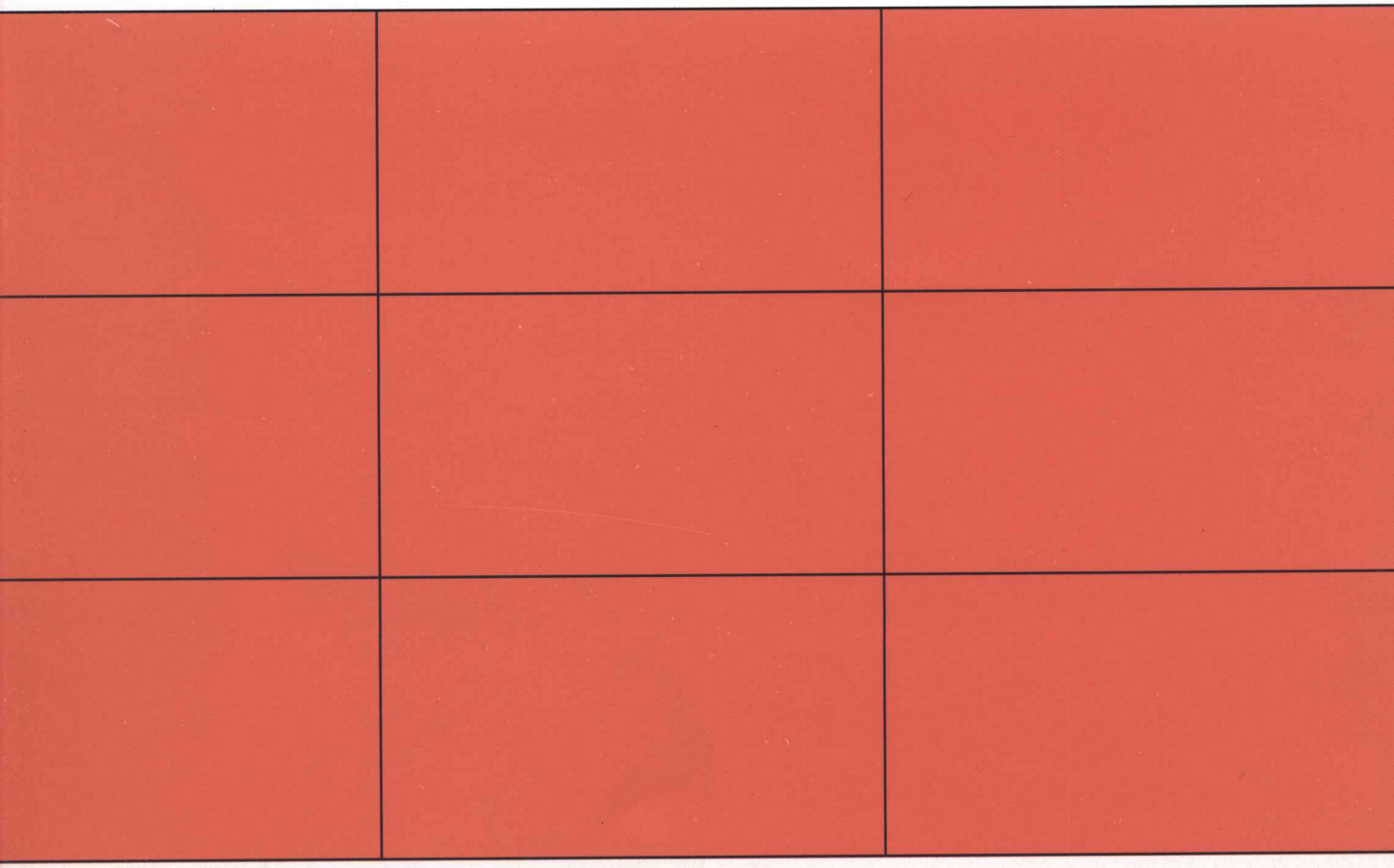
FDI in Thailand



FDI in Thailand

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In spite of significant improvement in domestic savings mobilization, there still exists a substantial saving-investment gap in Thailand necessitating foreign capital to finance public and private investment. Foreign direct investment (FDI) has become increasingly important in terms of capital formation and share of total foreign capital inflows. The share of FDI in total private investment increased from only 3 percent in 1980 to about 10 percent in 1990. The share of FDI in total foreign capital inflows also increased from only 10 percent in early 1980's to about 30 percent in 1990 (Pongpisanupichit and Pussarungsri, 1992).

This study on FDI will provide a brief description of the FDI profile in Thailand. Further, it will review and provide additional empirical tests on the factors affecting FDI in Thailand and its impacts on Thai economy. A special reference is made to the electrical and electronic sector in the section dealing with the technology transfer and exports relationship with FDI in Thailand.

I. PROFILE OF FDI IN THAILAND

In the first half of the 1980's, FDI in Thailand was rather small and fluctuated dramatically due to instability in both the domestic and world economies. FDI in Thailand started to expand at an exceptional pace after 1987, as the rising costs of production, especially labor costs and the appreciation of the currencies of Japan and the Asian NIE's, led to the relocation of their production bases to Thailand and other developing countries. The flow of FDI into the country increased threefold from about 9,000 million baht in 1987 to about 28,000 million baht in 1988, reaching a peak in 1990 at about 65,000 million baht (table I.1). This trend slowly started to decline at the beginning of 1990's. The decline in FDI was probably the consequence of the completion of the production bases adjustment by Japan and the NIE's, the emergence of infrastructure and human resource bottlenecks, and

domestic and international political instability in Thailand.

Japanese investment surged sharply from about 3,260 million baht in 1987 to about 14,500 million baht in 1989. The increase raised the share of FDI from Japan in Thailand from about 44 and 36 percent in 1986 and 1987, respectively to about 52 percent in 1988 (table I.1). However, the dominance of FDI from Japan did not last long. The share started to drop to about 41 percent and 38 percent in 1989 and 1990, respectively. The decline in percentage terms during that period was not the result of decreased Japanese investment. On the contrary, FDI from Japan increased considerably in 1989 and 1990. However, FDI from Japan levelled off at about 8,500 million baht in 1992. The decline in the Japanese share of investment in the early 1990's was due to economic troubles in Japan and the divergence of investors' interest to the People's Republic of China.

The FDI from the Asian NIE's (excluding Singapore) and ASEAN (including Singapore) also surged in 1988 (table I.1). The Asian NIE's percentage share rose successively to account for the highest portion (31 percent) of the total FDI in the country in 1992. Similarly, FDI from ASEAN also increased in 1988 and 1992.

FDI from the United States also increased steadily from 1,815 million baht in 1987 to about 11,800 million baht in 1992, capturing 21.9 % of total FDI in Thailand.

FDI in Thailand has been predominantly in the industrial sector, accounting for more than 50 percent of the total net FDI in 1987 and 1988 (table I.2). The proportion of FDI in the industrial sector has decreased sharply since 1988, from about 47 percent in 1989 to only about 32 percent in 1992. Nevertheless, in 1992, the share of FDI in this sector was still the highest.

The decline in the share of FDI in the industrial sector resulted from both the absolute decline of FDI in this sector and the increase in FDI overall, specifically in construction and financial sectors. In fact, FDI in most sectors, except that in financial institutions and construction dropped in 1991 and 1992. Recently, however, FDI in both sectors has become increasingly attractive to foreign investors, significantly in 1992 (table

I.2).

Within the industrial sector, FDI is concentrated in electrical appliances, accounting for almost one-third of the total FDI in this sector (table I.3). Other important sectors are chemicals, machinery and transport equipment, metal based and non-metallic, and textile industries. FDI in these sectors, except for textile and construction materials, has decreased rather sharply since 1990.

While FDI in the electrical appliances industry accounted for the largest portion of FDI in industrial sector, it, also has leveled off since 1990. The United States dominated this industry in the past, accounting for about 85 percent in 1981 (table I.4) However, its share started to decline in 1986. It decreased to about 8 percent in 1991 but increased again in 1992 to about 40 percent.

The diminishing dominance of the United States did not result from the decline of FDI in this industry, but rather from the surge of FDI from Japan and the Asian NIE's. After 1988, FDI from these countries jumped sharply as a result of rising labor costs and the appreciation of their currencies. Japan became the leading foreign investor in this industry in the late 1980's. It's share increased from about 7 percent in 1983 to about 74 percent in 1988, but fell sharply in 1992 to about 40 percent. It is noteworthy that Japan's FDI in the industry fell drastically from about 6,300 million baht to about 2,300 million baht. The decrease is more drastic than that of most countries. FDI from Hong Kong, Taiwan and Singapore in this industry increased sharply in 1988, and similar to Japan, fell off at the beginning of 1990's.

II. DETERMINANTS OF FOREIGN DIRECT INVESTMENT

This section presents a study of factors affecting foreign direct investment (FDI) in Thailand. It starts with a review of theories explaining the reasons for foreign direct investment, followed by a review of previous studies investigating motives and factors affecting the decision to invest in foreign countries, and specifically in Thailand. After the review, this study will report its own empirical results about factors affecting FDI in Thailand.

II.1 REVIEW OF THEORIES OF FOREIGN DIRECT INVESTMENT

At first it was believed that FDI as well as other forms of capital flows was caused by the interest rate differential among countries (Olin, 1967 and Nurske, 1972). This is obviously an inadequate explanation because there has been an interchange of FDI between countries with lower interest rates and those with higher rates. There are other theories attempting to explain the flow of FDI separately from capital flows, such as the Oligopolistic, Eclectic, Product Cycle, and Globalization of Production theories.

The Oligopolistic theory indicates that to overcome disadvantages in a host country such as knowledge about market and resources, foreign firms must have other advantage such as knowledge about technology and management, which create market power for them (Kindleberger, 1966 and Hymer, 1960).

Dunning (1981) (Ecletic theory) argued that the decision to invest in a foreign country depends not only on the advantages suggested by the Oligopolistic Theory, but also on other factors, namely, ownership-specific advantages, internationalization advantages and location-specific advantages. These advantages include specific knowledge about technology, avoiding tariff and non-tariff barriers, abundance and quality of resources and infrastructure in a host country. Dunning stated that if the three advantages are not substantial, a company will not invest in a foreign country.

Unlike the other two theories, the product cycle theory suggests that the pattern of trade and FDI of a commodity depends on the stage of the product cycle of that commodity (Vernon, 1966). This theory proposes that in the early stage, a country producing the new product has monopoly power in the market because it possesses specific technological knowledge. This country may also export to other countries. In the next stage, investors in the exporting country may decide to invest in importing countries to reduce the production costs and avoid tariff and non-tariff barriers of the import countries. They may export back to their home country because of the lower cost of production. In the last stage, investors in some importing countries may start to produce and export the product to other countries when technology become readily available.

Kojima (1978) presented the idea of how Japanese FDI may create exports for the host country. He classified motives of FDI from Japan into four types: exploitation of natural resources of a host country, taking advantage of the cheap labor of the host country, market expansion including avoiding trade barriers such as tariffs and quotas, and oligopoly. According to Kajima, FDI led by the first two motives could stimulate trade among countries.

According to the globalization of production theory, large multinational enterprises either invest in developing countries to produce parts and components or buy parts and components from firms in other countries, including those in developing countries, through subcontract arrangements. These parts and components are sent to processing centers to produce either finished products or more advanced intermediate products. FDI serves as a mechanism creating division of labor in production among countries according to their comparative advantages.

II.2 REVIEW OF STUDIES ABOUT FACTORS AFFECTING FDI

For factors affecting Japanese investors in selected host countries, the study of Allen (1973) finds that the most important factor is the economic and political stability of a host country, followed by the stability of the labor force, sufficiency of local funds, good joint-venture partners, tax incentives, sufficiency of foreign currencies, stability of the of host country, currency, exemption from import duties, economic planning and the attitude of the people and government of host country, in that order. He also found that the most important motive of Japanese investors is the protection of a foreign market, followed by the exploitation of natural and raw materials.

There are numerous studies investigating factors affecting FDI in Thailand conducted during 1970's. Findings of these studies are almost in consensus that the most important factor affecting FDI is the market factor (Attakorn, 1975, Tambunleartchai, 1980, and Sibunruang, 1984). Other important factors are trade protection including tariff barriers (Tambunleartchai, 1980), abundance and low cost of materials (Attakorn, 1975, and Tambunleartchai, 1980, and, Sibunruang, 1984), low labor cost (Attakorn, 1975, and Tambunleartchai, 1980), good environment for investment (Attakorn, 1975), and incentives provided by the host country (Tambunleartchai, 1980, and Sibunruang, 1984).

The study of Karnjanapunka (1978) finds that FDI in different industries usually has varied motives. For example, foreign investors in resource-based industries such as food, mining, agriculture and paper were more concerned about the exploitation of domestic resources than other factors to the contrary foreign investors in market-oriented industries such as those in chemical industry were concerned about local market access. Foreign investors in market-oriented and labor-intensive industries such as textile industry considered both access to local market and labor cost as the two most important factors.

II.3 DETERMINANTS OF FDI IN THAILAND

Based on the above review of theoretical and empirical works, a model has been constructed for empirical study of the determinants of recent FDI flows into Thailand. The explanatory variables suggested by the previous works include market size, trade barriers, labor costs, other costs of production, infrastructure facilities, and market power of the investors in the host country.

The model employed by this study, given data availability, is specified in equation (1).

(1) FDI = F[D,GDP,D*GDP, TRR, D*TRR, EGKC, D*EGKC,NTELP, D*NTELP, EJ],

where,

FDI = amount of net flow of FDI in Thailand

D = Dummy Variable representing the period before and after the Plaza Accord (D=0 before 1985, D=1 after 1985),

GDP = gross domestic product of Thailand,

TRR = an average tariff rate of Thailand,

EGKC = electricity generation of Thailand in term of kilowatt-hours per capita,

NTELP = telephone numbers per capita,

EJ = exchange rate of Japanese Yen per U.S. dollar.

FDI is the total net flow of FDI. The GDP variable represents the market factor. This variable is commonly used by regression studies of factors affecting industrial location because it is the most important factor affecting the market (e.g. Pussarungsri ,1989, Wheat, 1985 and Thongpakde and Pussarungsri, 1992). TRR, an average tariff rate, represents the tariff barriers of the country. A high tariff rate may create protection of the

domestic market for foreign investors. In this respect, the sign of coefficient should be positive. On the other hand, the high tariff rate may cause the higher costs of capital and intermediate products used in production. Thus it is possible that the tariff rate may deter FDI, resulting in negative coefficient.

The infrastructure variables, EWKC and NTELP, indicate the infrastructure that may enhance the internationalization and location-specific advantages of Thailand. It is also expected that the sign of their coefficients will be posititive. The reason is simply that infrastructure improves productivity and reduces the cost of production. The final variable, EJ or the exchange rate of Japanese Yen per dollar, indicates the rising cost of production in Japan and the NIE's. At first, the model included wage rates and the exchange rate of Japan and the NIE's. However, a very high degree of multicollinearity was found among these variables. Thus only the dollar exchange rate of Japanese Yen is selected to represent these variables.

The dummy variable, D, represents the shift in FDI due to the change in the international economic environment caused by the Plaza Accord which forced the appreciation of the currencies of Japan and the NIE's. Obviously the sign of this variable is expected to be positive. The multiplicative terms between the dummy variable and the explanatory variables are expected to have signs the same as those respective variables. They represent the change in behavior of FDI in Thailand due to the shift in the international economic environment.

The empirical study uses time series data from 1970 to 1990. FDI is the net flow of FDI into Thailand as reported by the Bank of Thailand. The average tariff rate, TRR, is calculated by dividing tariff revenue by value of total imports. The tariff revenue, value of total import, and GDP figures are from the Bank of Thailand. The number of telephones per capita is calculated by dividing the variable by the population of the country. The telephone data are from the Telephone Organization of Thailand. The electricity generation per capita is obtained by dividing electricity generation in the unit of kilowatt-hour by population. The

data of electricity generation are obtained from "Electric Power in Thailand," published by the National Energy Administration. Finally, the data of the exchange rates of Japanese Yen per dollar are from the International Financial Statistics Year Book. All variables, except D and EJ, are lagged for two periods reflecting the time lag of information and FDI decision. D and EJ are lagged for three periods reflecting the fact that FDI takes a longer period to respond to the change in those two variables than others.

Results of The Empirical Study

The result of the study is shown in table II.1. There are three equations due to the high multicollinearity between the multiplicative terms of the dummy variable and GDP, telephone number per capita and electricity generation per capita. They, therefore, cannot be included in the same equations. Each of them have to be included in the model separately, one at a time. The regression has a high R^2 in all equations indicating a high degree of goodness of fit. It means that explanatory variables as a whole explain FDI very well.

The market factor represented by the GDP of Thailand is proven to be important. The coefficient of the variable is significant at a 1 percent level in all three equations. To the contrary, the study does not show any impact of tariff rates on FDI. This may be the result of the aggregation of FDI data. The tariff rates also include those of intermediate products. Thus the positive and negative impacts may be cancel each other out . Similar to the tariff rates, the coefficient of the number of telephone lines per capita is not significant at a 10 percent level. That of the level of electricity generation per capita is significant at least at a10 percent level in two out of three equations. However, the coefficient is negative, instead of positive as expected. The problems with the coefficients of the infrastructure variables may occur because the infrastructure in the country changes only slowly, over time, while the regression study requires some degree of variation of a explanatory variable. Thus its impact on FDI cannot be fully revealed.

Finally, the coefficient of Japanese currency per dollar is significant in all three equations at least at a five percent level with the expected sign. Thus, it shows quite clearly that the result of rising production costs in Japan and the NIE's due to the appreciation of their currencies and rising wage rates contributed to the recent flow of FDI to Thailand as well as other countries in the Southeast Asia.

The important finding of the study is, however, the confirmation of the hypothesis that FDI shifts toward the cost reduction-oriented or export oriented motive. Beside the significance of the coefficient of the Japanese Yen the coefficients of the multiplicative terms for the dummy variables, infrastructure variables and tariff rate are also significant. The coefficients of the multiplicative terms between the dummy variable and both infrastructure variables are positive and significant at a 1 percent level. The significance indicates that infrastructure has become much more important in the second half of the 1980's due to the change in the nature of FDI. As foreign investors became more cost conscious, infrastructure facilitating business operation and improving the productivity of investments also became more important.

Similar to that of infrastructure, the coefficient of multiplicative term for the tariff rate is negative and significant in all three equations at least at a 5 percent level. This result shows that the tariff has become an obstruction to FDI instead of a favorable factor. Similar to the explanation for infrastructure, FDI has shifted away from the market-oriented motive to the cost reduction or export-oriented motive. Tariffs on intermediate products and capital increases costs of production for firms. Thus it thwarts FDI.

Finally, the shift of the FDI function is evidenced by the significance of the coefficient of the dummy variable, Which is positive and significant at a 1 percent level in all equations. This indicates that there is a significant increase in FDI in Thailand given the explanatory variables.

III. IMPACT OF FDI ON THAI ECONOMY

III.1 Previous Findings on the Impact of FDI

Studies on the impact of FDI on the Thai economy are well summarized by Sibunruang-Brimble (1992). Her study classifies the impact of FDI into various categories including export generation, employment generation, backward linkages, and technology transfer.

Sibunruang-Brimble (1992) reviewed a number of studies and concluded that FDI had a substantial impact on Thai exports. Sibunruang (1986) examined the impact of FDI on exports in the 1970's and found that promoted foreign-owned and foreign joint-venture firms contributed about 25 percent of total manufactured exports by the end of the decade. These studies also revealed that foreign invested firms comprised very high shares of total exports in some industries such as electronic and machinery industry.

The effect of FDI on manufacturing employment was found to be much less substantial. Using BOI survey data containing 600 manufacturing firms, Sibunruang-Brimble (1988) showed that in 1985 these firms accounted for only about 0.7 percent and 8.8 percent of the total labor force and manufacturing employment, respectively. The reason may be that foreign invested firms usually have a higher capital to labor ratio than Thai firms (Khanthachai et al. 1987).

For technology transfer aspect, according to Lipsey (1991), Three methods can be used. First, technology may be transferred through the training of local personnel who, in turn, train other local personnel and/or establish their own local firms. Second, foreign personnel train local parts and components suppliers to improve the quality and reliability of their products, and also to speed up the delivery of their products. Third, competition introduced by foreign firms forces local firms to become more efficient, and to acquire new technology.

In relation to the first means of transferring technology, a recent study by Kaosa-ard (1992) illustrates that foreign firms invested much more on training for high level staff than they did for low level staff. These firms generally employed on-the-job training for unskilled and semi-skilled workers. There has only been a limited degree of technology transferred through the FDI firms' training of local suppliers (Sibunruang-Brimble 1988). Similarly, the transfer of technology through subcontract arrangements is also found to be minimal (Dahlman et al., 1991)

FDI may have a negative impact on the local economy by creating pollution and foreign reserves leakage due to dependence on imported parts and components, as well as remittances of other payments and profits. Studies by Pongpisanupichit (1985) and TDRI (1989) indicated that the loss of foreign reserves caused by FDI has not been substantial in light of the capital inflows associated with it. In the case of foreign invested firms in Thailand, capital inflows to Thailand far exceeded remittances from Thailand, and the private capital inflow was far greater than capital outflow during 1970-1988.

Despite the contribution of these studies, there remain issues that have not been considered or where there is additional scope for research. First, the contribution of FDI to overall manufacturing investment may partially add to the problem of pollution. With regard to technology transfer, the diffusion of technology to local enterprises through the movement of labor has yet to be evaluated. Furthermore, Dahlman's (1991) study of technology transfer through subcontracting only considered direct transfers by foreign firms. Poh Kam (1991) argues, however, that the indirect transfer of technology through subcontracting is also important. Finally, the study of Sibunruang-Brimble (1988) considered only the quantity and share of promoted foreign firms' exports. The change in total exports caused by FDI firms has not been evaluated. This study is designed to improve the current understanding of impact of FDI on the Thai economy, by evaluating the impacts not considered by other studies. These impacts include the environment, the transfer of technology through job mobility and subcontract arrangements, and the impact

of FDI on exports. The study also attempts to evaluate the relationship between FDI and the exports of Thailand with special emphasis on the electrical appliances industry and the transfer of technology through subcontracting.

III.2 FDI AND TECHNOLOGY TRANSFER

The term technology has been defined in various ways. This study, however, emphasizes only on the economic function of technology. Based on its economic function, technology in this study means technological hardware and technical know-how that help producers or entrepreneurs distinguish their products from their competitors and/or provide cost advantage through economy of scale, and/or economy of scope (Poh Kam, 1991). There are many definitions of technology transfer (Santikarn, 1981). However, this study is interested in the diffusion of technology from FDI firms to local workers and firms.

III.2.2 Subcontract Arrangement and Technology Transfer

The subcontract arrangement is one form of arms-length market relationship consisting of a spot market transaction and a contractual supplier-buyers relationship. A subcontract arrangement between buyer and supplier sometimes has legal obligations for both parties on the specification of products, time of delivery, and quantity of transactions. It should be mentioned that in practice, sometimes it is difficult to distinguish between the two types of market transactions. The reason is that in many cases, the subcontract arrangement is conducted informally.

It is believed that subcontract arrangements may create diffusion of technology because buyers may teach their suppliers new knowledge. Poh Kam (1991) argued that this type of technology transfer is an indirect transfer. According to Poh Kam (1991) indirect technology transfers also include : spill over transfers, learning facilitation and inducement (table III.2.1). This study reexamines the process of technology transfer through subcontract arrangements by considering these three types of transfer.

A supplier may pursue technological progress through a subcontract arrangement. Poh Kam (1991) classified the types of technology into three categories: product, process and quality assurance technologies (table III.2.2). Product technology is knowledge involving the specification and design of products. Process technology is knowledge of the manufacturing of products. Finally, quality assurance technology is knowledge and capability concerning the achievement of conformation with the quality and performance required by buyers. This study is also based on the concept of Poh Kam in identifying level of technology transferred through the subcontract arrangement.

Subcontracting and Technology Transfer in Thailand : A Survey

For this study, twenty four FDI and Thai firms were interviewed. These firms consist of nineteen prospective buyers and five suppliers. For prospective buyers, there are fourteen electronics firms and five machinery firms. Among prospective buyers in electronics industry, there are ten FDI firms and four Thai firms. About half of the prospective buyers in the electronic industry are Japanese firms. Three out of four prospective buyers in the machinery industry are Japanese firms. The five prospective buyers in the machinery industry consist of three FDI firms and two Thai firms. Among the five suppliers, four of them are in the electronics industry. Only one of them is in the machinery industry (table III.2.3).

Comparing subcontract offers between the electronics and machinery industries, prospective buyers in machinery industry tend to offer more subcontract agreements to suppliers than those in electronics industry. Among fourteen prospective buyers in electronics industry, only five of them, all FDI firms, currently offer subcontract agreements to suppliers. In the machinery industry, there are five prospective buyers: three foreign firms, and two Thai firms (tables III.2.3). All but one of them currently offer subcontract arrangements to suppliers. The only firm that does not propose any subcontracts to suppliers is a Thai firm, which had offered subcontracts in the past. However, due to poor quality and delivery delays, the firm has abandoned the policy. Thus regardless of the size of

firms and nationality of ownership, more prospective buyers in the machinery industry offer subcontract agreements than prospective buyers in electronics industry.

The survey results also suggest that FDI firms are more likely to offer subcontract agreements than Thai firms. The nineteen prospective buyers in the survey consist of thirteen foreign firms, and six Thai firms. Among the thirteen FDI firms, eight propose subcontract arrangements to suppliers. Meanwhile, only one of the six Thai firms offers subcontracts to suppliers. The survey also found that Thai buyers have fewer activities related to technology transfer than FDI firms.

The study of technology transfer through subcontract arrangements has fourteen observations, including only those buyers and suppliers engaging in subcontract arrangements. They are composed of nine buyers and five suppliers. Buyers include five electronics firms and four machinery firms. Suppliers comprise four electronics firms and a machinery firm.

As expected, indirect transfer including spill over transfer and learning facilitation is more important than direct transfer. This type of technology transfer is usually ignored by most studies. The result of the study also indicates that direct transfer is also greater than we initially thought. Almost all buyers in the survey have at least one type of activity related to the direct transfer of technology to suppliers. As expected, inducement transfer is not found to be used by any suppliers in the survey.

The results of the survey are shown in table III.2.4, presenting three degrees of technology transfer, low, medium and high. The number of firms engaged in activities related to technology transfer are shown in table III.2.5. Most questions in the survey asked not only about activities, but also their frequency. The study will indicate high intensity only when at least 80 percent of the firms show the presence of such activities and when most of them frequently engage in such activities. The medium level is indicated when more than 50 percent but less than 80 percent of the firms indicate that they are engaged in such activities, with more than half of them having the activity rather often. The rest of activities

which are not included in the first two categories are classified as low intensity.

Direct transfer, although it is much less important compared to indirect transfer, is found to be quite substantial. The study finds the intensity of two activities related to direct transfer ranked as medium, according to the criteria of this study, in both industries (Table III 2.6, III 2.7, III 2.8 and III 2.9). These activities are advice/training on quality management systems and trouble shooting of specific productivity problems. Intensity of the other three activities classified as direct transfer is found to be low.

For activities classified as spill over transfer, the study indicates that most buyers and suppliers participated in these activities more than those classified as direct transfer. For firms in the machinery industry, intensity for product design specification and performance requirements is rated as high. It also has intensity ranked as medium in electronic industry. The other three activities have their intensity ranked as medium. For the electronic industry the intensity of two activities is ranked as medium. With the other two activities ranked as low. The other activity ranked as medium is the exposure to the multi-national enterprise system.

Activities in the learning facilitation group are found by this study to be the most commonly practiced by firms. For the machinery industry, only one activity, namely, sourcing of technical experts is classified as low. That of the other three activities is ranked as high. For the electronic industry, among four activities in this group, intensity of one activity is rated as high, with two others rated as medium. The activity whose intensity ranked as high is the advance indications of future quality/performance/feature requirements and targets. Similar to the machinery industry, the intensity of sourcing of technical experts is low.

Level of Technology Absorbed by Thai Suppliers Through Subcontract Arrangements

Despite the limited number of observations, the results of this study reveal some important characteristics of the level or stage of technology transfer to Thai suppliers through subcontract arrangements. The basic level includes product specification knowledge, product performance feedback, and process and basic-operation knowledge, respectively. The study finds that all suppliers gain a low level of all three types of technologies including products, quality control, and process technologies. However, only three of five suppliers respond that they have learned the middle level of technology for all three types. All of them are different in size ranging from firms with sales of one hundred million baht per year to only about thirty million baht per year. Thus there is no indication that firm size affects the speed and scope of the transfer of low and middle level of technology through the channel of inter-firm transaction linkage. For a high level of technology, including product design-knowledge (product technology), product/process performance improvement know-how (quality assurance technology), and process operation understanding and adaptation skills (process technology), there is only one firm claiming to have gained this level of knowledge. However, according to the respondent, the level of the benefit is still small. As expected, this firm is the largest in the survey with sales exceeding a hundred million baht annually. Therefore, firm size may contribute to the speed and scope of technology transfer in the high level of technology. Due to the smallness of the sample size, the study is unable to determine the difference of the scope and speed of technology transferred between firms in the machinery and electronics industries.

III.2.3 Job Mobility

The technology may also diffuse from FDI firms to domestic firms through the movement of workers from the former to the latter. Furthermore, those workers, after gaining knowledge by working with the FDI firms, may establish their own companies. This section examines whether those things really happen.

The study used both interviews and a questionnaire survey. However, due to the small number of interviewed persons and the limited response to the questionnaires, the number of observations is not as high as expected. There are eleven FDI firms and twelve Thai firms in the survey.

The study examines the turnover rate and job mobility direction of workers in Thai firms and FDI firms. The turnover rate of workers can be observed in terms of various indicators including average, maximum, minimum and variance of turnover rate. The direction of job movement is observed through interviews and a survey of labor migration from the firms ranked in order of popular direction by the reporting firms. The ranking of labor mobility direction includes foreign owned firms, joint-venture-firms, Thai firms, workers setting up their own companies, and others. The ranking of popular direction by the interviewed firms is used as a proxy for the direction of job mobility.

The study reveals the difference in the pattern of job mobility between workers of FDI firms and domestic firms in both turnover rate and direction of job turnover. The rate of job turnover in foreign firms, including those of unskilled workers, technicians and engineers is much lower than in Thai firms (table III.2.10).

The study also shows that the direction of worker mobility in FDI firms is mostly to other foreign owned firms or joint-venture firms. In the survey, most foreign firms ranked job mobility of their workers to other foreign owned firms highest, followed by joint-venture firms. None of them indicated mobility to Thai firms, or to set up their own company as the first or second highest (table III.2.11). On the contrary, although mobility to foreign owned and joint-venture firms are still ranked first and second most popular

direction, relatively fewer Thai firms have reported these two categories as the most popular direction.

This study, therefore, rules out the possibility that job mobility from FDI firms to Thai firms is a significant channel of technology diffusion. In the other words, the study shows the direction of job mobility to be a brain-drain process rather than a diffusion of technology. The same pattern has occurred in other developing countries such as Indonesia for the same reason (Hill ,1989).

III.3 ENVIRONMENTAL IMPACT OF FDI

As stated earlier, the contribution of FDI to the expansion of the manufacturing sector may intensify pollution problems. This section will review the impact of FDI on air and water pollution, and hazardous waste levels.

Air Pollution

Air pollution is mainly a consequence of fossil fuel combustion. The use of other types of energy (e.g. renewable energy) also contributes in a small way to air pollution. The combustion of fossil fuels and other renewable sources of energy emits sulfur dioxide, nitrogen oxide, suspended particulate matter, hydrocarbons, carbon dioxide, and carbon monoxide into the air. Among these emissions, three types are essential in terms of volume - sulfur dioxide, nitrogen oxide, and suspended particulate matter (TDRI, 1990).

A TDRI (1990) study shows that largest portion of sulfur dioxide emission in Thailand in the past, and projected for the near future, emanates from the power generation sector, followed by the industrial and transportation sectors, respectively. Compared to these three sectors, sulfur dioxide emissions by other sectors is minimal (table III.3.1). However, other sectors can generate sulfur dioxide indirectly through the usage of electricity.

The primary source of nitrogen oxide emissions is the transportation sector followed by the power and industrial sectors (table III.3.2). Unlike sulfur oxide emissions, however, the calculations are complicated by the fact that the use of transportation by each sector is not known. The proportion of nitrogen oxide emissions generated by the industrial sector through its use of transportation, therefore, cannot realistically be calculated.

The last important type of emission, suspended particulate matter (SPM), is significant in terms of quantity. SPM emissions are generated primarily by the industrial, residential and commercial sectors (table III.3.3). The proportion of SPM emitted by the industrial and transportation sectors, however, are projected to increase significantly in the near future. Within the industrial sector in 1988, manufacturers accounted for over 90, 97, and 99 percent of sulfer dioxide, nitrogen oxide, and SPM emissions, respectively (tables III.3.4, III.3.5, and III.3.6).

SPM emissions are primarily a result of industrial sector production. Among the industrial activities, manufacturing generates the highest proportion of pollutants, and more than 80 percent of the SPM emissions of this subsector are discharged by the non-metal and food industries (table III.3.6). The share of FDI in the food, non-metal, and metal industries, however, accounted for only about 16 percent of the total FDI (table III.3.8). Thus FDI again does not seriously add to the problem of SPM emissions in Thailand.

In summary, regarding the problem of air pollution, the non-metal products industry is the largest polluter followed by the food and textile industries (tables III.3.4, III.5 and III.3.6). Since FDI accounts for only a small portion of the total capital formation in Thailand and it does not concentrate heavily in the top three air polluting industries (tables III.3.8, III.3.8), it is reasonable to conclude that FDI does not seriously contribute, directly or indirectly, to the problem of air pollution.

Water Pollution

This section only considers waste-water containing biochemical oxygen demand (BOD) - a standard unit of measurement of biodegradable waste-water. Other types of waste-water, including hazardous waste, are discussed separately. In this regard, the two major contributors to BOD generation are the food and beverage industries, which are responsible for more than 95 percent of the total BOD discharged by the manufacturing sector (table III.3.9). BOI data indicate that only a small portion of promoted firms up to 1989 have been in the food and beverage industries (table II.3.9). In fact, of the countries investing through FDI in Thailand, none has focused primarily on the food and beverage industries (table III.3.9).

Hazardous Waste

As the Thai economy becomes more industrialized, the problem of hazardous waste will also become more serious. Chemicals and chemical products are widely used in various economic activities, resulting in the discharge of enormous quantities of hazardous waste. The manufacturing sector is persistently becoming a greater source of hazardous waste. Within the manufacturing sector, the basic-metal industry has generated the largest levels of hazardous waste (table III.3.10).

This study finds that FDI does not significantly contribute to the problem of hazardous waste generation. By 1989, only a small portion of promoted foreign firms concentrated in the basic metal industry (table III.3.10).

Attention, however, should not be paid only to the quantity of hazardous waste. Rather, the nature of waste is equally significant, since the degree of contamination varies with each type of waste. Based on the study by Engineering Science Inc., et al. (1989), a study by TDRI (1990, 1991) classifies manufacturing industries into four groups according to the nature or degree of waste contamination produced. The first group (rank 0) includes industries that do not produce, or only produce minimal amounts of hazardous waste. The rank 1 group contains industries that produce small amounts of hazardous waste. The third

group (rank 2) includes industries with the potential to generate moderate amounts of waste with low levels of contamination. The last group (rank 3) consists of industries with the potential to either generate large quantities of waste, or small amounts of waste with very high levels of contamination.

Data from the BOI show that the largest portion of promoted FDI is in the rank 2 group followed by the rank 1 and rank 0 groups. The lowest portion of promoted FDI is in the rank 3 group (table III.3.11).

Compared with the share of overall factories in the Thai manufacturing sector classified by degree of contamination, promoted FDI firms clearly focus more effort on the rank 1 and 2 industries. All manufacturing firms in the country are distributed relatively evenly over the rank 0, 1 and 2 groups, with the proportions remaining considerably stable over time (TDRI, 1990). The proportions of promoted FDI firms in ranks 1 and 2 were much higher than those of all manufacturing enterprises, indicating that, proportionally more than Thai firms, the investments made by promoted FDI firms are concentrated in the industries that generate considerable quantities of hazardous waste with moderate degrees of contamination. BOI data indicates that the country with the greatest proportion of its overall investment in rank 2 industries is the United States (table III.3.12).

Total value of promoted FDI in the rank 0, 1 and 2 industries is dominated by the Japanese, while investment from the EC and other countries monopolizes the rank 3 industries (tables III.3.13 and II.3.14). The number of promoted Japanese firms in rank 0 and 1 industries, however, is less than those of Taiwan and Hong Kong. Nevertheless, firms from Japan as well as most countries, do not invest in the rank 3 industries. Only businesses from the EC and other countries invest in this group of industries.

The BOI data illustrate quite clearly that the relative concentration of FDI is highest in the rank 2 industries. This concentration of FDI indicates that there is potential for FDI to generate moderate amounts of hazardous waste with low levels of contamination. Japanese investment does not concentrate in the rank 2 industries more than those of other countries.

However, in magnitude of investment, Japanese investment has potential to produce more hazardous waste than other countries.

III.4 IMPACTS OF FDI ON THAILAND'S EXPORT

III.4.1 Theoretical Linkage between FDI and Exports

Despite the export-complementary nature of FDI, it is rather difficult to establish the theoretical relationship between exports and FDI. Based on the typical Heckscher-Olin framework, under certain assumptions such as perfect competition, and equal productive capability, capital flows can substitute for commodity trade (Naya and Imada,1990). FDI would eventually bring about factor-price equalization, so that commodity trade between trading partners will not be necessary. Under this analysis, FDI would reduce the volume of trade rather than increase it. However, from some theories of FDI, such as the product cycle, Kojima and globalization of production theories presented in the previous section, the linkage between trade and FDI may be established.

III.4.2 Research Methodology

Basically, there are two methods that may be used to test our hypothesis: structural equations, and the causality test method. The first method involves specification and testing of the structural relationship between FDI and trade.

Alternatively the causality test method may be employed. This method was first introduced by Granger (1969) and Sim (1972). According to this method, to actually test the hypothesis, we must first define the null hypothesis that one variable, namely, FDI (X) does not help to explain exports (Y). The testing of this null hypothesis is simply a zero restriction test which consists of two models. The first model is called the unrestricted model, which includes Y as dependent variable and lagged values of Y and lagged values of X as independent variables. The second model is the restricted model which include Y as dependent variable and only lagged values of Y as independent variables. The basic idea is

that if X actually causes Y, its lagged values must significantly help to predict the value of Y. Thus, if it is the case, the error sum of squares of the restricted model should be significantly larger than that of unrestricted model. Thus we can employ the standard F-statistic to test the hypothesis.

(1) Unrestricted Model: $Y = \sum_{i=1}^{m} AiYt+i + \sum_{i=1}^{m} BiXt-i + Et$

(2) Restricted Model: $Y = \sum_{i=1}^{m} AiYt-i + Et$

The second step is to test the null hypothesis that Y does not cause X by using the same procedure. Only in this case, X is the dependent variable in both restricted and unrestricted models. It can be concluded that X causes Y if and only if the test shows that X causes Y but Y does not cause X. The reason is that if X and Y cause each other, both X and Y may be caused by the third variable. Thus the conclusion that X causes Y is no longer valid. In this study, if exports and FDI are shown to cause each other, a causality test of the causal effect of the third variable on both FDI and exports will be performed. In this case, the third variable is the world economy. It is selected because it is the variable most likely to influence both FDI and exports. The study will conclude that FDI does cause export only when the world economy is found not to cause export. Test were performed for FDI and exports of manufacturing sector, as well as FDI in the electronic appliance industry and exports of electrical appliances products. The study uses accumulated FDI instead of flow of FDI.

The study separates exports and FDI according to destinations and sources, respectively. For manufacturing sector, both destinations of exports and sources of FDI are classified into the United States, Japan, the NIE's and other countries. For FDI in the electrical appliances industry, the sources of FDI are classified into the United States, Japan, the NIE's, ASEAN and other countries. NIE's exclude Singapore, which is included in

ASEAN. Destinations of exports are classified in the same fashion as those of FDI. The study attempts to reveal what source of FDI affects exports to what destination. This study interprets the results of the causality tests in a rather restrictive manner. The possible linkage between FDI and exports as well as imports is concluded only when the F-statistics are significant at least at the 10 percent level for at least two lag levels.

III.4.3 RESULT OF THE CAUSALITY TEST

For the impact of FDI on exports of the manufacturing industry, the study finds only weak evidence of a causal effect. The F-statistics are rarely significant at the 10 percent level (table III.4.1). To the contrary, the study indicates that manufacturing exports greatly induce accumulated FDI into Thailand (table III.4.2). Based on the criteria of this study, manufacturing exports to Japan create accumulated FDI in the manufacturing sector from Japan, the United States, and other countries. The export of manufacturing products to the United States is revealed to generate accumulated FDI in manufacturing from other countries. Exports to NIE's appear to cause accumulated FDI in manufacturing sector from all countries, except from ASEAN countries. Similarly, export of manufacturing products to ASEAN appears to create FDI from all countries. The export of the products to other countries is shown to induce accumulated FDI from Japan, the United States, and other countries.

Unlike the test of the relationship between FDI and exports in the manufacturing sector, FDI and exports in the electronic appliances sector are shown to influence each other. The test shows that FDI in the industry from Japan causes exports from the industry to Japan, NIE's and ASEAN. Similarly, FDI from ASEAN is revealed to create exports of electrical appliance products to the United States and ASEAN. Nevertheless, the test does not show a causal effect of accumulated FDI from the United States, NIE's, and other countries on exports of electrical appliance products (table III.4.3).

For the test of the impact of exports of electrical appliance products on accumulated FDI in the industry, the study shows that exports to Japan induce accumulated FDI in the industry from Japan, and ASEAN (table III.4.4). Exports to the United State cause inflows of FDI from all countries, except from ASEAN. Exports of the products to NIE's appear to induce accumulated FDI from the United States and other countries. Exports of electrical appliance products to ASEAN are revealed to induce accumulated FDI from NIE's, and other countries. Finally, exports of the products to other countries is shown to induce FDI from all countries, except from ASEAN.

As previously discussed, from the criteria of the causality test, the test is not conclusive when accumulated FDI and exports of the electrical appliance sector simultaneously affect each other. Another test is performed, therefore, to examine the causal effect of the world economy index on accumulated FDI and exports of the electrical appliance industry. The result shows that the world economy has no significant effect on either accumulated FDI or exports of the industry (table III.4.5). Therefore, the relationship between the accumulated FDI and exports is confirmed.

The data also show that after the substantial increase in FDI in the electrical appliances industry, exports of these products has increased drastically (tables III.4.6 and III.4.7). Similar to exports, FDI in the electrical products industry also influences imports of parts and components for electrical products. Most of them come from Japan, the United States, Singapore and other NIE's (tables III.4.8 and II.4.9).

IV. SUMMARY

This paper examines various aspects about FDI in Thailand. They include the pattern of FDI in the country, factors affecting FDI and the impact of FDI on the Thai economy. On the first aspect, the study shows that FDI is usually concentrated in the manufacturing industry. Furthermore, FDI in this sector has increased drastically after 1987. The composition of FDI also shifted toward export-oriented industries such as the electronic appliances industry. However, recent data show that the volume of FDI in other sectors such as construction and financial institutions, increased rather drastically in the last two years.

For the study of factors affecting FDI, the study reviews previous studies and conducts its own empirical study. From our own study, it is found that the market factor represented by GDP, and the rising cost of production in Japan and NIE's represented by the exchange rate of Japanese Yen are the two most important factors. The study also finds a significant shift in behavior of FDI. Tariff rates and infrastructure variables have become much more important in the second half of 1980's. However, the coefficient of the tariff rate variable is negative instead of positive. This means that tariff rates have deterred FDI by increasing the cost of production, since after the second half of 1980's foreign investors have become more cost conscious. Besides factors investigated by this study, other important factors affecting FDI from other studies, are the quality of the labor force and joint-venture partners, political stability, sufficiency of local funds, and trade barriers.

From other studies, it is shown that FDI has strong impact on the exports of the country but has a moderate effect on employment, the usage of local resources, and technology transfer. This study examines the impact of FDI in three perspectives: technology transfer diffusion through subcontract arrangements and job mobility, the environment, and exports. For technology transfer the study finds that subcontract arrangemens, at least, moderately transfer technology from foreign investors to local suppliers. Nevertheless, technology transferred to local suppliers is usually at the basic

knowledge level. To the contrary, job mobility is found to be an insignificant channel of technology diffusion because workers of FDI firms rarely move to Thai firms. For environmental impact, the study indicates that FDI has not concentrated on activities generating high quantities of water pollutants, air pollutants and hazardous waste. However, a considerable portion of FDI is in industries generating hazardous waste with moderate degree of contamination. Finally, for its impact on exports the study finds that FDI does not significantly contribute to the export of total manufacturing products. Nevertheless, for some export-oriented industries such as electronic appliances, FDI has significantly generated exports of the products in the cases of FDI from Japan and ASEAN.

Table I.1 Net Flow of FDI into Thailand Classified by Countries

(Unit : Million Baht)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
U.S.	730.3	2,396.0	857.3	1,265.9	3,733.2	2,387.4	1,293.7	1,815.7	3,184.9	5,220.6	5,844.7	5,918.6	11,788.3
%	18.8	37.4	19.8	15.4	39.4	53.7	18.7	20.1	11.4	11.4	9.0	11.5	21.9
Japan	902.9	1,406.9	1,037.2	2,431.9	2,588.1	1,534.0	3,049.0	3,268.7	14,605.0	18,761.6	27,821.6	19,611.9	8,571.8
%	23.3	21.9	23.9	29.6	27.3	34.5	44.1	36.1	52.2	41.1	43.0	38.2	15.9
NIEs	1,123.7	335.0	594.8	919.6	401.7	816.2	1,092.9	1,505.8	6,235.5	11,032.2	14,174.7	14,614.9	17,032.2
%	29.0	5.2	13.7	11.2	4.2	18.4	15.8	16.7	22.3	24.1	21.9	28.4	31.7
Taiwan	1.9	11.9	1.8	28.3	45.0	170.6	132.6	687.3	3,136.4	5,062.3	7,138.0	2,753.5	2,220.8
%	0.0	0.2	0.0	0.3	0.5	3.8	1.9	7.6	11.2	11.1	11.0	5.4	4.1
Hong Kong	112.1	323.0	593.0	870.7	351.8	649.0	955.7	796.2	2,794.5	5,715.7	6,549.2	11,565.5	14,549.0
%	28.7	5.0	13.7	10.6	3.7	14.6	13.8	8.8	10.0	12.5	10.1	22.5	27.1
Korea	9.7	0.1	0.0	20.6	4.9	(3.4)	4.6	22.3	304.6	254.2	487.5	295.9	262.4
%	0.3	0.0	0.0	0.3	0.1	(0.1)	0.1	0.2	1.1	0.6	0.8	0.6	0.5
ASEAN	431.0	1,042.7	(367.2)	712.7	1,170.1	(1,082.0)	359.9	535.4	1,646.8	2,809.6	6,439.6	6,576.2	7,170.0
%	11.1	16.3	(8.5)	8.7	12.4	(24.4)	5.2	5.9	5.9	6.1	10.0	12.8	13.3
Singapore	277.3	1,018.8	(388.1)	556.0	1,121.3	(1,121.9)	401.3	535.5	1,571.9	2,746.1	5,909.6	6,469.3	6,722.0
%	7.2	15.9	(9.0)	6.8	11.8	(25.3)	5.8	5.9	5.6	6.0	9.1	12.6	12.5
Others	153.7	23.9	20.9	156.7	48.8	39.9	(41.4)	(0.1)	74.9	63.5	530.0	106.9	448.0
%	4.0	0.4	0.5	1.9	0.5	0.9	(0.6)	0.0	0.3	0.1	0.8	0.2	0.8
Other Countries	690.3	1,233.8	2,209.3	2,894.7	1,570.5	786.2	1,112.6	1,918.1	2,291.3	7,873.6	10,414.4	4,667.5	9,202.0
%	17.8	19.2	51.0	35.2	16.6	17.7	16.1	21.2	8.2	17.2	16.1	9.1	17.1
Total	3,878.2	6,414.4	4,331.4	8,224.8	9,463.6	4,441.8	6,908.1	9,043.7	27,963.5	45,697.6	64,695.0	51,389.1	53,764.3
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : Bank of Thailand

Table I.2 Net Flow of FDI into Thailand Classified by Sector

(in million baht)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1. Financial Institutions	-173.0	674.1	-480.3	996.6	156.0	-1239.7	510.2	442.9	2578.2	2843.2	3834.1	6812.8	6555.1
	-4.5	10.5	-11.1	12.1	1.6	-27.9	7.4	4.9	9.2	6.2	6.1	13.3	12.2
2. Trade	750.6	479.6	699.0	1697.6	1893.5	1081.8	1783.7	853.3	3879.5	6803.6	13012.1	7637.2	7095.9
	19.4	7.5	16.1	20.6	19.6	24.4	25.8	9.4	13.9	14.9	20.8	14.9	13.2
3. Construction	782.6	1276.8	736.9	741.5	1066.2	1585.3	1234.9	1349.1	1841.1	3925.5	3294.1	3351.3	14534.3
	20.2	19.9	17.0	9.0	11.1	35.7	17.9	14.9	6.6	8.6	5.3	6.5	27.0
4. Mining & Quarrying	596.7	767.7	1682.1	1454.2	2787.2	515.8	240.2	192.0	472.6	575.1	1139.2	2065.5	3125.5
	15.4	12.0	38.8	17.7	28.9	11.6	3.5	2.1	1.7	1.3	1.8	4.0	5.8
5. Agriculture	209.8	7.5	15.6	48.2	67.6	77.0	202.2	286.1	315.3	603.4	761.0	597.8	-150.6
	5.4	0.1	0.4	0.6	0.7	1.7	2.9	3.2	1.1	1.3	1.2	1.2	-0.3
6. Industry	1011.9	2526.1	1230.9	2567.8	3167.0	1358.1	2123.8	4749.3	16161.1	21858.4	29062.7	23349.5	17467.3
	26.1	39.4	28.4	31.2	32.8	30.6	30.7	52.5	57.8	47.9	46.5	45.4	32.5
6.1 Food	91.3	156.9	-257.3	217.7	105.9	394.8	286.9	436.6	1064.7	1962.0	1940.8	1683.1	1243.3
	2.4	2.4	-5.9	2.6	1.1	8.9	4.2	4.8	3.8	4.3	3.1	3.3	2.3
6.2 Textiles	-1.5	-32.2	420.7	13.3	452.5	59.8	85.7	995.7	1110.7	686.4	1762.5	1124.1	1462.0
	-0.0	-0.5	9.7	0.2	4.7	1.3	1.2	11.0	4.0	1.5	2.8	2.2	2.7
6.3 Metal based and Non - metallic	47.8	148.9	123.5	1022.2	78.3	-125.7	-22.6	365.1	2113.4	2762.1	2835.5	2195.5	1695.6
	1.2	2.3	2.9	12.4	0.8	-2.8	-0.3	4.0	7.6	6.0	4.5	4.3	3.2
6.4 Electrical appliances	448.2	624.4	666.7	394.0	1045.3	280.0	617.0	1136.5	6317.5	8857.2	10827.7	8932.7	5906.9
	11.6	9.7	15.4	4.8	10.8	6.3	8.9	12.6	22.6	19.4	17.3	17.4	11.0
6.5 Machinery & Transport Equipment	92.1	129.5	227.3	421.6	119.8	32.0	-14.9	159.9	630.7	1103.3	2423.5	2183.2	1083.5
	2.4	2.0	5.2	5.1	1.2	0.7	-0.2	1.8	2.3	2.4	3.9	4.2	2.0
6.6 Chemicals	213.4	177.5	106.5	350.3	283.3	488.4	484.0	868.1	1956.5	3478.0	4619.5	3834.1	1624.3
	5.5	2.8	2.5	4.3	2.9	11.0	7.0	9.6	7.0	7.6	7.4	7.5	3.0
6.7 Petroleum Products	2.2	1246.8	-129.1	0.0	934.2	0.0	8.2	-15.8	769.8	-1189.6	899.2	-374.0	1278.5
	0.1	19.4	-3.0	0.0	9.7	0.0	0.1	-0.2	2.8	-2.6	1.4	-0.7	2.4
6.8 Construction Meterials	1.3	12.5	8.8	19.1	5.8	38.3	5.4	6.3	26.3	85.4	12.2	145.9	375.0
	0.0	0.2	0.2	0.2	0.1	0.9	0.1	0.1	0.1	0.2	0.0	0.3	0.7
6.9 Other	117.1	61.8	63.8	129.3	141.9	190.4	674.1	796.8	2171.6	4113.5	3741.8	3624.9	2798.2
	3.0	1.0	1.5	1.6	1.5	4.3	9.8	8.8	7.8	9.0	6.0	7.1	5.2
7. Services	699.6	682.6	447.1	719.2	506.2	1063.5	813.4	1171.4	2529.4	8701.9	10938.6	5411.7	3711.0
	18.0	10.6	10.3	8.7	5.2	23.9	11.8	13.0	9.0	19.1	17.5	10.5	6.9
8. Others	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	186.3	360.5	474.4	2163.3	1425.8
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.8	0.8	4.2	2.7
TOTAL	3878.2	6414.4	4331.3	8225.1	9643.7	4441.8	6908.4	9044.0	27963.5	45671.6	62516.2	51389.1	53764.3
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : Bank of Thailand

Table I.3 Share of Net Flow of FDI into Thailand Classified by Industry

(%)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Food	9.0	6.2	(20.9)	8.5	3.3	29.1	13.5	9.2	6.6	9.0	5.7	7.1	7.4
Textiles	(0.2)	(1.3)	34.2	0.5	14.3	4.4	4.0	21.0	6.9	3.1	5.7	4.8	8.4
Metal based and Non - metallic	4.7	5.9	10.0	39.8	2.5	(9.3)	(1.1)	7.7	13.1	12.6	9.3	9.3	9.7
Electrical appliances	44.2	24.7	54.2	15.3	33.0	20.6	29.1	23.9	39.1	40.5	34.4	37.7	33.8
Machinery & Transport Equipment	9.1	5.1	18.5	16.4	3.8	2.4	(0.7)	3.4	3.9	5.0	8.0	9.6	6.2
Chemicals	21.0	7.0	8.7	13.6	8.9	36.0	22.8	18.3	12.1	15.9	13.9	16.2	9.3
Petroleum Products	0.2	49.4	(10.5)	0.0	29.5	0.0	0.4	(0.3)	4.8	(5.4)	9.8	(1.6)	7.3
Construction Materials	0.1	0.5	0.7	0.7	0.2	2.8	0.3	0.1	0.2	0.4	0.0	0.6	2.1
Other	11.8	2.4	5.2	5.0	4.5	14.0	31.7	16.8	13.4	18.8	13.1	16.4	15.8
Total Industry	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : Bank of Thailand

Table I.4 Netflow of FDI into Electrical Appliances in Thailand Classified by Country

(Unit : Million Baht)

	Total	USA	Japan	Hong Kong	Taiwan	Korea	Malaysia	Singapore	Asean
1980	448.2	202.5	28.6	204.0	0	3.7	0.0	0.0	0.0
(%)	100.0	45.2	6.4	45.5	0	0.8	0.0	0.0	0.0
1981	624.4	533.2	58.9	27.5	2.7	0.1	0.0	(0.7)	(0.7)
(%)	100.0	85.4	9.4	4.4	0.4	0.0	0.0	(0.1)	(0.1)
1982	666.7	519.3	88.3	26.8	0	0.0	0.0	0.0	0.0
(%)	100.0	77.9	13.2	4.0	0	0.0	0.0	0.0	0.0
1983	394.8	259.0	27.2	47.2	0.1	5.7	0.0	0.4	0.4
(%)	100.0	65.6	6.9	12.0	0	1.4	0.0	0.1	0.1
1984	1,045.3	309.7	588.8	45.7	0	0.0	0.0	3.5	3.5
(%)	100.0	29.6	56.3	4.4	0	0.0	0.0	0.3	0.3
1985	280.0	173.1	117.3	7.2	0	(4.7)	0.0	17.0	17.0
(%)	100.0	61.8	41.9	2.6	0	(1.7)	0.0	6.1	6.1
1986	617.0	28.7	319.7	1.0	2.1	0.0	0.0	258.4	258.4
(%)	100.0	4.7	51.8	0.2	0.3	0.0	0.0	41.9	41.9
1987	1,136.5	114.2	826.7	1.7	64.3	1.0	0.0	116.6	116.6
(%)	100.0	10.0	72.7	0.1	5.7	0.1	0.0	10.3	10.3
1988	6,317.5	314.5	4,697.1	400.5	151.4	86.0	0.0	612.4	612.4
(%)	100.0	5.0	74.4	6.3	2.4	1.4	0.0	9.7	9.7
1989	8,857.2	1,213.7	6,000.4	378.4	649.3	19.5	0.0	476.0	476.0
(%)	100.0	13.7	67.7	4.3	7.3	0.2	0.0	5.4	5.4
1990	10,827.7	696.4	6,966.6	560.0	599	138.2	393.8	776.7	1,170.5
(%)	100.0	6.4	64.3	5.2	5.5	1.3	3.6	7.2	10.8
1991	8,932.7	695.9	6,318.1	719.9	375.4	66.4	0.4	536.9	537.3
(%)	100.0	7.8	70.7	8.1	4.2	0.7	0.0	6.0	6.0
1992	5,906.9	2,377.2	2,312.2	177.8	260.6	44.4	0.0	582.9	582.9
(%)	100.0	40.2	39.1	3.0	4.4	0.8	0.0	9.9	9.9

Source : Bank of Thailand

Table II.1 Regression Results on Determinants of FDI in Thailand

Variables	Coefficents	Coefficents	Coefficents
Constant	17306.27 ***	17306.28 ***	17769.3 ***
	(3.699)	(3.699)	(3.146)
D-3	19049.73 ***	19049.77 ***	19318.49 ***
	(5.617)	(5.617)	(6.769)
GDP-2	0.028 **	0.028 **	0.027 *
	(2.832)	(2.832)	(2.164)
D*GDP-2	0.041 ***	-	-
	(4.769)		
TRR-2	39555.97	39555.97	4154.98
	(1.713)	(7.713)	(1.340)
D*TRR-2	-317287 ***	-688687 ***	-584840 ***
	(-2.985)	(-3.754)	(-4.386)
NTELP-2	0.001	0.001	-0.034
	(0.001)	(0.001)	(-0.077)
D*NETLP-2	-	4.19 ***	-
	-	(4.768)	
EGKC-2	-76.131 *	-76.131 **	-73.353
	(-2.055)	(-2.089)	(-1.724)
D*EGKC-2	-	-	158.123 ***
			(5.607)
EJ-2	-47.205 **	-47.205 **	-50.016 ***
2	(-3.167)	(-3.167)	(-2.945)
adjusted R	0.992	0.992	0.992 ***
F-Statistics	234.567 ***	234.567 ***	265.027 ***

Table III.2.1 Processes of Technology Transfer and Absorption Through Subcontract Arrangement

Direct Transfer
- Advice on Plant Layout, equipment selection and operations planning
- Advice/training on quality management system and other "good manufacturing practices"
- On-site audit of plant operation and trouble shooting of specific productivity problems
- Loaning of equipment and machinery either temporarily or permanently
- Training of supplier staff through formal courses/seminars or informal consultations/ visitations
Spill Over Transfer
- Product design specification and performance requirements
- Early supplier involvement in prototype development and value engineering stage
- Access to technological and market information on competitors products
- Informal sharing of technological information and ideas among technical staff of both companies
- Exposure to Multi-national enterprise (MNE) system of managing and organizing manufacturing activities and observation of MNE corporate culture ("organizational and management technology")
Learning Facilitation
- Testing and diagnostic feedback on quality and other dimensions of performance of supplier's products.
- Sourcing of technical experts to solve specific technical problems encountered by the supplier
- Advanced indications of future quality/performence/ features requirements and targets
Inducement
- Reduction of the perceived risk of technology investment decision by implicit MNE procurement commitment
- Provision of stable source of income to finance the investment
- Access to superior market demand information that improves investment decision

Source: Poh Kam (1991)

Table III.2.2: Model of the Generic Stages of Technological Progress of Suppliers Through Subcontracting

Level of technology	Product technology	Quality assurance technology	Process technology
Low	Product specification know-what	Product performance feedback	Process know-what and basic operation know-how
Medium	Product spec, know-why; know-what of related products and end product/process using the product	Product/process performance diagnostics	Process operation know-how
High	Product design know-how	Product/process performance improvement know-how	Process operation Know-why & adaptation know-how

innovative application of technological knowledge to other product/process

Source: Poh Kam (1991)

Table III.2.3: Subcontract by Prospective Buyers: Classified by Size, Nationality of Ownership, and Industry

Size	Foreign							Thai							Total
	Machinery			Electronics			Total	Machinery			Electronics			Total	
	Yes	No	Total	Yes	No	Total		Yes	No	Total	Yes	No	Total		
Large	3	0	3	3	2	5	8	0	0	0	0	1	1	1	9
Medium	0	0	0	1	2	3	3	1	1	2	0	3	3	5	8
Small	0	0	0	0	2	2	2	0	0	0	0	0	0	0	2
Total	3	0	3	5	5	10	13	1	1	2	0	4	4	6	19

Source: Survey

Table III.2.4: Intensity of Activities of all Buyers Engaged in Technology Transfer Through Subcontract Arrangement

	Intensity of Activities
Direct Transfer	
- Advice on Plant Layout, equipment selection and operations planning	Low
- Advice/training on quality management system and other "good manufacturing practices"	Low
- On-site audit of plant operation and trouble shooting of specific productivity problems	Medium
- Loaning of equipment and machinery either temporarily or permanently	Low
- Training of supplier staff through formal courses/seminars or informal consultations/ visitations	Low
Spill Over Transfer	
- Product design specification and performance requirements	High
- Early supplier involvement in prototype development and value engineering stage	Medium
- Informal sharing of technological information and ideas among technical staff of both companies	Medium
- Exposure to Multi-national enterprise (MNE) system of managing and organizing manufacturing activities and observation of MNE corporate culture ("organizational and management technology")	Medium
Learning Facilitation	
- Testing and diagnostic feedback on quality and other dimensions of performance of supplier's products.	High
- Feedback in the early stage of prototype development	High
- Sourcing of technical experts to solve specific technical problems encountered by the supplier	Low
- Advanced indications of future quality/performanec/ features requirements and targets	High

Source: Survey

Table III.2.5: Activities and Number of Firms Engaged in Technology Transfer Through Subcontract Arrangement by Buyers in Electronics and Machinery Industries

	Firm Engaged in Tech. Tr. Number (%)	
	Yes	No
Direct Transfer		
- Advice on Plant Layout, equipment selection and operations planning	3 (22)	11 (78)
- Advice/training on quality management system and other "good manufacturing practices"	6 (43)	8 (57)
- On-site audit of plant operation and trouble shooting of specific productivity problems	11 (78)	3 (22)
- Loaning of equipment and machinery either temporarily or permanently	6 (43)	8 (57)
- Training of supplier staff through formal courses/seminars or informal consultations/ visitations	7 (50)	7 (50)
Spill Over Transfer		
- Product design specification and performance requirements	12 (86)	2 (14)
- Early supplier involvement in prototype development and value engineering stage	9 (64)	5 (36)
- Informal sharing of technological information and ideas among technical staff of both companies	10 (71)	4 (29)
- Exposure to Multi-national enterprise (MNE) system of managing and organizing manufacturing activities and observation of MNE corporate culture ("organizational and management technology")	10 (71)	4 (29)
Learning Facilitation		
- Testing and diagnostic feedback on quality and other dimensions of performance of supplier's products.	11 (78)	3 (22)
- Feedback in the early stage of prototype development	11 (78)	3 (22)
- Sourcing of technical experts to solve specific technical problems encountered by the supplier	6 (43)	8 (57)
- Advanced indications of future quality/performanec/ features requirements and targets	12 (86)	2 (14)

Source: Survey

Table III.2.6: Intensity of Technology Transfer and Absorption Through Subcontract Arrangement in Machinery Industry

	Intensity of Activities
Direct Transfer	
- Advice on Plant Layout, equipment selection and operations planning	Low
- Advice/training on quality management system and other "good manufacturing practices"	Low
- On-site audit of plant operation and trouble shooting of specific productivity problems	Medium
- Loaning of equipment and machinery either temporarily or permanently	Low
- Training of supplier staff through formal courses/seminars or informal consultations/ visitations	Low
Spill Over Transfer	
- Product design specification and performance requirements	High
- Early supplier involvement in prototype development and value engineering stage	Medium
- Informal sharing of technological information and ideas among technical staff of both companies	Medium
- Exposure to Multi-national enterprise (MNE) system of managing and organizing manufacturing activities and observation of MNE corporate culture ("organizational and management Technology")	Medium
Learning Facilitation	
- Testing and diagnostic feedback on quality and other dimensions of performance of supplier's products.	High
- Feedback in the early stage of prototype development	High
- Sourcing of technical experts to solve specific technical problems encountered by the supplier	Low
- Advanced indications of future quality/performanec/ features requirements and targets	High

Source: Survey

Table III.2.7: Intensity of Technology Transfer and Absorption Through Subcontract Arrangement in Electronics Industry.

	Intensity of Activities
Direct Transfer	
- Advice on Plant Layout, equipment selection and operations planning	Low
- Advice/training on quality management system and other "good manufacturing practices"	Low
- On-site audit of plant operation and trouble shooting of specific productivity problems	Medium
- Loaning of equipment and machinery either temporarily or permanently	Low
- Training of supplier staff through formal courses/seminars or informal consultations/ visitations	Low
Spill Over Transfer	
- Product design specification and performance requirements	Medium
- Early supplier involvement in prototype development and value engineering stage	Low
- Informal sharing of technological information and ideas among technical staff of both companies	Low
- Exposure to Multi-national enterprise (MNE) system of managing and organizing manufacturing activities and observation of MNE corporate culture ("organizational and management technology")	Medium
Learning Facilitation	
- Testing and diagnostic feedback on quality and other dimensions of performance of supplier's products.	Medium
- Feedback in the early stage of prototype development	Medium
- Sourcing of technical experts to solve specific technical problems encountered by the supplier	Low
- Advanced indications of future quality/performanec/ features requirements and targets	High

Source: Survey

Table III.2.8: Activities and Number of Firms Engaged in Technology Transfer Through Subcontract Arrangement by Buyers in Electronics Industries

	Number of Firms (%) Yes	No
Direct Transfer		
- Advice on Plant Layout, equipment selection and operations planning	1 (11)	8 (89)
- Advice/training on quality management system and other "good manufacturing practices"	3 (33)	6 (67)
- On-site audit of plant operation and trouble shooting of specific productivity problems	7 (78)	2 (22)
- Loaning of equipment and machinery either temporarily or permanently	2 (22)	7 (78)
- Training of supplier staff through formal courses/seminars or informal consultations/ visitations	7 (44)	5 (56)
Spill Over Transfer		
- Product design specification and performance requirements	7 (78)	2 (22)
- Early supplier involvement in prototype development and value engineering stage	4 (44)	5 (56)
- Informal sharing of technological information and ideas among technical staff of both companies	5 (56)	4 (44)
- Exposure to Multi-national enterprise (MNE) system of managing and organizing manufacturing activities and observation of MNE corporate culture ("organizational and management technology")	7 (78)	2 (22)
Learning Facilitation		
- Testing and diagnostic feedback on quality and other dimensions of performance of supplier's products.	6 (67)	3 (33)
- Feedback in the early stage of prototype development	6 (67)	3 (33)
- Sourcing of technical experts to solve specific technical problems encountered by the supplier	2 (22)	7 (77)
- Advanced indications of future quality/performanec/ features requirements and targets	7 (78)	2 (22)

Source: Survey

Table III.2.9: Activities and Number of Firms Engaged in Technology Transfer and Absorption Through Subcontract Arrangement by Buyers in Machiinery Industry

	Number of Firms (%) Yes	No
Direct Transfer		
- Advice on Plant Layout, equipment selection and operations planning	4 (40)	3 (40)
- Advice/training on quality management system and other "good manufacturing practices"	3 (60)	2 (40)
- On-site audit of plant operation and trouble shooting of specific productivity problems	4 (80)	1 (20)
- Loaning of equipment and machinery either temporarily or permanently	4 (80)	2 (40)
- Training of supplier staff through formal courses/seminars or informal consultations/ visitations	3 (60)	2 (40)
Spill Over Transfer		
- Product design specification and performance requirements	5 (100)	0 (0)
- Early supplier involvement in prototype development and value engineering stage	5 (100)	0 (0)
- Informal sharing of technological information and ideas among technical staff of both companies	5 (100)	0 (0)
- Exposure to Multi-national enterprise (MNE) system of managing and organizing manufacturing activities and observation of MNE corporate culture ("organizational and management technology")	5 (100)	0 (0)
Learning Facilitation		
- Testing and diagnostic feedback on quality and other dimensions of performance of supplier's products.	5 (100)	0 (0)
- Feedback in the early stage of prototype development	5 (100)	0 (0)
- Sourcing of technical experts to solve specific technical problems encountered by the supplier	4 (80)	1 (12)
- Advanced indications of future quality/performanec/ features requirements and targets	5 (100)	0 (0)

Source: Survey

Table III.2.10: Turn Over Rate of Workers (%)

	Thai Firms			
	Mean Value	Maximum Value	Minimum Value	Variance
Unskilled Labors	18.08	50	1	260.74
Technicians	9.30	50	0	211.89
Engineers	9.30	50	0	222.39

	FDI Firms			
	Mean Value	Maximum Value	Minimum Value	Variance
Unskilled Labors	7.45	40.00	0	120.61
Technicians	3.09	10.50	0	8.76
Engineers	4.02	15.00	0	25.33

Source: Survey

Table III.2.11: Ranks of Directions of Labor Mobility

	Thai Firms			
	Rank			
	1	2	3	4
Rank	1	2	3	4
Move To Foreign Owened Firms	4	0	0	0
Move To Joint-Venture Firms	2	0	0	0
Move To Thai Firms	2	0	0	0
Establish Own Business	0	0	0	2

	Thai Firms			
	Rank			
	1	2	3	4
Move To Foreign Owened Firms	4	5	0	0
Move To Joint-Venture Firms	1	6	0	0
Move To Thai Firms	0	0	4	1
Establish Own Business	0	0	1	1

Source: Survey
Note: Rank 1 means most popular direction

Table III.3.1 Share of Sulfur Dioxide Emission by Sector

(Unit : Percentage)

Sector	1988	1991a	1996a	2011a
Industry	26.34	21.48	21.56	26.81
Agriculture	2.80	3.24	1.41	0.89
Res. & Comm.	1.31	0.56	0.40	0.24
Transportation	23.09	16.87	11.31	10.74
Power Generation	44.44	56.48	62.88	60.33
Refineries	2.02	1.42	2.44	0.99
Total	100.00	100.00	100.00	100.00

Source : Calculated from data from TDRI (1990)

a : Projected value

Table III.3.2 Share of Nitrogen Oxide Emission by Sector

(Unit : Percentage)

Sector	1988	1991a	1996a	2011a
Industry	10.77	13.07	12.33	11.64
Agriculture	1.08	1.65	1.28	0.76
Res. & Comm.	9.35	4.89	2.90	1.23
Transportation	66.59	63.90	66.69	59.76
Power Generation	11.79	16.11	16.21	26.38
Refineries	0.41	0.38	0.59	0.23
Total	100.00	100.00	100.00	100.00

Source : Calculated from data from TDRI (1990)

a : Projected value

Table III.3.3 Share of Suspended Particulate Matter (SPM) Emission by Sector

(Unit : Percentage)

Sector	1988	1991a	1996a	2011a
Industry	40.24	56.64	60.55	67.11
Agriculture	0.32	0.53	0.50	0.37
Res. & Comm.	38.01	20.63	12.66	4.08
Transportation	17.88	19.66	22.40	25.61
Power Generation	3.43	2.70	3.68	2.71
Refineries	0.12	0.11	0.21	0.12
Total	100.00	100.00	100.00	100.00

Source : Calculated from data from TDRI (1990)

a : Projected value

Table III.3.4 Share of Sulfur Dioxide Emission by Sector

(Unit : Percentage)

Sector	1988	1991	1996	2011a
Mining	0.96	1.06	0.77	0.66
Manufacturing	97.27	96.71	97.25	98.81
Food	18.77	16.66	16.60	10.63
Textile	14.54	14.49	17.49	19.56
Wood	1.30	1.08	1.24	1.23
Paper	7.64	8.21	9.01	6.96
Chemical	4.92	3.38	1.45	5.25
Non-Metal	35.91	40.77	36.91	40.45
Basic Metal	3.86	4.14	4.30	3.00
Other Mfg.	10.31	7.97	10.24	11.73
Construction	1.31	2.23	1.98	0.53
Total	100.00	100.00	100.00	100.00

Source : Calculated from data from TDRI (1990)

a : Projected value

Table III.3.5 Share of Nitrogen Oxide Emission by Sector

(Unit : Percentage)

Sector	1988	1991a	1996	2011a
Mining	3.05	2.98	2.69	2.85
Manufacturing	90.60	90.07	89.48	94.58
Food	20.77	21.36	19.61	12.09
Textile	6.02	5.42	6.30	8.76
Wood	0.74	0.50	0.54	0.59
Paper	7.02	7.73	8.20	7.87
Chemical	3.74	2.68	2.55	3.83
Non-Metal	37.74	47.16	46.22	54.04
Basic Metal	2.19	2.12	2.15	1.47
Other Mfg.	6.35	3.08	3.89	5.54
Construction	6.35	9.65	7.83	2.57
Total	100.00	100.00	100.00	100.00

Source : Calculated from data from TDRI (1990)

a : Projected value

Table III.3.6 Share of Suspended Particulate Matter (SPM) Emission by Sector

(Unit : Percentage)

Sector	1988	1991	1996	2011a
Mining	0.15	0.14	0.13	0.15
Manufacturing	99.54	99.53	99.49	99.71
Food	46.82	36.24	33.26	18.67
Textile	1.01	1.04	1.29	1.96
Wood	0.21	0.12	0.13	0.11
Paper	6.88	8.05	8.84	9.23
Chemical	2.13	1.05	1.10	1.46
Non-Metal	37.70	51.61	53.28	66.41
Basic Metal	0.91	0.89	0.94	0.89
Other Mfg.	3.86	0.48	0.63	0.99
Construction	0.31	0.33	0.38	0.13
Total	100.00	100.00	100.00	100.00

Source : Calculated from data from TDRI (1990)

a : Projected value

Table III.3.7 Share of FDI by Sector

(Unit : Percentage)

Sector	1980	1985	1989
Financial	6.61	28.12	13.96
Trade	25.58	16.54	18.33
Agriculture	0	0.78	1.23
Transport	3.88	2.98	1.35
Other Services	0.67	8.95	11.05
Industry	63.26	42.63	50.19
Total	100	100	100

Source : Calculated from Bank of Thailand's Data

Table III.3.8 Share of FDI in Industrial Sector by Industry

(Unit : Percentage)

Sector	1980	1985	1989
Mining	2.23	12.28	1.95
Manufacturing	43.69	48.87	85.55
Food	3.81	14.83	12.45
Textile	1.67	1.59	9.12
Chemical	8.52	14.55	11.67
Metal and Non-metal	2.34	3.84	4.08
Others	27.34	14.05	57.78
Construction	32.08	38.85	12.5
Total	100	100	100

Source : Calculated from Bank of Thailand's Data

Table III.3.9 Share of Biochemical Oxygen Demand (BOD) and Promoted FDI by Industry

TSIC		BOD (a) (1986)	Share of Promoted Foreign Firms in Each Industry to Total Promoted FDI (b)		
			Number of Firms	Registered Capital	Investment
		(%)	(%)	(%)	(%)
311-312	Food	55.89	6.59	1.36	3.23
313	Beverages	39.37	0.00	0.00	0.00
314	Tobacco	0.00	0.00	0.00	0.00
321	Textiles	1.63	4.12	26.74	2.12
322	Wearing Apparel	0.27	1.92	0.27	2.34
323-324	Leather Products & footwear	0.66	4.12	0.65	2.35
331-312	Wood and cork	0.00	2.75	1.34	1.51
341	Paper and paper products	2.23	0.27	0.00	0.01
342	Printihg, publishing & allied	0.00	0.00	0.00	0.00
351-352	Chemical products	0.41	4.95	4.56	16.72
353-354	Petroleum products	0.00	0.00	0.00	0.00
355-356	Rubber and rubber products	0.10	6.32	0.82	3.49
361-369	Nonmetallic mineral products	0.00	1.65	0.31	2.13
371-372	Basic metal industries	0.00	1.10	0.23	0.43
381	Fabricated products	0.00	9.07	5.91	16.18
382	Machinery	0.00	11.81	18.75	22.60
383	Electrical machinery	0.00	22.80	24.98	14.81
384	Transport equipment	0.07	3.02	0.68	1.40
385-390	Miscellaneous ne.	0.02	19.51	13.98	10.68
	Total	100.00	100.00	100.00	100.00

Source : (a) Calculated from Data from TDRI (1990)
(b) Calculated from BOI's Data

Table III.3.10 Share of Hazardous Waste and Promoted FDI Firms by Industrial Sector

TSIC		Hazardous		Share of Promoted FDI Firms in the Total Promoted FDI Firms (c)		
		(1986)a	(2001)b	Number of Firms	Registered Capital	Investment
		(%)	(%)	(%)	(%)	(%)
371-372	Basic metal industries	66.77	70.66	1.10	0.23	0.43
381	Fabricated products	12.11	6.84	9.07	5.91	16.19
384	Transport equipment	5.83	5.54	3.02	0.68	1.40
383	Electrical machinery	4.65	4.91	22.80	24.98	14.81
351-352	Chemical products	3.46	3.78	4.95	4.56	16.72
382	Machinery	2.75	2.89	11.81	18.75	22.60
321	Textiles	1.58	1.74	4.12	26.74	2.12
342	Printing, publishing & allied	1.35	1.66	0.00	0.00	0.00
355-356	Rubber and rubber products	0.75	1.01	6.32	0.82	3.49
341	Paper and paper products	0.25	0.28	0.27	0.00	0.01
353-354	Petroleum products	0.18	0.21	0.00	0.00	0.00
385-390	Miscellaneous ne.	0.16	0.20	19.51	13.98	10.69
331-312	Wood and cork	0.15	0.25	2.75	1.34	1.51
361-369	Nonmetallic mineral products	0.00	0.00	1.65	0.31	2.13
314	Tobacco	0.00	0.00	0.00	0.00	0.00
323-324	Leather Products & footwear	0.00	0.00	4.12	0.65	2.35
313	Beverages	0.00	0.00	0.00	0.00	0.00
311-312	Food	0.00	0.00	6.59	1.36	3.23
322	Wearing Apparel	0.00	0.00	1.92	0.27	2.34
	Total	100.00	100.00	100.00	100.00	100.00

Source : (a) Calculated from TDRI's Data (1990)
(b) Propected Value
(c) Calculated from BOI's Data

Table III.3.11 Share of Promoted FDI Firms by Hazardous Waste-Generating Rank (1989)

	Firms (%)	Registered Capital (%)	Investment (%)	Sales (%)
Rank 0	16.98	3.45	5.22	24.55
Rank 1	31.13	35.47	21.82	40.27
Rank 2	50.98	57.43	64.83	35.18
Rank 3	0.94	3.65	8.12	0.00
Total	100.00	100.00	100.00	100.00

Calculated from BOI's Data (1989)

Table III 3.12 Share of Promoted FDI Firms by Country and Hazardous Waste-Generating Rank (1989)

	Japan			U.S.A			Hong Kong		
	Firms (%)	Registered Capital (%)	Investment (%)	Firms (%)	Registered Capital (%)	Investment (%)	Firms (%)	Registered Capital (%)	Investment (%)
Rank 0	12.50	2.45	5.33	0.00	0.00	0.00	15.00	3.23	3.61
Rank 1	28.13	36.73	26.15	18.18	7.78	0.47	45.00	26.12	18.96
Rank 2	59.38	60.82	68.53	81.82	92.22	99.53	40.00	70.64	77.43
Rank 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source : Calculated from BOI's Data

Table III.3.12 (cont.)

	Taiwan			Singapore			Korea		
	Firms (%)	Registered Capital (%)	Investment (%)	Firms (%)	Registered Capital (%)	Investment (%)	Firms (%)	Registered Capital (%)	Investment (%)
Rank 0	21.15	13.10	10.16	0.00	0.00	0.00	0.00	0.00	0.00
Rank 1	38.46	22.38	23.25	42.86	93.56	49.52	28.57	51.02	3.06
Rank 2	40.38	64.52	66.59	57.14	6.44	50.48	71.43	48.98	96.94
Rank 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Calculated from BOI's Data (1989)

Table III.3.12 (cont.)

	EC			Others		
	Firms (%)	Registered Capital (%)	Investment (%)	Firms (%)	Registered Capital (%)	Investment (%)
Rank 0	29.17	13.93	11.13	25.93	3.28	3.02
Rank 1	25.00	30.97	22.89	22.22	11.89	18.74
Rank 2	41.67	25.58	36.89	48.15	50.66	25.59
Rank 3	4.17	29.52	29.09	3.70	34.18	52.65
Total	100.00	100.00	100.00	100.00	100.00	100.00

Calculated from BOI's Data (1989)

Table III.3.13 Share of FDI in Each Hazardous Waste-Generating Rank by Country

Countries	Rank 0			Rank 1			Rank 2			Rank 3		
	Firms (%)	Registered Capital (%)	Investment (%)	Firms (%)	Registered Capital (%)	Investment (%)	Firms (%)	Registered Capital (%)	Investment (%)	Firms (%)	Registered Capital (%)	Investment (%)
Japan	22.22	52.79	57.47	27.27	76.99	67.56	35.19	78.73	59.60	0.00	0.00	0.00
USA	0.00	0.00	0.00	3.03	0.13	0.22	8.33	0.96	15.87	0.00	0.00	0.00
Hong Kong	8.33	3.45	3.64	30.30	2.71	4.57	19.44	4.53	6.28	0.00	0.00	0.00
Taiwan	30.56	22.90	16.35	13.64	3.80	8.95	7.41	6.77	8.63	0.00	0.00	0.00
Singapore	0.00	0.00	0.00	4.55	10.53	1.08	3.70	0.45	0.37	0.00	0.00	0.00
Korea	0.00	0.00	0.00	3.03	0.32	0.05	4.63	0.19	0.52	0.00	0.00	0.00
EC	19.44	13.43	16.03	9.09	2.90	7.89	9.26	1.48	4.28	50.00	26.88	0.00
Others	19.44	7.43	6.51	9.09	2.62	9.67	12.04	6.89	4.44	50.00	73.12	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.00

Calculated from BOI's Data (1989)

Table III.3.14 FDI in Each Hazardous Waste-Generating Rank by Country

Countries	Rank 0				Rank 1				Rank 2				Rank 3			
	Firms (%)	Registered Capital (%)	Investment (%)	Sales	Firms (%)	Registered Capital (%)	Investment (%)	sales	Firms (%)	Registered Capital (%)	Investment (%)	Sales	Firms (%)	Registered Capital (%)	Investment (%)	Sales
Japan	8	272,729	737,780	37,277	18	4,092,510	3,622,635	0	38	6,776,070	9,493,966	861,522	0	0	0	0
USA	0	0	0	0	2	7,000	12,000	0	9	82,917	2,528,579	0	0	0	0	0
Hong Kong	3	17,840	46,719	0	20	144,100	245,071	8,267	21	389,651	1,001,037	0	0	0	0	0
Taiwan	11	118,340	209,840	563,860	9	202,230	480,127	906,001	8	582,900	1,375,356	0	0	0	0	0
Singapore	0	0	0	0	3	559,940	58,079	11,073	4	38,538	59,214	0	0	0	0	0
Korea	0	0	0	0	2	16,750	2,590	0	5	16,078	82,056	0	0	0	0	0
EC	7	69,392	205,851	0	6	154,257	423,207	15,231	10	127,373	682,171	0	1	147,000	0	0
Others	7	38,368	83,577	0	6	139,100	518,528	45,744	13	592,837	708,084	0	1	399,960	0	0
Total	36	516,669	1,283,767	601,137	66	5,315,887	5,362,237	986,316	108	8,606,364	15,930,463	861,522	2	546,960	0	0

Source : BOI

Table Table III.4.1 Result of Causality Test : Accumulated FDI Cause Exports in Manufacture

Accumulated FDI in Manufacture Products from (Cause)	Export of Manufacture Products to (Effect)	Lag 1 F-Statistics	F-Statistics Lag 2 F-Statistics	Lag 3 F-Statistics
Japan	Japan	0.055105	0.724276	13.11427*
	USA	10.41720**	2.656146	3.001379
	NICS	0.390258	0.657494	0.306079
	Asean	0.360949	0.004712	15.88573*
	Other	0.006342	0.148033	0.922321
USA	Japan	1.245332	2.472243	8.894581
	USA	0.158044	1.551263	0.799221
	NICS	1.619326	1.614721	2.824304
	Asean	4.027724*	0.664472	5.782666
	Other	0.855832	1.765600	5.288658
NICS	Japan	0.006346	5.392658	28.73091**
	USA	0.279278	0.719066	3.972989
	NICS	1.806730	0.547240	10.68184*
	Asean	0.224336	0.928216	5.153636
	Other	0.014624	1.062950	7.376167
ASEAN	Japan	0.100108	0.958474	7.773572
	USA	3.141437	2.404532	17.36364*
	NICS	1.874823	0.064281	0.560956
	Asean	1.104904	1.028459	5.471227
	Other	0.496608	0.874407	2.157760
Other	Japan	0.361336	10.25742**	3.178684
	USA	3.497765	3.611433	5.413877
	NICS	1.755057	4.670210	8.755599
	Asean	1.536301	6.257508	24.17553**
	Other	0.427554	7.654632	3.783205

Note : *** Significant Level 0 - 1 %
** Significant Level 1.001 - 5 %
* Significant Level 5.001 - 10 %

Table III.4.2 Result of Causality Test : Export Induce Accumulated FDI in Manufacture

Export of Manufacture Products to (Cause)	Accumulated FDI in Manufacture Products from (Effect)	Lag 1 F-Statistics	Lag 2 F-Statistics	Lag 3 F-Statistics
Japan	Japan	40.43033***	20.25036***	22.25664**
	USA	30.69603***	16.90188***	6.481463
	NICS	3.573693*	3.197111	5.692878
	Asean	4.888478*	2.004480	18.26320*
	Other	27.09091***	13.03560**	2.454366
USA	Japan	24.79257***	7.279658**	3.539207
	USA	105.9336***	43.78422***	27.52453**
	NICS	8.796234**	4.429213*	1.681498
	Asean	13.33895***	6.581539**	8.587988
	Other	42.15820***	19.70373***	5.292195
NICS	Japan	4.796545*	11.82723**	3.025656
	USA	8.786578**	1.902041	29.21863**
	NICS	9.605220**	3.05765	12.04400*
	Asean	0.641409	2.213830	1.093901
	Other	6.450091**	4.518632*	1.062672
ASEAN	Japan	54.54232***	49.97504***	91.62468***
	USA	27.16026***	4.112193*	4.302486
	NICS	6.704927**	5.096169*	36.07586**
	Asean	26.99667***	9.186987**	22.08833**
	Other	14.06211***	6.301222**	2.752500
Other	Japan	32.76275***	22.11371***	7.125038
	USA	25.16043***	8.404452**	5.369153
	NICS	5.450679**	3.437037	1.984387
	Asean	5.441201**	1.826418	2.980725
	Other	18.57649***	8.085646**	5.776042

Note : *** Significant Level 0 - 1 %
** Significant Level 1.001 - 5 %
* Significant Level 5.001 - 10 %

Table III.4.3 Result of Causality Test : Export Induce Accumulated FDI in Electronics

Export of Electronics Products to (Cause)	Accumulated FDI in Electronics Products from (Effect)	Lag 1 F-Statistics	Lag 2 F-Statistics	Lag 3 F-Statistics
Japan	Japan	10.28801**	0.927275	6218.994***
	USA	1.566986	2.767769	1.71925
	NICS	2.247590	0.072694	6.276201
	Asean	0.140144	14.77686***	14.56252*
	Other	30.53253***	49.21265***	18.03406**
USA	Japan	19.29599***	4.821421*	17.89446*
	USA	13.92591***	27.03969***	7.083540
	NICS	49.71044***	8.351667**	5.549988
	Asean	14.19146***	3.588001	0.302316
	Other	24.19703***	26.28994***	22.55319**
NICS	Japan	1.020631	0.934731	1.699730
	USA	9.608203**	8.301749**	3.497288
	NICS	7.416031**	2.506741	2.308045
	Asean	0.208727	3.123851	20.22769**
	Other	8.375879**	18.70946***	14.37590*
ASEAN	Japan	1.254962	8.489232**	6.542307
	USA	7.667466**	3.047527	5.035073
	NICS	2.561841	10.85476**	312.8970***
	Asean	0.000008	11.08581**	1.933895
	Other	2.646945	5.776557**	9.986289*
Other	Japan	5.817478**	4.784078*	16.74521*
	USA	7.123296**	20.84821***	8.398357
	NICS	26.12585***	6.338391**	6.392297
	Asean	2.961664	2.088988	0.402304
	Other	24.54810***	20.86126***	79.76023**

Note : *** Significant Level 0 - 1 %
** Significant Level 1.001 - 5 %
* Significant Level 5.001 - 10 %

Table III.4.4 Result of Causality Test : Accumulated FDI Cause Exports in Electronics

Accumulated FDI in Electronics Products from (Cause)	Export of Elecrtonics Products to (Effect)	Lag 1 F-Statistics	Lag 2 F-Statistics	Lag 3 F-Statistics
Japan	Japan	50.33348***	26.33732***	56.11192***
	USA	1.146026	2.126710	1.516526
	NICS	10.93530**	5.658297*	29.87298**
	Asean	42.20996***	22.50830***	130.8936***
	Other	0.036130	0.422665	0.476420
USA	Japan	7.609788**	2.102305	4.239471
	USA	0.139989	0.655399	3.753106
	NICS	10.20814**	3.485722	5.271552
	Asean	0.591113	0.883458	1.317285
	Other	1.658624	0.865459	0.442513
NICS	Japan	0.272536	0.335880	0.451069
	USA	2.988659	1.411834	2.203264
	NICS	0.104248	0.244109	0.579004
	Asean	0.677033	2.905005	13.55455*
	Other	0.287180	2.98540	0.393776
ASEAN	Japan	6.065124**	2.427557	1.032020
	USA	5.326839**	1.690828	23.32461**
	NICS	5.011359*	3.254861	4.940567
	Asean	5.565681**	4.776147*	11.74257*
	Other	1.880560	14.96547***	26.18796**
Other	Japan	1.619273	3.354437	11.70289*
	USA	0.805421	0.270770	1.465812
	NICS	5.048900*	3.192798	4.621106
	Asean	0.217241	5.220941*	4.371876
	Other	0.905414	0.821751	0.430355

Note : *** Significant Level 0 - 1 %
** Significant Level 1.001 - 5 %
* Significant Level 5.001 - 10 %

Table III.4.5 Result of Causality Test : Effect of the World Economy on Accumulated FDI

(Cause)	Accumulated FDI in Electronics Products (Effect)	Lag 1 F-Statistics	Lag 2 F-Statistics	Lag 3 F-Statistics
World GDP	Japan	0.427238	0.108845	0.818339
	USA	1.317399	0.306767	2.887725
	NICS	0.346868	0.216406	0.392652
	ASEAN	0.367862	1.458582	0.465309
	Other	0.001045	0.226861	0.618491
(Cause)	Accumulated FDI in Manufacture Products (Effect)	Lag 1 F-Statistics	Lag 2 F-Statistics	Lag 3 F-Statistics
World GDP	Japan	0.199329	0.182987	0.778767
	USA	2.680230	0.346824	0.405449
	NICS	0.001705	0.115939	2.419427
	ASEAN	0.064815	0.348396	0.210753
	Other	0.271257	0.331478	0.358283

Note : *** Significant Level 0 - 1 %
** Significant Level 1.001 - 5 %
* Significant Level 5.001 - 10 %

Table III.4.6 Value of Thailand's Export of Electrical Products Classified by Destinations

(Unit : Million US$)

	World	USA	Japan	Hong Kong	Korea	Malaysia	Singapore	ASEAN	Other
1980	337.8	83.1	1.4	24.5	13.6	46.0	143.1	196.1	19.2
1981	320.0	109.0	2.7	26.0	5.3	27.6	125.7	159.3	17.7
1982	332.7	136.0	3.5	28.4	2.1	28.4	104.9	138.6	24.2
1983	308.1	110.1	5.1	13.7	1.6	11.2	137.5	153.1	24.5
1984	424.6	171.8	3.5	11.5	3.5	13.7	166.4	182.4	51.9
1985	484.8	176.2	9.6	10.6	4.1	41.6	176.4	220.2	64.1
1986	781.5	272.1	11.5	10.6	9.4	67.0	300.6	373.4	104.5
1987	880.1	350.1	27.3	23.0	24.2	76.6	250.7	330.8	124.7
1988	1,995.4	820.5	79.7	85.2	23.3	105.1	479.2	601.4	385.3
1989	2,922.7	1,277.2	237.5	105.7	43.7	47.0	549.3	612.5	646.1
1990	4,224.5	1,618.3	412.0	160.1	65.2	98.3	852.9	1,007.6	961.3
1991	5,585.3	1,851.6	683.3	199.0	68.2	163.5	1,267.9	1,477.1	1,306.1

Source : UN Statistic Diskette

Table III.4.7 Share of Thailand's Export of Electrical Products Classified by Destinations

(Unit : Percentage)

	World	USA	Japan	Hong Kong	Korea	Malaysia	Singapore	ASEAN	Other
1980	100.00	24.60	0.41	7.24	4.03	13.61	42.34	58.05	5.68
1981	100.00	34.07	0.85	8.11	1.67	8.63	39.27	49.76	5.54
1982	100.00	40.87	1.05	8.53	0.63	8.55	31.53	41.66	7.26
1983	100.00	35.74	1.66	4.44	0.51	3.63	44.61	49.69	7.96
1984	100.00	40.46	0.82	2.72	0.82	3.21	39.20	42.96	12.22
1985	100.00	36.35	1.99	2.18	0.85	8.57	36.39	45.41	13.22
1986	100.00	34.81	1.47	1.36	1.20	8.57	38.46	47.79	13.37
1987	100.00	39.78	3.10	3.61	2.75	8.71	28.48	37.58	14.17
1988	100.00	41.12	3.99	4.27	1.17	5.27	24.01	30.14	19.31
1989	100.00	43.70	8.13	3.62	1.49	1.61	18.80	20.96	22.11
1990	100.00	38.31	9.75	3.79	1.54	2.33	20.19	23.85	22.76
1991	100.00	33.15	12.23	3.56	1.22	2.93	22.65	26.45	23.39

Source : UN Statistic Diskette

Table III.4.8 Value of Thailand's Import of Electrical Products Classified by Sources

(Unit : Million US$)

	World	USA	Japan	Hong Kong	Korea	Malaysia	Singapore	ASEAN	Other
1980	673.1	262.8	191.8	5.0	7.6	4.2	12.3	17.3	188.6
1981	670.8	261.4	238.6	5.7	4.7	3.6	17.5	21.7	138.7
1982	645.8	241.8	220.6	6.8	6.4	3.4	32.4	37.7	132.5
1983	951.1	218.5	432.4	11.8	11.3	9.2	61.4	73.9	203.1
1984	1,092.3	273.5	428.1	23.6	17.2	9.8	92.1	111.6	238.4
1985	888.4	208.6	350.9	23.7	19.4	11.7	71.7	105.2	180.7
1986	1,363.7	465.4	375.4	25.6	30.5	13.3	118.9	171.0	295.9
1987	1,802.3	659.2	424.1	17.7	56.1	16.1	203.0	305.6	339.6
1988	3,110.9	882.4	893.0	33.0	70.4	32.1	527.8	705.5	526.7
1989	3,769.9	979.7	1,234.6	56.9	127.1	51.3	631.0	691.9	679.7
1990	4,777.2	1,091.7	1,621.2	94.6	172.4	100.5	710.9	829.8	967.5
1991	5,772.2	1,257.9	1,897.4	136.6	206.2	166.4	931.4	1,119.9	1,154.2

Source : UN Statistic Diskette

Table III.4.9 Share of Thailand's Import of Electrical Products Classified by Sources

(Unit : Percentage)

	World	USA	Japan	Hong Kong	Korea	Malaysia	Singapore	ASEAN	Other
1980	100.00	39.04	28.50	0.74	1.13	0.62	1.83	2.57	28.02
1981	100.00	38.97	35.57	0.85	0.70	0.54	2.61	3.23	20.68
1982	100.00	37.44	34.16	1.05	0.99	0.53	5.02	5.84	20.52
1983	100.00	22.97	45.46	1.24	1.19	0.97	6.46	7.77	21.35
1984	100.00	25.04	39.19	2.16	1.57	0.90	8.43	10.22	21.83
1985	100.00	23.48	39.50	2.67	2.18	1.32	8.07	11.84	20.34
1986	100.00	34.13	27.53	1.88	2.24	0.98	8.72	12.54	21.70
1987	100.00	36.58	23.53	0.98	3.11	0.89	11.26	16.96	18.84
1988	100.00	28.36	28.71	1.06	2.26	1.03	16.97	22.68	16.93
1989	100.00	25.99	32.75	1.51	3.37	1.36	16.74	18.35	18.03
1990	100.00	22.85	33.94	1.98	3.61	2.10	14.88	17.37	20.25
1991	100.00	21.79	32.87	2.37	3.57	2.88	16.14	19.40	20.00

Source : UN Statistic Diskette

REFERENCES

Attakorn, V. (1975), Role of Japanese Investment in Thailan. Bangkok, Thailand, Odiun Store Publishing.

Akanalsu, K. (1962a), "A Historical Pattern of Economic Growth in Developing Countries," The Developing Economics, No.1 , pp. 3-25.

-------, (1962b), "A Theory of Unbalanced Growth in Developing Countries," Weltwirtschaftliches Archiv, Helf 86, Band 2, PP.196-217.

Bhote, K., (1989), Strategic Supply Management, American Management Association.

Biggs, T. Brimble, P. and D. Snodgrass, (1990), Rural Industries and Employment Project, TDRI, Bangkok.

Brimble, P., (1987), The Impact of Competition and Incentives on Efficiency and Productivity Changes: Case Studies of Industrial Firms in Thailand, Mimeo, the World Bank.

Casson, M., (1987), The Firm and the Market: Studies on Multi-national Enterprise and the Scope of the Firm, MIT Press.

Caves, R.E., (1971), Internationalization Coporations: The Industrial Economics of Foreign Investment." Economica, Vol. 38.

Chunanuntathum, S. and S. Sachchamarga, (1982), The Determinants of Foreign Direct Investmemt with a Specific role of foreign Exchange Rate: An Application to the Japanese Case in Thailand, Research Report Series No.39, Faculty of Economics, Thammasat University.

Dahlman, C.J., et al. (1990), "Technology Strategy for Industrial Competitiveness: A Case Study of Thailand," in World Bank (1991), Plan, Part II., Washington. D.C. and in Energy Department Working Paper. Industrial Paper No. 24, the World Bank, Aprial 1990.

Dobler, D., (1990), Purchasing and Material Management Competitiveness, 5th ed., McGraw-Hill, New York

Dunning, J.H., (1972), International Investment, Middelsex, Penguin Books Ltd.,

Granger, C., (1969), "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods". Econometrica.Vol. 37, PP. 424-438.

Gray, H.P.(1972), The Economics of Investment Abroad, London, Macmillan.

Hill, H. (1988, Foreign Investment and industrialization in Indonesia, Oxford University Press, Oxford

Hymer, S.H., (1960), International Operations of National Firms: A case study of Direst Investment, Ph.d Dissertation. M.I.T..

Kaosa-ard, M., (1991) "A Preliminary Study of TNC's Hiring and Localization Policies inThailand," TDRI Quarterly Reviews. Vol. 6, No.4.

------., (1992), "Manufacturing Growth: A Blessing for All!". in TDRI Synthesis Report Volume I. TDRI 1992 The Year-End Conference, TDRI, Bangkok, Thailand.

Kanjanapunka, P., (1978), Joint-Venture Business in Thailand: A Case Study of Thai-Japanese Joint-Venture, M.S. Thesis Thammasat University.

Kanjanavirojkul, S., (1987), A Case Study of Subcontracting System in Motorcycle, Diesel Engine for Agriculture and Refrigerator, Master of Economics Thesis, Thammasat University, Bangkok

Khanthachai, N. and others, (1987), Technology and Skills in Thailand, Institution of Southeast Asian Studies, Singapore.

Kindleberger, C.P., (1966), American Business Abroad: Six Lecture on Direct Investment, New Haven, Yale University Press.

Kojima, K., (1978), Direct Foreign Investment: A Japanese Model of Multinational Business Operation, London.

Lall, S. and P. Streeten, (1977), Foreign Direct Investment, Transnationals and Developing Countries, London, Macmillan.

Lipsey, R., (1991) "Direct Foreign Investment and Structural Change in Developing Asia, Japan, and the United States." in Ramstetter, E.D. (ed.) DIrect Foreign Investment in Asia's Developing Economies and Structural Change in the Asia Pacific Region. Westview Press, Boulder, Colorado.

------. and M. Y. Wise, (1984), "Foreign Production and Export to Individual Firms," Review of Economics and Statistics, Vol. 66, No.2, PP. 304-9.

MITI-SMEA, (1989), The Electronics Industry in Britain: Coping with Change, Routledge.

Nurkse, R., (1972), "Causes and Effects of Capital Movements."Editted by Dunning, J.E., Middlesex, Penguin Book Ltd.

Naya, S. and P. Imada, (1988), Trade and Investment Linkage in ASEAN Countries, East-West Center, Honolulu.

Ng, H. and N. Akarasanee, (1987), Industrial Restructuring in ASEAN and Japan: An Overview, Institution of Southeast Asian Studies, Singapore.

Olin, B., (1967), Interregional and International Trade, Revised edition, Harvard University Press.

Poh Kam, W. (1991), Technology Development through Subcontracting Linkages, Asian Productivity Organization, Tokyo

Pongpisanupichit, J., " A Comparative Study of Manufactures Export Performance of Foreign affiliates and Thai Firms," Journal of Economics and Business Administration, Vol. 12, No.2 May-August, 1985.

----------, (1985), Private Direct Foreign Investment and Thai Economy, Ph.D. Dissertation, Cornell University, 1985.

Precharmetra, A., (1992), Small Industries of Thailand: Impact from Policies. Paper prepared for TDRI's Year-End Conference 1992, TDRI, Bangkok, Thailand (in Thai).

Pindyck, R. and D. Rubinfeld, (1991), Econometric Models & Economic Forecasts. 3rd ed., McGraw-Hill, New York.

Porter, M., (1990), The Competitive Advantage of Nations, Macmillan.

Pussarungri, B. (1989), "Impact of Uncertainty of Imput Supply on Demand for the Input, Production and Locations of Manufacturing Plants A Case Study of Natural Gas Curtailment", Morgantion:Unprsblished Ph.D. Dissertation, West Virginia University.

Sako, M., (1989), "Partnership between Small and Large Firms: A Case Study of Japan." in EC Commission, pp. 66-79.

Santikarn, M., (1981), Technology Transfer: A Case Study. Singapore University Press, Singapore.

School of Development Economics NIDA (1991), Industrial Structure and Small and Medium Enterprise Development, A Report on the Seminar Jointly Organized by Economic Development Institution of the world Bank and National Institute of Development Administration (NIDA), Bangkok, Thailand, November, 1991.

Sibunruang, A., (1984), Foreign Direct Investment and Manufactured Exports in Thailand, Ph.d Dissertation, University of Sussex.

--------, (1986), Foreign Direct Investment and Manufactured Exports from Thailand. Chulalongkorn University Social Research Institute, Bangkok.

Sibunruang-Brimble, A., (1992), Changing Pattern of Foreign Direct Investment, Parer presented at Pacific Economic Outlook Specialists meeting, March 1992, Osaka.

--------, and P. Brimble, (1989), Data on Foreign Direct Investment, prepared for UNCTC, Mimeo.

--------, and --------, (1988), The Employment Effects on Manufacturing Multinational Enterprises in Thailand. Multinational Enterprises Programme, Working Paper No. 54, International Office, Geneva.

--------, and --------, (1991), "Export-Oriented Industrial Collaborations: A Case Study of Thailand," prepared for the United Nations on Transnational Coporations, (draft).

--------, and --------, (1987), "Foreign Investment and Export Orientation: A Thai Perspective," In Naya, S., VichitVadakan, and U. Kerdpibule (eds.), Direct Foreign Investment and Export Promotion, Policies and Experiences in Asia, Southeast Asia Central Banks Research and Training Center, and East-Was Resource Systems Institute.

Sim, C., (1972), "Money, Income, and Causality." American Economics Reviews. Vol. 62, pp. 540-552.

Soon Teck Wong, (1991), Industrial Structure and Small and Medium Enterprise Development in Singapore, Paper Presented at the Seminar on Industrial Structure and Small and Medium Enterprise Development Bangkok, Thailand, November 1991.

Taembunlertchai, S., "Attitude and Experience in Japanese-Thai Joint Venture Investment." In Current Development in Thai-Japanese Economic Relations: Trade and Investment, Edited by Medhi Krongkaew, Bangkok: Thammasat University Press.

----------, (1975) Foreign Direct Investment in Thailand's Manufacturing Industry, Ph.d Dissertation, Duke University.

----------, (1986), Small and Medium Scale Industries in Thailand and Subcontracting Arrangement, Institution of Development Economics, Toko, Japan.

TDRI (1992), Developing Thailand's Internediate Goods Industries, Bangkok.

-----, (1991), Infrastructure, supporting Facilities and Environmental Protection for Industrial Development, Bangkok.

-----, (1989), Direct Foreign Investment and Capital Flow, Paper prepared for TDRI's Year-End Conference 1989, TDRI, Bangkok, Thailand

-----, (1990), Greening of Thai Industry: Producing More and Polluting Less, Paper prepared for TDRI's Year-End Conference 1989, TDRI, Bangkok, Thailand.

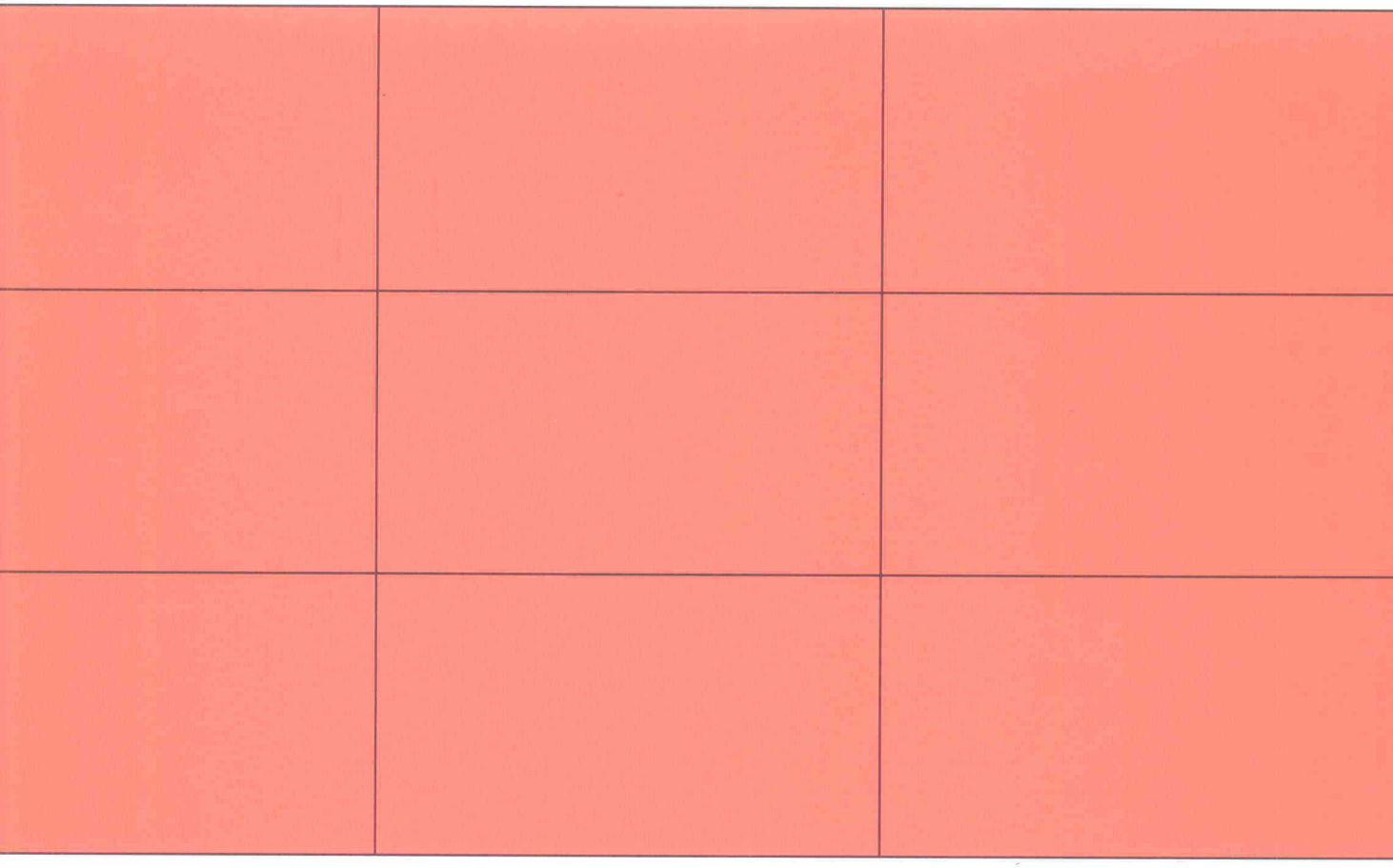
Thongpakde, N., W. Pupphavasa and B. Pussarungsri, (1991), Industrial Structure and Small and Medium Enterprise Development in Thailand, Paper Presented at the Seminar on Industrial Structure and Small and Medium Enterprise Development Bangkok, Thailand, November 1991.

Thongpakde, N. and B. Pussarungsri, (1992), "Regionalization Policy: Reversing the Comparative Disadvantages?" paper prepared for the TDRI Year-End Conference, Bangkok, Thailand.

Vernon, R., (1966), "International Investment and International Trade in The Product Cycle", Quarterly Journal of Economics, Vol. 80.

Williamson, E., (1975), Market Hierarchies, Free Press.

---------, (1986), Economic Organization: Firm, Markets and Policies Control, Wheasheaf Books.



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