CHUNG-HUA INSTITUTION FOR ECONOMIC RESEARCH

INDUSTRY CHARACTERISTICS AND FDI STRATEGY: A THREE-WAY TYPOLOGY OF TAIWANESE INVESTMENT IN MAINLAND CHINA

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DISCUSSION PAPER SERIES No.9610

December 1996

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ISBN 957-9676-20-8

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Industry Characteristics and FDI Strategy: A Three-Way Typology of Taiwanese Investment in Mainland China

by

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I. Introduction

From its early days to the present time, the short but vibrant life story of Taiwanese foreign direct investment (FDI) on the mainland may be roughly delineated into four phases. The first phase was initiated by export-oriented small- and medium-sized enterprises (SMEs) around the mid-1980s as a result of escalating domestic production costs. This occurred even before the Taiwan government officially lifted the ban on visits to relatives in the mainland in 1987. The lifting of the ban, as well as various investment incentives accorded by the Chinese government in 1988 under the "Regulations for Encouraging Investment by Taiwanese Enterprises," further strengthened the tendency for SMEs to migrate to the mainland. The geographic area where these SMEs chose to relocate production concentrated in the southern coastline of China, bringing to the region economic prosperity and large-scale employment and export growth with the inflow of FDI (Chung 1991).

The second phase of investment began in late 1990 when the Taiwan government announced a "positive list" of over three thousand items

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** An earlier version of this paper was presented at the International Conference on the Emergence of the South China Growth Triangle, Chung-Hua Institution for Economic Research, May 5-6, 1995, Taipei. The author thanks an anonymous commentator for helpful comments.

which were permitted for "indirect" investment in China.[1] Many medium- to large-sized enterprises (MLEs) previously constrained by government policy (and, for that matter, their own visibility) started to display strong interest in the mainland market. Not only did the average size of new investment projects grow substantially, but the scale of many existing operations was also augmented. Quite a few publicly listed companies from Taiwan, including President Enterprises, Nan Ya Plastics, Cheng Shing Rubber, and Sampo Corporation, formally entered the Chinese market during this second phase of cross-Straits investment.

A third wave of investment fever occurred soon after the Chinese communist leader Deng Xiaoping gave a speech in the spring of 1992 on an inspection tour to South China. Deng's speech not only reaffirmed the ongoing reform as a guiding policy, but also represented a step forward in opening up the long-protected service sector for foreign participation. According to the blueprint envisaged by Deng and later implemented by the Chinese authorities, various formerly forbidden areas such as the stock exchange, land development, banking and insurance, transportation and communications, and even public infrastructure, became accessible to eligible foreigners for the first time. For Taiwanese businessmen who enjoy the advantages of geographic proximity and identical linguistic and cultural backgrounds, the investment opportunities in China indeed seemed infinite.

The fourth phase of investment started around 1994 and may be regarded as a continuation and mixture of the previous two phases, combining service sector interests with large-scale manufacturing investment undertakings. With the Taiwan government gradually loosening control over cross-Straits investment activities, the areas of investment in China have shifted towards more capital-intensive sectors such as midstream chemical products, non-metallic mineral products, textiles, and basic metals. More and more MLEs originally catering to Taiwan's domestic market are now entering China with a view to securing a share of its vast market potential. Companies that are currently undertaking huge investment projects in China include the top-ranking corporations and

[1] Due to a sustained political confrontation between Taiwan and mainland China, there have not been direct transportation, communications, and trade links between the two economies since the late 1940s. The term "indirect" here refers to circuitous transportation and trade arrangements (often through Hong Kong) for people and businesses from both sides.

business conglomerates on the island, such as President Enterprises in the processed foods industry (ranked first in Taiwan's food industry and sixteenth for all private manufacturing enterprises in 1994), Chung Shing in the textiles and garment industry, Sampo and Chung Hwa Picture Tubes in the electronics and electrical appliances industry, and Chuen Yuan in the steel products industry (See Table 1). These enterprises are either predominant players in their own fields (e.g., Chi Mei is the biggest supplier of ABS in the world), or they represent established business groups across a variety of sectors (e.g., President Enterprises is the core of a conglomerate encompassing retail chain stores, processed foods, construction, and electronics). Similarly, Nan Ya Plastics, a member of the Formosa Plastics Group, is among the biggest producers in both the petrochemical and semiconductor fields; Tai Yuan is associated with the automobile-based Yue Loong conglomerate; and Chung Hwa Picture Tubes, a close affiliate to the household appliances giant Tatung. Even Acer, the largest and fastest-growing PC conglomerate from Taiwan, has stepped into the Chinese market of late to produce and market some of its varied information products.

With perhaps the exception of high-tech electronics firms and PC producers, most of these companies have been oriented toward the domestic market and have enjoyed a certain degree of oligopoly power within their respective fields. Their sheer size, coupled with superior financial capabilities, grant these firms a leading edge over their domestic competitors. However, the scale of their operations is still very limited as judged by international standards, neither do they possess internationally marketable brand names which would enable them to compete effectively, and in a sustainable fashion, overseas. Technologically speaking, they are the receivers of mature technology with little self-directed R&D capacity. In fact, they have derived most of their technology from such multinational corporations as Sanyo, Mitsubishi, and Hitachi in the consumer electronics industry; Ford, Toyota, and Honda in the automobile industry; and Du Pont and Dow Chemicals in the chemical industry, to cite only a few examples. One advantage they do have, in terms of operating in China, *vis-a-vis* these foreign multinationals is their psychic and cultural "closeness" to the Chinese market. An interesting question to ask, then, is whether these MLEs can transform their domestic market positions and intrinsic cultural advantage to gain an edge in their mainland operations, given that most of their multinational parent firms are already active in the Chinese market. More basically, we would like to find out why Taiwanese MLEs choose

Table 1 Selected FDI Cases in China by Major Taiwanese MLEs

Company Name	Sales Rank in 1994 (1)*	(2)**	FDI Location in China	Cum. FDI as of 1995 (US$ mil.)	Content of Investment
Processed Foods:					
1.President Enterprises	1	16	12 major cities	132.0	Milk powder, Tomato sauce, Edible oil & feed
2.Wei Chuan Foods Corp.	2	56	7 major cities	16.2	Processed foods
3.Charoen Pokphand Taiwan	3	80	Shenyang, Shandong	9.1	Animal feed & Processed foods
4.Great Wall Enterprise	4	87	Shenzhen, Dalian, Tianjin	16.5	Flour products, Feed & processing
5.Fwushow Industry	11	150	Xiamen	2.2	Aquarium products
6.Sino-Japan Food Ind.	34	262	Nantong, Zhanjian, Shuende, Shanghai	7.5	Aquarium prod. & Husbandry
7.Chou Chin Ind. Co.	45	374	Shanghai	6.4	Beverage products
8.Ding Shing Oil & Fat	-	610	Tianjin, Beijing, Qinhuangdao	-	Edible oil and Processed foods
Textiles:					
1.Formosa Taffeta	2	40	Guangdong	15.9	Textile fibres
2.Chung Shing Textile Co.	4	46	Shanghai, Chengdu & 6 other cities	34.0	Textiles, Underwear
3.Tai Yuan Textiles	7	139	Jiangsu	15.0+	Textiles, Apparel
3.Carnival Textile		395	Wuxi	10.5	Textiles, Apparel
4.Reward Wool Ind.	20	289	Ningbo	9.4	Textiles, Apparel
Electronics & Electrical:					
1.Chung Hwa Picture Tubes	6	22	Shanghai	8.0+	Mono electric guns, Color CRTs
2.Sampo Corp.	7	27	Beijing, Tianjin & 3 other cities	17.0	Electric household appliances
3.Pacific Cable and Wire	10	34	Shenzhen	-	Cable & wire
4.Walsin Lihwa	11	39	7 Major cities	44.0+	Cable and wire
5.Inventec	18	71	6 major cities	30.0	Multimedia
6.Kingtel Group	-	133	Huizhou, Beijing & 6 other cities	-	Telephone sets
7.Picvue Electronics	62	269	-	-	Small-sized LCDs
8.Tsann Kuen Enterprise	-	495	Xiamen	-	Small-item home appliances

* Company rank in industry;
** Company rank in all private manufacturing firms in Taiwan;
\- means data not available;
\+ means figures not complete.

Table 1 Selected FDI Cases in China by Major Taiwanese MLEs (continued)

Company Name	Sales Rank in 1994 (1)*	(2)**	FDI Location in China	Cum. $ of FDI (US$ mil.)	Content of Investment
Information:					
1.Acer Peripherals	3	29	Jiangsu	4.0	Keyboards, Monitors
2.GVC Corp.	5	37	Dongguan	0.7	PC mice, etc.
4.Delta Electronics	-	53	Dongguan	14.6	Power supply units
5.Hon Hai Precision	14	86	Shenzhen Kuenshan Shanghai	12.7	Electronic components & parts
6.Microtek International	28	126	Dongguan	3.5	Image scanners
7.Primax Electronics	-	174		0.7	PC mice, etc.
Rubber & Plastics:					
1.Nan Ya Plastics Corp.	1	1	Xiamen, Dongguan; 4 cities	29.0+	PVC tubes and cloth
2.Chi Mei Corp.	3	11	Danyang	94.5 -	Plastic materials, PS, ABS
3.Cheng Shin Rubber	1	94	Xiamen, Kuenshan	82.5	Rubber tires
4.Kenda Rubber Ind.	5	310	Shenzhen, Kuenshan	20.2	Rubber tires and Beverages
Transportation Equip.:					
1.China Motor	2	89	Fujian	4.9	Auto parts
2.Kwang Yang Motor	6	18	Changsha	16.1+	Motorcycles & parts
3.Giant Manuf. Co.	10	89	Kuenshan, Shanghai	12.0+	Bicycles
4.Lio Ho Machine Works	19	365	Xiamen	-	Auto parts
5.Far East Machinery	40	304	Kuenshan	-	Steel/iron casting Casting fin
6.Wintec Machinery	45	1232	Shantou	-	Bicycle parts
Other Areas:					
1.Yuen Foong Yu Paper	1	54	Qingdao, Kuenshan	19.3	Paper products
2.Taiwan Glass Ind.	1	24	6 major cities	53.5	Float glass, etc.
3.Chuen Yuan Steel Corp.	2	51	Shanghai, Beijing	8.9	Steel products
4.Ho Cheng Corp.	3	74	Jiangsu	13.6	Porcelain products
5.Pou Chen Corp.	4	92	Guangdong	4.1	Footwear

* Company rank in industry; ** Company rank in all private manufacturing firms in Taiwan. Cumulative sum of FDI is at mid-1995; - means data not available; + means data not complete.
Sources: *Top 500 Largest Corporations in Taiwan*, (1995); Investment Commission, MOEA; and various news paper releases.

to venture into the Chinese market even if many of them do not possess enough technological and marketing advantages. Are the motives similar to those dictating FDI from smaller firms? What are the differences? And how do these differences affect the behavior of FDI firms in their overseas operations as well as activities at home? These are the questions this paper seeks to address.

According to Chen, Ku, and Liu (1994), Taiwan's manufacturing industries may be grouped into four broad categories according to their respective characteristics: (1) the traditional manufacturing sector dominated by relatively independent SMEs; (2) the high-tech sector dominated by MLEs with a network of SMEs; (3) the monopolistic, capital-intensive sector dominated by MLEs which operate more or less independently; and (4) the networking traditional manufacturing sector dominated by SMEs. In the first and second sectors export propensity tends to be high; while the second and third sectors are generally dominated by large firms.[2] Their study was based on a clustering of 93 three-digit industries in Taiwan for the year 1991. The focus was on examining export competitiveness among different groupings of businesses, in particular SMEs, in order to explicate the witnessed decline of the SME's share in Taiwan's total exports in recent years. However, the same typological methodology may be fruitfully applied to analyze the effects of industry characteristics on the pattern of FDI and the resulting impact upon the home economy.

In the traditional FDI literature, the behavioral patterns of direct foreign investment are usually delineated into a *defensive* type and an *expansionary* type, in which the former refers to overseas ventures in search of low-cost labor (Kojima 1978) while the latter refers to on-site production to penetrate the local market (Hymer 1960; Caves 1971). However, this simple dichotomy between a defensive mode and an expansionary mode based on historical observations may inadvertently conceal the richness and specificity of FDI motivations for a newly-industrializing country such as Taiwan, whose indigenous enterprises are distinctively different from those of either Japan or the U.S. Given that firms from different industries may possess different strengths and distinct

[2] Also, see Chou, Tien-chen (1985) for a discussion of Taiwan's MLEs vs. SMEs in their respective roles in the economy.

weaknesses, it is natural to expect diverse behavioral patterns and FDI strategies among them when they engage in direct investments abroad. In the final analysis, such strategies and behavioral patterns are nothing but a response to their particular needs and/or advantages. More specifically, we would like to discover in this paper the innate relationship between industry characteristics on the one hand, and pattern of FDI on the other, of different types of manufacturing firms from Taiwan, and to contemplate the implications of this relationship for industrial restructuring in the home economy.

The remainder of this paper is organized as follows: in the next section a set of multivariate analytic techniques is applied to industry-level data of Taiwan for the period 1987-1993 to shed light on the possible relationships between industry characteristics and corporate FDI strategies. Specific use is made of cluster analysis and principal component analysis in an attempt to derive a useful classification of industry types and to sort out the common latent traits of the ten industry variables included in the study. A regression model is then set up to investigate the relationship between industry characteristics and the behavior of FDI relative to domestic restructuring. Section three applies the results from the multivariate analyses to postulate a three-way typology of Taiwanese FDI based on firm characteristics and industry performance in the home economy. We also offer simplified case studies of different FDI firms to elaborate, substantiate, and sometimes also correct for the multivariate analytic results which are based on industry-level data. Section four concludes the paper.

II. Industry Characteristics and the Pattern of FDI: A Multivariate Analytic Approach

According to official Chinese statistics, Taiwan's cumulative direct investment towards the mainland registered US$25.34 billion as of mid-1995, and more than 28,000 Taiwanese enterprises had established some form of operations in China. Taiwan's share in total foreign investment was 8.3 percent in terms of the value of contracts and 12 percent in terms of the number of cases contracted. On both counts Taiwan is second only to Hong Kong among all sources of foreign investment. Table 2 shows the industrial distribution of major foreign investors in China in terms of

Table 2 Industrial Distribution of FDI in China: 1992 Survey Data

unit: %

FDI source / Industry	Total	H.K.	Taiwan	U.S.	Japan	Singapore	Others
Agriculture & Forestry	**1.80**	**1.62**	**0.80**	**1.33**	**2.07**	**1.53**	**4.35**
Manufacturing	**62.12**	**59.13**	**76.72**	**73.71**	**33.93**	**61.61**	**72.34**
Processed Foods	4.13	2.72	8.09	7.71	1.43	15.64	7.56
Beverages & Tobacco	1.33	1.18	0.86	5.77	0.07	1.32	1.57
Textiles	7.95	9.59	7.92	3.23	1.15	4.41	4.92
Wearing Apparel	5.14	5.98	5.12	2.24	4.12	2.29	1.82
Leather Products	1.91	2.15	1.78	1.46	0.74	0.46	1.82
Wood & Bamboo Products	1.85	1.25	3.31	1.11	2.84	3.45	3.68
Paper Products	1.75	1.93	1.39	1.74	0.32	0.54	2.41
Chemicals	2.13	1.88	1.72	8.72	0.74	2.13	1.79
Chemical Products	2.44	2.01	3.64	4.75	1.32	7.43	2.60
Petroleum & Coal	0.20	0.15	0.05	0.39	0.00	1.38	0.68
Rubber Products	0.51	0.41	1.43	0.69	0.05	0.05	0.54
Plastic Products	5.59	5.44	9.35	2.23	0.69	4.36	8.40
Non-metallic Mineral Products	4.68	5.22	2.51	5.82	1.36	6.39	5.29
Basic Metals	1.24	1.18	0.85	0.66	1.85	0.45	2.21
Metal Products	3.13	2.83	5.25	6.94	1.07	1.09	2.62
Machinery	1.75	1.10	3.59	3.13	2.34	1.54	2.99
Electrical Appliances	9.40	9.47	9.37	9.42	3.87	6.75	9.23
Transportation Equip.	1.91	1.07	1.86	3.00	3.11	0.21	7.17
Precision Instruments	0.80	0.83	0.81	0.59	0.39	0.63	1.11
Miscellaneous Products	3.27	2.71	7.82	3.57	0.95	1.10	3.93
Service & Construction	**37.09**	**39.25**	**22.48**	**25.50**	**64.01**	**36.86**	**23.13**
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Adapted from Kao, Charng, et al. (1994), *A Comparative Study of Foreign Investment in Mainland China*, Supplementary Table 5-3, p.261.

realized investment at the end of 1992.[3] It can be seen that 76.72 percent of Taiwan's realized investment went to the manufacturing sector, whereas for Hong Kong, Singapore, and Japan the relevant figures were only 59.13, 61.61, and 33.93 percent, respectively. Furthermore, Taiwan's FDI towards the manufacturing sector accounted for 14.17 percent of the entire realized FDI flowing into that sector, second only to Hong Kong's share of 63.65 percent (Table 3). Similar figures for the U.S. and Japan were 6.09 and 4.32 percent, respectively. Thus, compared to other major investor countries, Taiwanese FDI has been concentrated more heavily in manufacturing activities. Within the manufacturing sector itself, major shares went to the electrical and electronics industry (9.37%), plastic products (9.35%), processed foods (8.09%), textiles (7.92%), miscellaneous products (7.82%), metal products (5.25%), and wearing apparel (5.12%) (See Table 2). It is interesting to note that FDI from Hong Kong also emphasized such sectors as textiles and apparel, electrical appliances, and plastic products. On the other hand, the U.S., as expected, invested more heavily in the beverage and tobacco industry, the electrical appliances industry, and the chemical industry, while Japanese FDI had been active mainly in wearing apparel, electrical appliances, and the transportation equipment industries.

Table 3 takes another angle by looking at the "absorption rate" of each investor country's FDI in total FDI solicited in each sector. It may be noted that Taiwanese FDI occupied a major share in rubber products (31.42%), miscellaneous products (26.97%), processed foods (22.11%), and machinery (23.12%). On the other hand, the U.S. had a share exceeding 20% in two sectors: beverages and tobacco, and the chemicals industry. For the large role Hong Kong has played in China's overall FDI inflows, its representation in such sectors as processed foods, wood and bamboo products, and the machinery industry were extraordinarily weak.

What do all these figures tell us? Do they mean, for instance, that for Taiwan and Hong Kong such sectors as textiles and apparel, electronics and electrical appliances, plastics products, and miscellaneous items are the **strong points** of their economies, just as chemicals and processed foods

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[3] For data on FDI's sectoral distribution in China, 1992 is the latest statistics we have for purposes of making country comparison. However, for Taiwanese FDI alone, 1993 data is also available from Kao and Wu (1995). See Kao, C. and S. Y. Wu (1994; 1995) for a detailed explanation of how these data are compiled.

Table 3 Taiwan's Share in Total FDI in Mainland China (1992)

unit: %

FDI source / Industry	Total	H.K.	Taiwan	U.S.	Japan	Singapore	Others
Agriculture & Forestry	**100.00**	**59.54**	**5.06**	**3.78**	**8.96**	**1.59**	**9.89**
Manufacturing	**100.00**	**63.65**	**14.17**	**6.09**	**4.32**	**1.88**	**15.30**
Processed Foods	100.00	43.33	22.11	9.50	2.70	7.07	9.89
Beverages & Tobacco	100.00	58.43	7.33	22.10	0.40	1.85	5.17
Textiles	100.00	79.37	11.24	2.07	1.12	1.04	2.95
Wearing Apparel	100.00	76.53	11.24	2.21	6.23	0.45	7.96
Leather Products	100.00	74.19	10.51	3.88	3.01	3.48	16.64
Wood & Bamboo Products	100.00	44.58	20.56	3.05	11.98	0.57	11.49
Paper Products	100.005	75.24	8.93	5.05	1.41	1.87	7.04
Chemicals	100.003	58.33	9.16	20.87	2.73	5.69	8.91
Chemical Products	100.00	54.41	16.86	9.92	4.22	12.59	27.77
Petroleum & Coal	100.00	47.42	2.50	9.72	0.00	0.17	8.83
Rubber Products	100.00	52.11	31.42	6.79	0.69	1.46	12.55
Plastic Products	100.00	64.11	18.89	2.03	0.96	2.55	9.44
Non-metallic Mineral Products	100.00	73.37	6.05	6.32	2.27	0.68	14.81
Basic Metals	100.00	62.57	7.69	2.69	11.56	0.65	6.99
Metal Products	100.00	59.47	18.95	11.27	2.66	1.64	14.28
Machinery	100.00	41.47	23.12	9.09	10.40	1.40	8.60
Electrical Appliances	100.00	69.50	11.79	5.34	3.36	0.20	31.36
Transportation Equip.	100.00	36.81	10.96	7.98	12.96	1.47	11.54
Precision Instruments	100.00	67.91	11.55	3.72	3.81	0.63	10.04
Miscellaneous Products	100.00	54.55	26.97	5.55	2.27	1.85	5.19
Service & Construction	**100.00**	**69.31**	**6.81**	**3.48**	**13.37**	**1.86**	**8.34**
Total	100.00	65.58	11.27	5.08	7.77	1.86	8.34

Source: Same as in Table 2; Supplementary Table 5-4, p.262.

may be called the strong points of the U.S.? The answer to this question may be more complicated than a clear-cut *yes* or *no*, but the question itself serves to remind us of a basic point: to understand the behavior of FDI properly, it is important to know about the industry (and firm) characteristics of the FDI carriers when they operate **at home.**

In order to analyze the relationship between industry characteristics on the one hand and pattern of FDI on the other, data on the following ten industry variables are collected for the two-digit industries of the Taiwan manufacturing sector:

(1) Labor intensity (LABORSR): measured by the share of total labor costs in annual production outlay. A high labor intensity implies greater pressure due to domestic shortage of labor and escalating wage costs, and thus harder squeeze on the profit margin and a need to transplant production to a low-wage destination such as China.

(2) Export intensity (EXPORTSR): measured by the value of exports divided by the value of total sales. Large export intensities (or propensities) may have double-edged implications for the companies involved. First, they may be under greater pressure to engage in price competition --and, therefore, are more cost-conscious -- or they may be better able to compete internationally because of their export experience and capabilities.

(3) SME share (SMESR): measured by the share of output produced by SMEs in total output in that sector. According to standard FDI theories, SMEs are in a disadvantaged position to make direct investment abroad because of their limited financial, technological, and managerial resources. However, as pointed out by Chung (1994) and others, Taiwanese FDI toward China (and, for that matter, Hong Kong's FDI toward the Pearl River Delta) has been made much easier due to cultural, geographic, and linguistic proximity which effectively lowers the implicit costs involved in making FDI. On the other hand, being an SME subject to macroeconomic changes, smaller firms may be more driven to relocate abroad than their MLE counterparts in order to maintain competitiveness and stay in business.

(4) CR_4 (CR4): four-firm concentration ratio measured by the share of sales of the largest four firms in the industry. It is expected that the greater this ratio the more inward-looking the sector (Chou 1985), which, in turn, implies a more traditional behavioral pattern for FDI. The oligopolistic structure of these industries may facilitate FDI

activities *a la* Hymer and Caves, but at the same time it also tends to solicit continual domestic investment by these same oligopolists so that they could maintain market position at home. Taken together, one expects to see an inverse relationship between CR_4 and FDI intensity (to be defined below).

(5) Network intensity (NETWORK): measured by the number of affiliated factories under a Center/Satellite system registered with the government divided by the total number of manufacturing firms. A well-developed network relationship can help maintain the structure of domestic production if the central leaders are able to supply new technologies and/or new market outlets in the process of an industrial restructuring. Otherwise the whole network may choose to move out, either in the form of group FDI or in a serial manner to the same effect, in an attempt to sustain the network relationship in which vertical and horizontal division of labor saves time and costs.

(6) R&D ratio (R&DSR): the ratio of R&D expenditure to total sales (averaged between 1987 and 1993). A high R&D ratio signifies corresponding efforts in process or product technology development, which is an important behavioral feature of a growing firm in many industries. Low values of R&D ratio indicate either that the products produced by the industry are very standardized, or that the firm is losing its hold to market competitiveness.

(7) Export growth (XG): average annual growth rate of sectoral exports between 1987 and 1993. High rates of export growth signify competitiveness and good business outlook, while low rates indicate the opposite.

(8) Output growth (RGDPG): average annual growth rate of sectoral output between 1987 and 1993.

(9) Capital growth (RKG): average annual growth rate of gross real domestic capital formation during the period 1987-1993.

(10) FDI intensity (DFIINTENS): measured by the ratio between the value of cumulative FDI towards China as of the end of 1993, and the value of gross real domestic capital formation, cumulative from 1987 to 1993. A higher value of FDI intensity indicates relatively meager investment efforts at home in the face of outward FDI, while a low value indicates the opposite, a state of healthy domestic capital formation relative to outward FDI.

Among the ten industry variables under investigation, only the last one, FDI intensity, is a composite variable in a *geographic* sense, i.e., it is compiled from the ratio between rate of *overseas* investment and rate of *domestic* capital formation. This variable is of particular interest to the present study because it bears direct implications for domestic restructuring in the face of outward FDI. It also proves to be an important dividing feature for different types of FDI strategies, as will be shown shortly and further discussed throughout the paper.

As may be suspected, a run of correlation analysis shows that many of these variables are highly correlated with each other, and there is often uncertainty in the direction of influence on theoretical grounds. Furthermore, due to the scantiness of data for some of these variables (in particular FDI intensity), we have only 18 observations for any statistical tests that may be run.[4] Under these circumstances, the usual practice of multiple regressions obviously is not appropriate and we resort to multivariate analytic techniques to derive statistically more "acceptable" results.

We will first conduct a cluster analysis, based on the ten variables listed above, to conjecture a preliminary classification of industries that exhibit distinctively differentiable characteristics. We then make use of the principal component analysis, a variant of the broader category of factor analysis, to purposely reduce the dimensionality of the variable space (or to "group" the variables this time, rather than "grouping" the industries as was done previously) while retaining most of the information contained in the original data set. A final regression of the variable of interest, FDI intensity, on the principal components scores derived from the previous step will, finally, help us explain better the relationship between industry characteristics and FDI strategies while avoiding the burden of being exposed to too many variables with only a few observations in the sample space.

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[4] The original data sets on domestic investment as well as FDI towards China are compiled according to a twenty-sector classification of all manufacturing industries. We have deleted two sectors that are dominated by state-owned monopolies, the petroleum and coal industry and the tobacco industry, on the basis that decision-making in these two sectors may be quite different from that in other sectors and that, as a result of their monopolistic position, their extreme values in some of the characteristic variables (for example, CR_4 and SME intensity) may bias the statistical results.

1. *Optimal Grouping of Industries*

The key idea of cluster analysis is to optimally classify a set of given data, which shows high multicollinearity among the variables, based on some internal maximizing or minimizing criteria. In order to show this, suppose we have a given data set **D**[5], for which there is the relationship:

$$\mathbf{T} = \mathbf{W} + \mathbf{B} \tag{1}$$

where **T** is the total dispersion matrix of **D**, **W** is the matrix of "within-group" dispersion, and **B** is the matrix of "between-group" dispersion. A criterion for clustering, suggested by Everitt (1974), is to minimize the within-group variability as measured by the sum of the variation on each variable, or, alternatively, the trace of the pooled within-group matrix of sums of squares and cross products. Furthermore, since we have the following relationship:

$$\text{trace } (\mathbf{T}) = \text{trace } (\mathbf{W}) + \text{trace } (\mathbf{B}) \tag{2}$$

one gets exactly the same results by maximizing the trace of **B**, the between-group dispersion matrix.

Table 4 presents the clustering results of the ten industry variables included in this study. As the choice of the number of clusters is intrinsically arbitrary,[6] we have chosen to "group" these variables into four clusters based on *a priori* judgment as well as previous literature (i.e., Chen, et al.). It turns out that the four groups have demonstrated visible differences just as expected.

The first cluster consists mainly of labor-intensive, export-oriented SMEs. One can see from Table 4 that the cluster means of these three variables are noticeably higher than those of the other clusters and are definitely higher than the manufacturing average. Furthermore, these sectors are also characterized by relatively lower values for the CR_4 and network intensity variables, indicating that firms in these sectors are largely independent producers and exporters rather than members of a closely integrated production network. What is more striking is the fact that this

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[5] In the discussion that follows all bold-faced capital letters refer to matrices and bold-faced lower-case letters refer to vectors.

[6] But, of course, an inappropriate choice of the number of clusters may lead to very poor results.

Table 4 Clustering Results of Taiwan's Manufacturing Sectors by Industry Characteristics

unit: %

Characteristics / Sector	Labor Intensity (1991)	Export Intensity (1991)	SME Share (1992)	CR4 (1992)	Network Intensity (1991)	R&D Ratio (87~93)	Export Growth (87~93)	Output Growth (87~93)	Capital Growth (87~93)	FDI Intensity (87~93)
Cluster I										
Apparel	25.08	58.18	68.49	8.67	3.25	0.08	-7.60	-5.60	-2.66	69.20
Leather Prod.	17.71	55.11	60.01	5.45	2.23	0.26	-12.40	-6.90	3.38	53.50
Wood Products	19.24	24.61	72.28	4.05	0.88	0.10	-16.70	-3.30	2.74	21.30
Rubber Prod.	20.21	42.73	51.15	20.82	7.62	0.75	-3.20	1.20	2.75	12.80
Plastic Products	18.68	32.99	73.24	15.18	3.29	1.57	-3.20	1.10	2.75	9.70
Miscellaneous Products	20.15	54.93	76.17	16.29	8.35	0.53	-9.10	-4.10	-1.15	28.10
Group Mean	**20.18**	**44.76**	**66.89**	**11.74**	**4.27**	**0.55**	**-8.70**	**-2.93**	**1.30**	**32.43**
s.d.	**2.58**	**13.71**	**9.52**	**6.68**	**3.02**	**0.56**	**5.28**	**3.40**	**2.54**	**23.84**
Cluster II										
Processed Foods	12.84	19.41	21.63	8.90	0.59	0.38	-1.90	2.60	4.11	10.40
Non-metallic Mineral Products	18.15	10.40	36.56	27.89	1.79	0.15	-4.30	8.40	3.51	6.60
Group Mean	**15.49**	**14.90**	**29.10**	**18.40**	**1.19**	**0.26**	**-3.10**	**5.50**	**3.81**	**8.50**
s.d.	**3.75**	**6.37**	**10.56**	**13.43**	**0.85**	**0.16**	**1.70**	**4.10**	**0.42**	**2.69**
Cluster III										
Paper Products	15.63	10.57	51.49	28.62	2.69	0.10	13.40	-1.80	9.65	5.60
Textiles	16.31	36.49	29.87	5.69	11.48	0.40	8.70	-1.20	3.48	5.00
Chemicals	12.02	26.79	13.51	24.39	6.68	1.08	16.00	6.80	8.52	5.20
Chemical Prod.	16.77	13.43	37.75	14.74	7.04	1.24	8.70	8.30	8.52	0.97
Basic Metals	11.11	9.69	30.38	6.07	11.08	0.37	11.80	8.80	5.32	0.30
Metal Products	21.01	24.54	74.50	10.80	3.42	0.31	6.30	9.40	10.06	6.20
Machinery	19.29	25.86	59.74	4.40	7.94	0.60	13.80	10.30	6.39	12.10
Transportation Equipment	13.59	17.39	21.52	35.25	36.90	0.93	7.30	8.40	4.91	4.70
Group Mean	**15.72**	**20.59**	**39.84**	**16.24**	**10.90**	**0.63**	**10.75**	**6.12**	**7.10**	**5.01**
s.d.	**3.41**	**9.37**	**20.55**	**11.76**	**10.96**	**0.41**	**3.49**	**4.81**	**2.42**	**3.60**
Cluster IV										
Electrical & Electronics	15.06	53.83	28.97	10.11	14.26	2.05	9.60	10.90	8.80	5.40
Precision Instruments	20.21	59.71	58.56	18.41	7.66	1.27	4.60	1.60	8.84	9.00
Group Mean	**17.63**	**56.77**	**43.77**	**14.26**	**10.96**	**1.66**	**7.10**	**6.25**	**8.82**	**7.20**
s.d.	**3.64**	**4.16**	**20.92**	**5.87**	**4.67**	**0.55**	**3.53**	**6.58**	**0.028**	**2.54**
All Sectors Mean	**17.39**	**32.04**	**48.10**	**16.28**	**7.62**	**0.65**	**2.33**	**3.04**	**4.99**	**14.78**
s.d.	**3.59**	**17.89**	**20.84**	**10.68**	**8.29**	**0.43**	**9.82**	**5.97**	**3.62**	**18.43**

Sources: Labor, export, and network intensities are calculated from *The Report on 1991 Industrial and Commercial Census, Taiwan-Fukien Area, The Republic of China*; SME shares are from *The White Book on Taiwan's Small- and Medium-Sized Businesses* (1994); CR4 ratios are calculated from *Monthly Statistics of Industrial Production* and *Top 500 Largest Corporations in Taiwan (1993)*; export, output, and capital growth rates between 1987 and 1993 are calculated from *Monthly Statistics of Taiwan's Import-Export Trade, The National Income Account* (various issues), and domestic capital formation data from the Directorate-General of Budget, Accounting and Statistics (in computer print-out form). The FDI intensity ratios are calculated based on the FDI sectoral distribution given in Kao and Wu (1995), Appendix Table A-4, and the total realized Taiwanese FDI of US$4.23 billion at the end of 1993.

cluster consists of almost all the "declining industries" in Taiwan and that both exports and output variables exhibited substantial negative growth for the period 1987-93. Finally, the cluster also shows the highest average level of FDI intensity among the four clusters, meaning that, compared to other sets of industries, industries within this group have exhibited a stronger drive for outward investment which overshadowed their new investment activities at home.

By contrast, the second and third clusters consist of low labor intensity, inward-looking industries with a relatively high ratio for CR_4.[7] Both the network intensity and R&D ratio indices are particularly low for the second cluster (processed foods and non-metallic mineral products) as are their economic performances (in particular export growth) in recent years, whereas for the third cluster export and output performances are among the highest. It may also be noted that the third group of sectors demonstrates the lowest level of relative FDI/domestic investment intensity, which may be part of the reason their domestic economic performances have scored so highly.[8] Two other important differences between the second and the third clusters need to be pointed out. First, the third cluster shows a highly networking pattern, while the second cluster scores the lowest in this respect; and, second, industries that fall into the third cluster have an additional common feature that is not properly captured by the present model, namely that they are often upstream or midstream producers whose output are used, domestically or overseas, in the manufacturing of downstream goods. This also partly explains why some of the industries in the third cluster (e.g., textiles and paper products) are able to enjoy

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[7] Since the first round of clustering based on the full sample of 18 sectors yielded unsatisfactory results in terms of the split-up between the second and the third clusters (i.e., processed foods was in the second cluster while paper products was in the third cluster), in view of the logistic nature of industries in cluster three (to be explained below) and the three domestic performance variables, we conducted a second round of clustering for the ten sectors involved (those in cluster two and cluster three) to arrive at the present result.

[8] It must be borne in mind that some industries or sub-industries within the third cluster (and also some within the second and the fourth clusters) were not allowed to make an FDI move toward the mainland until late 1994 under a gradual phase-in regulatory policy adopted by the Taiwan government. For example, the automobile sub-industry from the transportation equipment industry; petrochemicals from the chemicals industry, and synthetic fibers from the textiles industry, etc. Government regulation no doubt has exercised some restrictive (downward) effects on the behavior of FDI intensity for these sectors.

relatively high rates of export growth even when their domestic production is stagnant or declining. On the other hand, industries in the second cluster are either export-inefficient (due to the bulky nature of their products, as in the case of cement) or local consumption-oriented (e.g., processed foods), and therefore do not possess the same kind of cross-border logistic feature as do industries in the third cluster.

The last cluster consists only of two industries: electronics and electrical appliances, and precision instruments. These sectors exhibit the highest ratios for R&D and export propensities, which constitute the two distinguishing features that differentiate them from the industries in the third cluster. The FDI intensity variable also shows respectably low values (averaging 7.20 as compared with the manufacturing mean of 14.78). And, like the third cluster, it demonstrates the best domestic performance in terms of export and output growth as well as sectoral capital formation.

The above results seem to fit our *a priori* intuitive judgments and conform quite well with the results obtained by Chen, Ku, and Liu (1994). What we need to do now is to identify meaningful "variables" to account for the differences in relative investment behavior at home and abroad, i.e., the FDI intensity across different sectors and by different firms. To do this we turn to principal component analysis, widely in use in the administrative and business literature, which has the benefit of reducing the variable space without sacrificing too much of the embedded information.

2. *Reducing the Variable Space*

A direct way to find the principal components $\mathbf{Z}$ of the standardized explanatory variable matrix $\mathbf{X}_s$[9] is to find its singular value decomposition:

$$\mathbf{X}_s = \mathbf{PAQ}' = \mathbf{ZQ}' \qquad (3)$$

where $\mathbf{P}$ is the matrix of eigenvectors of $\mathbf{X}_s\mathbf{X}_s'$, $\mathbf{A}$ is a diagonal matrix of ordered positive values, $\mathbf{Z} = \mathbf{PA}$ is the matrix of principal component axes, and $\mathbf{Q}'$ is the transpose of the rotation matrix which leads to the principal components orientation of $\mathbf{X}_s$ (Green 1978). Intuitively, each $\mathbf{z}_j$ is a linear combination of the original variables given by $\mathbf{X}_s$ with weights defined by $\mathbf{q}_j$, the successive columns of $\mathbf{Q}$. The rotation matrix is orthogonal so it does not alter the basic relationship between the original data set. Furthermore, the principal component axes contained in $\mathbf{Z}$ are all mutually

[9] The subscript "s" refers to "standardization."

uncorrelated. One disadvantage of such a procedure is that the output (factor scores and factor loadings) that come out often become blurred in interpretation. A usual practice to remedy this defect is to do a Kaiser's (1958) Varimax rotation of the resulting factor loadings matrix so as to improve the interpretability of the solution.

In Table 5, the results of a first run of principal component analysis are shown. We can see from the table that the first three principal components (unnamed in that table) have cumulatively explained 74 percent of all the variances present in the original data set. Adopting the prevalent procedure of retaining all components whose eigenvalue exceeds unity,[10] we run the data matrix on the three principal components again, and subsequently rotate the axes using the Varimax procedure given by the software package STATGRAF to arrive at more interpretable results. Table 6 gives the final outcome of the Varimax-rotated principal component loadings matrix, which shows the correlation of the new principal components with the original explanatory variables. It is important to see that we now have three "identifiable" surrogate variables, each related to a specific set of the original variables (excluding FDI intensity) and may be conveniently termed the "growth factor," the "structure factor," and the "behavior factor," respectively, of the observed patterns of FDIINTENS. The "growth factor" relates primarily to the three performance variables: export growth, real GDP growth, and the average growth rate of domestic real capital formation. The "structure factor" relates primarily to the four structural variables (network intensity, labor intensity, SME share, and CR_4), while the "behavior factor" relates mainly to the two remaining behavior variables (R&D ratio and export intensity).

3. *Regression Results of FDIINTENS on the Reduced Variables*

Now we are in a position to investigate, through regression analysis, the possible relationships between industry characteristics (properly transformed) and the pattern of FDI in a reduced variable space. The regression equation is written as follows:

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[10] This rule of thumb for choosing the number of principal components is suggested by, for example, Kaiser (1959).

Table 5 Principal Component Analysis of Industry Characteristics

Result / Variable	Communality	Factor	Eigenvalue	Percent Variance Explained	Cumulative Percent Explained
XG	0.70737	1	4.12123	45.8	45.8
RGDPG	0.79998	2	1.43265	15.9	61.7
RKG	0.68108	3	1.10264	12.3	74.0
NETWORK	0.46885	4	0.88480	9.8	83.8
LABORSR	0.79662	5	0.55720	6.2	90.0
EXPORTSR	0.76920	6	0.45257	5.0	95.0
SMESR	0.77245	7	0.25369	2.8	97.8
R&DSR	0.72316	8	0.11727	1.3	99.1
CR4	0.36998	9	0.07796	0.9	100.0

Note: Excluding FDIINTENS we have 9 variables, each with 18 observations, to run the factoring analysis.

Table 6 Varimax-Rotated Principal Component Loadings Matrix

Factor / Variable	Factor I ("Growth")	Factor II ("Structure")	Factor III ("Behavior")
XG	0.82892*	0.28286	-0.03048
RGDPG	0.82980*	0.26918	0.06972
RKG	0.89406*	0.00132	-0.04452
NETWORK	0.12578	0.76012*	0.38340
LABORSR	-0.46839	-0.62367*	0.35059
EXPORTSR	-0.41701	-0.30686	0.75073*
SMESR	-0.43027	-0.73227*	0.14864
R&DSR	0.44811	0.32153	0.74732*
CR_4	0.03028	0.64025*	-0.02766

* signifies "simple structure" interpretable factor loadings, each accruing to a single factor in a row after the Varimax rotation.

$$FDIINTENS=\beta_0+\beta_1\ Growth+\beta_2\ Structure+\beta_3\ Behavior+\ \varepsilon \qquad (4)$$

Table 7 presents the regression results. The dependent variable, FDIINTENS, is seen to be associated with the first factor, or the "growth factor," most significantly (at the 1% level). The negative sign of the estimated coefficient, -13.3757, indicates the existence of a *positive* relationship between sectoral performance and the relative strengths of domestic investment versus outward FDI. The estimated coefficient for the second factor, the "structure factor," is also statistically significant at the 5% level and has a negative sign. The interpretation of this is that the higher the CR_4 ratio and the network intensity, and the lower the labor intensity and SME share, the lower FDIINTENS will be.[11] However, the last surrogate variable (the "behavior factor"), which summarizes the two characteristics variables R&D ratio and export intensity, fails to display a significant relationship with FDIINTENS but somehow indicates a positive direction of change. The explanation offered by the author is that these two characteristics variables are too "weak" in the sense that measurement errors easily arise (in particular for the R&D ratio variable) and that the theoretical implications for their association with the relative FDI/domestic investment behavior is not clear (especially for the export intensity variable as mentioned above). Furthermore, it is likely that each of these variables is affected by a different set of influences (not captured in the present model) such that there is less co-movement between their variation. For instance, plastic products from the first cluster and textiles from the third cluster have both shown a low FDI intensity along with high export intensities, but at the same time they differ diagonally in terms of R&D ratios. Finally, part of the reason for their weak explanatory power may simply lie in the fact that the manufacturing industries classification adopted presently (i.e., the standard twenty-sector classification) prove to be so rough and overwhelmingly encompassing that important differences *within* each sector are left out from the beginning. Nonetheless, we have already shown that FDI intensity, a measure of domestic investment strength in the face of outward FDI, can be explained quite satisfactorily overall by the structural or "latent" factors in the broad categories of growth performance and industrial structure.

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[11] Note, from the results in Table 6, that the "structure factor" is positively correlated with the two variables, network intensity and CR_4, and negatively correlated with SME share and labor intensity.

Table 7 Regression Results of FDI Intensity on the Principal Components of Industry Characteristics

Independent / Dependent	Constant	Factor I ("Growth")	Factor II ("Structure")	Factor III ("Behavior")
FDIINTENS	14.7817***	-13.3757***	-6.2986**	3.0026
	(5.3787)	(-4.7299)	(-2.2273)	(1.0618)
Adjusted R^2=0.5996		Degree of Freedom=14		D.W.=1.617

** signifies a 5% significance level and
*** a 1% significance level with the t-statistics in parentheses.

III. A Three-Way Typology of FDI Strategies: Application of Results and Case Studies

With a special emphasis on the importance of FDIINTENS in delineating different FDI orientations, Table 8 applies the results from our previous discussion to postulate a three-way typology of FDI strategies (row-wise) based on industry characteristics (column down). The first strategy, termed conveniently the **production relocation strategy**, pertains to the first cluster of industries, i.e., labor-oriented, export-driven SMEs that are more or less independent operators within the home economy. As widely documented in the literature, Taiwanese SMEs producing downstream labor-intensive products usually utilize the strategy of relocating or transplanting their operations in China since they lack the necessary resources to engage in transborder operations simultaneously (Chung 1991; Yen, Lin, and Chung 1992; Chung 1995). For these industries, sectoral performance at home is continually declining while exports are being supplanted by international rivals. With little in-house R&D capacity and faced with tremendous pressure to contain costs, many of these firms are, at least temporarily, being forced to exit the economy on a *migratory basis*.

Table 8 Industry Characteristics and FDI Strategies for Entering the Chinese Market

Strategy Type / Industry Characteristics	(1) "Production Relocation"	(2) "Market Integration"	(3) "Production Integration"
Cluster Type	**I**	**II, III**	**IV**
(1) "Structure":			
Labor Intensity	H	L, M	M
SME Share	H	L, M	M
Network Intensity	L	L, H	H
CR_4	L	H, M	M
(2) "Behavior":			
R&D Ratio	M	L, M	H
Export Intensity	H	L, L	H
(3) "Growth":			
Export Growth	L	L, H	M
Output Growth	L	M, H	H
Capital Growth	L	M, H	H
(4) FDI Intensity	H	M, L	M
Firm Size	SMEs	MLEs	MLEs
Market Orientation	Export-oriented	Domestic Market-oriented	Export-oriented
Sectoral Exports and Output at Home	Declining	Stagnant or Declining	Growing with Good Speed
Production Technology	Standardized; usually Labor-intensive	Standardized; often with Scale Economy	Emerging Technology; High Technology
R&D Effort	Design for Product Differentiation	Design for Product Differentiation; Product & Process Technology	Product & Process Technology

Note: H, M, and L refer to "high", "medium", and "low", respectively, as judged by the distance between the cluster mean and the manufacturing average adjusted by (a variable fraction of) the standard deviation for the manufacturing sector as a whole in such a way that, for each characteristic variable, three different levels of H, M, and L are always defined.

Sources: Table 4 and Table 6.

The second mode of FDI, or the **market integration strategy**, is usually adopted by firms with traits characteristic of the second and third clusters. These are mostly the domestic market-oriented, oligopolistic firms from the protected industries of Taiwan. Market pressures, if any, take the form of import competition and a gradual satiation of local demand. To achieve further growth, therefore, they must extend operations beyond present confines. When they make an FDI move to China they view the latter as a *likely extension* of their existing markets. Being inward-looking in nature and lacking export experiences, these firms often opt for direct investment rather than exporting as a way of integrating the Chinese market and gaining further growth momentum.

A third mode of FDI, the **production integration strategy**, pertains to the technically more sophisticated producers from a select group within the manufacturing sector. These are the firms that have done a lot of product and process R&D and have been highly successful in their *current lines of production*, as opposed to the former two groups of firms which are either encountering exporting difficulties or facing stagnant domestic demand. The industries in which they are located are characterized by quick-paced dynamism and abruptly-obsolete technologies which, in turn, exert immense pressure on these firms to continually upgrade. When they move up the product ladder they find it useful to transfer older models to a low-cost base for overseas production, thereby retaining market power in these fields, which then is fed back to support competition in newer products. In so doing, they gradually build up domestic as well as overseas production linkages for a whole range of interrelated products and, finally, may turn into truly **multinational firms**. In Taiwan, these firms are comparatively few in number but many more are beginning to emerge. A prerequisite for such a strategy of production integration, at least at the beginning, is availability of low-cost production bases which would render the strategy an operational one, and mainland China certainly plays its part in providing such a production base.

By adopting the above classification, one clearly sees that in the initial stage (i.e., prior to 1990) Taiwanese FDI toward China was largely carried out by firms from the first cluster of industries; whereas in subsequent phases (1991 onwards) the drive for FDI was mainly propelled by firms originating in the second, third, and fourth clusters. However, since we are dealing with industry averages, it is likely that there are exceptions to the rule. Following in this section, a number of simplified case studies will be given for each of the three main types of FDI strategies which may serve

to highlight this point and better elaborate our findings from the previous multivariate analyses.

1. The Production Relocation Strategy

The first set of industries, namely the labor-intensive, traditional downstream producers, aim to relocate to a low-wage country to retain cost-competitiveness in the world marketplace. Firm size is a crucial factor here. Being small in size and lacking spontaneous technological capabilities, smaller firms often fail to match the R&D schedule required for introducing new product series. They are also less equipped with financial and human capital to sustain cross-border operations all at one time. In fact, these are the firms one least expects to engage in direct investment abroad. The most important factor enabling their venture into China has been the low entry cost, a result of cultural proximity, in the Chinese market (Chung 1995). Without this benefit they are less likely to succeed in an overseas venture as exemplified by the fact that very few FDI cases by Taiwanese businessmen from these areas are observed in Southeast Asia and other countries. For the same reason, they are also less able to maintain operations at home once they have made a move abroad. With FDI in China, most of these firms simply transplant their entire operations and retain only some of the marketing and financial management functions in Taiwan. The result is a steady decline of industry performance at home. Exports of these labor-intensive sectors have diminished steadily since the late 1980s, and domestic investments and output have also experienced severe setbacks. As a result, composition of manufacturing output changed drastically between 1986 and 1994, with the share of light industrial products in total output dropping from 33.5 to 21.2 percent during the period. Furthermore, the organizational structure of Taiwan's manufacturing industries has also shifted, with the SMEs' share in total manufacturing exports dropping from 64.7 percent in 1987 to 52.6 percent in 1994, and that for total manufacturing sales from 46.9 percent in 1986 to a mere 37.0 percent in 1994. The correspondence between the relative decline in SMEs' share and that of labor-intensive exports from Taiwan is indeed striking, which serves as a clear indication that the by-gone industries have exited the island on a migratory basis.

This is not to say, of course, that these out-migrating SMEs will not come back to their home economy at some future point in time. Once they have established themselves as successful transplanters and have

accumulated sufficient resources, there is a good chance that they might return to Taiwan to set up new businesses in related fields or other areas. However, this would require the establishment of a new pattern of division of labor between the host and home economies with new linkages connecting overseas operations with operations in Taiwan. And that, as it stands, will be a second-round story beyond the scope of our present focus.

2. *The Market Integration Strategy*

Outside the realm of SMEs, by far the most prevalent motive of Taiwanese FDI in China is to attain market integration. For Taiwanese MLEs long constrained by the small size of the domestic market, attaining market integration is synonymous with achieving scale economy. Particularly for those firms born out of a domestic oligopolistic structure without much export experience, the best way to service the Chinese market seems to be through an act of FDI rather than through direct exporting.[12] Under this strategy, Taiwanese MLEs set out to cultivate the mainland market with a view to multiplying production bases and propelling future corporate growth. The level of domestic production usually is not affected by the FDI move, at least initially. But if one takes a longer view, these firms are fully capable of transplanting domestic production if the host country market reaches an efficient scale and if overseas production proves cheaper than domestic production. Home demand can then be satisfied by reverse sales (i.e., imports) from the FDI host location. Prominent examples of this type of FDI include MLEs from the processed foods industry, the non-metallic mineral products industries, the transportation equipment industries (in particular, the automobile industry) and many of the intermediate products industries (e.g., textiles, petrochemicals, and basic metals). Judging from firm-level data by way of interviews and anecdotes, we even find quite a few cases of electrical home appliances manufacturers among this broad category of market integration strategists.[13] One common characteristic of firms in this

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[12] China's tariff protection further strengthens the tendency of Taiwanese firms to opt for FDI rather than direct exports. In a sense, the Chinese tariff wall has recreated for Taiwanese MLEs the same permissive environment they once enjoyed at home.

[13] In fact, if we examine the relevant data at a more disaggregated, sub-industry level, we find the "electrical appliances" sub-industry within the broader category of "electronics

category is that they have been much more inward-looking than the average manufacturing firm in Taiwan for the past thirty years.[14] Furthermore, except for the processed foods industry which has grown essentially out of indigenous effort, many other sectors, including the home appliances and automobile industries, have been subject to strong foreign (in particular, Japanese) influences. In 1994, for instance, Taiwan's automobile industry consisted of eleven major MLEs, each having acquired its key production technology from one or two foreign partners in the form of either equity joint-venture (JV) or "technological cooperation." Of the thirteen foreign partners in total, eight originated from Japan, two from the U.S., two from France, and one from Germany. Automobile exports from Taiwan lasted only a short time with government support, but even then they did not reach any significant quantity.[15] In its heyday, the industry assembled some 460,000 cars per year with each manufacturer producing fewer than 42,000 cars on average, a scale much below the minimum efficiency scale of a standard auto plant (often considered to be 100,000 cars per year). Because of the limited scale of production, average costs are high and there are no incentives for R&D expenditures to develop key components. As a result, Taiwanese producers are as yet unable to produce their own car engines and transmission systems and these key components have to be imported every year in large quantities.[16] Furthermore, indigenous upstream capability in such important fields as high-grade plastic materials, special steels, and mechanical processing are also lagging, so that downstream auto assembly firms cannot gain support

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and electrical appliances industry" has, in fact, experienced a drop in both output and exports since the late 1980s. It is the grouping together, in the original data compilation of many of the variables that we use here, of this sub-sector with the other strong growing sub-sectors (such as electronic components and information products) that has resulted in this apparent inadequate classification of the industry types.

[14] Some of these sectors were vital for Taiwan's export drive in the 1950s and 1960s (e.g., canned vegetables and canned fruit), but most of them were not.

[15] Taiwan's auto parts and components manufacturing, on the other hand, has proved to be quite competitive in export markets. However, they pertain mostly to non-essential and peripheral parts and components.

[16] In 1993, ten auto firms gathered under government auspices in a strategic alliance to jointly develop a 1300cc auto engine for the first time.

from an indigenous competitive supply network.

Similar situations apply in the electric home appliances industry. Again, we see Japanese domination in the domestic oligopolistic structure for TV sets, refrigerators, washing machines, and air conditioners. Since Taiwanese firms never really established themselves as owners of specific technology (e.g., that of refrigerator compressors and large-sized CRTs and LCDs) or as an independently marketable brand name (most companies simply adopted the brand name of their parent firm with a slight twist), they are a far cry from such international giants as Philips (of Holland), RCA (of the U.S.), Hitachi, Mitsubishi, and Sanyo (of Japan).

These handicaps, however, did not prevent Taiwanese MLEs from making a move to China. Equipped with domestic marketing experiences and a peculiar breed of "location advantage" *vis-a-vis* mainland China,[17] these firms have indeed been able to reap respectable profits from their mainland operations. They introduced to the mainland mature models which have been market-tested in Taiwan and which utilized standardized technology they have already mastered. Their business headquarters are still rooted in Taiwan, taking charge of strategic planning, major R&D activities, and cross-regional trading arrangements. The Chinese market is viewed carefully as a likely extension of their existing markets, albeit the new territory may prove to be several times their original scale of operation.

A case in point is Sampo Corporation in the home appliances industry. Sampo is one of the leading home appliances manufacturers in Taiwan and initially derived its technology from its Japanese collaborator Sharp. The company gradually developed into a major supplier of TV sets, air conditioners, microwave ovens, refrigerators, and washing machines. However, a series of trade liberalization measures in the late 1980s has created severe competition in Taiwan's home appliances market (with the competition coming mostly from the Japanese collaborator or the parent firm itself). This, coupled with a gradual satiation of local demand, has squeezed the profit margin of most indigenous producers, forcing them to look elsewhere for corporate expansion. As a part-time exporter of color TV sets, Sampo had already set up marketing and assembly units in several other countries (including the U.S., Germany, Japan, Korea, Hong Kong,

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[17] For a detailed discussion of a marriage of this concept from the FDI literature and Taiwanese operations in mainland China, see Chung (1994).

and Thailand). The virgin market of China seems to be a natural next-step for the company. Since 1992, it has established six production and marketing facilities in China, including a washing machine JV in Tianjin, a microwave oven JV in Beijing, and an air conditioner factory in Dongguan. The company also has offices in Shanghai, Fujian, and Guangdong conducting sales, market analysis, and information gathering. Although many of these investment projects will take time to pay off, Sampo has been doing quite well in view of its fresh presence in the Chinese market.[18]

Another area where FDI towards China has been on a steady rise is the processed foods industry. In fact, the processed foods industry was among the first of Taiwanese MLEs to move into China, and it also comprises the largest group in terms of the number of MLE investors. Among these firms, President Enterprises stands out as the single most conspicuous investor owing to its market position in Taiwan. Being the core company of a conglomerate encompassing manufacturing, distribution, retail, and services, President ranks at the top in Taiwan's processed foods industry, and is making sweeping investments in mainland China at a scale much greater than its contemporaries. As of early 1996, President has poured over US$132 million into the Chinese market, setting up sixteen operative bases in different cities, including Beijing, Tianjin, Wuhan, Chengdu, Ningbo, Shenyang, and Xinjiang. Although its principal products currently lie in the traditional food category, it is prepared to enter other fields when the market is ready and the policy allows opening to foreign participation. President has already obtained the franchise from Southern Company of the U.S. to open Seven-Eleven convenience stores in China. It even has teamed up with Anheuser-Busch Company (producer of Budweiser Beer) and China Beer Plant in an attempt to enter the potentially immense beer market of China.

The aspiration for market integration beyond small home economy confines is not peculiar to electric home appliances makers and processed food manufacturers. Leading producers from other areas such as cable and wire (e.g., Pacific Cable and Wire and Walsin Lihwa), glass and paper products (e.g., Taiwan Glass and Yuen Foong Yu Paper), automobile and

[18] In 1994, Sampo earned a profit of RMB$23 million from its mainland operations and was ranked the sixth most profitable firm among all publicly listed companies in Taiwan that had business establishments in China.

motorcycles (e.g., Ching Chong, Kwang Yang, and Taiwan Yamaha), etc., are all plunging into the Chinese market in pursuit of an enlarged operational scale and the implied handsome returns. Some of these firms have diversified into other unrelated fields, including department stores and land development, but most continue with their original trade in the hope of turning the Chinese market to their side and salvaging flattening sales charts at home.

The above type of self-initiated FDI may be properly termed the "spontaneous" motive for market integration, which corresponds closely with the second cluster of industries generated by the multivariate analysis in Section II. However, there is yet another, more "passive" mode of market integration observed for a different set of firms (i.e., those in the third cluster). It is the attempt made by upstream producers to "follow thy patrons" to the FDI location and set up production units there in an effort to retain long-standing customer/supplier relationships. Failing to do so could mean a decline in business because most of their customers have already exited Taiwan and logistical supplies through exports would definitely increase costs (by the amount of tariffs, transportation costs, and insurance fees), rendering their products less competitive in the marketplace. Plastic materials and rubber tires are good examples of this scenario. Nan Ya Plastics, for instance, was in some sense forced by its downstream customers to make a move to Guangdong and Fujian. As most of Nan Ya's previous clients (the third-tier plastic processing firms producing handbags and shoes, etc.) had already been relocated to Fujian and Guangdong, Formosa Plastics (a maker of crude materials) and Nan Ya Plastics (a second-tier processing firm making plastic rods, plates, and the like) had no choice but to follow suit. A similar situation applies to the rubber tires industry, where the relocation of Taiwan's bicycle industry to Shenzhen and Jiangsu put tremendous pressure on (as well as had a great appeal to) the major tire producers, e.g., Cheng Shing and Kenda Rubber, to make a similar move.

It is important at this juncture to examine the impact of this market integration strategy, whether spontaneous or passive, on the industrial restructuring of the Taiwan economy. Since, under this strategy, an act of FDI is undertaken because domestic market potentials are gradually exhausted (or being replaced by overseas demand), it is clear that monolithic expansion of production at home is no longer an appropriate reaction. On the other hand, these firms will not exit the domestic market, either, because they have too much at stake there. Therefore, one tends to

see these MLEs making inter-industry restructuring efforts rather than intra-industry upgrading and/or expansion. More often than not, they have chosen to diversify into the growing sectors of the Taiwan economy, including the electronics, semiconductors, information, and telecommunications industries. Thus, we have witnessed Far Eastern from the textile industry, Sampo and Teco from the home appliances industry, Walsin Lihwa and Pacific Cable and Wire from the cable and wire industry, and Nan Ya Plastics from the plastic materials industry, to name only a few, engaging in heavy investment in the information and semiconductor industries (Table 9). They have done so with a view to recreating competitive advantages in a new series of industries and products at home while keeping their traditional lines of business running and expanding overseas.

3. The Production Integration Strategy

A third strategy, usually adopted by Taiwanese MLEs with a certain degree of technological superiority, is to further the company's internal linkages through intra-regional production integration. Production integration in this sense may take the form of either horizontal or vertical division of labor between home and overseas operations. In the case of horizontal integration, new product series and higher grade products of the same category may be introduced for home production while more mature models are transplanted overseas. For example, when the production of keyboards in the PC industry is moved offshore by Taiwanese PC firms, home equipment and technicians move towards the production of monitors, scanners, and notebook PCs (Chung 1994). This type of internal integration is not observed for all firms, however, due primarily to a lack of technical (and also financial) capability on the part of the firms. In order to diversify and upgrade toward higher level products, the firm has to spend heavily in R&D for product and process technologies. Firms capable of doing this are generally the growing firms in the home economy and their outward FDI is usually considered an expansionary act. Aside from horizontal division of labor across geographic areas, there are also cases of vertical integration. For example, Taiwan's leading PC producer, Acer, established a peripheral plant in Jiangsu only after it linked up with Texas Instrument to set up an 8-inch wafer fabrication plant in Taiwan. Its further goal is to move into the silicon wafer manufacturing field, possibly in a joint venture with one of the prominent players in the field, to enhance its chance of success. If Acer carries through with this plan,

Table 9 Traditional Firms Diversifying into High-Tech Production After the mid-1980s

Company Name (Rank in Manuf.)	Area of Production (Rank in Industry)	Invested company	New Area of Production	Set-up Date
1.Nan Ya Plastics (1)	Plastic Products (1)	Nan Ya Plastics (Electronics, Department) First International Computer	DRAM, 4"-6" STN LCD; TFT LCD Motherboards	1980s 1980s
2.China Steel (5*)	Steel (1)	Taisil Electronic Materials	Silicon wafer	1993
3.Tatung (5)	Electric Home Appliances (1)	Chung Hwa Picture Tubes	14", 15", 17" CRT STN LCD for Computers	1971
4.Far Eastern Textiles (15)	Textiles (1)	Vanguard International	Semiconductor fabrication	1994
5.President Enterprise (16)	Food Processing (1)	Mospec Semiconductor	Semiconductor devices	1987
6.Yuloong Motor (17)	Motor Vehicles (5)	Global Semiconductor	IC Fabrication	1994-95
7.Teco Electric & Machinery (23)	Electric Machinery (1)	UMC Shinetsu Semiconductor	Memory IC Silicon Wafer Materials	1980 1995-96
8.Sinkong Synthetic Fibers(36)	Synthetic fibers (4)	Li Jing Semiconductor	Semiconductor fabrication	1994-95
9.Sampo (27)	Elec. Home Appliances (7)	Hsin Bao Technology	IC Packaging	1990
10.Pacific Cable & Wire (34)	Cable & Wire (1)	Mosel Vitelic Winbond Vanguard Int'l	Semiconductor fabrication	1985 1987 1994
11.Walsin Lihwa (39)	Cable & Wire (2)	Winbond Vanguard Int'l	Semiconductor Fabrication	1987 1994
12.Yeu Tyan Machinery (104)	Motor Vehicles (10)	Takaya Department Store AASI Aero Space Co.	Service/retail; Small Jets Design & Manufacturing	1991 1991
13.Chia Hsin Livestock (283)	Food processing (31)	HMC Jia Shu Semiconductor	ASIC, Memory, DRAM	1987 1995-96

* Comparable in sales to the fifth place (Tatung Co. in 1994) in the private manufacturing ranking.
Sources: *Top 500* (1995); Various news releases.

it would provide a textbook case of backward integration from PC peripherals and desktop computers to semiconductor and silicon wafer manufacturing (Table 10).

A similar story may be told about Inventec, a major producer of calculators and electronic dictionaries from the 1980s. In order to cultivate the Chinese market, Inventec has thrown itself into the field of multimedia design and production, with software design implemented in China, mass production in Taiwan, and R&D for hardware development conducted in Taiwan. Currently, Inventec has six design bases in China (Beijing, Tianjin, Shanghai, Nanjing, Wuhan, and Xian), each with 200-300 graduate-level employees designing multimedia educational software and computer games. The products are distribution-tested in Taiwan at selected points before exported to overseas Chinese markets. The final target, of course, is the vast Chinese market itself. Presently, all six facilities in China have already obtained ISO-9001 recognition; and new products (English and mathematics teaching programs, Tang Dynasty poetry and English grammar-tutoring packages, etc.) were scheduled to be launched in June and September of 1996, respectively. This is a case of both forward (hardware) and backward (software) production integration.

Another leading electronics group in Taiwan, Taiwan Liteon Electronic Co., has also announced a plan recently to invest in Tianjin and Dongguan, respectively, for the production of semiconductor devices and power supply units. Originating with the production of diodes, the Liteon Group currently has three publicly listed companies under its flag and has already established several production facilities in Thailand, Malaysia, the UK, and the Philippines. As demand for its products from the local Taiwanese information and telecommunications industries is steadily on the rise, it has also decided to launch a major investment project in Taiwan to pioneer in the production of laser diodes. This will not only complete the product spectrum within its own conglomerate, but is also of great help to the local production network because previously all the laser diodes had to be imported from abroad. The investment projects in Taiwan would cost an estimated US$7 million, and Liteon plans to invest another US$160 million within the next five years to establish comprehensive production and R&D facilities between Taiwan and the mainland, with the aim of achieving an annual sales volume of NT$25 billion (close to US$1 billion) by year 2000 and becoming the world's fifth largest supplier of semiconductor devices and power supply units.

In fact, production integration can also take place in more traditional

Table 10 High-Tech Electronics and Computer Firms Linking Investment Projects Across the Strait Under a Production Integration Strategy

Company Name (1994 Rank)	Investment * Project in China	FDI Location	Investment Amount *	Investment Project at Home	Investment Amount
1.Chung Hwa Picture Tubes (22 / 7)	14" CRT	Shanghai & Suzhou	US$8 mil.	15" & 17" CRT, STN LCD	US$35 mil.
2.Acer Peripherals (29 / 10)	Monitors & Keyboards, etc.	Suzhou	US$4 mil.	TI-Acer: DRAM; Vanguard: DRAM, SRAM	Over US$600 mil.
3.GVC Corp. (37 / 14)	PC Mice & Elec. Components	Dongguan	US$1 mil.	Modems	-
4.Delta Electronics (53 / 21)	Switch Power Supply Units, Transformers	Dongguan	US$15 mil.	Desktop and Portable PCs, PC peripherals	-
5.Inventec Corp. (71 / 29)	Multimedia Software	6 Cities	US$30 mil.	Multimedia Hardware & Notebook PCs	-
6.Liteon Electronics (91 / 35)	Semiconductor Devices, Power Supply Units	Tianjin & Dongguan	US$10 mil. US$5 mil.	Laser Diodes	US$7.5 mil.
7.Primax Electronics (174 / 58)	PC Mice, Image Scanners	Dongguan	US$1 mil.	Network Interface, Image Scanners, etc.	-
8.Picvue Electronics (269 / 85)	LCD Backend Process	Shanghai	US$1 mil.	4", 6" & 10" SNT LCD	US$4 mil.

*Cumulative as of mid-1995; - means data not available; figures in parentheses are manufacturing and industry (inclusive of electronics and information subsectors) rankings in 1994.
Sources: Investment Commission, ROC; *Top 500* (1995); various news releases.

lines of business. Giant Manufacturing Co. is a good example from the bicycle industry. Having started up under the auspices of U.S. bicycle importers back in the 1960s, Giant has grown to be the biggest manufacturer of bicycles in Taiwan and became a listed company in 1994. When its fellow manufacturers in the same industry began to invest in China in the mid-1980s, Giant believed it should first strengthen its base at home. The company quickly adapted to the changing winds in the marketplace and developed a series of high-priced "sport bikes" that proved to be a sweeping success in the European and North American markets. Giant went on to put new models on the market in such a way that its annual sales grew at a remarkable rate despite a reduction in units sold. In 1992, it decided that the time was ripe for entering the Chinese market and devoted US$12 million to establish a sole proprietorship, by the name of Giant (China) Co., in Kunshan of Jiangsu province. While other Taiwanese bicycle makers have concentrated near Shenzhen, Giant believed it should build its facility near Shanghai if it wanted to sell locally. Initial production capacity was scheduled at 300,000 units annually with the final goal targeted at some 1,500,000 units a year. Fifty percent of this output would be sold locally and the rest shipped out as exports. The product, bearing its brand name Giant, is currently selling at RMB$600-1,000 a piece. At the same time, R&D and production in Taiwan has been elevated to manufacture even fancier models of sport bikes.

Thus, for firms pursuing a "production integration" strategy, domestic restructuring takes place alongside with an act of outward FDI. Particularly for MLEs equipped with better technological, managerial, and financial capabilities, new product lines are often introduced to replace the old ones which have been transplanted overseas. Usually, such a placement plan is well thought out before a foreign investment project is implemented. It is important to note that this effort to exploit the benefits of intra-regional division of labor within a firm's own production network also facilitates the process of domestic restructuring. Therefore, the larger the share of this type of FDI originating from the home economy, the speedier industrial transformation at home may take place and proceed.

IV. Conclusion

This paper adopts a multivariate analytic approach to analyze the underlying relationship between industry characteristics on the one hand and patterns of foreign direct investment on the other. The use of multivariate analytic techniques such as cluster analysis and principal component analysis helps overcome the difficulties arising from deficiency of data, limited number of observations, and high multicollinearity in most of the industry variables under investigation. The lack of a coherent body of theory on the relationships between industry characteristics and FDI behavior further necessitates such an analytical framework in which data, after proper transformation, are in some sense allowed to "speak for themselves."

We have distinguished between three types of FDI strategies, depending on the industry characteristics of the investing firms, to shed light on Taiwan's recent FDI move toward China. Specifically, we argue that Taiwanese FDI on the mainland can be delineated into three generic types: a **production relocation strategy** in which a firm seeks to control operation costs by relocating its *current lines of production* toward a low wage base; a **market integration strategy** designed to exploit economies of scale by cultivating *new geographic territories*, especially when the home market is near satiation; and a **production integration strategy** aimed at augmenting *internal production linkages* so as to strengthen the firm's market position and to achieve conglomeration effect. The first strategy is essentially *cost-driven* and is very similar to the one adopted by Japanese firms in the 1960s, except that Taiwanese SMEs in the 1980s did not belong to any closely integrated *keiretsu* systems, which were highly functional in maintaining the overseas/domestic operational ties for Japanese SMEs in the 1960s and 1970s. The second strategy is basically *market-driven* or *external growth-driven* which differs, again, from the U.S. pattern in that the FDI firms from Taiwan are not on a self-propelling product cycle and lack the corresponding technological, managerial, and marketing advantages to be truly competitive internationally. Finally, the third strategy may be called *internal growth-driven* and is a new breed in Taiwan. This strategy mixes *ex ante* growth considerations with careful labor-cost calculations such that the firm may gain the most from intra- and

inter-regional division of labor in the process of becoming a truly multinational enterprise.

The implication for the home economy in terms of industrial restructuring is different for each type of FDI strategy. Production relocation typically strips the FDI firm away from home production until the firm is able to reinvest at home again. Market integration implies a need to diversify product-wise when demand for existing output becomes stagnant or declining. In this case, we tend to witness not intra-industry but inter-industry restructuring, which redirects domestic resources away from the comparatively disadvantaged industries toward the comparatively advantaged industries in the home economy. On the other hand, firms pursuing a production integration strategy are often from the growing segments of the home economy with stronger financial and technological capabilities, and therefore they are also better able to accomplish the twin tasks of expansionary FDI and intra-industry upgrading at one stroke.

By way of case studies, we have seen that there are always exceptions to the rule. In particular, we have found the electrical home appliances sub-industry exhibiting behavioral traits more similar to the inward-looking oligopolistic MLEs (i.e., the case of Sampo), rather than to their export-oriented, technologically superior electronics and information fellow producers. On the other hand, we have also seen individual firms from the bicycle industry exhibiting, to some extent, a tendency to integrate internal production linkages across national borders, thereby falling more properly in the "high-tech, high network" category of industries. The primary reason for these exceptions seems to lie in the deficient compilation of the original data set. If finer classification of manufacturing activities is available, together with relevant domestic investment and FDI statistics, the multivariate analytic techniques used in the paper should be able to identify the differences and arrive at more robust results. Furthermore, addition of other potentially relevant variables can also help derive a more reasonable classification of industry types. These remain the goals for further research.

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