FDI and Industrial linkage

– Evidenced from Taiwanese Manufacturing Firms.

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Abstract

The purpose of this study aims to explore the influences of Industrial linkage on the Taiwanese manufacturing firm FDI decision. Empirical result showed that the importance of experience and knowledge in foreign operations. We also find that the linkages effects occur only in specific areas but not all. Especially, the linkages effects are positively and significantly related to Taiwanese manufacturing firms engage in FDI in China.

Key word: FDI、Industrial linkage、Input-output table.

1. Introduction

Since 1987, both the trade barriers of nations and the worse investment environment make the rapid growth of Taiwan's foreign direct investment (FDI). In 1990, when the government made the domestic firms open to invest in Mainland China, there was another wave of investment. During 1991 to 2002, foreign investment totaled up to $58.2 billion; much more than the total investment before 1990s (about $3billion). Most of the investment occurs in the Mainland China (about $26.6billion). Accompanying with the growing amount of foreign direct investment, the influence of foreign direct investment on domestic economy becomes an important issue. Among the determinants of foreign direct investment, there could be divided into two parts: macro and micro. In this paper, the emphasis will be focused on the micro side,

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the important influence of network, mimetic isomorphism and industrial clusters on FDI will be discussed as well.

A view of FDI is to interpret it as an attempt to access external resources in order to offset the weaknesses of the investor. Strategic linkage theory (Nohria and Garcia-Pont, 1991) and network approach (Johanson and Mattsson, 1987) fall into this category. In both approaches, linkages by FDI are considered to be a strategic choice that enhances, maintains, or restores the investor's competitiveness in a globalized market, rather than a profit-seeking motive aimed at extracting economic rent from a foreign market by exploiting its own strategic assets. Gomes-Casseres (1997) presented evidence to show that when firms are small relative to their rivals and markets, they tend to use network linkages to gain economies of scale and scope; when they are large in relative terms, they avoid forming alliances with other firms and tend to go it alone (instead of entering into joint ventures) when investing abroad.

Owing to the special characteristics of Taiwan’s firms, the relationships among firms is most noticed. How a firm will response if his rivals put forth some strategies? The subtle relationship among firms is so called isomorphism which is what will be discussed in the paper. Hawley (1950, 1968) considered isomorphism refer to the variation across organizational forms is a reflection of the diversity of the environment. DiMaggio and Powell (1983) argued that isomorphism arises as a result of inter-connectedness among organization, which makes organizations toward homogeneity. In addition, DiMaggio and Powell (1983) make the distinction between competitive isomorphism and institutional isomorphism. Most of the researches are focused on the influence of institutional isomorphism, thus we will discuss in turn the institutional isomorphism.

Organizations face pressures for conformity to institutional norms that typically arise from a number of sources. These include the broader normative environment,

the state or other dominant organizations, professional norms and standards as well as uncertainty about task requirements. Conformity to these pressures is reflected in specific organizational characteristics at the time of founding as well as in processes of organizational transformation. Institutional pressures influence organizations driving them to become isomorphic with their institutional environments and with each other. DiMaggio and Powell (1983) have categorized institutional pressures into three categories to institutional isomorphic change: coercive, normative, and mimetic.

Talking of coercive isomorphism and normative isomorphism, DiMaggio and Powell (1983) argued that coercive isomorphism is the result of both formal and informal pressures that can arise from interdependencies as well as from much broader, socio-cultural expectations that exist within the institutional environment. Normative isomorphism arises mainly from forces of professional. Then normative pressures for isomorphism develop as a consequence of professional interrelationships among organizations. It involves the development of normative standards which allow workforce members to maintain professional authority and autonomy.

In addition to coercive and normative isomorphism, mimetic isomorphism is a response to uncertainty that induces organizations to imitate other organizations. This imitation can occur implicitly via the transfer of personnel or explicitly through the use of consultants or trade associations (DiMaggio and Powell, 1983). Mimesis is an adaptive mechanism to helps firms to make decisions and take action under conditions of high uncertainty (DiMaggio and Powell, 1983, Haunschild and Miner, 1997). Besides, imitating the other organizations actions can reduce search costs and uncertainty (March, 1981).

Although the isomorphism can explain the FDI behavior well, there are still some drawbacks. Schmitz and Nadvi (1999) indicated that “There is increasing agreement

that clustering helps small enterprises overcome growth constraints and compete in distant markets but there is also recognition that this is not an automatic outcome". Industrial clusters seems to enable firms, especially small and medium-sized enterprises (SMEs), to become players in world markets why a high degree of inter-firm specialization and their proximity to other firms performing complementary functions offset the disadvantages of being small. Industrial clusters facilitate the mobilization of financial and human resources, which it breaks down investment into small risk attack. And finally industrial clusters on FDI will be investigated, and if the industrial clusters does affect the FDI behavior will be also examined.

From a network perspective, FDI is viewed as an effort by investors to forge linkages with foreign networks by establishing a presence in the foreign country. Although it is not always necessary to establish such a presence to build the linkages, as extensive international networking can be undertaken from the home base, local presence provides many advantages in networking, including proximity to the place where network activities are centralized and close contact with the network partners. The former provides ease of access to the flow of information, and the latter is conducive to the cultivation of mutual trust.

Linkages to foreign networks through FDI represent management of these relationships (Holm et al., 1996). Foreign linkages are made in order to preserve, strengthen and increase the value of these relationships. Even a small and weak firm can undertake FDI if it can leverage external resources, but the leverage will be successful only if the network relations so involved are competently managed by the investor. From a network perspective, FDI is made to preserve, strengthen and enhance the value of some important network relationships. The pursuit of FDI implies a strong commitment to these relationships because overseas investment is a risky venture, and such commitment is warranted only if the exchange partner believes that

the relationships are worth developing further to ensure that they can endure indefinitely (Morgan and Hunt, 1994).

In addition, the relationship between foreign direct investment (FDI) and industrial clusters has also received considerable and growing attention in development literature. Porter (1998) argued that industrial clusters are geographic concentrations of interconnected companies and institutions in a particular field. Porter (1998) also indicated that there are three effects to increase the competition for firm. First, it increases the productivity of firm in the industrial clusters. Then, it underpins future productivity growth by driving the direction and pace of innovation. Finally, it would expand the industrial cluster itself by stimulating the formation of new business. Therefore, industrial cluster allows each member to benefit as if it had greater scale or as if it had joined with others formally.

Empirical studies support Port's issues, which industrial clusters would help firms, particularly small and medium-sized firms (SMEs), to overcome growth constraints and compete in distant markets (Schmitz and Nadvi, 1999). Marshall (1920) showed that the agglomeration of firms in similar or related activities generated a range of localized external economies that lowered costs for clustered firms. Such advantages included a pool of specialized workers, easy access to suppliers of specialized inputs and services and the quick dissemination of new knowledge.

Further, Schmitz and Nadvi (1999) argued that Marshallian external economies are not sufficient to explain the effect of industrial clusters. In addition to incidental external economies, there is often a deliberate force at work, namely the conscious pursuit of joint action. This is what emerges from research on industrial cluster in advanced and in developing countries (Brusco, 1990; Cooke and Morgan, 1998; Humphrey and Schmitz, 1998; Rabellotti, 1997; Tendler and Amorim, 1996). They brought together the incidental and deliberate effects into the concept of collective

efficiency defined as the competitive advantage derived from external economies and joint action. That is to say that Industrial cluster is another Institutional Isomorphism**.**

In fact, Hennart and Park (1994) found that the previous investment in United States by another firms in the same vertical Keiretsu would significantly affect the likelihood of investment by other member firms under a dynamic or longitudinal data set used. Chang(1995) found the Keiretsu effect exists among Japanese firms belonging to the same business group. Thus, is the likelihood of locating a plant in a given country likely to be positively related to the number of prior plant locations by other firms in the same Taiwan manufacture? Or positively related to the number of other firms that have established a plant in a given country in the same industrial clusters?

The rest of this paper is organized as follows. In Section 2 the data analysis to describe the present situation of Taiwanese FDI and explain variables. Section 3 presents the empirical model and the variables. In Section 4 the empirical results and analysis are reported. Conclusions and policy implications follow in Section 5.

2. Data Analysis

When we investigate into Taiwanese FDI, it is necessary to have a general idea about the situation of recent foreign investment. To have a deeper understanding of Taiwanese FDI, the Census of Manufactures will be used to discover the present situation of Taiwanese FDI. And to have a concrete data about firms' linkages effects, the Input-Output table will be used to measure the effects. In 2.1, the resource of the data used in this study will be briefly described. In 2.2, the Census of Manufactures will be used to analyze the preset situation of Taiwanese FDI. And finally, Input-Output table will be described and introduced to measure the linkages effects in 2.3.

2.1 Resource of Data

The dataset of FDI survey is conducted by Department of Statistics, Ministry of Economic Affairs, Taiwan over the period of 1997-2000. That consisted of 1940 Taiwanese manufacturing firms engaging in FDI under government approval. We divide all invest areas into six parts: China, Japan, Southeast Asia, North America, Europe and others. The follows are the reasons why we choose to divide invest areas into six parts.

Since the government's open policy toward China, it has become the most important invest area for Taiwanese firms. For years, Taiwanese firms invest in China more than any other countries. Japan's location is close to us and its high technology is worth for us to learn. Japan has been the trade partner of Taiwan for a very long time. Before the open of China, Southeast Asian countries were the main areas for Taiwanese firms to invest because of their cheap labors and raw materials. But after China's open, the status of Southeast Asia was decreasing. However there are still many Taiwanese firms to have some processing industries in Southeast Asia. Just like Japan, North American has also been the trade partner of Taiwan for a long time.

Unlike to invest in Southeast Asia, firms who invest in North American are mostly for its high technology. By setting branches or subsidiaries over there firms can learn higher technology or management skills to make themselves upgrade. The reasons why firms invest in Europe are similar to those who invest in North America or Japan or even for business need. Besides the above five areas, the rest in the world were considered as others. There are still other countries for Taiwanese firms to invest for some other reasons.

From table 2.1 we can find that Mainland China is the main invest area since 1995. No matter in what year, there is about sixty percent of foreign investment firms choosing to invest in Mainland China and the U.S. is the second largest investing country for Taiwanese firms. Hong Kong is also an important investment area for Taiwanese firms but the proportion is in decrease. For one hand, maybe the Taiwan government's open toward Mainland China made the firms who want to invest in Mainland China do not need to invest in Hong Kong firstly. For the other hand, if Taiwanese firms invest in Mainland China directly, they can have the use of a premium from Mainland China government. As for the Southeast Asian countries, for example, Malaysia, Vietnam, Thailand, Indonesia, Singapore and Philippine, become the second important invest area because of the shorter distance and cheaper labors. But since the finance storm in 1997 the investment in Southeast Asia countries is decreasing, especially the invest areas of early stages- Malaysia and Thailand are more obvious. Besides finance storm, the giant effect of attracting money by Mainland China is one of the main factors for Taiwanese firms to invest less in Southeast Asian countries.

2.2 The preset situation of Taiwanese FDI

From table 1 and 2, we can see the total investment in each area over the period of 1997-2000. Since the government's open policy toward Mainland China, it has become the biggest invest area for Taiwanese firms. Mainland China has a vast territory, cheap labors and raw materials, so it becomes a popular invest country. From the table we can also see the truth that the investment in Mainland China is always the highest and the rate is increasing gradually. Southeast Asia is the second large area for Taiwanese firms because of its cheap labors and raw materials. Before Mainland China's open, Southeast Asia is the main area for Taiwanese firms to invest. Accompanied with Mainland China's open and Taiwanese government's policy to admonish firms not to invest in Southeast Asia, the investment in Southeast Asia decreased a lot than it was before. Though the investment in Southeast Asia is not as much as it was before, many Taiwanese firms still have branches over there for the cheaper labors and raw materials. But the total investment is just about the same over theses years.

As for North America, it is Taiwanese trade partner for a very long time and Taiwan earned a lot of foreign exchange from it. But many firms who undertake FDI or have branches in North America are based on technology seeking motive. Similar to North America, firms who invest in Japan and Europe also have the same motive to learn higher technology skill, but the investment in these two areas is not as much as in Mainland China or in Southeast Asia. Besides the five areas mentioned above, we consider the firms who invest in other areas as "Others" and there are still some firms for some reasons to invest in other areas.

Table 2.1-1 The Location Choice of Foreign Investment over years. (Unit: %)

Main Invest Areas	84	85	87	88	89	90	91
Mainland China	66.81	72.71	71.12	69.1	73.56	74.71	72.9
U.S.	18.84	12.88	17.48	19.8	17.64	16.49	17.14
Hong Kong	14.77	9.38	8.47	9.4	8.28	9.11	7.74
Malaysia	12.22	7.7	8.62	7.4	6.83	6.65	5.44
Vietnam	6.2	6.4	6.72	6.2	6.52	5.97	4.93
Thailand	11.98	8.38	7.44	6.1	5.85	5.6	4.42
Western Europe	2.43	3.2	4.19	-	4.66	3.93	4.29
Indonesia	7.9	6.02	6.8	5.2	4.76	4.5	3.69
Singapore	4.13	2.74	2.93	3.5	2.74	2.57	2.86
Japan	5.59	2.59	3.4	-	3	2.93	2.67
Philippine	5.05	3.05	4.51	3.5	-	-	2.21

Data Source: The Census of Manufactures of Department of Statistics, Ministry of Economic Affairs from 1996 to 2002.

Table 2.1-2

	1-China	2-Japan	3-Southeast Asia	4-North America	5-Europe	6-Others
1997	795	11	289	121	14	32
1998	980	6	352	204	20	61
1999	1269	16	345	204	28	68
2000	1261	10	351	187	13	83

Data Source: The Census of Manufactures of Department of Statistics, Ministry of Economic Affairs from 1997 to 2000.

The numbers in the columns are the total investments in that year of a given area.

Table 2.2-1

China- year 2000			(%)*
3190	Other Electronic and Appliances Manufacturing and Repairing	50/174	28.7356
2509	Other Plastic Products Manufacturing	56/198	28.2828
3172	Electronic passive devices Manufacturing	52/186	27.9570
3232	Motor Vehicle Parts Manufacturing	36/159	22.6415
3179	Other Electronic Parts and Components Manufacturing Not Elsewhere Classified	68/303	22.4422

*: The percentage was calculated by the FDI firms divided into the total firms of a certain industry.

Table 2.2-2

Japan- year 2000			(%)*
2631	Cement Manufacturing	1/21	0.047619
3142	Data Storage Media Units Manufacturing and Reproducing	1/21	0.047619
1199	Other Food Manufacturing Not Elsewhere Classified	1/27	0.037037
2122	Synthetic Resin and Plastic Materials Manufacturing	1/54	0.018519
1390	Other Textile Mills	1/66	0.015152

*: The percentage was calculated by the FDI firms divided into the total firms of a certain industry.

Table 2.2-3

Southeast Asia- year 2000			(%)*
1720	Metallic Furniture and Fixtures Manufacturing	10/69	0.144928
1360	Other Textile Mills	9/75	0.120000
3232	Motor Vehicle Parts Manufacturing	14/159	0.088050
3171	Semi-conductors Manufacturing	12/174	0.068966
3179	Other Electronic Parts and Components Manufacturing Not Elsewhere Classified	16/303	0.052805

*: The percentage was calculated by the FDI firms divided into the total firms of a certain industry.

Table 2.2-4

North America- year 2000			(%)*
3145	Computer Components Manufacturing	12/75	0.160000
3141	Computer Manufacturing	8/66	0.121212
3171	Semi-conductors Manufacturing	20/174	0.114943
3144	Computer Peripheral Equipment Manufacturing	10/96	0.104167
3161	Wired Communications Equipment and Apparatus Manufacturing	5/69	0.072464

*: The percentage was calculated by the FDI firms divided into the total firms of a certain industry.

Table 2.2-5

Europe- year 2000			(%)*
3251	Bicycles Manufacturing	1/27	0.037037
3144	Computer Peripheral Equipment Manufacturing	2/96	0.020833
3141	Computer Manufacturing	1/66	0.015152
3232	Motor Vehicle Parts Manufacturing	1/159	0.006289
3179	Other Electronic Parts and Components Manufacturing Not Elsewhere Classified	1/303	0.003300

*: The percentage was calculated by the FDI firms divided into the total firms of a certain industry.

Table 2.2-6

Others- year 2000			(%)*
1411	Outerwear Manufacturing	9/81	0.111111
1503	Footwear Manufacturing	3/33	0.090909
3171	Semi-conductors Manufacturing	8/174	0.045977
1360	Other Textile Mills	2/75	0.026667
3145	Computer Components Manufacturing	2/75	0.026667

*: The percentage was calculated by the FDI firms divided into the total firms of a certain industry.

Table 2.2-7 Main Investing Motives of Foreign Investment over years. (Unit: %)

Main Investing Motives	1996	1997	1998	1999	2000
Potential local market	49.62	50.47	67.6	68.9	63.55
Abundant local labors	63.72	65.19	74.2	80	62.76
Worse domestic economic environment	33.46	36.71	50.5	65.5	36.08
Match up with foreign clients	24.47	30.22	40.6	47.4	33.36
Follow Taiwanese clients	19.82	21.91	11.1	2.8	27.19
Land	15.24	17.09	31.3	40.6	19.03
Raw material	12.73	17.09	28.7	25.4	15.3
Capital skill	13.11	18.12	41.1	34.9	12.63
Local government’s reward	-	-	15.1	13.5	10.74
For the convenience of getting skill and energy	-	-	13.7	18.2	5.02

Data Source: The Census of Manufactures of Department of Statistics, Ministry of Economic Affairs from 1996 to 2002.

From table 2.2-1, we can see that the top five industries invest in China are processing industries. This just corresponds to our previous statement. These industries are those who search for cheap labors and raw materials, so they chose to invest in China. Different from investing in China, firms who invest in Japan are more diversified. The investment includes cement, data storage, food, plastic and textile. But from this table, we can find that the investment in Japan is not very much.

Similar to those who invest in China, firms invest in Southeast Asia are mostly for its cheap labors and raw materials. Many firms set export processing zone here to save their labor cost. Besides labors and raw material, distance is another important factor for Taiwanese firms to invest in Southeast Asia. But since the finance storm in 1997 the investment in Southeast Asia countries is decreasing. America is a country of advanced science and technology, so as mentioned earlier, firms invest in North American are mostly for their high-tech learning. From this table we can see that industries invest there are the ones who engaged in computer related products.

Similar to invest in North America, firms who invest in Europe are for its high-tech resources. From this table we can also see that, in fact, Europe is not an important investment area for Taiwanese firms. Table 2.2-6 shows the industries who invest expect in previous mentioned areas. It presents that besides the five areas, there are still some industries invest in other areas for any other reason.

From table 2.2-7 we can find that whether the firms decide to invest or not base on two main premises: “potential local market” and “abundant local labors.” Especially potential local market replaced abundant local labors and became the most important motive for firms to invest abroad. It can be concluded that more and more firms decide to invest abroad for the high potential market areas in the future. Besides above two factors, “the worse of the domestic economic environment” is another important factor to affect firms’ investment. By the way, our government should do more efforts to

improve the domestic economic environment but not just forbid firms to invest abroad. As for other factors to invest abroad “follow Taiwanese clients” becomes more and more important in recent years, this is the reason why this study focuses part on the linkages effects. From this point of view, we can know that the influence of linkages effects on FDI is more and more obvious.

2.3 Linkages Effects

From the last Table 2.2-7, we can know that linkages effects play an important role in Taiwanese FDI. This phenomenon is more common in Taiwanese Small and Medium firms. But from the Census of Manufactures we can only know whether a firm undertake FDI or not and we don not know if the linkages effects are large or small. By this way, this section will not only discuss whether firms undertake FDI or not but also examine if the degree of the linkages effects will affects firms’ FDI choices. However there is one important premise we have to set up. That is we have to know the linkages effects among these FDI firms.

As for the linkages effects, strategic linkage theory contends that firms can gain access to desired strategic capabilities by linking to firms with complementary capabilities, or by pooling their internal resources with firms possessing similar capabilities (Porter and Fuller, 1986; Nohria and Garcia-Pont, 1991). Strategic linkages as such enable investors to gain economies of scale and scope, to improve the efficiency of operations, to reduce the vulnerability to market fluctuations, and most of all, to pave the way for further growth in the future (Chen and Chen, 1998).

Though many scholars (Chen and Chen, 1998; Nohria and Garcia-Pont, 1991; Johanson and Mattsson, 1987) though that linkages effects is positive to firms’ FDI, they did not give any concrete data. Owing to the difficulties in getting the linkages effects among firms and the former literature focused just only on one specific industry,

this study takes a proxy variable to measure the linkages effects among these FDI firms of different industries. By the Input-Output table and the number of investment in the past, we can calculate the real linkages effects among industries and to demonstrate which industries are affected by linkages effects most. By the former tables mentioned in 2.2, we know a certain industry's investment in a certain area. By the certain industry's investment in a certain area and the linkages effects, we want to examine if Taiwanese FDI is affected by "follow Taiwanese clients" this kind of linkages.

Because we want to measure the linkages effects among firms, we used the Input-Output table to be the measurement basis. So it's necessary to have a general understanding about what Input-Output table is. The Input-Output table measures that when the final demand of a certain department adds one unit, the certain department needs to purchase how many units directly or indirectly from other departments. For example, when the tire industry produces one product, he needs to purchase how many production materials from the plastic industry, petroleum industry and other industries respectively. By this table, we can find the degree of dependence of firms and then we can know the linkages effects of the firms of certain industries.

By this kind of calculations, we can find that "Other Textile Mills", "Outerwear Manufacturing","Footwear Manufacturing", "Metallic Furniture and Fixtures Manufacturing", "Synthetic Resin and Plastic Materials Manufacturing", "Other Plastic Products Manufacturing", "Cement Manufacturing" and "Computer Components Manufacturing" are the industries that affects most by their partners. That means theses there is the strong linkages effects among these industries. And we will have a model to test our hypothesis if these industries real have strong linkages effects in the next chapter.

3. Empirical Model

The resource of data, present situation of Taiwanese FDI and linkages effects had been introduced in chapter3. In this chapter, an empirical model will be developed to examine our hypotheses. Three types of explanatory variables were employed in the regression. The first is measured at if the accumulated investment events in the past three years, past two years and the last year have influences on this year's investment. The second is the firm specific set of variables. The firm specific set of variables includes the average R&D intensity (RDSL), the average capital/labor ratio (KL), averaged firm size and wage. Finally, linkages effects of industries were employed to be the last variable. By linkages effects, we want to know if firms' FDI will be affected by this effect. And the variables used in this model will be described as well.

3.1 Empirical Model

In the empirical model, the Probit model was employed in this study due to the dependent variable y_i being a binary variable that takes the value of 1 if a firm FDI in region i, $i \in \{\text{china,north america, japan, europe,southeast asia,others}\}$, and zero otherwise. The Probit model could be stated as following:

$$\begin{aligned} & y_i^* = X_i\beta + u_i \quad , \quad u_i \sim N(0,\sigma^2) \\ & \begin{cases} y_i = 1, & \text{if } y_i^* > 0 \\ y_i = 0, & \text{if } y_i^* \le 0 \end{cases} \quad , \end{aligned} \qquad (1)$$

, where yi^* was the value function of FDI for firm i, the value function was different between the benefit and cost for FDI, it was unobservable for researcher but firm i; *xi* included the factors influencing FDI for Taiwanese manufacturing firms in 2000; β are the parameters we are interested in; and u was a " white noise" error term.

3.2 Explanatory Variables

The accumulated investment is measured as the past three years' investment, past two years' investment and last year's investment events of a given industry in a given area. We want to know if the past investment experience would affect today's investment choices, so we accumulated investment events in the past three years, past two years and the last year. Ito and Elizabeth (2002) suggested that the firs' investment patterns are related to the number and identities of competitors, host country characteristics, and foreign experience. Johanson and Vahlne (1977) also described the importance of experience and knowledge in foreign operations. Lin and Yeh (2004) also used the umber of enterprises to be a variable to examine whether a firm to invest or not to invest in China. However their finding suggested that the number of enterprises invested in previous years is negatively related to invest in China (Lin and Yeh, 2004). So it is difficult to expect a prior definition relationship between the accumulated investment events and FDI.

RDSL is the average R&D intensity of firms over the period of 1997-2000. The ratio is measured by R&D cost divided by operating income and the measurement unit is "%". According to Chen (1998; 2002) and Lu (2002), it is expected that the higher the RDSL, the higher the propensity to engage in FDI. Chen and Chen (1998) suggested that R&D intensity as a kind of firm-specific assets, and they pointed out conventional theory views foreign direct investment as an attempt to exploit firm-specific assets in a foreign market (Hymer, 1960; Caves, 1971). The choice of location for FDI is based on the location advantages that maximize the value of firm-specific assets net of set-up costs (Dunning, 1981; Caves, 1971). Firm-specific advantages, location advantages and internalization advantages are the three ingredients of the eclectic theory of FDI (Dunning, 1981). From this perspective, it can be expected that R&D intensity is also positively related to FDI.

KL is the average capital/labor ratio of firms over the period of 1997-2000. It is measured by real assets divided by the total employees and the measurement unit is “dollar/per head”. Lin and Yeh (2004) took capital/labor ratio as an indicator of ownership advantage. As mention previously, a firm with more ownership advantages would be more likely to invest abroad. So it is expected the higher the capital/labor ratio, the higher the firms to engage in FDI.

Averaged firm size (SIZE) is measured by the average firm size of the same industry over the period of 1997-2000 and the measurement unit is “per head”. According to Kojima (1978), there are three main motives behind the desire to engage in FDI which involve an orientation towards resources, markets or factors. From a factor-oriented perspective, labor-intensive firms will invariably prefer to select one of the less-developed countries as their FDI destination in order to take advantage of cheap labor (Lecraw, 1977). Since SMEs, in contrast to their larger counterparts, will usually adopt labor-intensive production techniques, it is assumed that they will tend to choose low-wage and low-income areas as their production bases. And Ito and Elizabeth (2002) argued that Competing effectively in overseas markets requires investing firms to possess an identifiable advantage over local firms (Hymer, 1960). Size is one such advantage (Horst, 1972), and is often used as a proxy for firm-specific advantages. Because larger firms have more resources to invest in foreign markets, we expect a firm’s size to be positively related to the probability of its FDI (Ito and Elizabeth, 2002).

Wage is measured by the average wage paid by the firms to each employee over the period of 1997-2000. It was calculated as the total wages divided by all employees and the measurement unit is “dollar/per head”. Cushman (1987) argued that a rise in the foreign wage discourages FDI unless the foreign capital-labor substitution effect is strong. Makino, Lau and Yeh (2002) also argued that the

primary purpose of firms which engage in resource/labor-seeking FDI is to acquire particular and specific resources in a host country at a lower real cost than could be obtained in their home country. Lin and Yeh (2004) also regarded the wage rate to be an indicator of labor cost pressure. By this point of view, we can expect that the higher the wage rate of host country, the higher the propensity of firms to engage in FDI.

The last type of variable is the linkages effects (LINK). As mentioned in chapter 3, this study takes advantage of 『Input-Output table』 to measure the linkages effects among these firms of different industries. We want to know if firms' FDI choices are affected by this kind of linkages effects. Strategic linkages motivate Taiwanese FDI in the United States, while relational linkages facilitate Taiwanese FDI in Southeast Asia and China (Chen and Chen, 1998). Chen (2003) also pointed out that FDI often starts at a location close to the home base where support from the domestic networks can be drawn, subsequently moving on to more distant locations after investors have accumulated new network resources. From these viewpoints, we can expect that linkages effects are positively related to FDI. It's to say that the higher the linkages effects, the higher the firms engage in FDI.

4. Empirical Results

In this study, we used some theories to explain firms' FDI behavior and we want to know if the linkages effects occur only in specific areas. From the data and empirical model, there are some interesting findings as follows.

The empirical results of FDI are shown in Table 4.1~4.6. From these results we can find that the total number of past investment of one, two, three have positive relationship with the investment likelihood for firms in the same industry in year 2000. Johanson and Vahlne (1977) argued that the importance of experience and knowledge in foreign operations. Ito and Elizabeth (2002) also suggested that more

experienced firms accumulate more operational know-how with respect to FDI. Then the result was consistent with our expectation that the total investment in the previous years is positively related to firms engage in FDI.

However, linkages effects do not hold in every area but some specific ones. According to Chen and Chen (1998), the purpose of strategic linkages through FDI is to tap into strategic resources in a foreign market, such as market intelligence, technological know-how, management expertise, or simply reputation for being established in a prestigious market. They also argued that strategic linkages as such enable investors to gain economies of scale and scope, to improve the efficiency of operations, to reduce the vulnerability to market fluctuations, and most of all, to pave the way for further growth in the future. Finally they thought that network strength helps firms overcome entry barriers to foreign markets and enables it to tap into local complementary resources. Chen (2003) also pointed out that FDI often starts at a location close to the home base where support from the domestic networks can be drawn, subsequently moving on to more distant locations after investors have accumulated new network resources. But in the study, we found that linkages effects are positively and significantly related to investment in China while negatively and significantly related to investment in North American and other areas. A completely different result was shown when we look at the influence of linkages effects. So it is difficult to expect a prior definition relationship between linkages effects and FDI.

In addition, the influence of linkages effects is negatively and significantly related to FDI behavior of North America and other areas. According Chen and Chen (1998), they thought the network linkages are positively related to FDI. But in our empirical results, it showed the linkages effects is affected by time length and may have negative relationship with FDI in different areas. This result is against expectation; one possible explanation for the finding is that firms engage in FDI in different areas

might be for different resources demand. For example, Makino, Lau and Yeh's (2002) asset-exploitation and asset-seeking perspective provide a good explanation.

In control variables, Hymer (1960), Caves (1971) regarded R&D intensity as a kind of firm-specific assets, and they pointed out conventional theory views foreign direct investment as an attempt to exploit firm-specific assets in a foreign market. So it is expected that the higher the R&D intensity, higher propensity the firms engage in FDI. But in the empirical results of our dataset, the R&D intensity is not significant in each area. So it is difficult to expect a prior definition relationship between R&D intensity and FDI.

Lin and Yeh (2004) took capital/labor ratio as an indicator of ownership advantage, a firm with more ownership advantages would be more likely to invest abroad. The result of investment in Southeast Asia is consistent with our expectation. The KL is positively and significantly related to firms engage in FDI. Ito and Elizabeth (2002) argued that competing effectively in overseas markets requires investing firms to possess an identifiable advantage over local firms (Hymer, 1960). Size is one such advantage (Horst, 1972), and is often used as a proxy for firm-specific advantages. Therefore a firm's size positively related to the probability of its FDI is expected. This expectation was consistent with our result of investment in North America and Others.

Cushman (1987) argued that a rise in the foreign wage discourages FDI unless the foreign capital-labor substitution effect is strong. Lin and Yeh (2004) also regarded the wage rate to be an indicator of labor cost pressure. From our empirical result, we can find that this kind of affect occur only in Southeast Asia. It means that firms invest in Southeast Asia mostly are for its cheap labors.

Table 4. 1

Probit Model for China

	Variables	Model 1	Model 2	Model3	Model 4	Model 4
Past Investment	Past3	–	3.903E-3*** (4.500)	–	–	1.796E-2 (2.750)
	Past2	–	–	5.077E-3*** (4.520)	–	-4.183E-2 (-2.900)
	Past1	–	–	–	9.202E-3*** (4.880)	4.126E-2 (3.280)
Control Variable	Size	-4.874E-3*** (-6.360)	-4.892E-3 (-6.020)	-4.709E-3 (-5.860)	-4.399E-3 (-5.520)	-4.108E-3 (-4.690)
	KL	-6.960E-5** (-2.100)	-5.400E-5 (-1.610)	-4.940E-5 (-1.470)	-4.460E-5 (-1.330)	-6.440E-5 (-1.830)
	RDSL	2.829E-3 (1.340)	-8.507E-4 (-0.3.900)	-1.486E-3 (-0.670)	-1.675E-3 (-0.760)	1.314E-3 (0.520)
	Labor Cost	7.664E-4 (0.860)	6.690E-4 (0.730)	5.110E-4 (0.560)	3.922E-4 (0.430)	7.487E-4 (0.800)
Linkages Effect	L3	–	8.846E-4* (1.740)	–	–	1.704E-2 (1.590)
	L2	–	–	1.058E-3* (1.670)	–	-3.893E-2 (-1.380)
	L1	–	–	–	1.672E-3 (1.590)	3.111E-2 (1.200)
Log Likelihood		-1179.032	-1166.643	-1166.987	-1165.540	-1159.636
Number of firm		1,905	1,905	1,905	1,905	1,905

The number in the parentheses is the t value.

* is the significance at 10% level ** is the significance at 5% level *** is the significance at 1% level

Table 4. 2

Probit Model for Japan

	Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Past Investment	Past3	–	3.644E-1*** (3.060)	–	–	7.981E-2 (0.200)
	Past2	–	–	5.613E-1*** (3.310)	–	-8.855E-1 (-1.120)
	Past1	–	–	–	1.082*** (4.030)	2.104*** (2.830)
Control Variable.	Size	-9.809E-4 (-0.350)	-1.613E-3*** (-0.470)	-1.640E-3 (-0.500)	-2.663E-3 (-0.840)	-3.736E-3 (-1.020)
	KL	1.306E-4 (1.630)	1.225E-4 (1.410)	1.579E-4 (1.870)	1.411E-4 (1.480)	1.124E-4 (0.990)
	RDSL	-4.107E-3 (-0.3500)	-3.335E-4 (-0.030)	-3.360E-3 (-0.250)	-1.272E-2 (-0.710)	-3.491E-2 (-1.110)
	Labor Cost	-2.485E-4 (-0.080)	-9.704E-4 (-0.290)	-1.953E-3 (-0.560)	-3.080E-5 (-0.010)	3.562E-3 (0.840)
Linkages Effect	L3	–	-1.189E-1 (-0.550)	–	–	3.315E-1 (0.590)
	L2	–	–	-3.248E-1 (-0.760)	–	-2.547 (-0.800)
	L1	–	–	–	-2.949E-01 (-0.490)	2.004 (0.580)
Log Likelihood		-59.874	-54.886	-53.129	-49.682	-48.207
Number of Firm		1,905	1,905	1,905	1,905	1,905

The number in the parentheses is the t value.

* is the significance at 10% level ** is the significance at 5% level *** is the significance at 1% level

Table 4. 3
Probit Model for Southeast Asia

	Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Past Investment	Past3	–	8.772E-3** (2.440)	–	–	-7.841E-4 (-0.050)
	Past2	–	–	1.638E-2*** (3.190)	–	-3.787E-2 (-1.150)
	Past1	–	–	–	4.979E-2*** (4.690)	1.217E-1*** (3.940)
Control Variable.	Size	1.133E-3 (1.440)	3.590E-4 (0.420)	3.962E-4 (0.470)	3.802E-4 (0.460)	7.854E-4 (0.780)
	KL	1.276E-4*** (3.570)	1.351E-4*** (3.710)	1.461E-4*** (3.930)	1.555E-4*** (4.150)	1.590E-4*** (4.210)
	RDSL	-2.709E-3 (-1.090)	-4.994E-3* (-1.810)	-5.854E-3** (-2.060)	-7.001E-3** (-2.430)	-5.318E-3* (-1.850)
	Labor Cost	-2.911E-3*** (-2.910)	-2.821E-3*** (-2.800)	-3.021E-3*** (-2.980)	-3.372E-3*** (-3.290)	-3.626E-3*** (-3.400)
Linkages Effect	L3	–	-1.070E-8 (-1.330)	–	–	-8.850E-9 (-1.090)
	L2	–	–	-4.767E-4 (-0.190)	–	-2.507E-2 (-1.310)
	L1	–	–	–	1.677E-3 (0.320)	5.181E-2 (1.350)
Log likelihood		-901.331	-896.856	-896.119	-890132	-884.061
Number of Firm		1,905	1,905	1,905	1,905	1,905

The number in the parentheses is the t value.

* is the significance at 10% level ** is the significance at 5% level *** is the significance at 1% level

Table 4. 4
Probit Model for North America

	Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Past Investment	Past3	–	1.883E-2*** (4.540)	–	–	-4.558E-2 (-0.870)
	Past2	–	–	2.569E-2*** (4.810)	–	-2.364E-3 (-0.030)
	Past1	–	–	–	6.874E-2*** (5.940)	1.929E-1*** (4.050)
Control Variable	Size	3.122E-3*** (3.950)	-6.423E-4 (-0.550)	-7.734E-4 (-0.670)	-9.214E-4 (-0.850)	1.202E-3 (1.030)
	KL	-1.057E-4*** (-2.370)	-3.410E-5 (-0.730)	-2.420E-5 (-0.520)	6.890E-6 (0.150)	3.830E-5 (0.790)
	RDSL	-6.112E-4 (-0.220)	-6.286E-3* (-1.920)	-6.417E-3* (-1.970)	-8.113E-3** (-2.430)	-7.409E-3** (-2.150)
	Labor Cost	4.625E-3*** (3.890)	3.670E-3*** (2.990)	3.344E-3*** (2.700)	2.238E-3* (1.760)	1.753E-4 (0.1201)
Linkages Effect	L3	–	-5.403E-3* (-1.710)	–	–	5.637E-2 (1.190)
	L2	–	–	-6.915E-3* (-1.730)	–	-7.582E-2 (-0.950)
	L1	–	–	–	-1.463E-2* (-1.840)	-5.771E-3 (-0.090)
Log likelihood		-575.305	-562.521	-561.029	-554.567	-547.257
Number of Firm		1,905	1,905	1,905	1,905	1,905

The number in the parentheses is the t value.

* is the significance at 10% level ** is the significance at 5% level *** is the significance at 1% level

Table 4. 5
Probit Model for Europe

	Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Past Investment	Past3	–	1.522E-1*** (3.090)	–	–	-3.367E-2 (-0.900)
	Past2	–	–	1.885E-1*** (3.350)	–	-9.667E-2 (-0.180)
	Past1	–	–	–	3.375E-1*** (3.550)	5.258E-1 (1.510)
Control Variable	Size	1.795E-3 (0.870)	1.082E-3 (0.410)	1.561E-3 (0.610)	1.858E-3 (0.710)	1.654E-3 (0.610)
	KL	-1.194E-4 (-0.990)	-3.850E-5 (-0.300)	-2.090E-5 (-0.160)	-2.290E-5 (-0.180)	-4.280E-5 (-0.330)
	RDSL	-2.008E-2 (-1.130)	-2.972E-2 (-1.460)	-2.826E-2 (-1.440)	-3.172E-2* (-1.930)	-3.115E-2* (-1.670)
	Labor	3.867E-3 (1.420)	1.251E-3 (0.400)	5.493E-4 (0.170)	5.887E-4 (0.180)	1.757E-3 (0.500)
Linkages Effect	L3	–	-1.348E-1 (-1.140)	–	–	-1.142E-1 (-0..500)
	L2	–	–	-1.517E-1 (-1.130)	–	1.652E-1 (0.580)
	L1	–	–	–	-4.125E-1 (-1.160)	-1.298E-1 (-0.880)
Log Likelihood		-75.156	-68.598	-67.991	-66.302	-65.699
Number of Firm		1,905	1,905	1,905	1,905	1,905

The number in the parentheses is the t value.

* is the significance at 10% level ** is the significance at 5% level *** is the significance at 1% level

Table 4. 6
Probit Model for Others Country

	Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Past Investment	Past3		1.143E-1*** (6.030)			1.605E-1* (1.870)
	Past2			1.386E-1*** (5.740)		4.554E-3 (0.3.00)
	Past1				2.086E-1 (5.040)	-1.137E-1 (-0.850)
Control Variable.	Size	3.832E-3*** (3.910)	-7.345E-4 (-0.570)	-8.370E-4 (-0.640)	-1.282E-3 (-0.880)	9.520E-5 (0.600)
	KL	1.340E-5 (0.250)	9.280E-5* (1.710)	1.024E-4* (1.900)	8.420E-5 (1.560)	9.770E-5* (1.750)
	RDSL	4.633E-4 (0.130)	9.230E-4 (0.250)	-3.183E-4 (-0.080)	1.552E-3 (0.430)	-1.214E-4 (-0.300)
	Labor Cost	-1.403E-3 (-0.940)	-1.216E-3 (-0.790)	-1.591E-3 (-1.040)	-1.020E-3 (-0.670)	-1.715E-3 (-1.060)
Linkages Effects	L3		-5.485E-2* (-1.930)			1.360E-1 (0.900)
	L2			-7.967E-2** (-2.270)		-4.281E-1** (-1.970)
	L1				-1.108E-1** (-2.090)	3.438E-1* (1.920)
Log likelihood		-331.964	-310.349	-311.473	-316.273	-307.105
Number of Firm		1,905	1,905	1,905	1,905	1,905

The number in the parentheses is the t value.

* is the significance at 10% level ** is the significance at 5% level *** is the significance at 1% level

5. Conclusions

With the coming of globalization, firm's FDI plays an important role in Taiwan. The past FDI researches focused on macro data. However the macro data can not reflect each firm's heterogeneous. In this study, we use network linkages, industrial clusters and mimetic isomorphism to investigate Taiwanese firms FDI behavior. In data source, this study used the dataset of FDI survey conducted by Department of Statistics, Ministry of Economic Affairs, Taiwan over the period of 1997-2000. That consisted of 1905 Taiwanese manufacturing firms engaging in FDI under government approval. But to investigate into individual firm's characteristics, we use the Factory's Correction and Operation Investigation over the period of 1997-2000 is conducted by the Industry Development Bureau, Ministry of Economic Affairs, Taiwan to catch the points of RDSL, KL, averaged firm size and wage.

The empirical results showed that the accumulated investment in previous years did affect the likelihood of firm's FDI in same industry. This finding is consistent with the former researches (Ito and Elizabeth, 2002; Johanson and Vahlne, 1977 and Lin and Yeh, 2004). The result indicates the importance of experience and knowledge in foreign operations.

As for the linkages effects, Chen and Chen (1998) argued that linkages effects should be positively related to FDI, but they did not consider the time factor. They also focused only on the relationship between linkages effects and FDI, while they did not provide a concrete data to describe this situation. In this study, in order to have a deeper understanding about the influence of linkages effects on the likelihood for Taiwanese manufacturing firm's FDI, we used a proxy variable to measure this relationship between firms in differential industry. From our empirical results, we can find that the linkages effects occur only in specific areas but not all. Especially, the linkages effects are positively and significantly related to Taiwanese manufacturing

firms engage in FDI in China.

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