The Role of Taiwanese Foreign Direct Investment in China: Economic Integration or Hollowing-Out?

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Abstract

The purpose of this paper is to examine the allocation of the FDI flows in the East Asian region among Southeast Asian countries and China. In addition, it will also investigate the role of the public policy and the private firms during the foreign direct investment process in 1990s. In particular, we will emphasize the Taiwan case, since Taiwan has been one of the main contributors in this region. And we will show the dynamics of the industry types of foreign direct investment during 1990s.

It appears that foreign direct investment plays the main role of economic integration between Taiwan and China during the process. However, the expansionary outward FDI may cause a hollowing-out of Taiwan domestic industries.

Keywords: FDI **(**foreign direct investment), Economic integration, Probit model, Hollowing-out

I. Introduction

The amount of net foreign direct investment in developing countries has climbed more than twelvefold since 1980 according to the IMF data. Long-term foreign investment could provide developing countries with important benefits. Public sector infrastructure projects are in greater demanding. However, in the private sphere, the long-term foreign direct investment could expand the capital stock in the host country.

The FDI (foreign direct investment) in the East Asian area is quite active since 1990. Taiwan, Korea, Hong Kong, Singapore, as well as Japan are the main contributors of FDI flows in this region, while China and the Southeast Asian countries are the demanders of these flows.

The 1997-98 Asian Financial Crisis had caused the direction of the FDI flows to change. This is particularly clear in the allocation of foreign direct investment funds between crisis countries in the East Asia and China. For example, the FDI flows from Taiwan to China increased over the last ten years. The proportion of FDI to China comparing with those to the crisis countries increased steadily after 1997.

Although there are several driving forces behind the economic integration in the East Asian region, for example, technology, preference and public policy, it appears that the private enterprises have been playing the main role during the process. The purpose of this paper is to examine the allocation of the FDI flows in the East Asian region among Southeast Asian countries and China. In addition, it will also investigate the role of the public policy and the private firms during the foreign direct investment process in 1990s. In particular, we will emphasize the Taiwan case, since Taiwan has been one of the main contributors in this region. And we will show the dynamics of the industry types of foreign direct investment during 1990s. It appears that foreign direct investment plays the main role of economic integration between Taiwan and China during the process.

However, the expansionary outward FDI may cause a hollowing-out of Taiwan domestic industries. The prospect of this trend will be projected in this paper.

The investment risk from the firm's prospect will be explored through the questionnaire to the Taiwan firms doing investment in China. The balance between economic security（or country risk）and individual firm's investment risk will be examined so that policy implications could be drawn from this study.

The remainder of this paper is organised as follows. Section II describes the pattern of Taiwanese FDI. Section III describes the data characteristics. Section IV summarises the empirical results. Section IV concludes the paper.

II. The Pattern of Taiwanese FDI

The idea that the pattern of foreign direct investment (FDI) differs depending on the source of investment was suggested by Kojima (1973). He argued that FDI originating in Japan was in line with the host country's comparative advantages and results in a trade promotion effect. In contrast, Kojima (1973) claimed that FDI originating in the U.S. did not conform to the host country's comparative advantages and resulted in a trade reduction effect. The difference came from the fact that Japanese FDI emanated from competitive industries while the U.S. FDI came from oligopolistic industries. That is, the difference in domestic market structure leads to difference in overseas operations, which in turn account for the different effects of FDI.

Kojima's argument challenges orthodox FDI theory based on Hymer (1960), which asserts that FDI only comes from oligopolistic firms possessing some kind of intangible asset. According to Hymer, an intangible asset is prerequisite for FDI because it offsets the disadvantages suffered by a transnational firm when it operates in a foreign country. In contrast, Kojima explained that Japanese firms from competitive industries invested

abroad because of changes in macroeconomic conditions in Japan, which made it impossible for firms to continue producing at home. However, Kojima's competitive firms must also possess some industry-specific intangible asset, otherwise, these firms would have chosen to switch to a new industry, one which is favored by the changed macroeconomic conditions at home, instead of venturing abroad to carry on the old business. In this sense, Kojima's firms are not so competitive after all, for any intangible asset generates on economic rent which is non-existent in a competitive industry. And economic rent is what a FDI firm seeks to internalize through transnational operations when the existing markets do not enable the firm to extract this rent through other arrangements such as licensing or direct export (see Buckley and Casson (1976)).

Kojima's idea that his firms are competitive firms may stem from the observation that a substantial proportion of Japanese FDI in manufacturing is undertaken by small and medium-sized firms and on a smaller scale than by American firms.

Likewise, Taiwanese firms started to make substantial direct investment in Southeast Asia in 1980 and in China in 1991 and behaved like Kojima's Japanese firms. That is, Taiwanese FDI is dominated by small and medium-sized firms. The intangible asset possessed by these firms is related to their ability to conduct small scale and flexible production. That small scale firms are able to conduct this is due to their support by an efficient production network encompassing a larger number of highly specialized producers. Firms in the networks are generally independent and are constantly competing among themselves, but they share production and market information that enables them to react quickly and fruitfully to change in technology and market (see Perrow (1992)).

In addition, like Japanese FDI firms, Taiwanese firms faced terrible conditions in the domestic investment environment since the late 1980s. Land prices increased sharply and the wage rate was raised up, while the Taiwan dollar appreciated. Firms attempted to escape from the worsening domestic investment environment and turn to foreign

investment to keep their export markets and competitiveness in the industries. That is, FDI appears to play a defensive role in retaining export markets for firms under adverse investment conditions at home. Such kinds of defensive FDI is a substitute for domestic production.

However, started from mid 1990s, Taiwanese firms increased their foreign investment to exploit their assets, such as patents, other technological assets, reputation, skills in production, marketing, and advertising. The FDI plays an expansive role in the international market and it is quite complementary to domestic production.

Taiwanese FDI is concentrated in less-developed, such as China and Southeast Asian countries. The pattern shifts toward American countries and Europe after 1996 under the ”go-slow, be patient” policy, which puts a US$50 million and US$60 million cap on any single investment in China as well as the strike of the Asian financial crisis (see Table 1). However, since 2000, Taiwanese FDI toward China surged due to the high economic growth in China and political instability in Taiwan. It is expected that Taiwanese FDI toward China will continue growing in the next ten years, since go-slow policy has been decided to be abandoned and be replaced with the new “active openness and effective management” policy. According this new policy, Taiwan entrepreneurs will be allowed to make investment directly in China, except those might cause any damage to Taiwan’s national security. In addition, both Taiwan and China of the two sides across the Taiwan Strait are to become members of the World Trade Organization in November 2001. Trade related investment will be enhanced therefore.

The effect of outward FDI on Taiwan domestic industries is a subject of continuous debate. Using the firm-level data during 1986 to 1994, Chen and Ku（2000）found that FDI will strengthen rather than weaken the viability and competitiveness of domestic industries. However, our study will show that this trend is changing. Domestic production and investment in Taiwan were shrunk over time.

III. Data characteristics

Whether Taiwanese FDI in China had adversely affected the industry growth in Taiwan has been seriously concerned. A negative association of parent production with production of affiliates would suggest a displacement of labor-intensive production to lower-waged country like China. However, a positive association would suggest either an expanding market share or requiring intermediate goods from the parent company. Theoretically, it is impossible to determine whether the net effect on production is positive or negative.

According to the statistical data from Ministry of Economic Affairs, the induced export from Taiwan to China due to the foreign direct investment in China had been raised to 37.67% of total export in 2000. In effect, if we follow the official statistics from China, the export of FDI inducement is about 56.22% of total export from Taiwan to China.

Our research is based on the 2002 survey data which had been published in August 2002[1]. It should be noted that the 2003 survey data published in October 2003 is also available. There were cross-sectional survey data conducted by Ministry of Economic Affairs. The 2002 survey data on foreign investment by manufacturers shows that firms investing in China thought that the material and intermediate products imported from Taiwan increased by some 19.60% and 16.56% respectively compared with those in 2000, while the material and intermediate products purchased from the other Taiwanese affiliates in China increased about 34.13% and 26.59% respectively in the year 2000 as compared to the year 2000. The samples are in the list of manufacturers that were permitted to make foreign investment by the Investment Commission of Ministry of

[1] The authors appreciate Professor Hui-Lin Lin of National Taiwan University who provides this data.

Economic Affairs. The 2002 survey sample consisted of 3481 manufacturers, while there were 3467 manufacturers in 2003 survey sample.

The 2002 and 2003 sampling data includes 2170 and 1852 manufacturers respectively excluding those closes, moved out, and withdrawn from investing. Based on these sample, it shows that by the end of 2001and that of 2002, Taiwan foreign investment in China (including Hong Kong), Southeast Asia and other developed countries (including the U.S.) accounted for 70%, 12.49% and 12.40% of total Taiwanese foreign investment respectively (see Table 2). It's worth to mention that Taiwanese foreign investment in China has increase trend. Table 3A shows that there's no change on expanding parent company's production scale after foreign investment for some 50.89% of the manufacturers in China, while 32.78% think that it has benefit on expanding parent company's production scale. In addition, Table 3A also shows that in 2001 about 35.85% of the manufacturers in all investment areas think benefit on expanding parent company's production scale after foreign investment, while 50.65% firms think that it has no change and detrimental were 50.65%.

Table 4 shows that when the causes of investment are to expand export market, to demand by foreign customers, follow Taiwan consumers, incentives from investing area, cost savings such as land acquirement, material supply, cheap labor, deterioration of domestic investment environment, reduce exchange rate risk, and most-favored nation treatment, the foreign direct investors answer "no change" on expanding their domestic production scale. In contrast, firms making outward foreign investment because of acquirement of land, capital utilization, and overcome trade barrier think benefit on expanding their domestic production scale. Table 5 shows that in 2001 most Taiwanese FDI is horizontal integration, while about 721 firms adopted the forward or backward integration. The firms which horizontal integration and irrelevant product inclined to think not change on expanding the parent company's production, while vertical

integration tends to think benefit. Table 6 suggests that large, medium and small FDI firms are inclined to think benefit or not change on expanding parent company's production.

As for the R&D activities of manufacturers with foreign direct investment, Table 7 shows that 79.72% of the firms with FDI in China have R&D department in their domestic institutes in 2001. It suggests that R&D activities of the parent companies are more important to firms, although the counter proportion in developed countries is higher.

Table 8 shows the type of industries by investing area. As a result, machinery and equipment, computer, communication and video and radio electronic products, electronic parts and components, and electrical machinery, supplies and equipment were the major investment industries of Taiwanese foreign investment in China.

IV. Empirical analysis

Since the survey data used are measured by discrete or ordered scales. We specified regression models with discrete dependent variables to analyse the variation of production and R&D strategies after foreign investment. Expanding the domestic production scale is categorized as detrimental, no change, and beneficial, which are indicated by an ordered scale 0,1,2. We specified an ordered probit model to analyse the effects of FDI. We wish to examine the factors that would result in Taiwanese FDIs which might be mainly complementary or substitute.

The type of investment is divided into four types, i.e. market expansion, technology acquirement, cost savings and others, based on the causes of investment that were described in the questionnaire. Three dummy variables are created to represent four types of investment motivation. Cost savings are classified as defensive investment elements and their expected coefficient signs are thus negative. However, market expansion and

technology acquirements are both expansive investing elements and their expected coefficient signs are positive.

The ratio of foreign investment to total investment in 2001 is used as an explanatory variable to the relationship between foreign investment and domestic investment. If FDI has a squeeze impact on domestic investment, then its sign is negative, while if it has a supplementary effect, then the sign is positive.

The sales ratio variable is calculated as the foreign operating revenue relative to total operating revenue. We expected that sales ratio has a positive effect on expanding domestic production.

Parent firms with profit are assigned code 1, otherwise 0. It is expected that the parent firms with profit after investing in foreign countries will keep expanding their domestic production. The coefficients of profit status are expected to be positive. As for firm size, it is divided into three types—small, medium and large firms. Two dummy variables are created to represent three types of firm size. Those firms that have more than 200 employees is defined as large firms and are assigned code 1, otherwise code 0. And if the numbers of firm's employees is less 99, we are defined as small firm. It is expected a large firm tends to expand their domestic production. The coefficient of large firm is suggested to be positive. However, for a small firm, it may be pushed to a less-developing country due to the deterioration of domestic economic environment, and therefore the coefficient of small firm is expected to be negative.

Three variables are created to indicate the characteristics of each firm. One is labor-intensive industry, i.e., those firms which labor input of foreign production is higher and are assigned a code of 1, otherwise 0. Another is electrical & electronics industries. That is, those firms in computer, communication and video and radio electronic products, electronic parts and components and electrical machinery, supplies and equipment are denoted electrical & electronics. The other is fabricated metal products industry. The

summary statistics for the explanatory variables is reported in Table 9.

Table 10 reports the ordered probit model results for domestic production scale strategy. Table 10 shows that market expansion and technology acquirement have a significant positive effect, while cost savings has significantly positive effect on domestic production strategy. It also shows that the FDI in China and Southeast Asia have a significant negative effect. Both the vertical integration and horizontal integration are important factors to parent production strategy. After investing in foreign countries, firm size has a little effect on their parent production strategy. It also suggests that ratio of foreign investment has an insignificantly negative effect on the parent scale. Also, firms with profit have a significantly positive effect on their domestic production strategy. Similarly, the estimated coefficient of labor-intensive and electrical & electronics are significantly positive. Likewise, the parent R&D has significantly and positively affected on parent production scale strategy.

The estimated coefficients should be interpreted in the sense that they affect the probability that a certain event will occur. This interpretation can be obtained by computing the marginal effects from the estimated model. The marginal effects measures the change in the probability of each choice with respect to a change in an explanatory variable, *ceteris paribus*. Note that the sum of the marginal probabilities of selecting any of the three categories of expanding the domestic production scale equals zero. The results of marginal probabilities are also presented in Table 10. It shows that those factors such as market expansion, technology acquirement and cost savings induce firms to expand domestic production scale. The probabilities were 7.10%, 10.74% and 5.92% respectively. Also, large firms with high probability wanted to expand domestic production scale only with probability 1.09%, while small firms even thought that expansions of scale do harm to them. Those firms in labor-intensive and electrical & electronics industries have high probability to expand their domestic production scale.

The probabilities were 9.89% and 11.74% respectively. However, Taiwanese firms in China and Southeast Asia comparing with those in other areas to think that domestic production expansion was detrimental. Those firms with parent R&D, horizontal and vertical integration have higher probability to expand their domestic production scale.

Due to statistically significant effect from the FDI in China and Southeast Asia on parent company production strategy, we further investigate whether there is any different factor on investment in developed countries, China and Southeast Asia by Taiwan's enterprises. The analytical results are shown in Table 11. Table 11 suggests that FDI in China with market expansion oriented has positive effect on domestic production, while there is supplementary effect of cost savings motivation. The significant and positive effects for FDIs in China and Southeast Asia show that there exists production supplementary for Taiwan exports. Both estimated coefficients of horizontal integration and vertical integration are significant. In addition, except FDI in developed countries, firm size coefficients are statistically insignificant for FDIs in China and Southeast Asia. It also shown that ratio of foreign investment coefficients are insignificantly negative. This reflects that FDI has little substitution effect on domestic investment.

In addition, to estimate the effect of R&D strategies after foreign investment, a bivariate probit model applied. The analytical results are shown in Table 12. Table 12 shows that large firms will enhance their R&D activities. And firms that are motivated to expand into foreign markets and rely on technology from domestic parent accompanies are more inclined to conduct R&D activities. Also both horizontal and vertical integration production have positive effects on conducting R&D activities. In addition, foreign affiliates that rely on parent companies, technology lead their parent companies to conduct more R&D activities. Moreover, the R&D in foreign affiliates is complementary to that in the parent firm.

V. Concluding remarks

The paper investigates the variation of production and R&D strategies after foreign investment. We found that market expansion, technology acquirement, cost savings, investment in China and Southeast Asia, type of production, profit status, labor-intensive and electrical & electronics industries, and parent R&D are important factors on parent domestic production strategy after foreign investment. However, the firm size has little effect on expanding domestic production. And FDI has little substitution effect on domestic investment. In addition, we have also found that the driving force of economic integration between Taiwan and China is technology rather than public policy. Taiwanese FDI toward China plays an important role during the economic integration process. Table 13 presents the evolution of Taiwan and China (including Hong Kong) exports and imports of goods and services as a percent of GDP from 1990 to 2000, as well those between Taiwan and Southeast countries. The ratios are steady and linear over the last decade. And the average growth rate of trade and exports in two regions are about the same rate, i.e., 6.4%.

It should be noted that the trade pattern of Taiwan's trade in the East Asian region indicates that factors other than free trade agreements (e.g., NAFTA and European Union) are important for increasing regional trade. Taiwan is not a member of regional free trade area, yet the share of its trade involving other emerging East Asian countries increased over the last ten years (see Table 13). The association of Southeast Asian nations (ASEAN) formed a free trade area in 1992 with an agreement of Common Effective Preferential Tariff (CEPT). Following the creation of the free trade area, the share of regional trade rose from 14% in 1990 to 18% in 1999 (see IMF's ***Direction of Trade Statistics***). Since both Taiwan and China became members of the World Trade Organization (WTO) in 2002, it is expected the intraregional trade across the Taiwan

Strait will be spurred by an overall reduction in the level of trade barriers.

Recent trade integration across Taiwan Strait has been technology-driven and it will be accelerated by the WTO agreements in the future. It is always pointed out defensive Taiwan FDI, especially those labor-intensive industries, seeks cheap labor in the host countries to reduce the cost of production may cause a “hollowing-out” of domestic industries. And this worry cannot be refuted from a microeconomic perspective by utilizing firm data as shown in this study. However, as the non-labor-intensive industry grows and expansionary FDI is undoubtedly beneficial to domestic industries, we will expect larger FDI in this region, including China and Southeast countries. The economic integration will be more closely, as Taiwan government decided to relax the limits on Taiwan outward FDI in China. In fact, direct investments by domestic producers in such sectors as automobiles, semiconductors and chemicals have international diversification effect as well as vertical and horizontal integration effects. However, it should be mentioned that those who lack substantial investments in human capital and become unskilled workers in textiles and apparel for example would restrict trade and outward FDIs in this region, since the Stopler-Samuelson theorem applies to a decline in the relative wage of unskilled labor-intensive goods. Economic integration in this region needs more supplementary proposals including labor mobility as well as capital mobility policies such as tax agreement and investment security treaty. In the next stage, policy as well as technology will be the driving forces behind the regional economic integration.

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Table 1

Approved Taiwanese Outward Foreign Direct Investment

Unit: US $ 1000

Year	Total (%)	ASEAN (%)	China (%)
1994	1616764 （100）	397731 （24.6）	962209 （57.27）
1995	1356878 （100）	326098 （24.03）	1092713 （80.48）
1996	2165404 （100）	587268 （27.12）	1229241 （56.76）
1997	2893826 （100）	641241 （22.16）	1614542 （55.77）
1998	3296302 （100）	477494 （14.49）	1519209 （46.08）
1999	3269013 （100）	522180 （15.97）	1252780 （38.33）
2000	5077062 （100）	389446 （7.67）	2607142 （51.35）
2001	4391654 （100）	477139 （10.86）	2784147 （63.40）

Source : ***Taiwan Statistical Data Book*（Council for Economic Planning and Development）**

Table 2

Foreign Direct Investment by Areas

Year / Area	1997	1998	1999	2000	2001	2002
Developed Country	153	238	251	213	269	186
	(12.11)	(14.65)	(12.99)	(11.15)	(12.40)	(10.04)
China (including Hong Kong)	842	1048	1345	1343	1519	1383
	(66.60)	(64.49)	(69.58)	(70.31)	(70)	(74.68)
Southeast Asia	244	286	272	274	271	197
	(19.30)	(17.60)	(14.07)	(14.35)	(12.49)	(10.64)
Others	25	53	65	80	111	86
	(1.98)	(3.26)	(3.36)	(4.19)	(5.12)	(4.64)
Total	1264	1625	1933	1910	2170	(1852)

Source: ***1998~2003 survey on foreign investment by manufactures*** **(Ministry of Economic Affairs).**

Table 3A

Foreign Direct Investment Areas and Expanding of Domestic Scale (2001)

Domestic Scale / Area	Beneficial	No Change	Detrimental	Total
Developed Country	146	113	10	269
	(54.28%)	(42.01%)	(3.72%)	
China (including Hong Kong)	498	773	248	1519
	(32.78%)	(50.89%)	(16.33%)	
Southeast Asia	90	149	32	271
	(33.21%)	(54.98%)	(11.81%)	
Others	44	64	3	111
	(39.64%)	(57.66%)	(2.70%)	
Total	778	1099	293	2170
	(35.85%)	(50.65%)	(13.50%)	

Note: 1.Developed Country refers to the United States, Canada, Mexico, West European, Japan, Australia and New Zealand.

2.Southeast Asia refers to Malaysia, Singapore, Thailand, Indonesia, the Philippines and Vietnam.

Source: ***2002 survey on foreign investment by manufactures*** **(Ministry of Economic Affairs).**

Table 3B

Foreign Direct Investment Areas and Expanding of Domestic Scale (2002)

Domestic Scale / Area	Beneficial	No Change	Detrimental	Total
Developed Country	118	63	5	186
	(63.44%)	(33.87%)	(2.69%)	
China (including Hong Kong)	540	658	195	1393
	(38.77%)	(47.24%)	(14.0%)	
Southeast Asia	68	108	21	197
	(34.51%)	(54.82%)	(10.66%)	
Others	33	46	7	86
	(38.37%)	(53.49%)	(8.14%)	
Total	759	875	228	1862
	(40.76%)	(47.0%)	(12.24%)	

Note: 1.Developed Country refers to the United States, Canada, Mexico, West European, Japan, Australia and New Zealand.

2.Southeast Asia refers to Malaysia, Singapore, Thailand, Indonesia, the Philippines and Vietnam.

Source: ***2003 survey on foreign investment by manufactures*** **(Ministry of Economic Affairs).**

Table 4

Causes of Investment and Expanding of Domestic Scale

Domestic Scale / Cause of Investment	Beneficial	No Change	Detrimental	Total
Market expansion	549	669	161	1379
	(39.81%)	(48.51%)	(11.68%)	
Demand by foreign customers	299	311	114	724
	(41.30)	(42.96%)	(15.75%)	
Follow Taiwan consumers	202	282	106	590
	(34.24)	(47.80%)	(17.97%)	
Incentives from investing area	75	122	36	233
	(32.19%)	(52.36%)	(15.45%)	
Acquirement of technology	57	49	3	109
	(52.29%)	(44.95%)	(2.75%)	
Acquirement of land	155	186	72	413
	(37.53%)	(45.04%)	(17.43%)	
Material supply	124	160	48	332

	(37.35%)	(48.19%)	(14.46%)	
Cheap labor	481	641	240	1362
	(35.32%)	(47.06%)	(17.62%)	
Capital utilization	131	114	29	274
	(47.81%)	(41.61%)	(10.58%)	
Deterioration of domestic environment	244	385	154	783
	(31.16%)	(49.17%)	(19.67%)	
Quota	16	19	9	44
	(36.36%)	(43.18%)	(20.45%)	
Reduce exchange rate risk	15	21	6	42
	(35.71%)	(50%)	(14.29%)	
Overcome trade barrier	31	26	6	63
	(49.21%)	(41.27%)	(9.52%)	
Most-favored nation treatment	43	64	12	119
	(36.13%)	(53.78%)	(10.08%)	
Others	8	53	5	66
	(12.12%)	(80.30%)	(7.58%)	

Source: See Table 3.

Table 5

Type of Production and Expanding of Parent Production

Domestic Scale / Type of Production	Beneficial	No Change	Detrimental	Total
Horizontal Division	362	560	172	1094
	(33.09%)	(51.19%)	(15.72%)	
Vertical Division	330	299	92	721
	(45.77%)	(41.47%)	(11.76%)	
Irrelevant Product	86	240	29	355
	(24.23%)	(67.61%)	(8.17%)	

Source: See Table 3.

Table 6

Firm-size and Expanding of Parent Production Scale

Domestic Scale / Firm Sized	Beneficial	No Change	Detrimental	Total
Small	337	572	171	1080
	(31.20%)	(52.96%)	(15.83%)	
Medium	154	215	52	421
	(36.58%)	(51.07%)	(12.35%)	
Large	287	312	70	669
	(42.90%)	(46.64%)	(10.46%)	
Total	778	1099	293	2170
	(35.85%)	(50.65%)	(13.50%)	

Source: See Table 3.

Table 7

Domestic and Foreign R&D Department by Investment Areas

R&D / Area	Domestic R&D department		Foreign R&D department	
	no	yes	no	yes
Developed Country	17	252	134	135
	(6.32%)	(93.68%)	(49.81%)	(50.19%)
China (including Hong Kong)	308	1211	492	1027
	(20.28%)	(79.72%)	(32.39%)	(67.61%)
Southeast Asia	65	206	108	163
	(23.99%)	(76.01%)	(39.85%)	(60.15%)
Others	19	92	68	43
	(17.12%)	(82.88%)	(61.26%)	(38.74%)
Total	409	1761	802	1368
	(18.85)	(81.15)	(36.96)	(63.04)

Source: See Table 3.

Table 8

Type of Industry by Investing Area

Investing Area / Type of Industry	Developed country	China (including Hong Kong)	Southeast Asia
08. Food	5	40	9
10.Textile mill products	4	55	20
11.Wearing apparel and accessories	3	28	20
12.Leather and fur products	1	50	2
13.Wood and bamboo products	3	14	11
14.Furniture and fixtures	0	16	9
15.Pulp, paper and paper products	1	18	6
16.Printing and related support activities	0	13	0
17.Chemical material	12	35	12
18.Chemical products	10	49	13
19.Petroleum and coal products	0	2	2
20.Rubber products	0	27	7
21.Plastic products	7	80	13
22.Non-metallic mineral products	3	33	12
23.Basic metal	6	30	8
24.Fabricated metal products	6	92	25
25.Machinery and equipment	12	179	16
26.Computer、communication and video and radio electronic products	100	169	21
27.Electronic parts and components	60	197	17
28.Electrical machinery, supplies and equipment	13	141	17
29.Transport equipment	9	97	20
30.Precision instruments	10	55	0
31.Miscellaneous industrial products	4	99	11
Total (Manufacturing)	269	1519	271

Source: See Table 3.

Table 9

Summary statistics for Explanatory Variables

Variable	Mean	Standard deviation	Minimum	Maximum
Investment area –				
Developed Country	0.1240	0.3296	0	1
China (including Hong Kong)	0.7000	0.4584	0	1
Southeast Asia	0.1249	0.3307	0	1
Ratio of foreign Investment	0.2548	0.2814	0.05	0.95
Profit status	0.4945	0.5000	0	1
Cause of Investment-				
Market expansion	0.6355	0.4814	0	1
Technology acquirement	0.0502	0.2185	0	1
Cost savings	0.6493	0.4773	0	1
Firm size –				
Small scale	0.4977	0.5001	0	1
Large scale	0.3083	0.4619	0	1
Sales ratio	0.3109	0.2972	0	0.95
Technology source parent firm	0.8452	0.3618	0	1
Industry –				
Labor-intensive industry	0.5747	0.4945	0	1
Electrical & Electronics	0.3636	0.4811	0	1
Fabricated metal products	0.0571	0.2322	0	1
Type of production –				
Vertical integration	0.3323	0.4711	0	1
Horizontal integration	0.5041	0.5001	0	1
R&D –				
With domestic R&D	0.8115	0.3912	0	1
With foreign R&D	0.6304	0.4828	0	1

Table 10

Empirical Results for Ordered Probit Model

Variable	Coefficient	Marginal Effect		
		Detrimental	No change	Beneficial
Intercept	-0.9191*** (-6.992)			
Cause of investment –				
Market expansion	0.1940*** (3.487)	-0.0772	0.0062	0.0710
Technology acquirement	0.2794** (2.227)	-0.1104	0.0030	0.1074
Cost savings	0.1616*** (2.573)	-0.0643	0.0051	0.0592
Investment area –				
China	-0.3099*** (-3.796)	0.1230	-0.0061	-0.1169
Southeast Asia	-0.1999* (-1.873)	0.0793	-0.0077	-0.0716
Type of production –				
Horizontal integration	0.3759*** (4.728)	-0.1491	0.0106	0.1384
Vertical integration	0.6101*** (7.314)	-0.2387	0.0083	0.2305
Firm size –				
Small	-0.0204 (-0.283)	0.0081	-0.0006	-0.0076
Large	0.0292 (0.381)	-0.0117	0.0008	0.0109
Ratio of foreign Investment	-0.1342 (-1.190)	0.0535	-0.0038	-0.0497
Profit status	0.1794*** (3.301)	-0.0715	0.0051	0.0664
Sales ratio	0.1448 (1.293)	-0.0577	0.0041	0.0536
Industry –				
Labor-intensive	0.2698*** (4.605)	-0.1072	0.0084	0.0989
Electrical & Electronics	0.3131*** (5.464)	-0.1244	0.0070	0.1174
Fabricated metal products	-0.1239 (-1.065)	0.0493	-0.0045	-0.0448
R&D –				
With domestic R&D	0.2518*** (3.405)	-0.0998	0.0098	0.0900
With foreign R&D	-0.0818 (0.059)	0.0326	-0.0022	-0.0304
μ_1	0.3724*** (18.290)			
Log likelihood	-2023.173			
Chi-squared (degrees of freedom)	218.4418 (17)			
Number	2170			

Note: ***, ** and * indicate significance at 1,5,and 10% level, respectively. Numbers in parentheses are t-statistic. The estimation software package used is LIMDEP 8.0.

Table 11

Empirical Results for Ordered Probit Model by Area

Variable	Developed countries	China (including Hong Kong)	Southeast Asia
Intercept	-2.0394***	-1.0201***	-1.0934***
	(-3.518)	(-6.616)	(-3.323)
Cause of investment –			
Market expansion	0.4597**	0.1197*	-0.0154
	(2.298)	(1.811)	(-0.099)
Technology acquirement	0.1770	0.4003**	0.1522
	(0.741)	(2.234)	(0.245)
Cost savings	0.1177	0.1201*	0.3186*
	(0.559)	(1.626)	(1.766)
Type of production –			
Horizontal integration	0.5943***	0.2670***	0.4234**
	(2.589)	(2.623)	(2.170)
Vertical integration	0.9383***	0.4949***	0.5318**
	(4.200)	(4.612)	(2.345)
Ratio of foreign Investment	-0.6055	-0.0364	-0.0274
	(-1.166)	(-0.283)	(-0.085)
Profit status	0.2354	0.1853***	0.1264
	(1.327)	(2.884)	(0.793)
Firm size –			
Small	-0.5153**	0.1018	-0.2594
	(-2.216)	(1.192)	(-1.258)
Large	0.0306	0.0225	0.2724
	(0.142)	(0.244)	(1.168)
Sales ratio	0.5905*	-0.0022	0.0020
	(1.640)	(-0.017)	(0.006)
Industry –			
Labor-intensive	0.2478	0.2806***	0.4735***
	(1.189)	(4.143)	(2.822)
R&D –			
With domestic R&D	1.2045***	0.2998***	0.1228
	(2.300)	(3.569)	(0.618)
With foreign R&D	0.0046	-0.0722	0.0416
	(0.026)	(-1.014)	(0.248)
μ_1	0.1178***	0.4404***	0.3419***
	(3.233)	(17.019)	(6.009)
Log likelihood	-184.2430	-1484.9740	-238.5690
Chi-squared(degrees of freedom)	71.8142(13)	84.1054(13)	36.2616(13)
Number	269	1519	271

Note: ***, ** and * indicate significance at 1,5,and 10% level, respectively. Numbers in parentheses are t-statistic. The estimation software package used is LIMDEP 8.0.

Table 12

The Determination of R&D for Parent firms

Variable	Coefficient	*t-statistic*
Intercept	0.7336	4.810***
Firm size –		
Small	-0.6586	-6.786***
Large	0.2487	2.080**
Investment area –		
China	-0.5193	-4.306***
South-east Asia	-0.4600	-3.164***
Cause of investment –		
Market expansion	0.1633	2.281**
Technology acquirement	0.0677	0.379
Cost savings	-0.0607	-0.747
Type of production –		
Horizontal integration	0.0481	0.479
Vertical integration	0.2923	2.681***
Technology source parent firm	0.4217	4.271***
Ratio of foreign Investment	-0.7600	-6.198***
Industry –		
Electrical & Electronics	0.4136	5.198***
Affiliate with R&D	0.8639	11.662***
Log likelihood	-845.4015	--
Chi-squared(degrees of freedom)	409.8020(13)	--
Number	2170	--

Note: ***, ** and * indicate significance at 1,5,and 10% level, respectively. The estimation software package used is LIMDEP 8.0.

Table 13 Taiwan Exports and Imports in the Region, 1990-2001

Unit: 100 million US$

	Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Export	ASEAN 5	67.86	73.48	81.52	88.95	106.84	139	142.1	148.7	104.5	126.8	163.992	128.6
Percentage of Taiwan GDP	(%)	(4.24)	(4.10)	(3.84)	(3.97)	(4.38)	(5.25)	(5.08)	(5.12)	(3.91)	(4.40)	(5.30)	(4.57)
	Singapore	22.03	24.03	25.05	28.9	33.65	44	45.7	48.9	32.6	38.2	54.558	40.515
	Thailand	14.23	14.44	18.09	20.18	24.4	30.7	27.9	25.6	19.3	21	25.623	21.257
	Malaysia	11.03	14.46	16	16.71	22.24	29	29.5	30.4	22.9	28.5	36.117	30.6
	Indonesia	12.46	12.07	12.15	12.85	14.33	18.7	19.6	21.3	10.5	13	17.337	14.8
	Philippines	8.11	8.48	10.23	10.31	12.22	16.5	19.3	22.4	19.3	26.1	30.357	21.5
	Vietnam						10.1	11.8	13	12.1	13.4	16.635	17.3
	Hong Kong	85.56	124.31	154.15	184.53	212.62	261.1	267.9	286.9	248.2	260.1	313.363	269.614
Percentage of Taiwan GDP	(%)	(5.34)	(6.93)	(7.26)	(8.23)	(8.71)	(9.86)	(9.58)	(9.89)	(9.29)	(9.03)	(10.13)	(9.59)
	China	32.78	69.28	96.97	127.27	146.53	178.98	191.48	205.18	183.8	212.21	261.44	240.61
Percentage of Taiwan GDP	(%)	(2.05)	(3.86)	(4.57)	(5.67)	(5.99)	(6.76)	(6.85)	(7.07)	(6.88)	(7.37)	(8.45)	(8.56)
Import	ASEAN 5	40.14	49.09	60.59	67.65	84.21	101.7	107.5	128.6	122.1	140.4	197.162	155.4
Percentage of Taiwan GDP	(%)	(2.51)	(2.74)	(2.86)	(3.02)	(3.45)	(3.84)	(3.84)	(4.43)	(4.57)	(4.88)	(6.37)	(5.53)
	Singapore	14.06	14.45	16.94	18.65	24.12	29.6	27.9	31.5	27	33.1	50.138	33.7
	Thailand	4.47	5.86	8.24	9.73	11.08	14.9	16.7	19.3	19.7	23.8	27.68	21.8
	Malaysia	10.03	14.09	18.29	19.38	23.26	29.5	35.7	42.3	36.2	38.8	53.254	42.1
	Indonesia	9.22	12.34	14.07	16.24	21.14	21.5	18.8	21.8	21	22.9	30.151	25.2
	Philippines	2.36	2.35	3.05	3.65	4.61	6.2	8.4	13.7	18.2	21.7	35.939	32.5
	Vietnam						2.7	3.2	3.9	3.4	3.9	4.689	4.2
	Hong Kong	14.46	19.47	17.81	17.29	15.33	18.4	17	20	19.5	20.9	21.866	18.5
Percentage of Taiwan GDP	(%)	(0.90)	(1.09)	(0.84)	(0.77)	(0.63)	(0.69)	(0.61)	(0.69)	(0.73)	(0.73)	(0.71)	(0.66)

Table 13 Taiwan Exports and Imports in the Region, 1990-2000 (continued)

Percentage of Taiwan GDP	China	7.65	11.26	11.19	10.16	18.59	30.91	30.6	39.15	41.11	45.26	62.23	59.02
	(%)	(0.48)	(0.63)	(0.53)	(0.45)	(0.76)	(1.17)	(1.09)	(1.35)	(1.54)	(1.57)	(2.01)	(2.104)
Total Trade	ASEAN 5	108	122.57	142.11	156.6	191.05	240.7	249.6	277.3	226.6	267.2	361.154	284
Percentage of Taiwan GDP	(%)	(6.74)	(6.83)	(6.70)	(6.98)	(7.82)	(9.09)	(8.93)	(9.56)	(8.48)	(9.28)	(11.67)	(10.10)
	Singapore	36.09	38.48	41.99	47.55	57.77	73.6	73.6	80.4	59.6	71.3	104.696	74.215
	Thailand	18.7	20.3	26.33	29.91	35.48	45.6	44.6	44.9	39	44.8	53.303	43.057
	Malaysia	21.06	28.55	34.29	36.09	45.5	58.5	65.2	72.7	59.1	67.3	89.371	72.7
	Indonesia	21.68	24.41	26.22	29.09	35.47	40.2	38.4	43.1	31.5	35.9	47.488	40
	Philippines	10.47	10.83	13.28	13.96	16.83	22.7	27.7	36.1	37.5	47.8	66.296	54
	Vietnam						12.8	15	16.9	15.5	17.3	21.324	21.5
Percentage of Taiwan GDP	Hong Kong	100.02	143.78	171.96	201.82	227.95	279.5	284.9	306.9	267.7	281	335.229	288.114
	(%)	(6.24)	(8.01)	(8.10)	(9.00)	(9.33)	(10.55)	(10.19)	(10.58)	(10.02)	(9.76)	(10.83)	(10.25)
Percentage of Taiwan GDP	China	40.43	57.93	74.07	86.89	98.09	114.5	113	114.6	100.1	98	115.7	299.63
	(%)	(2.52)	(3.23)	(3.49)	(3.87)	(4.02)	(4.32)	(4.04)	(3.95)	(3.75)	(3.40)	(3.74)	(10.66)

Source: Taiwan Statistical Data Book