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Trade – the Case of the United States**



Tina Yiping Chen

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Australian National University

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FOREIGN DIRECT INVESTMENT AND INTRA-INDUSTRY TRADE – THE CASE OF THE UNITED STATES

The possible link between intra-industry trade (IIT) and foreign direct investment (FDI) has attracted a great deal of attention from some economists, but there has been little empirical research on the subject. There are two schools of thought on how FDI might cause IIT. One theory is that MNEs mostly produce differentiated goods, while the second theory posits that most intra-industry trade is intra-firm trade from MNEs. This paper uses data on US firms from the US Department of Commerce to examine the link between FDI and IIT. The data shows that US intra-firm trade is growing hand in hand with US FDI, and suggests that there may be a causal linkage. By using Spearman's correlation analysis, this paper shows that the direct linkage between US FDI and IIT seems positive and strong. However, the theory that intra-firm trade is causing a link between FDI and IIT does not seem to be supported by a regional breakdown of the data.

Introduction

The issue of whether intra-industry trade (IIT) is closely related to foreign direct investment (FDI) has attracted a great deal of attention from some economists. But there has been little theoretical analysis of the linkage, and even less empirical research. Some researchers, observing a link between the investment of multinational enterprises (MNEs) and intra-firm trade, have used intra-firm trade to show the relationship between FDI and IIT. This paper examines survey data on US firms from US Department of Commerce, which suggests there is a strong link between intra-firm trade and FDI of US MNEs. Data restrictions make it difficult to calculate the proportion of IIT that is intra-firm trade. Instead this paper employs correlation analysis to directly examine whether there is empirical evidence for a link between FDI and IIT. The paper uses these results to reassess whether the regional distribution of intra-firm trade suggests intra-firm trade is responsible for this link.

Theoretical explanations of the linkage between FDI and IIT

There are two schools of thought on how FDI might cause IIT. One school believes that most goods produced by MNEs are differentiated – that is firms engage in trade producing horizontally or vertically differentiated goods to meet different incomes or tastes. The second



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theory is that most intra-industry trade is intra-firm trade from MNEs, who locate different stages of the production process in different countries.

The OLI paradigm and differentiated goods

Dunning (1981) proposed an 'eclectic' approach known as 'the OLI paradigm' to explain the motives behind foreign direct investment. According to this approach, foreign direct investment is likely when three conditions hold. First, the firm must enjoy certain *ownership* advantages in a foreign market and have a competitive advantage over local producers. This advantage may take the form of technical know-how or patent protection. The second condition is the existence of *locational* advantages in producing in the foreign market, including access to raw materials, the availability of relatively cheap labour or the ability to avoid import restrictions. The third condition is the opportunity to exploit ownership and locational advantages through *internalisation* gains from accessing internal markets rather than relying on arms-length arrangements.

This framework links FDI and IIT by assuming that the goods being produced by MNEs are differentiated. When such goods are produced, the firm's ownership advantage may be in the form of a brand image (Greenaway and Milner 1986). Locational advantages in this case are likely to come from differences in factor prices or the ability to respond more readily to changes in tastes by being in the foreign market. Internalisation reduces uncertainty and encourages trade and, in the case of differentiated goods, might also facilitate the exploitation of vertical economies of scale.

Intra-firm and intra-industry trade

Agmon (1979) argues that the factors that are likely to result in the emergence of MNEs are the same factors that encourage intra-industry trade, therefore the two are complementary. MacCharles (1987) sees FDI followed by intra-industry trade as a way to exploit firm-specific advantages as well as a means of acquiring information about foreign markets. In this setting, the positive linkage between FDI and IIT is intuitively observed. Management expertise and the knowledge MNEs have about products and production technologies flows within the firm and provides foreign subsidiaries with competitive advantages over their counterparts in host countries. MNEs are able to alter production through access to the products of affiliates and



the marketing channels of parents. This international allocation of resources reduces the firm's costs and gives subsidiaries access to export markets, creating international intra-firm and intra-industry trade and resource relocation.

This type of trade occurs because of production and marketing cost advantages that are specific to the location (Greenaway and Milner 1986). Lower marketing costs come from greater access to local consumers, an ability to respond to changes in tastes and preferences, as well as lower freight costs. The production cost advantage relates to economies of scale and scope. There may be an optimal plant size for a given number of varieties which necessitates specialisation by varieties. Plants are often established as specialist suppliers of components to affiliates, and production is likely to reflect comparative advantage (that is, parent companies produce high-quality varieties in capital-abundant countries and their subsidiaries specialise in low-quality varieties in labour-abundant countries). The vertical specialisation of production activities across nations allows the firm to overcome the problems of small-scale production and diversity of activities that would exist if plants produced for the domestic market alone. Because subsidiaries owned by multinationals in host countries are more efficient and competitive than local firms, much of the host country's international trade is intra-firm trade of products and components.

Empirical work on the linkage between FDI and IIT

While the linkages between FDI, intra-firm and intra-industry trade appear theoretically viable, the empirical evidence is very limited.

Baldwin (1979) measured the determinants of FDI in a study of 27 industries in 30 countries, and found that product differentiation does affect FDI. On the other hand, Norman and Dunning (1984) come to no firm conclusion about whether intra-industry trade and FDI should be viewed as substitutes or complements, and Markusen (1983) finds a variety of circumstances in which factor movements and commodity trade are likely to be complements rather than substitutes. Wickham and Thompson's (1989) study finds the activities of multinational enterprises (MNEs) not to be a significant determinant of IIT.

The relationship between intra-firm and intra-industry trade is less difficult to prove. Bonturi and Fukasaku (1993) find that intra-industry trade in manufactured goods among developed countries often takes the form of intra-firm trade. Other case studies provide evidence on intra-firm trade in particular industries where intra-industry trade is prevalent (Casson et



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al. 1986). When Caves (1981) included a proxy that directly measured intra-firm trade in a study of intra-industry trade in a multi-country and multi-industry study in the principal OECD countries, intra-firm trade turns out to be positively and significantly related to the pattern of intra-industry trade. Based on the work of Hirsch (1976) and Agmon and Hirsh (1979), Mainardi (1986) argues that any intra-firm trade is likely to be intra-industry trade when differentiated products are being produced.

Data availability and limitations

Empirical study of the linkage between FDI and IIT is mainly hampered by the relative scarcity of detailed data linking FDI and trade. The only systematic information available is from the United States Department of Commerce on FDI and the intra-firm trade of American firms.

In the United States, a company is defined as an affiliate if its parent owns 10 per cent or more of its voting stock, and as a subsidiary or majority-owned foreign affiliate (MOFA) if the parent owns more than 50 per cent of the voting stock. Benchmark surveys (US Department of Commerce 1977, 1982, 1987 and 1994) provide disaggregated data at a country-level on the foreign affiliates of US companies. Annual surveys are also available, but for confidentiality reasons, these surveys are more limited in coverage.

The pattern of US foreign direct investment

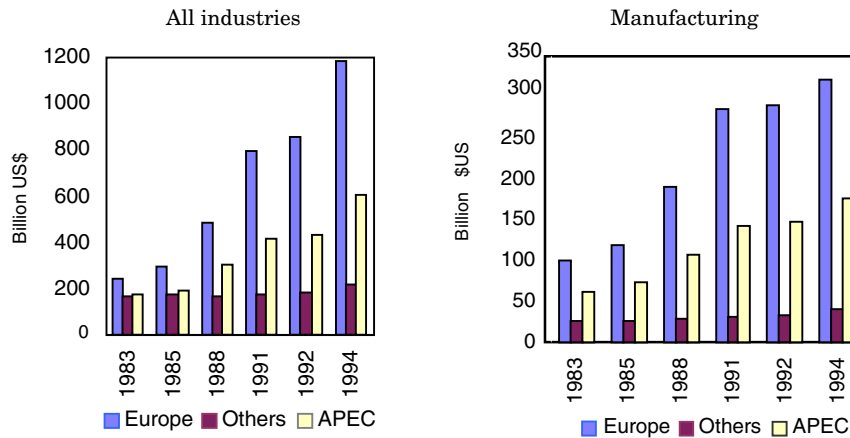
Until World War I, nearly all investment abroad was portfolio (financial) investment (Sodersten and Reed 1994). According to Henderson et al. (1997), US investment was different: Americans firms were involved in foreign direct investment much earlier.

The United States began to emerge as a major source of direct investment after World War I, as successful American industrialists began to establish offshore operations. Following World War II, the United States became the world's primary supplier of international finance, including official loans, gifts and direct investment. American firms made major contributions to postwar industrial reconstruction. By 1960 the United States was supplying approximately two-thirds of all international investment. By the 1980s Europe and Japan had also become major outward investors, and in the 1990s, with the fall of the Soviet Union and the opening up of developing economies, FDI became the main instrument for global industrialisation.

US FDI in terms of the total assets of affiliates has increased substantially. The rise is more pronounced for investment as a whole than for the manufacturing sector, and is particularly



Figure 1 Total assets of affiliates, region by destination, 1983–94



Notes: Europe is the geographical region; others is the rest of the world; APEC is the original 18 founding members.

Source: Author's construction using data from 'Total assets of affiliates, of majority-owned non-bank foreign affiliates of non-bank U.S. parents', in *U.S. Direct Investment Abroad*, US Department of Commerce, various years.

strong in Europe (Figure 1). The share of manufacturing in total US foreign direct investment rose from 35 per cent in 1983 to 38 per cent in 1988, but then fell to 34 per cent in 1994. This reflected the shift in investment toward manufacturing from other industries in the 1980s and then toward services, such as the wholesale and finance sectors, in the 1990s (Table 1). The relative decline in manufacturing investment was more significant in Europe (falling from 40 per cent in 1983 to 27 per cent in 1994) than in APEC (from 40 per cent in 1983 to 34 per cent), developed APEC (from 39 per cent to 35 per cent) and developing East Asia (from 30 per cent to 29 per cent). Totally owned affiliates and majority-owned foreign affiliates (MOFAs) shared the same pattern.

European and APEC economies account for a major part of total US foreign direct investment and their shares have increased over time. Europe received approximately 40 per cent of all US foreign direct investment from MOFAs in 1983 (Figure 2). APEC accounted for around 30 per cent of this investment and the rest of the world received the remaining 30 per cent. The picture started to change in the late 1980s, and by 1994 Europe's share of US direct investment had increased to almost 55 per cent. APEC's share rose to 35 per cent and the rest

**Table 1 US FDI in manufacturing as a percentage of total FDI, 1983–94**

	1983	1985	1988	1991	1992	1994
Totally owned						
All countries	35.03	36.49	37.93	35.99	33.87	28.86
Europe	40.46	41.54	40.77	36.80	33.65	26.84
APEC	39.97	42.37	40.58	39.52	38.18	34.21
Canada, Australia, Japan	39.10	41.94	39.42	38.16	37.72	34.77
East Asian developing	30.44	32.38	38.99	38.47	35.49	29.37
Others	20.55	19.76	23.53	22.82	23.39	22.63
Majority-owned						
All countries	32.39	33.19	34.15	33.30	32.30	26.87
Europe	40.96	40.41	39.06	36.11	34.03	27.18
APEC	36.22	38.52	35.08	34.61	34.66	29.14
Canada, Australia, Japan	36.09	38.67	33.93	33.53	33.23	28.23
East Asian developing	26.30	28.28	31.58	31.41	32.32	26.04
Others	15.84	14.91	17.60	17.40	18.72	18.85

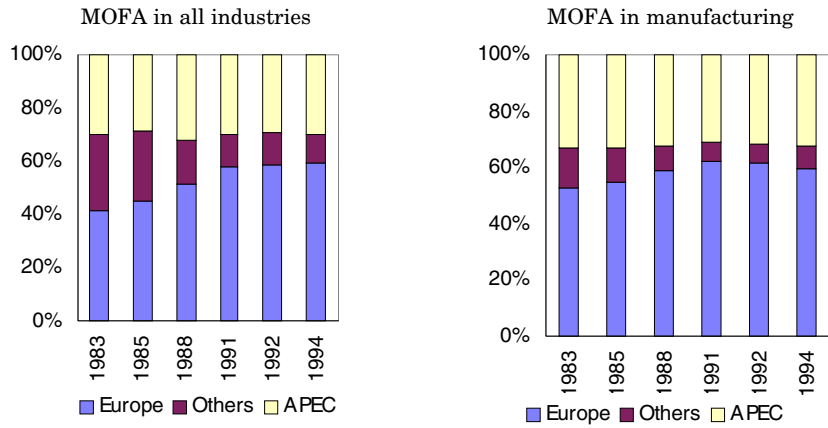
Source: Author's calculation based on data from 'Total assets of affiliates of total and majority-owned non-bank foreign affiliates of non-bank US parents', in *U.S. Direct Investment Abroad*, US Department of Commerce, various years.

of the world received only 10 per cent. The change was not as pronounced in the manufacturing industry. Europe initially received more than half of the manufacturing investment of US MOFAs. This investment increased significantly over the 1980s and, despite a slight decrease in the early 1990s, by 1994 Europe's share rose to approximately 60 per cent. There has been a large decrease in manufacturing US investment in the rest of the world, but no significant change in APEC, which receives approximately 30 per cent of this investment.

A breakdown of the data for APEC and Europe shows there are regional differences in US direct investment. Investment in developed APEC, both in all industries and in manufacturing, has decreased significantly while it has increased markedly in developing East Asian economies, especially in the early 1990s (Figure 3). This may have been because of the strong economic prospects of developing East Asia or because labour-intensive operations were transferred to East and Southeast Asia after the appreciation of the yen and rising costs of investing in Japan. Another factor may have been the investment boom in China (Petri 1995).

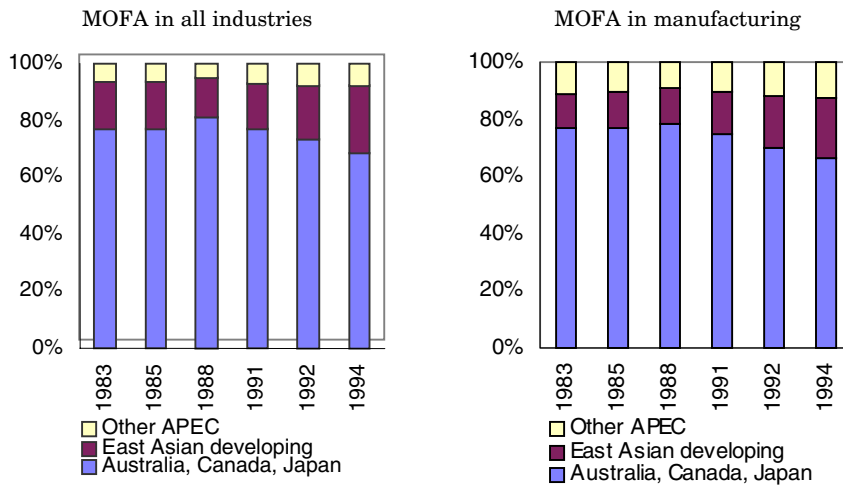


Figure 2 US foreign direct investment by regions, 1983–94



Source: Authors' construction using data from 'Total assets of affiliates, country by industry of majority-owned non-bank foreign affiliates of non-bank US parents', in *U.S. Direct Investment Abroad*, US Department of Commerce, various years.

Figure 3 US foreign direct investment in APEC, 1983–94



Source: See Figure 2.



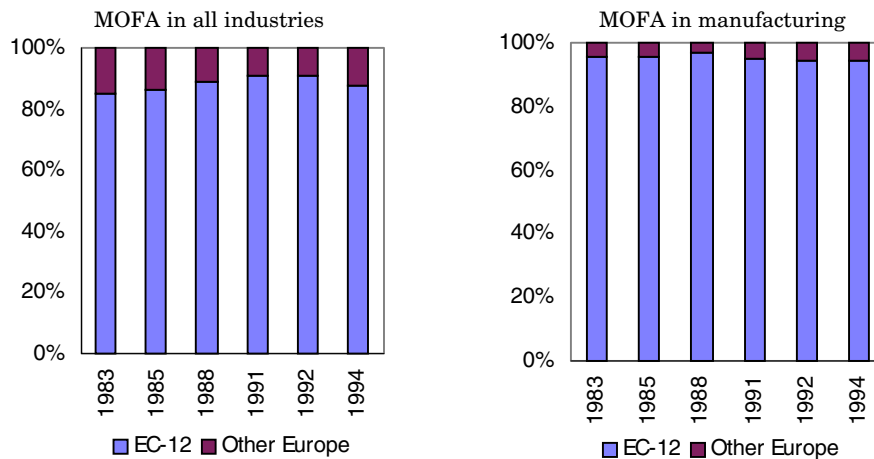
US direct investment in Europe has mainly been in the EC-12 (Figure 4). More than 80 per cent of total investment and 95 per cent of manufacturing investment from MOFAs has gone to these countries. Overall this trend strengthened in the 1980s and early 1990s, and then declined slightly in 1994. Manufacturing investment to the EC-12 increased slightly in 1988 and then decreased to fall slightly short of the 1983 level by 1994.

FDI and intra-firm trade

Sales by US affiliates have been increasingly directed to local markets. Between 1983 and 1994, local sales rose from 65 per cent to 67 per cent of all sales, while sales to other foreign countries dropped slightly from 24 per cent to 23 per cent of total sales (Table 2). In APEC the share of local sales in total sales (71 per cent) is higher than in Europe (64 per cent), and the share of sales to other countries (11 per cent) is much lower than in Europe (32 per cent). Petri (1995) observed highly visible American export platforms in developing East Asia in the 1970s, but the data show that sales have increasingly targeted local markets. For developing East Asia, local sales were low in 1983 (38 per cent) but increased to 53 per cent in 1994, while sales to foreign countries fell from 34 per cent in 1983 to 29 per cent in 1994.

Another characteristic of US direct investment is that substantial trade takes place within the MNE. Intra-firm trade has been increasing (Table 3). The share of intra-firm trade in all US trade is also substantial – 26 per cent on average for exports and 16 per cent on average for imports over the period 1983–94 (Table 4).

As shown in Table 5, most US intra-firm trade is with APEC economies – 54 per cent for exports and 64 per cent for imports in 1994 – although APEC's share has declined. In 1994 Canada accounted for approximately 60 per cent of APEC's total US intra-firm trade, and Canada, Japan and Mexico accounted for more than 90 per cent of this trade.

Figure 4 US foreign direct investment in Europe, 1983–94

Source: See Figure 2.

Table 2 Sales by affiliates, region of affiliate by destination, 1983–94

	1983	1985	1987	1988	1991	1992	1994
Share of local sales in total sales							
All countries	64.76	63.83	66.14	65.34	66.35	65.91	66.91
Europe	62.29	61.65	63.40	61.80	64.27	64.00	64.77
APEC	72.53	69.50	71.44	71.41	72.25	71.04	70.51
East Asian developing	38.48	34.47	38.53	41.76	n.a.	51.78	52.58
Others	57.42	58.18	64.67	65.15	58.00	59.52	65.57
Share of foreign sales in total sales							
All countries	24.36	23.50	22.96	23.72	23.55	24.04	22.61
Europe	33.77	33.25	32.05	33.23	31.73	32.21	31.18
APEC	10.07	10.18	9.41	9.71	9.82	10.60	10.91
East Asian developing	34.05	36.45	32.42	34.38	27.91	n.a.	28.74
Others	23.68	20.70	15.81	16.73	19.28	18.91	16.30

Note: n.a. = not available.

Source: Author's construction using data on 'Sales by affiliates, country of affiliates by destination of majority-owned non-bank foreign affiliates of non-bank US parents', in *U.S. Direct Investment Abroad*, US Department of Commerce, various years.

Table 3 Intra-firm trade in US MNE trade, 1983–94

	A	B	B/A
US exports shipped by US parents to affiliates			
	Total MNE exports (million US\$)	To affiliates (million US\$)	Share (per cent)
1983	146212	49397	33.8
1985	164138	61852	37.7
1987	166425	66414	39.9
1988	199704	79378	39.7
1991	239674	97124	40.5
1992	245475	104679	42.6
1994	317251	134311	42.3
US imports shipped by affiliates to US parents			
	Total MNE imports (million US\$)	From affiliates (million US\$)	Share (per cent)
1983	115135	43632	37.9
1985	139416	54027	38.8
1987	150865	60379	40.0
1988	163117	69491	42.6
1991	193343	83483	43.2
1992	199858	92614	46.3
1994	240617	119438	49.6

Source: Author's calculation using data on 'US exports (imports) associated with US parents and their foreign affiliates of non-bank US parents' in *U.S. Direct Investment Abroad*, US Department of Commerce, various years.

Table 4 Intra-firm trade in total US trade, 1983–94

	Total exports (million US\$)	Intra-firm exports (million US\$)	Share (per cent)	Total imports (million US\$)	Intra-firm imports (million US\$)	Share (per cent)
1983	194620	49397	25.38	267971	43632	16.28
1985	205239	61852	30.14	358705	54027	15.06
1987	243682	66414	27.25	422407	60379	14.29
1988	304886	79378	26.04	459017	69491	15.14
1991	397705	97124	24.42	507020	83483	16.47
1992	420812	104679	24.88	551591	92614	16.79
1994	476190	134311	28.21	687096	119438	17.38

Sources: For intra-firm trade data, see Table 3; Total exports and imports are from UN commodity trade data in International Economic Data Bank, Australian National University.

Table 5 Regional distribution of US intra-firm trade, 1983–94 (per cent)

	1983	1985	1987	1988	1991	1992	1994
Exports							
All countries	100	100	100	100	100	100	100
Europe	31.39	29.57	29.80	31.26	32.65	32.52	30.69
Others	6.88	5.81	5.29	4.89	13.94	14.80	15.58
APEC	61.73	64.62	64.91	63.85	53.42	52.67	53.74
APEC							
APEC	100	100	100	100	100	100	100
Canada	66.95	68.84	65.34	62.47	64.20	64.16	58.71
Japan	5.55	6.46	8.32	9.82	15.25	14.17	13.93
Mexico	7.25	8.63	9.40	9.48	17.38	19.28	19.82
Imports							
All countries	100	100	100	100	100	100	100
Europe	12.16	13.62	17.31	16.84	15.42	15.40	15.13
Others	15.88	10.98	8.97	9.10	19.20	21.28	20.70
APEC	71.96	75.40	73.72	74.06	65.38	63.31	64.16
APEC							
APEC	100	100	100	100	100	100	100
Canada	67.53	65.33	60.22	62.27	66.92	67.63	68.16
Japan	2.25	3.05	4.69	4.41	3.63	3.72	4.07
Mexico	6.25	8.52	10.57	10.69	16.96	19.93	22.47

Source: Author's calculation using data on 'US Merchandise trade with affiliates, by country of affiliate of majority-owned non-bank foreign affiliates of non-bank US parents', in *U.S. Direct Investment Abroad*, US Department of Commerce, various years.

US intra-firm trade is mainly concentrated in manufacturing (Table 6). Intra-firm exports have been declining and imports have increased. Manufacturing intra-firm trade is mainly in three sectors: transportation equipment, machinery and chemicals.

The tables show that the volume and structure of US direct investment abroad has changed dramatically since 1983. Investment in Europe has been stronger than in APEC and the share of investment in manufacturing has declined in both regions. Affiliate sales have increasingly concentrated on local markets and there is no evidence of export platforms in developing East Asia.¹ It can be observed that as US direct investment abroad has increased, US intra-firm trade has increased. The proportion of US intra-firm trade in US MNE trade is now substantial.

Table 6 Sectoral structure of US intra-firm trade, 1983–94 (per cent)

	1983	1985	1987	1988	1991	1992	1994
Exports							
All industries	100	100	100	100	100	100	100
Petroleum	2.89	2.56	2.04	1.54	2.22	1.77	1.45
Manufacturing	69.40	70.48	69.76	68.29	65.69	66.36	59.46
Food and kindred products	1.57	1.12	1.23	2.01	1.39	1.86	1.55
Chemicals and allied products	7.87	6.91	8.10	7.51	7.53	7.58	7.26
Primary and fabricated metals	1.25	1.47	1.24	1.48	1.39	1.31	1.22
Machinery, except electrical	11.04	11.08	10.26	9.89	12.38	12.07	10.31
Electric and electronic equipment	10.39	8.85	9.70	8.73	8.89	8.76	8.26
Transportation equipment	29.41	34.35	32.69	31.97	25.67	25.54	23.36
Other manufacturing	7.87	6.60	6.55	6.69	8.44	9.25	7.50
Wholesale trade	25.69	25.43	26.91	28.78	30.41	30.07	36.57
Other industries	2.02	1.64	1.29	1.38	1.68	1.79	2.52
Imports							
All industries	100	100	100	100	100	100	100
Petroleum	24.91	20.83	13.70	9.77	11.73	10.37	6.62
Manufacturing	66.39	70.89	74.27	78.52	77.92	79.15	82.86
Food and kindred products	0.89	1.15	1.00	0.93	1.29	1.35	1.51
Chemicals and allied products	4.04	3.40	3.84	3.88	4.40	4.42	4.09
Primary and fabricated metals	0.91	1.08	1.69	2.15	0.98	1.03	1.16
Machinery, except electrical	6.78	7.76	11.63	13.22	16.53	16.35	18.28
Electric and electronic equipment	13.60	13.62	13.73	13.17	12.41	13.40	12.33
Transportation equipment	35.66	39.37	37.16	39.26	35.37	35.56	39.34
Other manufacturing	4.51	4.50	5.22	5.90	6.94	7.04	6.15
Wholesale trade	6.45	6.63	10.08	9.92	9.25	9.28	9.83
Other industries	2.26	1.65	1.96	1.79	1.10	1.20	0.69

Source: Author's calculation using data on 'US merchandise trade with affiliates by industry of affiliates of majority-owned non-bank foreign affiliates of non-bank US parents', in *U.S. Direct Investment Abroad*, US Department of Commerce, various years.

Testing the relationship between FDI and IIT

The positive relationship between US direct investment and US intra-firm trade seems clear. The data on intra-firm trade could be used to prove a direct link between intra-industry trade and FDI if most IIT is in differentiated products. The simplest way to prove this link would be to calculate the percentage of IIT that is intra-firm trade. However, data limitations exclude this approach (see Greenaway 1987). Other methods include the construction of a model of the

determinants of FDI using product differentiation as an explanatory variable, and the construction of a model of the determinants of IIT using multinational activities as an explanatory variable. These approaches also require substantial data. This paper adopts a more direct and straightforward way of using correlation analysis to look at the association between the two variables; that is, to examine the association between US direct investment and US intra-industry trade.

The FDI data are on non-bank affiliates and are from the US Department of Commerce surveys of 1985, 1988, 1991 and 1994. IIT is calculated as Grubel–Lloyd indices using United Nations commodity trade data and UNIDO export and import data at the 4-digit level.² Industries are classified at two levels – all industries and manufacturing – as it is believed that IIT is mainly from the manufacturing sector. As regional patterns of US FDI vary, the analysis is first conducted on pooled European and APEC data, and then Europe and APEC are separated out to see whether results differ.

There are many ways to analyse the associations between two variables.³ Due to the nature of these data – FDI data are values and IIT data are percentages – Spearman’s rank correlation is the most suitable analysis. The formula for the Spearman’s rank correlation coefficients is:

$$\theta = \frac{\sum (R_i - \bar{R})(S_i - \bar{S})}{\sqrt{\sum (R_i - \bar{R})^2 \sum (S_i - \bar{S})^2}}$$

where R_i is the rank of the i th x value, S_i is the rank of the i th y value, and \bar{R} and \bar{S} are the means of the R_i and S_i values, respectively. Averaged ranks are used in the case of tied scores (Mendenhall and Reinmuth 1978).⁴

A total of 15 APEC economies and 17 European economies were included, although in some years data were not available. The estimated Spearman’s correlation coefficients between FDI and IIT and the number of observations used are reported in Table 7.

The above estimates strongly support the hypothesis of a positive association between FDI and IIT for the pooled group. There is a positive relationship between US foreign direct investment in Europe and APEC together and US IIT with these economies. This positive

Table 7 Estimated Spearman's correlation coefficients between FDI and IIT

	All industries Totally owned	Majority-owned	Manufacturing Totally owned	Majority-owned
All economies				
1985	0.562** (31)	0.597** (31)	0.643** (31)	0.586** (29)
1988	0.551** (31)	0.604** (31)	0.576** (31)	0.636** (31)
1991	0.641** (31)	0.649** (32)	0.659** (30)	0.789** (32)
1994	0.588** (31)	0.548** (32)	0.583** (29)	0.617** (32)
Europe				
1985	0.801** (17)	0.818** (17)	0.859** (17)	0.799** (15)
1988	0.791** (17)	0.816** (17)	0.774** (17)	0.774** (17)
1991	0.796** (17)	0.796** (17)	0.770** (16)	0.789** (17)
1994	0.755** (17)	0.755** (17)	0.746** (15)	0.748** (17)
APEC				
1985	0.364 (14)	0.368 (14)	0.468* (14)	0.333 (14)
1988	0.307 (14)	0.411 (14)	0.407 (14)	0.485* (14)
1991	0.472* (14)	0.461* (15)	0.567* (14)	0.630* (15)
1994	0.346 (14)	0.249 (15)	0.394 (14)	0.496* (15)

Notes: 1 Data in parenthesis are the number of observations.

2 * significant at 5 per cent critical value.

3 ** significant at least at 1 per cent critical value.

4 Critical values are obtained from 'Critical values of Spearman's rank correlation coefficient', in *Statistics for Management and Economics*.

Source: Author's calculations.

association is evident at a 1 per cent significance level for each year for all industries, and for manufacturing, for both totally owned and majority-owned non-bank foreign affiliates.

When the estimation is conducted for Europe and APEC separately, however, the results differ. The results obtained for the European economies are consistent with the pooled sample:



positive and significant at a 1 per cent significance level. Although the results for APEC exhibit a positive association between FDI and IIT, significance at the 5 per cent level is only seen in 1991 for all industries, in 1985 and 1991 for totally owned manufacturing, and in 1988, 1991 and 1994 for majority-owned manufacturing.

These results are not surprising. US direct investment to these regions differs for several reasons: direct investment is mainly concentrated in developed economies, therefore Europe receives a larger amount of investment than APEC, and it could be expected that much trade in differentiated goods will be taking place. US direct investment to APEC is mainly concentrated in Canada, Japan and Mexico and it is argued that to some extent, trade in parts and components between US firms and southern counterparts in Canada and Mexico takes the form of non-equity subcontracting arrangements. That is, intra-industry trade takes place, but at arm's length. Oman (1989) argues that non-equity forms of corporate networking based on outward-oriented industrialisation have also been important in the recent economic development of Asia Pacific economies.

Conclusion

This paper has reassessed the linkage between FDI and IIT both theoretically and empirically. Theoretically, the OLI paradigm can be used to explain how FDI can cause IIT if it is assumed that the goods traded are differentiated vertically or horizontally and that all intra-firm trade is intra-industry trade (Mainardi 1986). An examination of US Department of Commerce data shows that intra-firm trade is growing hand in hand with FDI. This observation supports Mainardi's assertion. It is reasonable to assume that some intra-firm trade is intra-industry trade and therefore that FDI and IIT are linked. If most intra-firm trade is IIT, then this relationship would be strong. This calculation is not viable in practice, so this paper used Spearman's rank correlation coefficients to reveal that US direct investment to Europe and APEC and intra-industry trade with those economies is positively and significantly correlated. Although this examination is not able to prove how they are linked – whether through intra-firm trade or some other reason – it does provide strong empirical support to the hypothesis that FDI and IIT are closely related. Theory suggests this linkage could be the result of intra-firm trade, but because the results differ regionally, the evidence tends not to support this argument. The linkage between FDI and IIT is shown for the case of Europe in that the results obtained from the European economies are positive and significant for all the cases conducted.



The results obtained from the APEC economies exhibit a positive association between FDI and IIT, but this is significant in only a few cases. As shown above, more than 50 per cent of US intra-firm trade is with APEC, but only 30 per cent of US intra-firm trade is with Europe, therefore suggesting that intra-firm trade is not at least a determining cause of the linkage between FDI and IIT in the case of APEC.

The data shows that the relationship between FDI and IIT differs regionally. A detailed study on US direct investment to Europe and APEC would aid further understanding of the regional differences in US foreign direct investment. Further studies on the cause of the linkage between FDI and IIT (that is whether it is through intra-firm trade or some other factor) would contribute significantly to this understanding.

Notes

- 1 US investment in Hong Kong and Singapore in the 1980s and Indonesia in the 1990s may have been to provide export platforms.
- 2 These data are obtained from the International Economic Data Bank, Australian National University.
- 3 See Kalirajan (1998) for a more detailed discussion.
- 4 When there are no ties in either the R or the S observations, the expression for θ can be reduced to the simpler expression that often appears in textbooks: $\theta = 1 - \frac{6 \sum d_i^2}{n(n-1)}$ where $d_i = S_i - R_i$ and n is the number of observations.

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