Chapter 4
Methodology

In this Chapter, two economic models, total FDI in Thailand and FDI from EU in Thailand, are revised from the studies by Pupphavesa and Pussarungsri (1994) and Wang and Swain (1995). The models are created to find significant determinants which have direct and indirect impact on total FDI in Thailand and FDI from EU in Thailand. The following section represents some reasons for choosing the variables in those models. The last section involves the source of data employed in this empirical study.

4.1 Model

In deriving the FDI function in this study, the previous studies by Pupphavesa and Pussarungsri (1994) and Wang and Swain (1995) are used as examples to re-construct the models of total FDI in Thailand and FDI from EU in Thailand.

Pupphavesa and Pussarungsri's model

The following model is the study by Pupphavesa and Pussarungsri (1994).

$$FDI = F[D, GDP, D*GDP, TRR, D*TRR, EGKC, D*EGKC, NTELP, D*NTELP, EJ],$$

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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, 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, and

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

Wang and Swain's model

The following equation belongs to the study by Wang and Swain (1995).

$$FDI = F[GDP^{(+)}, GDPA^{(+)}, GR^{(+)}, TARIFF^{(+)}, WAGE^{(-)}, BOND^{(-)}, DISCOUNT^{(-)}, EXRT^{(+/-)}, IMP^{(+/-)}, GROECD^{(+)}, D^{(-)}],$$

where,

FDI = the real annual change in foreign direct investment in period *t* (US$ billion in current prices),

GDP = the real gross domestic product (US$ billion in current prices),

GDPA = the absolute real change in GDP (US$ billion in current prices),

GR = the real growth rate (percent),

TARIFF = the average tariff rate facing with foreign exporters into Hungary,

WAGE = the ratio of Hungary's average wage to the U.S. average wage (percent),

BOND = the U.S. government long-term bond yield (percent),

DISCOUNT = the Hungarian central bank's discount rate (percent),

EXRT = the exchange rate between U.S. dollar and Hungarian forint,

IMP = the changes in Hungarian imports (US$ billion),

GROECD = the average growth rate in OECD countries, and

D = a dummy variable to capture political effects (for the years 1978-1989 D=1, and for all other years D=0).

The first revised model (Total Foreign Direct Investment in Thailand)

It is first important to note that FDI is treated as a dependent variable of the system. This means that FDI is determined by various independent variables. Such independent variables are, for example, size of a market, wage rates, exchange rate risks, protective tariff rate, etc. Therefore, in order to estimate any determinant on FDI, these independent variables need to be taken into account. Then, as stated that the models used in this study will be developed further from those of Pupphavesa and Pussarungsri (1994) and Wang and Swain (1995), the first equation of total FDI in Thailand is set up as the following:

$$\begin{aligned} TFDI = \beta_0 &+ \underset{(+)}{\beta_1 GDP} + \underset{(+)}{\beta_2 TARIFF} + \underset{(+)}{\beta_3 EGKC} + \underset{(+)}{\beta_4 TEXPT} + \underset{(-)}{\beta_5 WAGE2} \\ &+ \underset{(-)}{\beta_6 BOND2} + \underset{(+)}{\beta_7 EXRT} + \underset{(+)}{\beta_8 GROECD} + \underset{(-)}{\beta_9 DEU} + \underset{(+)}{\beta_{10} DPOL} + \underset{(+)}{\beta_{11} TFDI_{(lags)}} + \varepsilon_t \end{aligned}$$

where,

TFDI	= total FDI inflow in Thailand (million baht),
β_0	= the constant term,
$\beta_1, \beta_2, \ldots, \beta_{11}$	= the regression coefficients,
GDP	= the real gross domestic product (billion baht),
TARIFF	= the average tariff rate facing with foreign exporters into Thailand (percent),
EGKC	= electricity generation of Thailand in term of kilowatt-hours per capita,
TEXPT	= total Thai export to developed countries (million U.S. dollar),
WAGE2	= wage ratio between Thailand and the U.S. (percent),
BOND2	= the U.S. government long-term bond yield (percent),
EXRT	= the exchange rate between Thailand and the U.S.,
GROECD	= the average growth rate in OECD countries (percent),
DEU	= the dummy variable representing the period before and after

the EC's 1992 programme (D=1 before 1992, D=0 1992 and after),

DPOL = the dummy variable representing the political instability in Thailand (D=1 normal situation, D=0 when there were frequent changes in government and the military government or a transitional period),

$TFDI_{lags}$ = total FDI in Thailand in the past period, and

ε_t = a stochastic error term.

As stated, this is the model of total foreign direct investment in Thailand (TFDI). It is assumed to be expressible as a linear function of economic and political variables. The selection process of variables in this model is based on the literature of FDI in Thailand and the determinants of FDI in transforming economies as listed in Pupphavesa and Pussarungsri (1994) and Wang and Swain (1995) (though the model is constrained to some extent due to the availability of data). In addition, with three exceptions (Thai exports to developed countries, the average growth rate in OECD countries and the dummy variable representing the period before and after the EC 1992 programme), independent variables are chosen to reflect the attractiveness of Thai market as a potential location for foreign capital.

Even though the model has been revised from the previous studies, however, it has been added one more variable, the dummy variable representing the period before and after the EC 1992 programme (DEU). The reason for this is that including such variable should reflect the impact of higher degree of regional integration (EU) on Thailand.

There are more reasons for choosing those independent variables in this model, depending on each variable. First, according to the market-size hypothesis, FDI in any period is assumed to be a function of size of domestic market, which is given by the level of GDP (GDP variable). The expected sign of the market size (GDP) coefficient is expected to be positive. This, again, refers to the market-size hypothesis which leads to

the belief that bigger size of a domestic market, larger volume of FDI into the country, or vice versa.

Secondly, in terms of TARIFF, the selection of this variable is based on the following hypothesis. According to Jeon (1992), foreign exporters might find it more profitable to establish production facilities inside a country's tariff wall. Also, if export costs are too high, a growing host market will encourage foreign firms to its local investment (Moore 1993). This means that export firms may set up production facilities in importing country's market in order to obtain cost saving, e.g. export costs (providing that production cost disadvantages do not overwhelm the cost savings). Thus, this hypothesis leads to the fact that the higher the tariff barriers, the higher the flow of investment (because firms want to avoid tariff, so they establish production facilities within host country). In this study, then, TARIFF is represented the average tariff rate facing by foreign exporters to Thailand (percent). According to the hypothesis, this variable should be able to explain why foreign firms choosing to invest in Thailand rather than exporting to. In addition, in terms of the expected sign, the coefficient for the tariff-protection variable is expected to be positive. This is because if tariff barriers are high, it is likely that foreign firms would invest more in Thailand in order to avoid such high import duties.

Thirdly, EGKC, which represents the electricity generation in Thailand in terms of kilowatt-hours per capita, indicates the fact that a good quality infrastructure should encourage foreign firms to invest in Thailand. In other words, this may enhance the location-specific advantages of Thailand. In terms of the expected sign, again, the coefficient of this variable is expected to be positive. Infrastructure can improve productivity and reduce costs of production and, henceforth, encourage more foreign firms to invest in Thailand. (On the other hand, if the infrastructure's quality is low, it will discourage firms from investing in Thailand.)

Fourthly, TEXPT (total Thai export to developed countries) is selected because of the Product Life Cycle theory. In the second stage of the theory, having decided to invest

in importing countries to reduce the production costs and avoid tariff barriers, foreign firms may even export goods and products back to their home countries; as goods and products can be produced with relatively cheaper costs. Therefore, TEXPT is introduced in this study to prove this theory. In terms of the expected sign, a positive sign is expected on this variable's coefficient. After exporting goods back to their home countries in the second stage of Product Life Cycle theory, foreign firms might even export more goods and products to other countries (the third stage of the theory) when technology becoming available. Such firms can make more profit because they can produce goods and products cheaply in a host country. Thus, it is obvious that TEXPT should change in the same direction with total FDI in Thailand, i.e. a higher degree of foreign firms in Thailand exporting to developed countries, a larger amount of FDI into Thailand.

Fifthly, WAGE2 is the ratio of wages between Thailand (host country) and US (represented other home countries). Foreign investment can be viewed as a way to minimize costs of firms (by investing in a form of multinational enterprises [MNEs]). Firms may undertake foreign investment because of manufacturing cost advantages (e.g. low labour cost and abundant natural resource) in the host country. The neoclassical hypotheses suggested that low labour cost play an important role in decisions to invest oversea. This means that low-wage countries can expect an inflow of foreign capital more than high-wage ones. Therefore, WAGE2 is crucial in terms of reflecting advantages, if any, of low labour cost. In particular, this variable shows the extent to which cheap labour affected foreign capital inflow in Thailand. Furthermore, the expected sign of this variable's coefficient is believed to be negative. There are two cases to discuss. First, if Thai wage decreases, WAGE2 will also decrease because WAGE2 is a relative wage between Thailand and US. This will lead to, according to the hypothesis in this paragraph, increasing amount of FDI into Thailand by the MNEs (which are seeking to lower costs). Second, if Thai wage stays constant but US wage increases, WAGE2 will also decrease. This situation will also lead to increasing FDI in Thailand because wage in home countries (represented by US in this case) is higher and firms need to find a way to

reduce costs. In either case, it is obvious that the direction of changes between WAGE2 and the amount of FDI in Thailand are opposite.

Sixthly, BOND2 is introduced in this study and represented the US Government long-term bond yield. This is based on the hypothesis that FDI is also determined by the cost of investment. This variable acts as a measure of long-term market opportunities available to foreign investors in their home markets (US represented in this case). In terms of expected sign, if bond yield in home countries is high, it would induce foreign firms to invest in their home markets rather than set up production facilities in a host country. This variable also represents opportunity cost of foreign firms in choosing between investing in home or host countries. Thus, BOND2 is expected to be negative.

Seventhly, EXRT represents exchange rate (Baht: 1 US Dollar) between Thailand (host country) and US (represented home countries). Foreign companies may find financial advantages in establishing production factories in a country with a relatively weaker currency than in home countries. Though a few studies have shown that a weak currency discourages the inflow of FDI, the majority of economists, who have tested this hypothesis statistically, have come to the conclusion that a weak currency encourages inflow of FDI and discourages outflow of direct investment. Therefore, the sign of this variable's coefficient is expected to be positive because EXRT increase means Thai currency is weakening, thus encourage more FDI.

Eighthly, OECD growth rates (GROECD) are added to see whether economic growth in main capital-exporting countries affects the inflow of foreign capital to Thailand. It is believed that economic prosperity in the home market indirectly helps firms to perform better and be able to accumulate assets for export and investment. This hypothesis is similar to that of Emmott (1993), who states that the optimistic case for cross-border investment also depends on economic growth in the home countries. Therefore, the sign of this variable's coefficient is expected to be positive.

Ninthly, the dummy variable (DEU) represents any change in total FDI in Thailand due to changes in international economic environment caused by the EC 1992 programme (D=1 is the period before 1992 and D=0 is 1992 and the period after). The principal goals of the EC 1992 programme are free trade and higher degree of integration among member countries of the European Community. Therefore, it is questionable for developing countries whether such programme will have an effect on trade between EU and the rest of the world or it will be more likely to become a newly protectionism "Fortress Europe". Coefficient of this variable is expected to be negative. In order to export goods and products to EU countries, firms do not have to invest in Thailand if EU is integrated successfully. This means that, for example, US firm that needs to export to EU can establish its production factory in any less-developed EU countries (e.g. Greece, Spain and Portugal). This would reduce costs, e.g. cost of transportation, and also firm can avoid tariff and non-tariff barriers.

The discussion about DEU also leads to the issues of trade and investment diversion. First, as argued in the previous paragraph, the middle income developing countries, in this case Thailand, stands to lose its export potential to firms in less developed EU countries. The most vulnerable group, which is likely to lose its market, is the group of low-value, undifferentiated and price-elastic goods. Such goods are, for example, textiles, clothing, footwear and leather. The impact of trade diversion will be minimized in non-competing primary goods and specialized high-value goods. Secondly, direct investment in developing countries can move toward EU by both EU firms and firms in other industrialized countries, instead of moving only to developing countries. This investment diversion is caused by cost advantages of working within the integrated market, fear of protectionism. Even though there have been no study to confirm the situations in this paragraph, however Hallett (1994) states that the effect of a higher degree of EU integration must worsen the position of developing countries somewhat further and may easily turn an insignificant loss on the trade account into a significant loss overall.

Tenthly, the political climate and the political instability in Thailand should have an impact on FDI. Thus, a dummy variable (DPOL) is employed to prove this hypothesis (D=1 is stability and D=0 is instability). There have been many changes in Thai government during the last two decades. It is also a fact that there is no single Thai Government completing a 4-year term. Foreign firms might perceive this situation as Thailand lacking of political stability. This can affect foreign investors' confidence and reduce FDI inflow. Thus the coefficient of this variable is expected to be positive as foreign investors prefer political stability.

Next, FDI in the past, $TFDI_{(lags)}$, is put into this equation due to direct investment's pattern is a long-term investment. The coefficient of this variable is expected to be positive because it is assumed that firms should continue their investment in a long-term in order to reduce costs.

Finally, ε_t, a stochastic error term is assumed to be independently and normally distributed with zero means and constant variance.

The second revised model (European Union Foreign Direct Investment in Thailand)

Secondly, the equation of EU's FDI in Thailand is as follows:

$$\begin{aligned} FDI = {} & \beta_0 + \underset{(+)}{\beta_1}GDP + \underset{(+)}{\beta_2}TARIFF + \underset{(+)}{\beta_3}EGKC + \underset{(-)}{\beta_4}DISCOUNT + \underset{(+)}{\beta_5}EXPT \\ & + \underset{(-)}{\beta_6}WAGE1 + \underset{(+)}{\beta_7}EXRT + \underset{(+)}{\beta_8}GREU + \underset{(-)}{\beta_9}DEU + \underset{(+)}{\beta_{10}}DPOL + \underset{(+)}{\beta_{11}}FDI_{(lags)} \\ & + \varepsilon_t \end{aligned}$$

where,

FDI = FDI from EU in Thailand period t (million baht),

β_0 = the constant term,

$\beta_1, \beta_2, \ldots, \beta_{11}$ = the regression coefficients,

GDP = the real gross domestic product (billion baht),

TARIFF = the average tariff rate facing with foreign exporters into Thailand (percent),

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

DISCOUNT = Thai central bank's discount rate (percent),

EXPT = total Thai export to EU (million U.S. dollar),

WAGE1 = wage ratio between Thailand and Germany (percent),

EXRT = the exchange rate between Thailand and the U.S.,

GREU = the average growth rate in European Union (percent),

DEU = the dummy variable representing the period before and after the EC's 1992 programme (D=1 before 1992, D=0 1992 and after),

DPOL = the dummy variable representing the political instability in Thailand (D=1 normal situation, D=0 when there were frequent changes in government and the military government or a transitional period),

$FDI_{(lags)}$ = inflow of FDI from EU in Thailand in last periods, and

ε_t = a stochastic error term.

This is the model of European Union foreign direct investment in Thailand (FDI). It is assumed to be expressible as a linear function of economic and political variables. The previous model (TFDI) is used as a basic concept in creating this model. However, this model uses DISCOUNT [discount rate of Bank of Thailand] instead of BOND (German Government long-term bond yield) because using DISCOUNT leads to a more significant result than using BOND.

Again, there are several reasons for choosing those variables. First, GDP variable represents the size of Thai domestic market. Therefore, according to the hypothesis that market-size does have an impact on FDI (see the explanation in the previous section), this variable seems to be crucial. EU investors are likely to invest more if Thailand has a

larger domestic market (i.e. because of a stronger purchasing power). The direction of such impact is also expected to be positive with the belief that a larger domestic market would induce more FDI.

Secondly, EU investors might try to avoid tariff barriers by establishing production facilities within Thailand. Thus, similarly to the previous model (TFDI), this variable should be able to explain why EU firms choosing to invest in Thailand rather than to export to Thailand. The coefficient is also expected to be positive because a high tariff barrier would induce EU firms to establish more production facilities in Thailand.

Thirdly, EGKC (electricity generation in Thailand in terms of kilowatt-hours per capita) represents the fact that infrastructure of Thailand encourages EU firms to invest more, e.g. a good infrastructure can be more convenient. Thus, the coefficient of this variable is expected to be positive.

Fourthly, in order to test the hypothesis that FDI is determined by the cost of investment, the variable DISCOUNT (Bank of Thailand's discount rate) has been used. DISCOUNT represents an opportunity cost for EU firms in borrowing in Thailand, as most EU invested enterprises in Thailand do finance some of their affiliates activities through local resources*. The coefficient of this variable is expected to be negative. If the discount rate of Thailand is high, EU firms are unlikely to finance their projects to local resources and might reduce the amount of FDI.

Fifthly, EXPT represents total Thai export to EU. As stated in the previous section, the second stage of the Product Life Cycle theory allows investing firms (in this model, EU firms) to export goods and products back to their home countries because of the lower cost of production. Therefore, EXPT is introduced in this study to prove this theory. It is also expected to have a positive sign on its coefficient because if EU firms

* Aliber (1978), introducing foreign exchange risk into the theory of FDI, found that MNEs had a lower cost of capital due to its lower perceived foreign exchange risk, MNEs enjoy some advantages in borrowing local funds in the host country, given a strong home nation currency.

can export more from Thailand back to their home countries, they might invest more in Thailand because of a low-cost production.

Sixthly, WAGE1 represents the ratio of wages between Thailand and Germany (representing EU countries). As stated about WAGE2 in the previous model, the reason for choosing wage variable is based on the hypothesis that MNEs use foreign investment as a way to reduce cost, i.e. by seeking a low wage country. Therefore, if the relative wage between Thailand and EU (represented by Germany) decrease, it would induce more FDI from EU into Thailand. Thus, the sign of this variable's coefficient is expected to be negative.

Seventhly, EXRT, which represents exchange rate (Baht: 1 US Dollar), is the same variable as in the previous model. The reason for using US Dollar is that at this moment most of trade and investment in the world are in US Dollar terms. Then, the coefficient is expected to be positive as a weak Baht (more Baht per 1 US Dollar) would induce more FDI from EU.

Eighthly, GREU represents EU average growth rate over 1970-1997, in order to see whether economic growth in home countries affects the inflow capital into Thailand. This, again, is similar to the reason for choosing GROECD in the previous model. The sign of coefficient is expected to be positive because MNEs (of EU) tend to locate more production facilities in Thailand if Thai economy is expanding relatively to the EU economies.

Ninthly, again, dummy variable (DEU) is the same variable in the previous model (D=1 is the period before 1992 and D=0 is 1992 and the period after). This variable is an attempt to reflect any difference in FDI from EU to Thailand between before and after the EC 1992 programme. The coefficient's sign is expected to be negative because, for example, if EU is fully integrated, a rich country in EU, e.g. Germany, does not have to seek cost advantages outside their region, some less developed EU countries, e.g. Greece, can fulfill this need.

Tenthly, DPOL is also the same variable as in the previous equation. DPOL is a dummy variable representing political stability in Thailand (D=1 is stability and D=0 is instability). The coefficient is expected to be positive as EU investors tend to prefer to political stability.

Next, European Union foreign direct investment in Thailand in the previous period, $FDI_{(lags)}$, is one factor which is likely to induce more foreign capital (from EU) into Thailand. Because direct investment is one type of long-term investment, EU investors have to inject more inflow to their affiliates in order to expand their projects. Therefore, the coefficient of this variable is expected to be positive.

Finally, ε_t represents a stochastic error term. It is assumed to be independently and normaily distributed with zero means and constant variance.

4.2 Model Estimation

In this study, the Ordinary Least Squares technique (OLS) is applied to estimate these two models. The important question to address is whether the signs of the individual coefficients conform to theoretical expectations.

4.3 Sources of Data

The time series data employed in this study are obtained from many sources. TFDI and FDI are obtained from the Department of Economic Research and the Monthly Bulletin of the Bank of Thailand. GDP, BOND2, EXRT and DISCOUNT are obtained from the International Financial Statistics Yearbook of the International Monetary Fund. TEXPT and EXPT are collected from the Direction of Trade Statistics Yearbook of the International Monetary Fund. GROECD is obtained from OECD Economic Outlook. EGKC is collected from the Annual Report of the Electricity Generating Authority of

Thailand, and GREU is obtained from World Economic Outlook of the International Monetary Fund.

Series on the average tariff rate, TARIFF, is not directly available from any source. Therefore, TARIFF is calculated from Thai import duties divided by total value of Thai imports. Series of import duties is obtained from the Monthly Bulletin of the Bank of Thailand while total value of Thai imports is collected from the Direction of Trade Statistics Year Book of the International Monetary Fund.

WAGE1 is derived from wage ratio between Thailand and Germany. Thai wage is calculated from Thai minimum wage divided by working hours (eight hours per day). While German wage is derived from indexes of German wages: hourly earnings from the International Financial Statistics Year Book of the International Monetary Fund and the average gross hourly nominal earnings of blue collar workers from Series No.1 Labour Market Studies of the IFO Institute for Economic Research By Netherlands Economic Institute. Also, WAGE2, wage ratio between Thailand and the U.S., is not directly available from any sources. The US wage is obtained from the International Financial Statistics Yearbook of the International Monetary Fund. Finally, a list of all data is shown in Appendix A.