these examined industrialised countries such as the United States or the United Kingdom. Two examples are Greenaway et al. (2001) and Markusen and Maskus (2002). In this paper, we use the case of Korea to investigate whether there is a systematic relationship between FDI and intra-industry trade. As noted earlier, Korea emerged as one of the major capital exporters in the Asia Pacific region in the 1990s. During the recent financial crisis, FDI inflows steadily increased, and the magnitude and importance of FDI rapidly increased. We focus on finding a plausible relationship between the pattern of intra-industry FDI and intra-industry trade, using empirical data covering the years 1989–99. The investigation assumes that FDI is positively related to intra-industry trade in Korea, due to the fact that firm-specific assets are jointly used at the plant level.

The paper is organised as follows. First, we briefly discuss recent developments in FDI inflows and outflows in Korea, highlighting the industry pattern of FDI inflows and outflows in the 1990s. Next, we describe patterns of intra-industry trade during 1989–99. We then conduct correlation studies to explore the potential relationship between FDI and the pattern of trade. We conclude with findings, policy implications and suggestions for further research.

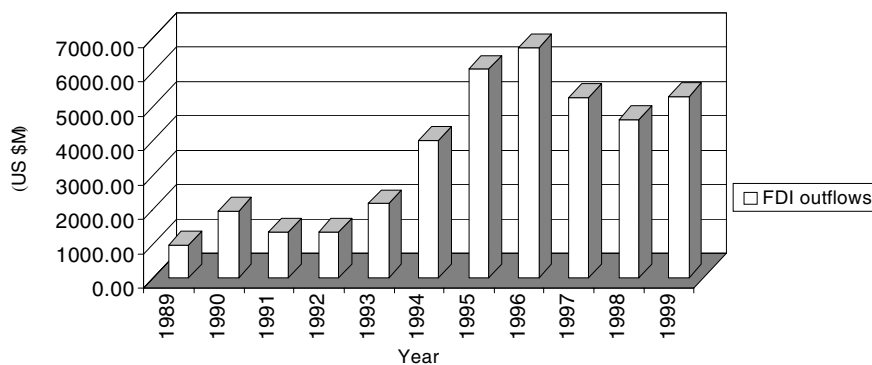
Foreign direct investment in Korea

Outflows

In the 1990s, one of the main characteristics of the Korean economy was an increased level of globalisation through FDI outflows and inflows. Massive outflows of FDI started around the mid-1980s, when the Korean macroeconomic environment deteriorated. High levels of outward FDI generally continued in the 1990s, though there was a relative slowdown in the early years of the decade. As can be seen in Figure 1, outward FDI has accelerated since 1993. Reasons include the appreciation of the Korean won, rapid increases in real wage costs and the liberalisation of policy toward outward FDI (Park and Lim 2000). Korea has become one of the major capital

exporting countries in the Asia Pacific region, together with Japan and other Asian NIEs such as Hong Kong and Taiwan (UNCTAD 1997). During the recent financial crisis, Korea maintained relatively high outward FDI flows, although the level was not as high as that of the pre-crisis period (Figure 1). During the crisis, decreases in outward FDI in Korea were smaller than decreases in other types of international capital movements (UNCTAD 1999).

Figure 1 Total outward FDI (manufacturing) (in 1990 prices)



The relatively minor decrease in outward FDI was in stark contrast to a rapidly increased volume of FDI inflows during the crisis period. One reason may have been that MNEs investing in Korea and Korean MNEs had different motives for their investment. The Korean government actively promoted FDI as a way out of the crisis. Foreign MNEs may have taken advantage of their improved relative wealth when the value of the Korean won, and subsequently the value of the stock market, plummeted (Seo 1999). Moreover, unlike outward FDI, inward FDI may not have been motivated by real wage cost advantages (Seo 1999). Perhaps the financial constraints on Korean MNEs during the crisis were not as serious as people believed, so they could maintain a relatively high level of outward FDI.⁹

Table 1 shows the industry distribution of outward FDI in Korea during the 1989–99 period.¹⁰ Two interesting observations can be made. First, outward FDI was concentrated in a relatively small number of manufacturing industries (such as textiles and clothing, and electrical and electronics), although all manufacturing industries conducted outward FDI. Second, there were changes in major capital exporting industries among Korean manufactures. In the early 1990s and, to a certain extent, the mid-1990s, the major capital exporting industries

Table 1 Industry distribution of outward FDI in Korea, 1989–99 (%)

Year	Food & clothing	Textiles & lumber	Paper & petroleum	Chemicals	Ceramics	Metals	Machinery	Electrical & electronics	Transport equipment	Other manufactures
1989	6.13	22.83	2.19	6.24	0.80	42.46	1.48	10.65	2.37	4.85
1990	8.31	26.00	10.06	11.05	1.55	7.91	1.73	12.09	12.49	8.80
1991	6.14	20.98	9.05	9.51	7.63	17.89	3.66	8.81	10.18	6.15
1992	1.93	24.72	4.32	6.65	3.96	14.67	6.85	27.09	2.80	7.00
1993	1.99	26.41	2.22	5.79	11.58	5.16	6.45	22.00	11.13	7.28
1994	3.55	20.35	2.98	4.57	7.31	13.16	3.87	26.67	13.89	3.65
1995	4.09	13.54	3.26	5.91	4.72	6.24	6.03	39.55	12.98	3.67
1996	3.93	11.43	4.36	10.19	2.72	6.73	7.85	31.16	18.64	2.99
1997	4.19	13.48	3.54	8.00	1.33	14.92	12.22	24.81	14.17	3.34
1998	2.08	10.32	2.52	8.04	2.29	4.53	7.24	49.60	12.50	0.90
1999	3.73	10.25	2.47	7.50	1.08	2.25	24.22	19.99	26.36	2.16

Sources: Authors' own calculations, based on the amount of FDI; original figures were obtained from the Export–Import Bank of Korea.

were relatively labour-intensive manufacturing industries, especially the textile and clothing industry. This observation agrees with the results of earlier studies on outward FDI in Korea. For example, Lee (1995) and Park and Lim (2000) conclude that deterioration in the macroeconomic environment has been the main driver for outward FDI in Korea. However, since the mid-1990s, capital- and technology-intensive industries such as the electrical and electronics industry, transport equipment industry, chemical and petroleum industry and machinery industry have emerged as major capital exporting industries. The electrical and electronics industry accounted for almost 50 per cent of all FDI outflows in 1998, with the transport equipment industry contributing the next highest share.

There are three possible interpretations for the recent outward FDI by capital- and technology-intensive industries in Korea. First, Korean MNEs were vertically integrated, so production requiring relatively simple assembly processes was relocated to host countries that provided cheap labour, such as the ASEAN countries, China, India and Vietnam. Second, Korean MNEs adopted a global business strategy in order to maximise their global profits, thus assimilating MNEs in industrialised countries. Third, capital- and technology-intensive industries might have conducted FDI to support the FDI previously conducted in labour-intensive industries in host countries.

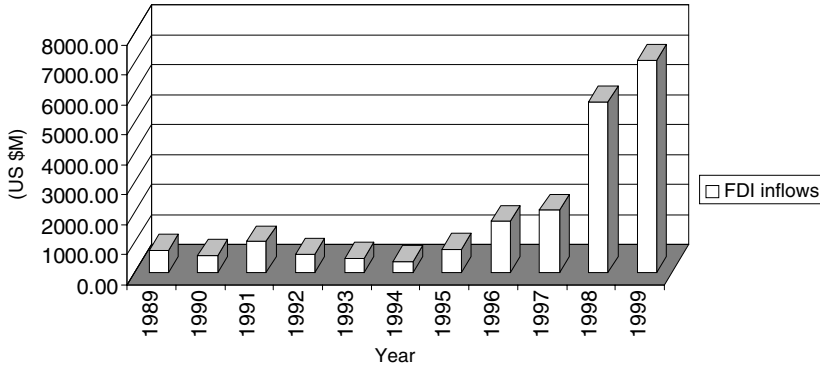
The first two interpretations have different implications for the impact of FDI on the pattern of trade, although they may not be mutually exclusive. If the firms were vertically integrated while their export orientation was maintained, they would use the host countries as an export platform for finished products through simple assembly processes. The trade pattern would then continue to be one of inter-industry trade. However, if Korean MNEs, as multi-product firms, had a business strategy of maximising global profits, they would produce differentiated products in the host country, and the trade pattern would be one of intra-industry trade.¹¹

Inflows

There was very little inward FDI in Korea's early economic development (Seo 1997). In the early 1980s, significant policy changes led to a moderate increase in inward FDI. The changes aimed to facilitate technology transfer through FDI when industrialised countries became reluctant to transfer technology to Korea through licensing and other mechanisms (Lee 1994). Finding marketing outlets for Korean exports was also an important reason for the Korean government encouraging FDI. Inward FDI policies have subsequently become increasingly more liberal, through industry deregulation and the abolition of restrictions on inward FDI (Kim 1997).

Inward FDI has shown a long-term increasing trend, although growth has been moderate and sometimes volatile. The importance of inward FDI was greatly emphasised in the recent financial crisis. The Korean government behaved as if inward FDI was the only way out of the crisis¹² and subsequently almost completely liberalised inward FDI policies to the extent that even hostile mergers and acquisitions were allowed. Such changes in policy and other economic factors resulted in Korea attracting a large amount of FDI (Figure 2).

Table 2 shows the industry distribution of inward FDI in manufacturing to Korea during the 1989–99 period.¹³ The industry distribution seems to be quite different from that for outward FDI. As in outward FDI, a relatively small number of manufacturing industries (the chemical industry, electrical and electronics industry, food industry and transport equipment industry) attracted major shares of inward FDI. Until the mid-1990s, the chemical industry attracted the largest share of inward FDI. More recently, the electrical and electronics industry and the food industry have increased the amount of inward FDI, followed by the transport equipment industry and the machinery industry. The textile and clothing industry, which was one of the major capital exporting industries, attracted only a very small proportion of inward

Figure 2 Total inward FDI (manufacturing) (in 1990 prices)

FDI during the period.¹⁴ This may be attributed to two facts. First, the Korean economy is less reliant on labour-intensive manufacturing than are other countries, due to comparative disadvantage as a result of rising real wages. Second, light, labour-intensive manufacturing such as textiles and clothing, especially the garments industry, is quite mobile. Firms in these industries often move from a country in which the macroeconomic environment has become less favourable to one where conditions are more favourable. Similar observations can be made for the metals industry and other manufacturing industries.

Inflows and outflows together

Table 3 shows net FDI flows (the difference between outflows and inflows of FDI) in Korea during the 1990s. In most manufacturing industries, outward FDI far exceeded inward FDI, although that pattern changed during the financial crisis. In the textile and clothing industry, outflows outweighed inflows throughout the 1989–99 period. Outflows also exceeded inflows in the metals industry and ‘other manufactures’. These are labour-intensive industries using relatively mature production technologies and are export oriented. When production costs increased due to high real wage rates and unfavourable exchange rate movements, firms relocated production facilities to countries with cheap production costs. The fact that FDI outflows exceeded inflows in these industries indicates that Korea did not develop its locational advantages sufficiently for foreign MNEs to move from their previous locations. FDI inflows often exceeded outflows in the chemicals

Table 2 Industry distribution of inward FDI in Korea, 1989–99 (%)

Year	Food	Textiles & clothing	Paper & lumber	Chemicals & petroleum	Ceramics	Metals	Machinery	Electrical & electronics	Transport equipment	Other manu- factures	Total manu- facturing
1989	5.92	1.92	0.76	33.94	5.67	1.73	13.73	15.93	19.59	0.81	100.00
1990	5.64	2.05	0.19	43.43	2.80	2.26	13.61	15.31	12.84	1.87	100.00
1991	8.63	1.16	0.92	63.59	0.23	0.79	7.96	11.61	4.66	0.45	100.00
1992	7.24	3.77	15.08	43.47	4.18	2.65	5.90	10.28	6.17	1.26	100.00
1993	7.47	0.87	0.31	54.24	5.53	2.87	9.45	8.58	8.37	2.32	100.00
1994	4.43	1.52	1.79	38.12	6.89	1.86	12.13	15.71	16.49	1.07	100.00
1995	1.66	6.57	9.34	31.99	2.28	0.86	11.46	26.28	8.11	1.47	100.00
1996	13.10	1.09	4.31	32.90	2.43	0.67	8.22	22.57	14.06	0.65	100.00
1997	36.23	3.63	8.35	11.98	2.29	0.59	7.07	12.39	16.80	0.67	100.00
1998	12.54	0.31	28.66	15.53	4.87	0.13	10.25	24.01	3.13	0.57	100.00
1999	4.42	0.65	0.33	18.56	0.70	8.44	9.09	42.06	9.28	6.48	100.00

Source: Original FDI figures were obtained from Ministry of Commerce (2000), Industry and Energy Trends in Foreign Direct Investment, Korea. Authors' own calculations based on amount of FDI.

Table 3 Net FDI flows in Korea, 1989-99 (US\$ '000)

Year	Food	Textiles & clothing	Paper & lumber	Chemicals & petroleum	Ceramics	Metals	Machinery	Electrical & electronics	Transport equipment	Other manu- factures
1989	12,671	194,077	14,472	-190,726	-34,090	374,289	-86,660	-19,138	-121,332	38,356
1990	128,878	493,931	194,665	-38,441	13,927	140,772	-45,652	145,943	168,017	160,316
1991	-8,306	274,648	114,062	-549,787	101,888	236,326	-34,949	-3,631	89,488	79,291
1992	-19,898	321,408	-37,251	-188,586	28,250	188,050	57,618	312,274	-873	89,798
1993	6,350	602,209	49,290	-152,670	236,929	103,541	98,524	460,309	211,576	155,079
1994	137,675	884,417	123,290	46,678	292,022	568,446	120,392	1,103,872	541,333	155,290
1995	261,516	856,702	137,221	114,838	298,957	414,051	305,615	2,438,073	804,854	235,195
1996	43,827	842,079	245,758	134,122	158,542	494,774	433,965	1,916,757	1,135,557	213,401
1997	-602,533	712,600	13,281	191,900	24,860	869,386	557,117	1,177,398	444,273	181,631
1998	-622,472	460,552	-1,527,161	-518,028	-173,055	202,754	-251,820	922,676	399,909	8,702
1999	-116,600	498,581	107,603	-924,301	7,362	-481,775	640,132	-1,935,337	739,881	-346,885

Sources: Table 1 and Table 2.

industry, as well as the machinery industry and the food industry. In these industries, market size, market access and proximity to customers are considered to be important determinants for FDI.

Given that there seems to have been two-way FDI in Korea, it is worth measuring the extent of intra-industry FDI. By modifying the standard intra-industry trade (IIT) index, the intra-industry FDI (IIFDI) index can be defined as follows:¹⁵

$$IIFDI = \{1 - |OFDI - IFDI| / (OFDI + IFDI)\} * 100 \quad (1)$$

where *OFDI* is outward FDI flow and *IFDI* is inward FDI flow. The index varies between 0 (a perfect inter-industry FDI) and 100 (a perfect intra-industry FDI).¹⁶

Table 4 shows the IIFDI indexes for Korean manufacturing industries. It has several interesting features. No industry had an index above an average level of IIFDI for the entire period from 1989 to 1999. However, two industries stand out. The chemicals industry performed above the average for almost the entire period, except in 1999, when the index fell only slightly below the average. The machinery industry IIFDI index was above the average except in 1989 and 1997. These two industries ranked relatively low in terms of outward FDI distributions (see Table 1) but high in inward FDI distributions (see Table 2).

Other industries which often had index values above the average include the food industry, the paper and lumber industry, and the transport equipment industry. The IIFDI index of the electrical and electronics industry was above the average in the early 1990s, and again more recently. This result is interesting because the electrical and electronics industry is prone to both FDI inflows and FDI outflows (Table 1 and Table 2, respectively). Nevertheless, the fact that outward FDI dominated inward FDI (Table 3) has somehow implied relatively low IIFDI index values. This may suggest that in the electrical and electronics industry outward FDI focused on factories or plants for final product assembly processes for export purposes, requiring a large capital investment, whereas foreign MNEs in this industry might have invested more in technology-intensive and skill-intensive intermediate products or parts production, requiring relatively small capital investment. This may further suggest that Korea's locational advantages are not strong enough to appeal to foreign MNEs producing final products.

Three manufacturing industries (the textile and clothing industry, the metals industry and 'other manufactures') had IIFDI index values below the manufacturing average for almost the entire period.¹⁷ All had relatively large shares of outward FDI but attracted relatively

Table 4 Intra-industry FDI index for manufacturing industries in Korea, 1989-99

Year	Food	Textiles & clothing	Paper & lumber	Chemicals & petroleum	Ceramics	Metals	Machinery	Electrical & electronics	Transport equipment	Other manufactures	Average
1989	87.20	12.63	43.30	37.35	29.99	6.33	23.76	91.02	26.22	23.48	38.13
1990	33.79	4.61	1.15	91.79	70.09	15.79	59.64	55.04	47.14	11.99	39.10
1991	95.29	8.29	14.65	32.12	4.57	6.68	74.16	98.52	52.70	10.83	39.78
1992	73.10	13.19	76.46	49.68	65.74	15.44	57.04	29.90	98.90	15.38	49.48
1993	92.53	1.50	6.23	63.55	19.75	22.58	50.26	16.41	29.42	13.60	31.58
1994	20.52	1.36	10.44	86.77	15.94	2.56	44.73	10.26	19.66	5.25	21.75
1995	10.15	12.00	54.75	83.21	11.93	3.57	40.00	16.09	15.19	9.98	25.69
1996	92.03	4.76	40.40	90.45	37.20	4.98	42.22	31.25	32.34	10.45	38.61
1997	45.15	19.31	96.72	74.57	81.20	3.08	37.35	33.08	63.98	14.78	46.92
1998	23.66	7.23	13.25	59.00	55.05	6.63	72.73	74.91	47.33	88.30	44.81
1999	77.29	15.77	30.62	46.31	93.13	33.18	66.93	52.35	64.14	39.82	51.95

Notes: The weighted average index of intra-industry FDI at this level of industry classification did not differ much from what is presented in this table. Thus, only the arithmetic average index is presented in this table.

smaller amounts of inward FDI. Again, locational advantages in Korea may not have been strong enough to appeal to foreign MNEs. Moreover, the macroeconomic environment in Korea during the 1990s may have encouraged these industries to find alternative locations through outward FDI.

Intra-industry trade in Korea

We now turn to patterns and changes in intra-industry trade. We use the Grubel–Lloyd index (Grubel and Lloyd 1975) to measure the extent of intra-industry trade, which is defined as follows:

$$IIT = \{1 - |X - M| / (X + M)\} * 100 \quad (2)$$

where X is exports and M imports. The index varies between 0 (a perfect inter-industry trade) and 100 (a perfect intra-industry trade).

Table 5 shows the IIT index of manufacturing industries in Korea. The average index indicates that a relatively large proportion of manufacturing trade in Korea is intra-industry trade. In other words, in the manufacturing industries, Korea exports and imports similar products. The extent of overall intra-industry trade marginally increased during the 1990s. However, there seem to have been wide fluctuations of IIT indexes within industries as well as across industries. The textile and clothing industry had relatively low IIT index values. In fact, the IIT index for the textile and clothing industry was much lower than the manufacturing industry average value throughout the 1989–99 period. The situation was similar for the paper and lumber industry, whose IIT index was consistently lower than the average index value. This industry only recently achieved an index value above average.¹⁸

Three industries had distinctively high IIT indexes during the 1989–99 period. They are the electrical and electronics industry, the metals industry and ‘other manufactures’. In addition, their index values were higher than the manufacturing average for almost the entire period. Although the chemical and petroleum industry and the transport equipment industry often had IIT index values above the manufacturing average, these two industries differ in terms of the movements of their IIT index values. While the value of the IIT index for the chemical and petroleum industry increased recently, that for the transport equipment industry has declined substantially, in the latter half of the 1990s dropping below the manufacturing average.

Table 5 Intra-industry trade index for manufacturing industries in Korea, 1989-99

Year	Food	Textiles & clothing	Paper & lumber	Chemicals & petroleum	Ceramics	Metals	Machinery	Electrical & electronics	Transport equipment	Other manufactures	Average
1989	88.95	23.98	60.90	47.32	85.63	97.81	61.19	81.48	71.74	64.71	68.37
1990	83.39	25.73	56.89	45.55	86.18	97.55	55.99	82.20	71.96	69.48	67.49
1991	75.46	29.07	51.68	59.39	68.21	87.71	55.05	83.46	72.26	73.95	65.62
1992	72.48	30.54	50.41	70.85	74.00	94.44	63.60	82.10	77.51	79.31	69.52
1993	75.05	33.11	48.01	70.34	90.12	87.97	71.64	77.97	67.97	86.08	70.83
1994	74.11	40.79	55.81	69.78	76.59	94.39	66.09	75.16	73.73	92.51	71.90
1995	69.99	46.66	53.35	70.69	62.50	89.19	68.01	71.95	70.56	97.75	70.07
1996	69.08	50.80	56.04	76.95	57.51	83.35	69.24	82.05	64.64	99.50	70.92
1997	71.79	46.98	67.80	92.45	60.97	93.93	85.00	87.43	49.57	98.32	75.42
1998	82.78	30.57	97.83	95.17	98.86	74.04	85.90	77.60	29.49	76.38	74.86
1999	74.95	38.57	88.02	98.44	86.12	93.15	86.38	85.16	30.51	81.84	76.31

Notes: The weighted average of intra-industry trade index at this level of industry classification did not differ much from what is presented in this table. Thus, only the arithmetic average index is presented in this table.

Sources: Calculated from the data supplied by the International Economic DataBank.

Intra-industry FDI and intra-industry trade in Korea

How do IIT indexes compare with those of IIFDI? At the same level of manufacturing industry classification, the average IIT indexes were higher than IIFDI indexes throughout the 1989–99 period. However, the gap between the two indexes has recently narrowed. As noted above, the IIT index values for the metals industry and ‘other manufactures’ were high and above the average value of the IIT index, while the values of IIFDI were small and consistently below the average value of the IIFDI index. In the electrical and electronics industry, the IIT index values were higher than the manufacturing average throughout the period, but the IIFDI index values were higher than the average only in the early 1990s and late 1990s.

We extended the analysis by using a dominance table to show the evolution of IIFDI and IIT and, especially, to highlight the increase in the difference between the IIFDI index and the IIT index as Korea’s income grew (in the context of Markusen and Maskus 2002). IIT or IIFDI dominance (D) can be defined as the difference between the values of these two indexes. That is,

$$D_j = (IIFDI_j - IIT_j),$$

where D is dominance.

If D_j is positive – i.e. $IIT_j < IIFDI_j$ – then industry j is more oriented to intra-industry FDI.

If D_j is negative – i.e. $IIT_j > IIFDI_j$ – then industry j is more oriented to intra-industry trade.

Table 6 shows the IIT or IIFDI dominance over time for each manufacturing industry in Korea in the 1990s. The IIFDI index dominated the IIT index in only 25 of 110 cases, and even then the difference was relatively small. We borrow the concept of ‘extended globalisation’ developed by Greenaway et al. (2001) as a measure of aggregate supply in a given market. When we define it as the average of the IIT index and the IIFDI index, Korean globalisation is seen to take the form of trade rather than FDI. The type of dominance (IIT or IIFDI) seems to be different for relatively labour-intensive industries and for capital-intensive, technology-intensive industries. In labour-intensive industries such as the textile and clothing industry, the metals industry and ‘other manufactures’, the IIT index absolutely dominates, indicating that intra-industry trade is the dominant form of the globalisation of the Korean economy. In more capital-intensive and technology-intensive industries, the IIFDI index exceeds the IIT index, implying that international production through FDI has increasingly become an important form of globalisation for Korean manufacturing industries.

Table 6 Intra-industry trade and intra-industry FDI dominance in manufacturing industries in Korea, 1989–99

Year	Food	Textiles & clothing	Paper & lumber	Chemicals & petroleum	Ceramics	Metals	Machi- nery	Electrical & electro- nics	Transport equip- ment	Other manu- factures
1989	-1.75	-11.35	-17.60	-9.97	-55.64	-91.48	-37.43	9.54	-45.52	-41.23
1990	-49.60	-21.12	-55.74	46.24	-16.09	-81.76	3.65	-27.16	-24.82	-57.49
1991	19.83	-20.78	-37.03	-27.27	-63.64	-81.03	19.11	15.06	-19.56	-63.12
1992	0.62	-17.35	26.05	-21.17	-8.26	-79.00	-6.56	-52.20	21.39	-63.93
1993	17.48	-31.61	-41.78	-6.79	-70.37	-65.39	-21.38	-61.56	-38.55	-72.48
1994	-53.59	-39.43	-45.37	16.99	-60.65	-91.83	-21.36	-64.90	-54.07	-87.26
1995	-59.84	-34.66	1.40	12.52	-50.57	-85.62	-28.01	-55.86	-55.37	-87.77
1996	22.95	-46.04	-15.64	13.50	-20.31	-78.37	-27.02	-50.80	-32.30	-89.05
1997	-26.64	-27.67	28.92	-17.88	20.23	-90.85	-47.65	-54.35	14.41	-83.54
1998	-59.12	-23.34	-84.58	-36.17	-43.81	-67.41	-13.17	-2.69	17.84	11.92
1999	2.34	-22.80	-57.40	-52.13	7.01	-59.97	-19.45	-32.81	33.63	-42.02

Notes: Figures are calculated as the difference of the IIFDI index and the IIT index (IIFDI – IIT).

We conducted correlation studies to further investigate the potential relationship between FDI and intra-industry trade. The results are presented in Table 7. For the overall manufacturing industry, the coefficient is positive but small (0.085). However, the relationship between IIFDI and IIT is not significant. A positive but insignificant relationship between IIT and IIFDI was also found for US–UK bilateral trade and investment (Greenaway et al. 2001). At individual industry level, the paper and lumber industry, the transport equipment industry and ‘other manufactures’ have negative correlation coefficients for IIFDI and IIT; the other seven industries have positive coefficients. There is not a significant relationship between IIFDI and IIT in any manufacturing industry except the electrical and electronics industry, whose correlation coefficient is positive and marginally significant at around the 25 per cent significance level.

The lack of a significant relationship between IIFDI and IIT in Korea does not mean that FDI had no impact on the pattern of trade. The asymmetry of FDI determinants for outflows and inflows in Korea may have resulted in different impacts on Korea’s trade pattern. If so, the overall impact on IIT in Korea may have been the result of two different impacts of FDI compromising

Table 7 Correlation coefficients of intra-industry trade and intra-industry FDI in Korean manufacturing industries

Industry	Correlation coefficient (<i>t</i> -value)
All manufacturing	0.085
Food	0.007
Textiles and clothing	0.144
Paper and lumber	-0.059
Chemicals and petroleum	0.006
Ceramics	0.191
Metals	0.180
Machinery	0.104
Electrical and electronics	0.392
Transport equipment	-0.198
Other manufactures	-0.308

each other. In one study of Korean outward FDI in ASEAN, Seo et al. (2000) found that outward FDI flows consistently had a negative impact on bilateral intra-industry trade. The increased IIT in the bilateral trade between Korea and the ASEAN countries was primarily due to income factors, as often hypothesised in the IIT literature.

Conclusion

In this paper, we describe the patterns of outward and inward FDI and their impacts on recent patterns of trade in Korea.

In Korea, there have been relatively rapid increases of outward FDI flows and, recently, inward FDI flows. Different industries show different patterns of outward and inward FDI flows. Capital-intensive and technology-intensive industries account for the major share of inward FDI flows. Labour-intensive industries dominate outward FDI flows, although capital-intensive and technology-intensive industries such as the electrical and electronics industry and the transport equipment industry have increased their share. Our findings suggest that there is a vacuum in relatively labour-intensive manufacturing industries, which have rushed out to countries offering cheap production costs and failed to develop strong location advantages for MNE

operations in Korea. This suggests that the Korean government should pay more attention to design, high value adding labour skills and craftsmanship, with a view to attracting more FDI.

By utilising the 'extended globalisation' concept of Greenaway et al. (2001), we found that in Korea there is no significantly positive overall relationship between IIT and IIFDI. Globalisation of the Korean economy has so far relied on intra-industry trade rather than international production through FDI. It is possible that consideration of aggregated FDI flows, as adopted in this paper, might have neutralised the overall impact of FDI on the pattern of intra-industry trade. This requires immediate research, along with more detailed industry case studies and firm-level studies on this issue.

Table A1 Linkage between industry classification and SITC

Sector	Industry	SITC (Rev. 1)
Food	Food, beverage & tobacco	012, 013, 022, 023, 024, 032, 046, 047, 048, 053, 055, 061, 062, 073, 091, 099, 11, 122, 4
Textiles & clothing	Textile products, including fabrics & fibre yarn; wearing apparel, leather & fur; footwear	61, 65 ^a , 83, 84, 85 ^b
Paper & lumber	Wood products including lumber & plywood; furniture; paper & paper products including pulp; printing	243, 25, 63, 64, 82, 892
Chemicals (incl. petroleum)	Chemicals, including medicine, cosmetics & fertilisers; rubber, plastic, tire & tube, petroleum (refining) & petroleum product; coal products	231 ^c , 266, 51, 53, 54, 55, 56, 57, 332, 52
Ceramics	Ceramics; primary glass; cement	661, 662, 663, 664, 665, 666
Metals	Iron & steel (products); miscellaneous non-ferrous including ingot; structure metal & metal products	67, 68, 69, 812 ^d
Machinery	Power generating machine & electrical appliances	71(-711) ^e , 951
Electrical & electronics	communication equipment, electrical parts & miscellaneous machinery	72
Transport equipment	Transport equipment including motor vehicle & shipbuilding	711 ^f , 73
Other manufactures	Precision instrument; other manufactures	667, 861, 863, 864, 891 ^g , 894, 895, 897, 899

Notes: SITC = standard industrial trade classification

a SITC 65 division also includes SITC 6538 subgroup.

b SITC 851 group also includes SITC 85101 item.

c SITC 2312 subgroup represents all of SITC 231 group.

d SITC 8122 subgroup is included in SITC 812 group.

e SITC 71 division includes SITC 7194 subgroup, excluding SITC 711 group.

f SITC 711 group also includes SITC 7111 subgroup.

g SITC 891 group also includes SITC 8911 subgroup.

Source: Seo (1997).

Notes

- 1 See, for example, Helpman and Krugman (1985).
- 2 In this paper MNEs are treated as equal to FDI.
- 3 In the new trade theory, the level of intra-industry trade is higher among similar countries than among countries that are not so similar.
- 4 The situation where only MNEs exist, because firm-level fixed costs are lower than trade costs. The size of the effect depends on the similarity between countries in size and factor endowments.
- 5 To a lesser extent, Gopinath and Vasavada (1999) also showed that foreign affiliate sales meagrely substitute for exports in the US food processing industry.
- 6 However, it does not completely contradict the ensuing empirical observations of FDI and intra-industry trade because there is no causal relationship explicitly mentioned between the two. In fact, these models show that intra-industry trade exists even without MNEs. These two phenomena may not be mutually exclusive, and thus the existence of MNEs may or may not affect intra-industry trade.
- 7 This model is often called the 'flying-geese model' of FDI or the 'modified product cycle model'.
- 8 The term 'new' wave comes from significant changes in the determinants of FDI and the increased importance of the networking abilities of MNEs.
- 9 For example, due to the financing advantage of MNEs, as they do not rely on domestic capital sources alone. See Caves (1996).
- 10 Some reservations are required in interpreting the tables because manufacturing industries have been reclassified throughout the paper according to the availability of FDI statistics for the entire period. In particular, the petroleum industry category is incorporated into the chemicals industry category. Appendix Table A1 shows the reclassification.
- 11 However, in both cases intra-firm trade would increase.
- 12 See address by the President of Korea at <http://www.mofe.go.kr/ENGLISH/DATA/E_POLICY_ISSUE/9806eb_16>.
- 13 However, during the 1994–96 period the financial and services sector attracted around 50 per cent of total inward FDI flows to Korea.
- 14 This was also the case for inward FDI in 'Other manufactures' during the period.
- 15 Modified forms of the standard Grubel–Lloyd intra-industry index are used for different cases of intra-industry measures other than trade. For example, Ekholm (2002) and Markusen and Maskus (2002) measure the extent of the intra-industry affiliate production using the Grubel–Lloyd index.
- 16 It is more desirable to use foreign affiliate sales as there are conceptual mismatches between trade and MNEs (Markusen and Maskus 2002). However, some other studies – Grosse and Trevino (1996) and Hejazi and Safarian (1999) – used FDI data. They

usually found that there were no significant differences in econometric results between models with foreign affiliate sales and FDI. Furthermore, no data on foreign affiliate sales are available for Korea.

- 17 The IIFDI of 'other manufactures' had an IIFDI index value of 88.30 in 1998, which is far above the manufacturing average.
- 18 The index value for the machinery industry was also below average in seven out of the 11 years considered in this paper.

References

- Baldwin, R. and Ottaviano, G. (2001) 'Multiproduct multinationals and reciprocal FDI dumping', *Journal of International Economics* 54, 429–48.
- Caves, R. (1996) *Multinational Enterprises and Economic Analysis*, Cambridge: Cambridge University Press (second edition).
- Dunning, J. (1993) *Multinational Enterprises and the Global Economy*, Workingham: Addison-Wesley.
- Ekholm, K. (2002) 'Factor endowments and intra-industry affiliate production by multinational enterprises', In Lloyd, P.J. and Lee, H.H. (eds), *Frontiers of Research in Intra-Industry Trade*, Basingstoke: Palgrave (Chapter 12).
- Gopinath, M., Pick, D. and Vasavada, U. (1999) 'The economics of foreign direct investment and trade with an application to the US food processing industry', *American Journal of Agricultural Economics* 81, 442–52.
- Greenaway, David, Lloyd, Peter and Milner, Chris (2001) 'Intra-industry foreign direct investment and trade flows: new measures of globalisation of production'. In Cheng, L. K. and Kierzkowski, H. (eds), *Global Production and Trade in East Asia*, Norwell MA: Kluwer Publishers (Chapter 6).
- Grosse, R. and Trevino, L. (1996) Foreign direct investment in the United States: an analysis by country of origin, *Journal of International Business Studies* 27, 139–155.
- Grubel, H.G. and Lloyd, P. (1975) *Intra-Industry Trade*, London: Macmillan.
- Hejazi, W. and Safarian, A.E. (1999) Modelling links between Canadian trade and foreign direct investment, *Industry Canada Research Publications*.
- Helpman, E. and Krugman, P. (1985) *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition and the International Economy*, Cambridge: MIT Press.
- Kim, J.D. (1997) 'Impact of foreign direct investment liberalisation: the case of Korea, *KIEP Working Paper 97-1*, Korea Institute for International Economic Policy.
- Kojima, K. (1975) *Direct Foreign Investment: A Japanese Model of Multinational Business Operations*, London: Cromm Helm.
- Kojima, K. (1985) 'The allocation of Japanese direct investment and its evolution in Asia, *Hitotsubashi Journal of Economics* 26, 99–116.
- Lee, H.G. (1994) *Foreign Direct Investment and Investment Policies*, Seoul: Korea Development Institute.

- Lee, K. (1995) 'Structural changes in the Korean economy and Korean investment in China and ASEAN'. In La Croix, S., Plummer, M. and Lee, K. (eds), *Emerging Patterns of East Asian Investment in China from Korea, Taiwan and Hong Kong*. New York: M.E. Sharpe (an East Asia Gate Book).
- Markusen, J. (1995) 'The boundaries of multinational enterprises and the theory of international trade', *Journal of Economic Perspectives* 9, 169–89.
- Markusen, J. and Maskus, K.E. (2002) 'A unified approach to intra-industry trade and direct foreign investment'. In Lloyd, P.J. and Lee, H.H. (eds), *Frontiers of Research in Intra-Industry Trade*. Palgrave: Basingstoke (Chapter 11).
- Markusen, J. and Vernables, A.J. (1998) 'Multinational firms and the new trade theory', *Journal of International Economics* 46, 183–203.
- Markusen, J. and Vernables, A.J. (2000) 'The theory of endowment, intra-industry trade and multinational trade', *Journal of International Economics* 52, 209–34.
- Mundell, R. (1957) 'International trade and factor mobility', *American Economic Review* 47, 321–35.
- Park, K.H. and Lim, Y.T. (2000) 'External factors inducing Korea overseas direct investment', *The Journal of the Korean Economy* 1:1, 191–205.
- Petri, P. (1995) 'The interdependence of trade and investment in the Pacific'. In Chen, E.K. and Drysdale, P. (eds), *Corporate Links and Foreign Direct Investment in Asia and the Pacific*. Sydney: Harper Educational.
- Seo, J.S. (1997) 'Dynamics of comparative advantage and foreign direct investment in Korea and Taiwan: an analysis of the relationship between FDI and trade', Unpublished PhD thesis, University of New South Wales, Sydney, Australia.
- Seo, J.S. (1999) 'Recent trends and development of inward foreign direct investment in the crisis ridden Korea'. In Park, D.S. and Suh, C.S. (eds), *Linking Korea and Australasia for the New Century*. Proceedings of the First Korean Studies Association of Australasia Conference, 27–28 September 1999, Sydney.
- Seo, J.S., Lee, K. and Suh, C.S. (2000) 'Foreign direct investment and its impact on the bilateral intra-industry trade: a Korean case study with ASEAN'. In Enderwick, P. et al. (eds), *The Role of Multinational Enterprises in the New Millennium*. Proceedings of the 2000 Annual Conference, Australia–New Zealand International Business Academy, Auckland, New Zealand.
- Simon, D.F. and Jun, Y.W. (1995) 'Technological change, foreign investment and the new strategic thrust of Japanese firms in the Asia-Pacific'. In Chen, E.K. and Drysdale, P. (eds), *Corporate Links and Foreign Direct Investment in Asia and the Pacific*. Sydney: Harper Educational.
- Suh, C.S. and Seo, J.S. (1998) 'Trends in the pattern of foreign direct investment: the case of the Asia-Pacific region'. In A. Levy-Livernore (ed.), *Handbook on the Globalisation of the World Economy*. Cheltenham: Edward Elgar.
- UNCTAD (United Nations Conference on Trade and Development) (1997) *World Investment Report 1997*. New York: United Nations.
- UNCTAD (1999), *World Investment Report 1999: Foreign Direct Investment and the Challenge of Development*, New York: United Nations.

Previous *Pacific Economic Papers*

- 328 The effects of the euro on financial markets, activity and structure
Werner Studener, June 2002
- 327 The compatibility of capital controls and financial development: a selective survey
and empirical evidence
Menzie D. Chinn, May 2002
- 326 The Basel Process and regional harmonisation in Asia
Shinichi Yoshikuni, April 2002
- 325 Trends in global finance, markets and institutions: some implications for
developments in the Asian Region
William E. Alexander, March 2002
- 324 The IMF and East Asia
Gordon de Brouwer, February 2002
- 323 APEC and the new economy
Mari Pangestu and Sung-hoon Park, January 2002
- 322 East Asian steel projections for the 1990s revisited
Ben Garvey and Peter Drysdale, December 2001
- 321 Evidence of shifts in the determinants of the structure of Japanese manufacturing
trade, 1970–95
Peter Drysdale and Ligang Song, November 2001
- 320 The services content of Japanese trade
Kozo Kiyota, October 2001
- 319 Changes in the Japanese food sector
Ray Trewin et al., September 2001
- 318 The changing economic performance and political significance of Japan's agricultural
cooperatives
Yoshihisa Godo, August 2001
- 317 Bank and corporate restructuring in crisis-affected East Asia: from systemic collapse
to reconstruction
Masahiro Kawai, July 2001
- 316 Hot and spicy: ups and downs on the price floor and ceiling at Japanese
supermarkets
Kenn Ariga, June 2001

- 315 China's admittance to the WTO and industrial structural adjustment in the world economy
Christopher Findlay, May 2001
- 314 'Japan Inc.' in the agricultural sector: reform or regression?
Aurelia George Mulgan, April 2001
- 313 Encouraging 'democracy' in a Cold War climate: the dual-platform policy approach of Evatt and Labor toward the allied occupation
Christine de Matos, March 2001
- 312 Managing capital flows: a distortions approach
Dominic Wilson, February 2001
- 311 Old issues in new regionalism
Christopher Findlay, January 2001
- 310 Trade conflicts between Japan and the United States over market access: the case of automobiles and automotive parts
Masao Satake, December 2000
- 309 Subregional trading arrangements among APEC economies: managing diversity in the Asia Pacific
Andrew Elek, November 2000
- 308 Weathering the Asian crisis: the role of China
Yongzheng Yang and Rod Tyers, October 2000
- 307 The internationalisation of the yen: essential issues overlooked
Tetsuji Murase, September 2000
- 306 Japan's local governance at the crossroads: the third wave of reform
Purnendra Jain, August 2000
- 305 Some key issues for the East Asian food sector
M. Honma, R. Trewin, M. Bosworth, R. Stringer and Y. Godo, July 2000
(special volume)
- 304 Food embargoes against China: their likelihood and potential consequences
Yongzheng Yang, June 2000
- 303 Foreign direct investment and intra-industry trade – the case of the United States
Tina Yiping Chen, May 2000
- 302 Implications of recent Japanese legal reforms
Leon Wolff, Veronica Taylor and Akiyoshi Horiuchi, April 2000
(special volume)

- 301 Toward reform and transparency in Japanese policymaking processes
J.A.A. Stockwin, Jennifer Amyx and Gregory Noble, March 2000
(special volume)
- 300 A way forward for Japanese agriculture?
Masayoshi Homna, Ray Trewin, Jennifer Amyx and Allan Rae, February 2000
(special volume)
- 299 Japanese foreign direct investment in the world economy 1951–1997
Roger Farrell, January 2000
- 298 The genesis of APEC: Australian–Japanese political initiatives
Takashi Terada, December 1999
- 297 Is shutting Krugman’s ‘liquidity trap’ the answer to Japan’s problems?
Dominic Wilson, November 1999
- 296 Japanese government–business collaboration and the operations of Japanese corporations in Asia: A telecommunications case
Hidetaka Yoshimatsu, October 1999
- 295 Free trade champion? Australian views of the US crusade against Japan
Julia Lowell, September 1999

Annual subscription rate for twelve issues:

Individuals A\$65.00
Institutions A\$110.00

Cost for single issues:

A\$15.00
A\$10.00 (Students)

No postage required within Australia

Available from: Publications Department
Australia–Japan Research Centre
Asia Pacific School of Economics and Management
The Australian National University
Canberra ACT 0200, Australia
Facsimile: (61 2) 6125 0767
Telephone: (61 2) 6125 3780
E-mail: ajrc@anu.edu.au
URL: <http://ajrcnet.anu.edu.au/>