

# Trade Effects of Foreign Direct Investment: Evidence for Taiwan with Four ASEAN Countries

By

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## I. Introduction

**F**oreign direct investment (FDI) has long been practiced by multinational corporations in developed countries. It has also increasingly become a way of expansion or relocation for firms in newly industrialized countries such as Taiwan. Like Japan in the past, Taiwan has experienced a huge currency appreciation and rapid increases in production costs in recent years, causing many domestic firms to invest abroad. The impact of FDI on the domestic economy then becomes an important issue when considering if the restrictions on FDI should be further curtailed. This paper examines one aspect of the impact, namely the trade effect, and presents some empirical evidence as information for policy deliberation.<sup>1</sup>

Will outward FDI benefit a home country's exports? Although Mundell (1975) presented a case in which product trade and FDI can be substitutes, Schmitz and Helmberger (1970) and Markusen (1983) argued that they are generally complements. Adler and Stevens (1974) pointed out the complexities of export displacement involved, while Lipsey and Weiss (1981) found that U.S. foreign manufacturing in-

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<sup>1</sup> Large-scale and continued increases in FDI should have important effects on a home country's economy. Two of these are the effects on domestic investment and foreign trade. According to an analysis (Lin et al. 1994) based on a dynamic econometric model of Taiwan with 29 industrial sectors, it is found that about \$76 (in Taiwan dollars) of domestic investment was displaced for every \$100 of investment made abroad during the period 1986–1991 examined. This is a substitution effect of outward FDI. On the other hand, FDI was found to have stimulated exports. The effect of outward FDI on Taiwan's economic growth is thus mixed.

vestment tended to promote U.S. exports. Ozawa (1971) and Kojima (1973, 1982) also characterized Japanese overseas investment as trade-oriented FDI.

Thus, the exact relationship of trade and FDI is essentially an empirical one. Although the total effect of FDI on trade should be measured in terms of world trade, the purpose of this paper is much more limited. To present statistical evidence, it focuses only on the effect of FDI on aggregate exports and imports between two countries. Specifically, we estimated the effect of Taiwan's outward FDI in a host country on exports to and imports from the host country and the trade effect of inward FDI from that country based on time series data. The countries considered are: Indonesia, Malaysia, the Philippines, and Thailand, all in Southeast Asia.<sup>2</sup>

In the following, we discuss the relationship of trade and FDI in Section II and the statistical model to be used in Section III. Regression results and the conclusions are given in Sections IV and V, respectively.

## II. FDI and Trade

Table 1 summarizes the possible effects of FDI on trade between countries A and B, devised from the standpoint of A investing in B and receiving investment made by B.<sup>3</sup> The effects depend on whether the investment is made to produce services (S), final goods (F), or materials including parts (M) for markets A, B, or C (other countries). Tradable goods are classified into three categories: equipment and machinery (E), materials (M), and other goods (G).

To explain the table we consider three cases. First, if country A (say, Taiwan) invests in country B (say, Indonesia) to establish a trading company, a banking business, or a retail store, trade between A and B is expected to expand.

Second, country A invests in country B to produce final goods because of low wages, market proximity, trade barriers, or internaliza-

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<sup>2</sup> In recent years Taiwan has increased its FDI tremendously in the People's Republic of China. The latter reports that the actual amount of investment made by Taiwanese firms had exceeded \$11 billion in US dollars by the end of 1993. Unfortunately the People's Republic of China was not included in our study due to lack of time-series data.

<sup>3</sup> The effects of outward (or inward) FDI on bilateral trade are complicated. They will depend on what products are produced in the host country, for which market they are produced, and then which tradable goods are being considered. Table 1 lists all the possible cases which may arise.

Table 1 – *The Effects of FDI on Trade between Two Countries*

FDI		Exports from A to B			Imports to A from B		
in produc- tion of	for market of	E	M	G	E	M	G
<i>Outward FDI: from A to B</i>							
S	B	$\geq 0$	$\geq 0$	$\geq 0$	$\geq 0$	$\geq 0$	$\geq 0$
F	A	$\geq 0$	$\geq 0$	0	$\geq 0$	$\leq 0$	$\geq 0$
	B	$\geq 0$	$\geq 0$	$\leq 0$	0	$\leq 0$	0
	C	$\geq 0$	$\geq 0$	0	0	$\leq 0$	0
M	A	$\geq 0$	$\geq 0$	$\geq 0$	0	$\geq 0$	0
	B	$\geq 0$	$\geq 0$	0	0	0	0
	C	$\geq 0$	$\geq 0$	0	0	0	0
<i>Inward FDI: from B to A</i>							
S	B	$\geq 0$	$\geq 0$	$\geq 0$	$\geq 0$	$\geq 0$	$\geq 0$
F	B	$\geq 0$	$\leq 0$	$\geq 0$	$\geq 0$	$\geq 0$	0
	A	0	$\leq 0$	0	$\geq 0$	$\geq 0$	$\leq 0$
	C	0	$\leq 0$	0	$\geq 0$	$\geq 0$	0
M	B	0	$\geq 0$	0	$\geq 0$	$\geq 0$	$\geq 0$
	A	0	0	0	$\geq 0$	$\geq 0$	0
	C	0	0	0	$\geq 0$	$\geq 0$	0
<i>Note:</i> A=country A, B=country B, C=other countries, E=equipment and machinery, F=final goods (E included), G=final goods (E excluded), M=material (primary & intermediate), parts and components, S=services.							

tion, or for other reasons. A common practice is for A to export to B equipment and machinery for plant installation and then material for processing or parts for assembling. Thus, A's exports of equipment and material to B should increase. The export of equipment may occur only once, but that of material tends to be recurrent unless the supply is later replaced by a new source other than A.<sup>4</sup> Consequently, A's imports of final goods made in B may increase. The increased imports may reduce the imports from B of the material previously used by A to produce the final goods at home. If the final goods formerly produced in A were exported to B, the exports are expected to decrease as a result of export displacement.

Third, when country A invests in country B to produce primary or intermediate material or industrial parts, exports of equipment and/or

<sup>4</sup> To prevent its exports from being replaced by a new source of supply, the home country must constantly upgrade its technology and thus maintain its technological superiority. Japan appears to be one country which is accomplishing this. Whether Taiwan can do the same remains to be seen.

material from A to B may increase. The produced material may be shipped back to A with or without some of the previous imports of material from B being replaced. The final goods made from the imported material at home may return to B from A.

The above discussion is made for outward FDI and trade between the home and host countries. Symmetrical relationships can be also inferred for inward FDI and trade as summarized in the lower portion of Table 1.

In short, the above explanation suggests that the impact of FDI on bilateral trade can be positive or negative depending on what the final outcome is. Thus, the sign of FDI is taken to be uncertain in the model specified below.

### III. The Statistical Model

For demonstration, we examine the bilateral trade effects of FDI between Taiwan and each of the four countries stated above. We note that Taiwan's outward FDI rose dramatically after 1986 for four reasons: (a) the tremendous appreciation of the Taiwan currency against the US dollar (a 38 percent rise during 1986–1987), (b) deteriorating domestic investment conditions (high wage rates, rocketing land prices, environmental problems, and others), (c) intense international competition, particularly from low-wage countries, and (d) relaxation of foreign exchange controls.

Table 2 indicates that the six-year total of Taiwan's FDI to Indonesia, Malaysia, the Philippines, and Thailand during 1987–1992 (about US\$13 billion as approved by the host countries) was 87.8 times the total for the period 1981–1986. The total of inward FDI from the four countries for the second period (merely US\$0.4 billion) was about 3.7 times the total for the first period. On the other hand, Taiwan's total exports to and imports from the four countries had risen by 3.7 and 2.7 times between 1986 and 1992, respectively.

As pointed out by Chen (1992), Taiwanese FDI in the ASEAN countries was mainly motivated by low-wage considerations and thus was predominantly in the labor-intensive industries. The equipment and material came mostly from Taiwan and a portion of output was then shipped back home. This investment pattern shows that Taiwan's FDI in the above four countries is a cause, rather than an effect, of the expansion of trade with those countries. We also observe that inward FDI from those countries, a good portion of which was in the

Table 2 – *FDI and Trade between Taiwan and Four Southeast-Asian Countries (millions of US dollar)*

	Taiwan's FDI				Taiwan's trade			
	outward to		inward from		export to		import from	
	1981 –1986	1987 –1992	1981 –1986	1987 –1992	1986	1992	1986	1992
Indonesia	36.4	3,317.5	26.6	12.4	391.8	1,214.8	357.3	1,407.3
Malaysia	41.4	5,553.0	33.8	36.0	205.7	1,600.3	500.8	1,829.2
Philippines	2.7	429.2	40.7	307.9	328.6	1,023.3	152.7	305.2
Thailand	67.7	3,715.8	7.3	18.8	278.6	1,810.0	162.9	824.6
Sum	148.2	13,015.5	108.4	375.1	1,204.7	5,648.4	1,173.7	4,366.3

*Note:* FDI figures are cumulative sums approved by host countries and are obtained from ROC's Investment Commission (1993c). Trade figures are annual totals from ROC's Ministry of Finance (1993a).

service and food industries, was largely made for the local market and thus not so much trade-induced.<sup>5</sup>

The above discussions allow us to treat FDI as an explanatory variable and exports (imports) as the explained variable. Our statistical model thus consists of the following export and import equations:

$$EX_t = a_1 + a_2 YH_t + a_3 PW_t + a_4 OI_t + a_5 COI_{t-1} + a_6 CII_{t-1} + u_t \quad (1)$$

$$IM_t = b_1 + b_2 YT_t + b_3 PW_t + b_4 II_t + b_5 CII_{t-1} + b_6 COI_{t-1} + v_t \quad (2)$$

where  $EX$  = Taiwan's real exports to country  $i$

$IM$  = Taiwan's real imports from country  $i$

$YH$  = real GDP of country  $i$

$YT$  = real GDP of Taiwan

$PW$  = wholesale price ratio between Taiwan and country  $i$

$OI$  = Taiwan's real outward FDI to country  $i$

<sup>5</sup> Inward FDI from the four countries was made mainly by overseas Chinese, about 94 percent for the entire period 1952–1992. During this period about 22, 47, 91, and 65 percent were invested in service and food industries by overseas Chinese from Indonesia, Malaysia, the Philippines, and Thailand, respectively. On the other hand, the percentages for outward FDI to the four countries in the same industries during the same period were merely 1.8, 2.5, 1.5, and 17.0 percent, respectively (ROC's Investment Commission, 1993c).

$II$	= Taiwan's real inward FDI from country $i$
$COI$	= cumulative $OI$
$CII$	= cumulative $II$
$u, v$	= error terms
$a_j$ 's, $b_j$ 's	= parameters
$t$	= year
$+, -, ?$	= expected signs.

The above specification is explained below. Basically, an income or output variable and a relative price variable should appear in (1) and (2). Thus, country  $i$ 's GDP appears in the export equation while Taiwan's GDP is in the import equation. The wholesale price ratio of Taiwan to the  $i$ th country is used in both equations. We tried a scheme by which two variables for wholesale price were employed, one for the relative wholesale price in Taiwan to the group of the four countries and the other for the relative wholesale price of the group of four countries to the  $i$ th country concerned.<sup>6</sup> But the scheme was abandoned because of its poor results.

The remaining variables are for testing the effects of FDI on trade, the main concern of this study. Current  $OI(II)$  is introduced mainly to account for Taiwan's exports (imports) of machinery and equipment to (from) country  $i$ .  $OI(II)$  with a one-year time lag was tried and then abandoned.<sup>7</sup> Both  $COI$  and  $CII$  appear in (1) and (2) to account for the shipments of material and/or final goods resulting from all past FDI, outward as well as inward. They are lagged one year due to time lags in production. Although the signs of the parameters of these

<sup>6</sup> Taiwan's export to country  $i$  (the Philippines, Indonesia, Malaysia, or Thailand) faces two forms of competition, from the  $i$ th country itself and from other countries wishing to export to the  $i$ th country. Thus three prices are involved: (a) Taiwan's export price, (b) export price of the competitors, and (c) producer price of the  $i$ th country. These three prices can be reduced to two relative prices: (a)/(b) and (a)/(c). Or one can employ the relative price of (a) to (d), which is a weighted (based on import shares of the  $i$ th country) average of export prices of Taiwan and its competitors, and the relative price of (d) to the  $i$ th country's producer price. The second scheme was employed in our regression analysis by taking three out of the four countries in turn as competitors, except for the one under study, and by using the  $i$ th country's wholesale price in place of its producer price where data are not available. The results are mixed in terms of sign and significance. There is an indication of multicollinearity due to the fact that the  $i$ th country's import price is part of its wholesale price. Thus the scheme was abandoned. Instead, the ratio of the wholesale prices of Taiwan and the  $i$ th country is employed. This relative price is also employed in the import equation for the  $i$ th country for the same reason.

<sup>7</sup> Since  $OI(II)$  is part of  $COI(CII)$ , use of current  $OI(II)$  is more consistent with that of  $COI(CII)$  lagged one year. This yields better statistical results.

FDI variables are uncertain, as we explained in Section II, they are believed to be positive. Our purpose is to empirically determine their signs in both (1) and (2) and to consider their statistical significance.

#### IV. Results

Equations (1) and (2) in level form were estimated by the least squares method which took serial correlations into account for the sample period 1972–1992. Log form is not used because some values of  $OI$  and  $II$  are zero. There are 21 annual observations and 15 degrees of freedom. One or two earlier observations were employed as initial values in the case of AR(1) or AR(2). Sources of data and the regression results are given in Table 3. It is noted that the amount of outward FDI approved by the Taiwan government was much smaller than the amount approved by the host country. Thus, data from the latter were used in our analysis.

Table 3 yields several interesting results. First, both current and cumulative outward FDI ( $OI_t$  and  $COI_{t-1}$ ) have a significant positive effect on exports. This is quite consistent with the behavior of Taiwanese firms which export equipment to the host country at the outset as part of their investment and then material later. Moreover, cumulative outward FDI ( $COI_{-1}$ ) also has a significant positive effect on Taiwan's imports from the host country, except in the case of the Philippines. This appears to reflect the subsequent shipments of finished products to Taiwan as a result of previous investment in the host country. Why this was not so for the Philippines is not clear. It may be that the products were mainly sold in the local market or exported to other countries as discussed in Section II.

Second, current inward FDI ( $II_t$ ) shows no effect on Taiwan's imports from the home country. Two reasons may be cited for the asymmetric effect of the inward FDI: it may have been quantitatively insignificant, or the equipment was purchased in the local market. The trade effect of cumulative inward FDI ( $CII_{-1}$ ) is found to be inconsistent across countries in terms of sign and significance. The sign for this term is mostly positive but not statistically significant.<sup>8</sup> The exception is for the exports to the Philippines. The significantly negative effect

<sup>8</sup> It is noted that the exports or imports concerned are those between the host and home countries. Cumulative inward FDI may increase Taiwan's exports to or its imports from other countries. Similarly, inward FDI may increase Taiwan's imports from other countries even though not necessarily from the home country.

Table 3 – Regression Results, 1972–1992

Variable	Indonesia		Malaysia		Philippines		Thailand	
	EX	IM	EX	IM	EX	IM	EX	IM
$YI_t$		0.003 (0.4)		0.007 (3.0) <sup>a</sup>		0.003 (3.7) <sup>a</sup>		0.004 (1.8) <sup>c</sup>
$YH_t$	0.001 (0.0)		0.163 (3.5) <sup>a</sup>		-2.5 (-0.3)		4.31 (1.2)	
$PW_t$	-137.4 (-2.5) <sup>b</sup>	-79.3 (-1.1)	-4.3 (-0.4)	-15.1 (-0.5)	62.9 (1.4)	82.8 (1.7) <sup>d</sup>	-117.8 (-2.9) <sup>a</sup>	255.0 (3.8) <sup>a</sup>
$OI_t$	0.212 (2.1) <sup>b</sup>		0.197 (11.2) <sup>a</sup>		1.727 (6.3) <sup>a</sup>		0.341 (9.1) <sup>a</sup>	
$COI_{-1}$	0.243 (3.8) <sup>a</sup>	0.296 (3.6) <sup>a</sup>	0.182 (14.4) <sup>a</sup>	0.172 (7.4) <sup>a</sup>	0.316 (1.9) <sup>d</sup>	-0.072 (-0.2)	0.250 (20.2) <sup>a</sup>	0.255 (9.4) <sup>a</sup>
$II_t$		-0.794 (-0.1)		1.205 (0.8)		0.007 (0.01)		0.314 (0.1)
$CH_{-1}$	6.972 (1.5)	5.097 (0.7)	-0.178 (-0.3)	0.856 (0.7)	1.992 (5.8) <sup>a</sup>	0.027 (0.1)	9.47 (1.9) <sup>d</sup>	-21.6 (-2.7) <sup>b</sup>
$C$	24,801 (2.9) <sup>b</sup>	15,740 (1.3)	-3,103 (-1.7)	-2,221 (-0.6)	-11,641 (-1.5)	-11,831 (1.5)	11,126 (2.7) <sup>b</sup>	-18,629 (-3.3) <sup>a</sup>
Rho1	0.293 (1.1)	0.316 (1.2)				0.338 (0.9)	-0.824 (-3.5) <sup>a</sup>	
Rho2	-0.599 (1.8) <sup>d</sup>					-0.400 (-0.9)		
$R^2$	0.885	0.889	0.996	0.978	0.972	0.884	0.994	0.941
DW	1.57	1.71	1.86	1.64	1.88	1.83	2.29	1.79

*Note:* EX = Taiwan's exports to country  $i$  shown, IM = Taiwan's imports from same country. Other variables are those given in Section III.  $R^2$  is adjusted. DW is Durbin-Watson statistic. Figures in parentheses are t-statistic. Superscripts a, b, c or d mean significant at the 1, 2.5, 5 or 10 percent level, respectively, under a one- or two-sided (for uncertain signs) test. The uncertain zone of DW is 0.63 to 1.71. Data on trade, GDP, wholesale prices, and exchange rates are from ROC and IMF (see references for specific sources). Data on FDI are figures approved by host countries and are obtained from ROC's Investment Commission (1993c). All variables are in New Taiwan dollars except  $YH$  which is in the host country's currency.

on imports from Thailand may possibly reflect some degree of import displacement.

Third, GDP should have a positive effect on trade. This is so for imports but less so for exports. That is, Taiwan's GDP has a significant positive effect on its imports from Malaysia, the Philippines, and



Table 4 – Regression Results, 1971–1992

Variable	Indonesia		Malaysia		Philippines		Thailand	
	EX	IM	EX	IM	EX	IM	EX	IM
$YI_t$		0.009 (8.6) <sup>a</sup>		0.011 (13.9) <sup>a</sup>		0.002 (18.4) <sup>a</sup>		0.005 (6.6) <sup>a</sup>
$YH_t$	-0.218 (-4.7) <sup>a</sup>		3.004 (2.8) <sup>a</sup>		-30.24 (-4.3) <sup>a</sup>		166.8 (3.3) <sup>a</sup>	
$PW_t$	8.596 (4.4) <sup>a</sup>	-1.196 (-0.6)	-14.52 (-1.6)	-0.364 (-0.2)	10.8 (1.7)	1.84 (3.9) <sup>a</sup>	24.1 (2.2) <sup>b</sup>	-5.38 (-1.2)
$C$	-155 (-0.6)	45 (0.2)	-420 (-0.8)	-200 (-0.9)	-503 (-0.7)	-244 (-3.9) <sup>a</sup>	-3,561 (-3.9) <sup>a</sup>	360 (0.9)
$R^2$	0.639	0.840	0.305	0.909	0.564	0.947	0.567	0.779
DW	0.52	0.45	0.41	0.72	0.45	1.33	0.26	0.65

*Note:* EX = Taiwan's exports to country  $i$  shown, IM = Taiwan's imports from same country. Other variables are those given in Section III.  $R^2$  is adjusted. DW is Durbin-Watson statistic. Figures in parentheses are t-statistic. Superscripts a or b mean significant at the 1 or 2.5 percent level, respectively, under a one- or two-sided test. The uncertain zone of DW is 0.84 to 1.27. See Table 3 for sources of data.

Thailand, but only Malaysia's GDP has the same significant effect on Taiwan's exports to Malaysia. The relative price should affect exports negatively but imports positively. This is clearly so for Thailand but results are mixed for the other countries. For example, the relative price has a wrong sign for the imports from Indonesia and Malaysia, and also for the exports to the Philippines. The estimated coefficients, however, are all insignificant. How will these two variables (income and price) perform in the absence of the FDI variables? Table 4 gives the results for comparison.

As the table shows, the GDP variable is now very significant in each export and import equation, but its sign is wrong for the exports to Indonesia and to the Philippines. The signs for these two exports then become insignificant and one of them changes sign when the FDI variables are introduced. As to the price variable, the sign is correct only for two cases, the exports to Malaysia and the imports from the Philippines, with the latter's estimate being very significant. Two of the signs, which are wrong and significant, are the exports to Indonesia and Thailand. They are correct and significant when the FDI vari-

ables are present. Moreover, the sign of the term for imports from Thailand also becomes correct and significant in the presence of the FDI variables. It is noted that the Durbin–Watson statistic is very low in all equations, indicating an omission of some important variables. Thus, improved results are obtained, except for the imports from the Philippines, when the FDI variables are added to each equation containing only output and price variables. In short, Taiwan's outward investment has been found to greatly increase the bilateral trade with its host countries.

### V. Conclusion

The dramatic rise in Taiwan's outward FDI to Southeast Asia in recent years has greatly increased trade with its host countries as shown above. It should have also increased trade with other countries besides the bilateral trade examined. As one more example, we point out the phenomenal increase in Taiwan's FDI and trade with China, although this is not examined in our analysis due to data insufficiency. During 1987–1992, cumulative Taiwan FDI approved by the People's Republic of China amounted to US\$8.98 billion, almost 6.9 times the total for the countries examined above. As a result, Taiwan's exports to China grew by 38 percent annually during that period, mostly in the shipment of equipment and material. Imports from China also grew by 31.1 percent per year during the same period. This provides another strong case in favor of FDI for the promotion of world trade.

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**Abstract:** Trade Effects of Foreign Direct Investment: Evidence for Taiwan with Four ASEAN Countries. – This paper examines the trade effects of foreign direct investment (FDI) between Taiwan and each of the following four ASEAN countries: Indonesia, Malaysia, the Philippines, and Thailand. Regression results show that Taiwan's outward FDI has a significant positive effect on exports to and imports from the host country, whereas no such effects were consistently found for inward FDI from the same country. JEL No. F21

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**Zusammenfassung:** Die Auswirkungen ausländischer Direktinvestitionen auf den Außenhandel: Befunde für Taiwan und vier ASEAN-Länder. – Der Verfasser untersucht die Wirkungen auf den Handel, die von ausländischen Direktinvestitionen zwischen Taiwan und jedem der folgenden vier ASEAN-Länder ausgehen: Indonesien, Malaysia, die Philippinen und Thailand. Regressionsergebnisse zeigen, daß taiwanische Direktinvestitionen in den vier Ländern eine signifikante positive Wirkung auf Exporte in das Gastland und auf Importe aus diesem Land haben, während durchweg keine solchen Wirkungen bei Direktinvestitionen des Gastlandes in Taiwan festgestellt wurden.