

FOREIGN DIRECT INVESTMENT IN MANUFACTURING SECTOR IN MALAYSIA

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Abstract

This paper analyses the determinants of foreign direct investment (FDI) in the manufacturing sector in Malaysia from eleven countries during the period 1988 to 2000. The empirical results indicate that gross domestic product, lending interest rate, labour productivity, exports to home country and imports from home country significantly influenced the level of FDI inflows into Malaysia. However, exchange rate, exchange rate variation, wage and openness index were not important in influencing FDI.

Key words: foreign direct investment, manufacturing sector

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1. Background

Malaysia's rapid industrialisation was largely the result of its early openness to the inflows of foreign direct investment (FDI). Before independence in 1957, Malaysian foreign direct investment activities were concentrated in mining, plantation agriculture, commercial enterprises and utilities. After its independence, the pattern of FDI changed as activities in existing sectors expanded and there was diversification into other agricultural crops and into manufacturing. During the 1960s, Malaysia's FDI policy focused on the development of import-substituting industries (ISIs). Later, during the 1970s, Malaysia switched to more export-oriented industries (EOIs) and, in particular, labour-intensive industries. Because Malaysia's labour force was relatively inexpensive, educated and abundant, it fulfilled the needs of foreign firms (Tham 1997:1-2; Lin 1994; Sulong 1990).

The Malaysian government has long considered manufacturing as the most dynamic sector and central to Malaysian economic development. A proactive industrial policy began with the establishment of the Federal Industrial Development Authority (FIDA) in 1965 by the Malaysian Government. FIDA was responsible for promoting and co-ordinating industrial development activities. In 1979, the Authority was renamed the Malaysian Industrial Development Authority (MIDA). From then on, MIDA has been the primary government agency responsible for the large flows of foreign investment into the manufacturing sector (MIDA 1996: 45). Realising FDI as an important source for Malaysia's industrial development, the Government has initiated various incentives and liberal policies to promote foreign investments in the manufacturing sector. These include the enactments of Investment Incentives Act and Free Trade Zone Act, liberal policies on equity, tax incentives and so forth (Ministry of Finance Malaysia 2001:173-210).

From 1980 to 1989, the average annual FDI flow into Malaysia's manufacturing sector was RM2.33 billion (nearly US\$1 billion). In 1980, it was about RM0.73 billion (US\$0.34 billion) but in 1990, it increased significantly to RM17.63 billion (US\$6.5 billion). The share of FDI for the sector was 42.8 per cent in 1980 and it exceeded 50 per cent after 1990 (Tham 1997:18). In 1993, the United States (USA) and Japan provided more than 50 per cent of total FDI in the sector. In the year 2000, the USA, Japan, Netherlands, Singapore, Germany and Taiwan were among the major sources of FDI in Malaysia. For the period 1996~2000, proposed FDI in approved manufacturing projects totalled RM73.7 billion (US\$19.4 billion). This amount constituted 53.8 per cent of total proposed capital investment (TPCI) that consists of both domestic and foreign investments (MIDA 2001).

This paper is divided into six sections. Section 2 outlines the research problem and objectives. Section 3 reviews some theoretical and empirical literature of FDI. Section 4 describes the sources of collected data, method and model applied to the analysis of FDI. Section 5 presents the empirical results and interpretation, and section 6 ends this paper with conclusions.

2. Problem Statement and Objectives

For Malaysia, FDI is strongly promoted to help achieve its sustainable economic growth, improve employment conditions, accelerate modernisation in industrialisation programme and raise living standards of its society. In the present era of globalisation and liberalisation, trade and investment activities are expanding rapidly, which leads

to increasing multilateral relationships between Malaysia and other countries regardless of their stage of development.

The Asian financial crisis of 1997-1998 severely affected the economic growth of Malaysia. The real Gross Domestic Product (GDP) growth rate declined from 7.4 per cent in 1997 to -7.4 per cent in 1998. By 1999, growth rebounded to 5.3 per cent. In Malaysia's manufacturing sector, foreign investment flows in the total proposed capital investment (TPCI) were also affected. The amount of FDI in terms of applications received for the establishment of manufacturing projects decreased from RM14 billion (US\$5 billion) in 1997 to RM12.6 billion (US\$3.2 billion) in 1998. It further decreased to RM9 billion (US\$2.4 billion) in 1999.¹

For more than five years prior to the crisis period, the exchange rate of the Malaysian ringgit varied only in the range of RM2.36 to RM2.51 per US dollar. But when the crisis occurred, the ringgit depreciated against the US dollar by almost 50 per cent (RM4.88=US\$1) (Athukorala 1998). Because of the volatility, Malaysia's currency has since been pegged at RM3.80=US\$1. Malaysia's experience of the currency crisis seems to show that foreign exchange rates have an impact on the inflows of FDI. The question is: are they a significant influence on total inflows of FDI in Malaysia? What other factors influence the level of FDI in Malaysia? How will all these factors be treated in order to improve the level of inward FDI? Based on the questions, the objectives of this paper are (i) to analyse factors that determine the inflows of FDI and (ii) to evaluate some policy actions related to FDI promotion in the manufacturing sector of Malaysia.

3. Literature Review

Various theories are developed by economists to explain the existence and expansion of FDI in open economies. In the theory of location, Dunning (1993) and Vernon (1974) explained locational decisions and activities of multinational enterprises (MNEs) from the aspects of production cost and market size of the host countries. The expansion of foreign firms in the host countries is commonly in response to the calculations of labour cost, transport cost, tax rates and other costs. In searching for profits and risk reduction, MNEs' production activities are diversified with emphasis on industrial innovation in existing markets.

Dunning's eclectic theory (1988, 1981) explains three factors that cause differences between countries in their international investment involvement and structures. First, capability to possess specific ownership advantages by the MNEs. The possession enables the enterprises of one nationality to compete with those of other nationalities in the host countries. Second, capability of the enterprises to internalise these specific advantages. The internalisation is done either through extension of existing value-added chains of production or establishing new ones. Lastly, whether it is profitable for the enterprises to locate any part of their production facilities in their own country or a host country.

In theory of comparative advantage, Kojima (1978: 103-118) identified the characteristics of two different models of FDI: trade-oriented investment model and the anti-trade-oriented investment. In the first model, trade is promoted when business

¹ RM – Ringgit Malaysia (Malaysia's currency). In annual average, Malaysia's exchange rates were at RM2.8:US\$1 in 1997, RM3.9:US\$1 in 1998 and RM3.8:US\$1 in 1999.

decision-making in investment is subject to the comparative profit rates, which correspond to the comparative costs. The second model takes place when the comparative profit rates contradict comparative costs due to existing monopolistic elements in industries. Kojima (1975) used different terms to explain the models of FDI, arguing that FDI works either as a complement to international trade (trade-creating type) or as a substitute for it (trade-destroying type). The trade-creating type of FDI is a complement to commodity trade and it creates a harmonious trade with the host country. It relates to the first model of FDI. Meanwhile, the trade-destroying type of FDI is a substitute for commodity trade, which relates to the second model of FDI.

Other theories such as the product cycle theory of Vernon (1979, 1966), industrial organisation theory of Hymer (1960/1976) and Caves (1971), internalisation theory of Buckley and Casson (2000, 1976), internationalisation process approach of Bell and Young (1998) and Johanson and Wiedersheim-Paul (1975), and risk diversification theory of Agmond and Lessard (1977) and Grubel (1968) are provided in the area of FDI too. For empirical studies, all the theories help identify many determining factors that influence FDI in host countries.

In their empirical analysis of Japanese direct investment flows in the individual countries of the European Community (EC) and in the United States, Barrel and Pain (1999) selected labour cost, anti-dumping cases, interest rates, exports and two dummy variables for accession of Spain and Portugal into the EC (set to zero before 1986 and unity thereafter) and for membership of the Exchange Rate Mechanism (ERM) of the European Monetary System as determining factors. Their results suggest that anti-dumping cases, labour costs and interest rates have influenced Japanese direct investment in the host countries. Barrel and Pain (1996) selected market size, as measured by Gross National Product (GNP), labour cost and capital cost and found them as important factors in the decision of US companies to invest abroad.

In their analysis of the determinants of FDI in China, Liu et al. (1997) selected nine variables namely, wage, GDP, exchange rates, exports, imports, interest rates, country risk, total cultural difference between China and the home country, and the geographic distance between China and the home country. Their estimation results indicate that inward FDI was determined by most of their selected variables (except interest rate, country risk and total cultural difference). Wang and Swain (1997) selected factors to explain inflow of FDI in Hungary and China that included market size, as measured by GDP, cost of capital, labour cost, tariff barriers, exchange rates, import volumes, economic growth, productivity (only for China) and political stability. They found that market size, growth rate, cost of capital and political stability were the main determinants of FDI in Hungary while market size, labour cost, exchange rates, cost of capital and political stability were the main determinants of FDI in China.

Based on the above theoretical and empirical literature, determining factors of FDI inflows into the manufacturing sector in Malaysia are identified. The analysis uses a panel data set of FDI inflows in the sector by country of origin.

4. Methodology and Model Specification

This section is divided into five sub-sections: source of FDI data, sources of data for explanatory variables, economic model, econometric model and, finally, definitions and expected signs of explanatory variables.

4.1 Source of FDI Data

To analyse the inflows of FDI by country of origin, a data set of approved FDI in manufacturing projects were obtained from the office of MIDA in Kuala Lumpur. The data of approved FDI were employed in the estimation of the FDI model because they are cash flows from foreign firms that were actualised.

Limited by data availability, the study period is from 1988 to 2000. The number of selected home countries in the sample is 11, which is based on their level of percentage share of total real FDI in the approved manufacturing projects for an average of ten years (1991 to 2000). Each of them should contribute more than two per cent of the total FDI. On this basis, the home countries selected are Australia, France, Germany, Japan, Korea, Netherlands, Singapore, Switzerland, Taiwan, United Kingdom and United States. These 11 out of more than 60 home countries contributed 86.25 per cent of real FDI inflows into the manufacturing sector of Malaysia.

Annual data of FDI in the manufacturing sector in real value terms were then calculated by applying the following formula:

$$\text{Real value of FDI} = (\text{nominal value of FDI} \div \text{GDP deflator}) \times 100 \quad (1)$$

Obtaining FDI data in real value terms means removing the influence of inflation from their nominal value terms. The above formula used annual data of the GDP deflator to calculate the real FDI. The GDP deflator is a price index used to measure inflation in an economy and formulated by the ratio of the nominal GDP in a given year to real GDP (multiplied by 100) (McTaggart et al. 1999: 21.18; Dornbusch et al. 1995: 35). Malaysia's and the selected home countries' annual data on the GDP deflator were obtained from International Financial Statistics Yearbook (IFS), with the base year 1995=100. For Taiwan, the data obtained were from Taiwan Statistical Data Book that uses base year 1996=100. In this paper, the data of real FDI inflows by country of origin that represent dependent variable were recalculated at the base year 1998=100.

4.2 Sources of Data for Explanatory Variables

For explanatory variables, their sources of data were obtained from IFSY, Key Indicators of Developing Asian and Pacific Countries, Yearbook of Labour Statistics, Direction of Trade Statistics Yearbook, Taiwan Statistical Data Book, World Development Indicators and Main Economic Indicators. Various official websites were also accessed to obtain data, which include Reserve Bank of Australia, Central Bank of Canada, the Federal Reserve of United States and Statistics Bureau & Statistics Center, Japan under the Ministry of Public Managements, Home Affairs, Posts and Telecommunications.

4.3 Economic Model

Based on the literature briefly described above, the proposed economic model is

$$FDI = f \left(\begin{matrix} +/- \\ + \\ - \\ - \\ - \\ + \\ +/- \\ +/- \\ +/- \end{matrix} (GDP, ER, ERV, HMIR, WG, LP, XTHM, MFHM, OPIN) \right) \quad (2)$$

where

FDI is the annual inflow of real FDI in approved manufacturing projects in Malaysia (in million Ringgit);

GDP is the ratio of Malaysia's real GDP to home country's real GDP;

ER is the ratio of real RM/US\$ exchange rate to the home country's real currency/US\$ exchange rate;

ERV is the ratio of nominal RM/US\$ exchange rate variation to the home country's real currency/US\$ exchange rate variation;

HMIR is real home country's lending interest rate (%);

WG is the ratio of real Malaysia's wage in manufacturing sector to real home country's wage in the same sector;

LP is the ratio of Malaysia's real labour productivity to home country's real labour productivity;

XTHM is Malaysia's real exports to home country (in million Ringgit);

MFHM is Malaysia's real imports from home country (in million Ringgit);

OPIN is the ratio of Malaysia's openness index to home country's openness index.

As noted above, all the explanatory variables (except HMIR, XTHM and MFHM) are in ratio form. In the model of Liu et al. (1997), HMIR is also in ratio form but it is not in Barrel and Pain's (1999) model. All variables except ERV and OPIN are in real terms. Expected signs on the coefficients of the explanatory variables are indicated at the top of each of the variables in equation (2).

4.4 Econometric model

A pooled cross-sectional, time series log-log model is estimated using the sample data.

$$\ln FDI_{it} = b_0 + b_1 \ln GDP_{it-1} + b_2 \ln ER_{it-1} + b_3 \ln ERV_{it-1} + b_4 \ln HMIR_{it-1} + b_5 \ln WG_{it-1} + b_6 \ln LP_{it-1} + b_7 \ln XTHM_{it-1} + b_8 \ln MFHM_{it-1} + b_9 \ln OPIN_{it-1} + \varepsilon_{it} \quad i=1, \dots, 11, \quad t=1988, \dots, 2000, \quad (3)$$

where b_0 is the intercept, $b_1, b_2, b_3, b_4, \dots, b_9$ are the slope parameters or coefficients that measure the FDI elasticities with respect to the (lagged) explanatory variables, ε is a random error term, i and t refer to the i -th country in the t -th time period, \ln denotes the natural logarithm, and the other variables are as defined earlier. Besides giving better results of expected sign of explanatory variables than linear model, the

log-log model is selected because its coefficients can directly measure the FDI elasticities with respect to the explanatory variables. In addition, all the explanatory variables are lagged one period to reflect the fact that there is usually a lag between the point at which a firm decides to invest in another country and the time at which the funds actually become available.

The econometric model estimated allows for cross-sectional heteroskedasticity and time-wise autoregressive behaviour in the error term. Details of the econometric model are provided in Appendix I. The estimation of parameters in the model was obtained by a feasible Generalized Least Squares (GLS) procedure.

4.5 Definitions and Expected Signs of Explanatory Variables

In this analysis, the variables selected are GDP, exchange rate and exchange rate variation, lending interest rate, wage, labour productivity, exports, imports and openness index. Besides the GDP deflator, Consumer Price Index (CPI) is another type of price index used to obtain the real value of data of certain explanatory variables. CPI is based on the consumption expenditures of a typical metropolitan family. It is calculated as the ratio of the value of a base year basket in a given year to its value in the base year (multiplied by 100) (McTaggart et al. 1999: 21.20). Like the data of real FDI inflows by country of origin that represent the dependent variable, the real value of explanatory variables were also calculated at the base year 1998=100.

4.5.1 Gross Domestic Product (GDP) (+/-)

In this analysis of FDI, GDP is presented as the sum of final expenditures that include private consumption, government consumption, gross fixed capital formation, increase or decrease in stocks and exports of good and services less imports of goods and services. Specifically, this measure explains the demand side of the economy, shown as:

$$C + G + I + NX \equiv Y \quad (4)$$

where C is consumption spending by households, G is government purchases of goods and services, I is investment spending by businesses and households and NX is net foreign demand. The total demand for domestic output that consists of C, G, I and NX is equal to output supplied (Y).

To calculate annual data of GDP in real terms, the annual data of the GDP deflator (base year 1998=100) of the country were used:

$$\text{Real GDP} = (\text{nominal value of GDP} \div \text{GDP deflator}) \times 100 \quad (5)$$

Data of Malaysia's relative real GDP were then obtained by dividing Malaysia's real GDP over the home country's real GDP (multiplied by 100).

The sign of the coefficient on the GDP variable depends on the relative strength of two opposing hypotheses.

According to the market size (or demand size) hypothesis, FDI inflow is a function of the market size (or demand size) of the host country measured by GDP. The sign of the coefficient of GDP (as a proxy for the market size or demand size) is expected to

be positive. If there is a more rapid expansion of the host country market than the market of the home country, the host country will be a more attractive location for foreign firms to invest. Thus if the ratio of Malaysia's real GDP to home country real GDP (or the relative real GDP) is higher, the higher is the FDI inflow in Malaysia.

Contrastingly, from Malaysia's general economic equilibrium point of view, the sign of the GDP coefficient is expected to be negative. The increased inflow of FDI is to supplement the lack of aggregate supply of domestic investment in the country. By this reasoning, a low level of GDP in Malaysia will lead to a high level of FDI inflows in the country.

4.5.2 *Exchange Rate (+)*

Exchange rate is defined as the domestic currency price of one unit of foreign exchange. Under flexible exchange rates, there are changes in the price of foreign exchange referred to as currency depreciation or appreciation. A currency depreciates when it becomes less expensive in terms of foreign currencies. For instance, if the exchange rate of the US dollar changes from RM2.70 per US dollar to RM2.20 per US dollar, the US dollar is depreciating. In this analysis, time series data of every country in the sample refer to period averages of market exchange rates and official exchange rates. The exchange rates are in US dollar terms.

To calculate the annual exchange rate in real terms, annual data of CPI (base year 1998=100) of the country were used:

$$\text{Real exchange rate} = (\text{nominal exchange rate} \times \text{foreign CPI}) \div \text{domestic CPI} \quad (6)$$

where foreign CPI here refers to the CPI of USA.

Data of Malaysia's relative real exchange rate were then obtained by dividing Malaysia's real exchange rate over the home country's real exchange rate (multiplied by 100).

A rise in the real exchange rate implies a real depreciation of the host country currency. A real depreciation of the host country currency favours home country firms to purchase host country assets for their investment activities that will lead to an increase in FDI inflow in the host country. In international trade, the real depreciation makes exports from the host country cheaper. This attracts home country firms to increase their investments in the host country and export their products back to their home country and to the world. In general, the higher the ratio of Malaysia's currency/US\$ exchange rate to the home country currency/US\$ exchange rate, the higher will be inward FDI in Malaysia.

4.5.3 *Exchange Rate Variation (-)*

The variable of exchange rate variation in this study is to explain the effect of exchange rate risk or volatility on inward FDI. It is a proxy for financial risk. This effect is analysed by employing data of exchange rate variations. To obtain the data, all the data of exchange rates at the end of period of every month of every year from 1987 to 1999 for every country in sample were collected (12 countries in total). From these data, the data of annual coefficient variances of exchange rate of every country were obtained. In the case of obtaining coefficient variances of the US exchange rate,

the appreciation or depreciation of its currency is against the German Deutsche Mark (PRS Group, accessed on 28 April 2002). (The ratio of Malaysia's exchange rate variation to US exchange rate variation is against the German Deutsche Mark). Finally, data of Malaysia's relative exchange rate variation were obtained by dividing Malaysia's exchange rate variation over the home country's exchange rate variation (multiplied by 100).

The definition of exchange rate variation in this study is different from that developed by Görg and Wakelin (2001:8). They measured exchange rate volatility by the standard deviation of the exchange rate defined as the annual standard deviation of the log of the monthly changes in the exchange rate.

Large movements of the foreign exchange variability affect FDI in the sense that home country firms may anticipate greater uncertainty of the income generated from their foreign branches. If the investors are risk-averse, increased uncertainty about exchange rates will lead to a lower level of FDI. Thus, the higher the ratio of the host country currency/US\$ exchange rate variation to the home country currency/US\$ exchange rate variation, the lower will be inward FDI in the host country. However, if the foreign investors are not risk-averse, the unstable movement of exchange rates does not affect their decision to increase their investment in host country.

4.5.4 *Lending Interest Rate (-)*

In this analysis, the lending interest rate is a proxy for the cost of capital. It is the bank rate charged on the short- and medium-term borrowing of the private sector. Interest rates can be decreased or increased by monetary policy of the government to control inflation in economy.

To obtain the annual interest rate in real terms, annual data of the inflation rate of the country were used. The inflation rate is derived as follows:

$$\text{Inflation rate} = [(\text{current CPI} - \text{past CPI}) \div \text{past CPI}] \times 100 \quad (7)$$

where CPI is at the base year 1998=100.

The inflation rate is thus the percentage change in the general price level. Real interest rate is then calculated by applying the formula of

$$\text{Real interest rate} = (\text{nominal interest rate} - \text{inflation rate}) \quad (8)$$

The source of finance for FDI is basically from the home country. If the lending interest rate that represents the cost of borrowing in the home country is decreased, home country firms will become more willing to invest in the host country. Thus, the lower the lending interest rate in the home country, the higher will be inward FDI in Malaysia. But FDI can also be financed in Malaysia and in other countries due to the present globalisation of financial markets. As such, there is also a possibility of that the home country interest rate will not have any effect on the level of FDI inflows.

4.5.5 *Wage (-)*

Initially, time series data for labour cost in the manufacturing sector for each country in sample were sought. Labour cost comprises remuneration and all kinds of payments in the employment of labour. But limited data of this variable for many countries cause wage in the sector to be used as its proxy. Wage is the major part of labour cost. It is the earning that includes payments in kind and family allowances, and covers salaried employees as well as wage earners. In this analysis, the data of wages in the sector are average earnings per worker and obtained from establishment sample surveys or censuses, social insurance records and other sources.

There were some missing data of wages for Malaysia, Australia, France and Switzerland in certain years that need to be estimated. In the case of Malaysia, there were missing data for 1998 and 2000. To estimate them, the movement trends of the country's labour cost data and data of wages were compared. Since the direction differences (or the proportional changes between them) were less than 20 per cent, the estimated values were accepted.

To deal with the missing data of Australia, its estimated data of 1997 was obtained by taking the average data of 1996 and 1998. Switzerland's estimated data were obtained by taking the average data of 1994 and 1996 for the missing data of 1995 and by taking the average data of 1996 and 1998 for the missing data of 1997. To overcome the other missing data for Australia (1999-2000), France (1999-2000) and Switzerland (1999-2000), their data of CPI at the base year 1998=100 were compared to their data of wages, respectively. Their estimated data were accepted, as their proportional changes between the two lines were less than 20 per cent. In a different case, for Germany, time series data of wages before unification, that is 3.10.1990, were related to the territory of the Federal Republic of Germany.

To calculate annual data of wage in real terms, annual data of CPI (base year 1998=100) of the country were used:

$$\text{Real wage} = (\text{nominal wage} \div \text{CPI}) \times 100 \quad (9)$$

Data of Malaysia's relative real wage were then obtained by dividing Malaysia's real wage over the home country's real wage (multiplied by 100) with standardised unit of measurement such as in terms of per month, per week and per hour.

Theoretically, the lower host country's level of wage will cause home country firms to tend to increase their investments in the host country. Labour cost of the host country is cheaper than their home country labour cost. Thus, the lower the ratio of Malaysia's wage to home country wage, the higher will be inward FDI in Malaysia.

4.5.6 *Labour Productivity (+)*

Initially, data of real labour productivity in the manufacturing sector were sought. However, not all countries in sample have data of total employment in the sector. Because of this limitation, data of real labour productivity in general were obtained by using total employment.

$$\text{Real labour productivity} = \text{real GDP} \div \text{total employment} \quad (10)$$

There were missing data for France (1989-1990), Germany (1989-90), Switzerland (1989-90) and Malaysia (1991 and 1994). But official estimates of data for France and Switzerland were already reported by their governments to the ILO. The missing data of Germany were estimated by comparing its data of total employment with its data of population. The proportional changes between the two lines were less than 20 per cent and, thus, the estimated values were accepted. As for Malaysia's estimated data, they were obtained by taking the average data of 1990 and 1992 for the missing data of 1991 and by taking the average data of 1993 and 1995 for the missing data of 1994.

Data of Malaysia's relative real labour productivity were then obtained by dividing Malaysia's real labour productivity over the home country real labour productivity (multiplied by 100).

If the level of host country labour productivity increases faster than the level of home country labour productivity, home country firms will be willing to increase their investment activities to use cheaper labour in the host country. Thus, the higher the ratio of Malaysia's real labour productivity, the higher will be inward FDI in the country.

4.5.7 *Exports from Malaysia (+/-)*

Data of Malaysia's exports to home country in real terms were obtained by using its data of GDP deflator (base year 1998=100) in calculation:

$$\text{Real exports} = (\text{nominal exports} \div \text{GDP deflator}) \times 100 \quad (11)$$

Greater exports may encourage greater FDI in the host country when FDI is regarded as complementary to trade. It is because foreign subsidiaries in the host country may export their final products back for their home country market. If FDI is regarded as a substitute to trade, a high level of exports to the home country may not increase the inflows of FDI. The high level of exports from the host country means the home country can gain products by way of bilateral trade. The home country investors may not be induced to come and invest in the host country to produce output and export back to their home country.

4.5.8 *Imports to Malaysia (+/-)*

Like data of Malaysia's exports to home country, the data of imports to Malaysia in real terms were also obtained by using the host country data of the GDP deflator (base year 1998=100) in calculation:

$$\text{Real imports} = (\text{nominal imports} \div \text{GDP deflator}) \times 100 \quad (12)$$

Imports from home country to host country may represent parent companies' supplies of machinery or product lines for their subsidiaries in the host country. Thus, greater imports may lead to higher inward FDI in the host country. An opposing view is that high imports from the home country may lead to a fall in FDI because growing imports may imply lower tariff/non-tariff trade barriers in the host country. Home country firms prefer not to invest in the host country as they may increase their products locally and export them to the host country.

4.5.9 *Openness Index (+/-)*

This variable is selected to measure how open Malaysia is to international trade activity. For Singapore, its export data are taken from the current account because they are not available in the national accounts.

The data of openness index is calculated by the following formula developed by Hung (accessed on 31 March 2002)

$$\text{Openness index} = (\text{nominal exports} \div \text{nominal GDP}) \times 100 \quad (13)$$

The issue of openness index data is that, the bigger the country, the lower its openness index. Smaller countries have larger openness indexes. So it may not really be a good index to take into consideration.

Theoretically, if FDI is regarded as a complement to trade, a high openness index in the host country can positively influence the level of FDI inflow. A high level of exports induces foreign subsidiaries to make more investment in the host country so that they can increase their exports to their own home country and to the world. Thus, the higher the ratio of the Malaysia openness index to home country openness index, the greater FDI in the host country. However, if FDI is regarded as a substitute to trade, a high openness index may not lead to a high level of FDI in the host country because the home country can gain products by way of international trade.

5. **Empirical Results**

Following the steps of Cheng et al. (2001), the tests of hypotheses are carried out for the coefficients of the GLS regression function. The reliability of the model is examined too. This section is divided into two sub-sections. Section 5.1 reports and interprets the estimated coefficients of the FDI model in Malaysia. Section 5.2 reports and interprets the model fitness.

5.1 *Estimated Coefficients*

The estimated coefficients are summarised in Table 1. The elasticity values are estimated directly from the log-log model of FDI.

5.1.1 *Relative Real GDP (GDP)*

The estimated coefficient of GDP variable (β_1) is -0.4134. It means that if the GDP decreases by 1 per cent, the mean value of total FDI in Malaysia would be increased by 0.4134 per cent, holding other variables in the model constant.

Null hypothesis $H_0: \beta_1 = 0$

Alternative hypothesis $H_1: \beta_1 \neq 0$

Since the GDP coefficient's probability value (p value) is zero, which is lower than 0.05 level of significance, the null hypothesis can be rejected. There is a relation between GDP and FDI. This variable is statistically significant to the explanation of inward FDI in Malaysia, although the degree of elasticity is not so strong. Its negative sign accords with the theoretical expectation from the point of view of Malaysia's general economic equilibrium. From this view, high inflow of FDI is to supplement aggregate supply deficiency of domestic investment (supply side of GDP) in Malaysia.

Table 1: Estimates of Elasticities for the Determinants of FDI by Country of Origin in Malaysia, 1988~2000

Variable	Estimated Coefficient	Standard Error	T-Ratio	P-Value
Relative real Gross Domestic Product (GDP)	-0.4134	0.1030	-4.011	0.000*
Relative real exchange rate (ER)	-0.2961	0.2291	-1.292	0.198
Relative exchange rate variation (ERV)	-0.0040	0.0146	-0.271	0.787
Real home country's lending interest rate (HMIR)	-0.8438	0.0964	-8.752	0.000*
Relative real wage (WG)	-0.6004	0.4656	-1.290	0.199
Relative real labour productivity (LP)	1.3759	0.4362	3.154	0.002*
Malaysia's real exports to home country (XTHM)	-0.7634	0.1153	-6.622	0.000*
Malaysia's real imports from home country (MFHM)	1.2051	0.1191	10.12	0.000*
Relative openness index (OPIN)	0.2119	0.2592	0.817	0.415
Constant	15.633	1.199	13.04	0.000*

Note: Buse (1973) R-Square = 0.8704. F (from mean) = 99.28 (P-Value = 0.000)
 Number of observations = 143. * indicates that the coefficient is significantly different from zero at either 1, 5, or 10 per cent level of significance.

5.1.2 Relative Real Exchange Rate (ER)

The estimated coefficient of ER variable (β_2) is -0.2961. It means that if ER rises by 1 per cent, the mean value of total FDI in Malaysia would be decreased by 0.2961 per cent, holding other variables in the model constant.

Null hypothesis $H_0: \beta_2 = 0$
 Alternative hypothesis $H_1: \beta_2 \neq 0$

Since the coefficient's p value is 0.198, which is even higher than 0.10 level of significance, the null hypothesis cannot be rejected. There is no relation between ER and FDI. It is not statistically significant to the explanation of inward FDI in Malaysia. Moreover, this variable has a sign that does not conform to its theoretical

expectation, which implies that a depreciation of Malaysian Ringgit (RM) will lead to a lower level of FDI.

5.1.3 *Relative Exchange Rate Variation (ERV)*

The estimated coefficient of the ERV variable (β_3) = -0.0040. It means that if the level of ERV decreases by 1 per cent, the mean value of total FDI in Malaysia would be increased by 0.0040 per cent if other variables in the model hold constant.

Null hypothesis $H_0: \beta_3 = 0$
Alternative hypothesis $H_1: \beta_3 \neq 0$

Since the coefficient's p value is 0.787, which is much higher than 0.10 level of significance, the null hypothesis cannot be rejected. There is no relation between ERV and FDI although this variable has the right sign that agrees with its theoretical expectation. Thus, ERV is not statistically significant to the explanation of inward FDI in Malaysia.

5.1.4 *Real Home Country Interest Rate (HMIR)*

The estimated coefficient of HMIR (β_4) is -0.84380. It means that if the HMIR is decreased by 1 per cent, the mean value of total FDI in Malaysia would increase by 0.84380 per cent if other variables hold constant.

Null hypothesis $H_0: \beta_4 = 0$
Alternative hypothesis $H_1: \beta_4 \neq 0$

Since the coefficient's p value is zero, which is lower than 0.05 level of significance, the null hypothesis can be rejected. There is a relation between HMIR and FDI. This variable is statistically significant to the explanation of inward FDI in Malaysia. It has the right sign, which implies that the lower costs of borrowing in the home country will attract more investments from the home country firms to flow into Malaysia.

5.1.5 *Relative Real Wage (WG)*

The estimated coefficient of WG variable (β_5) is -0.6004. It means that if the WG decreases by 1 per cent, the mean value of total FDI in Malaysia would be increased by 0.6004 per cent, holding other variables in the model constant.

Null hypothesis $H_0: \beta_5 = 0$
Alternative hypothesis $H_1: \beta_5 \neq 0$

Since the coefficient's p value is 0.199, which is higher than 0.10 level of significance, the null hypothesis cannot be rejected. There is no relation between WG and FDI although this variable has the right sign that agrees with its theoretical expectation. Thus, WG is not statistically significant to the explanation of inward FDI in Malaysia.

5.1.6 *Relative Real Labour Productivity (LP)*

The estimated coefficient of LP variable (β_6) is 1.3759. It means that if the LP increases by 1 per cent, the mean value of total FDI in Malaysia would be increased by 1.3759 per cent, holding other variables in the model constant.

Null hypothesis	$H_0: \beta_6 = 0$
Alternative hypothesis	$H_1: \beta_6 \neq 0$

Since the coefficient's p value is 0.002, which is lower than 0.05 level of significance, the null hypothesis can be rejected. There is a relation between LP and FDI. This variable is statistically significant to the explanation of inward FDI in Malaysia. It supports the theoretical expectation that higher LP will lead to the increase amount of foreign investments in Malaysia. The high value of the coefficient suggests that inward FDI is very sensitive to labour productivity in the host country.

5.1.7 Malaysia's Real Exports to Home Country (XTHM)

The estimated coefficient of XTHM variable (β_7) is -0.7634. It means that if the XTHM decreases by 1 per cent, the mean value of total FDI in Malaysia would be increased by 0.7634 per cent, holding other variables in the model constant.

Null hypothesis	$H_0: \beta_7 = 0$
Alternative hypothesis	$H_1: \beta_7 \neq 0$

Since the coefficient's p value is zero, which is lower than 0.05 level of significance, the null hypothesis can be rejected. There is a relation between XTHM and FDI. This variable is statistically significant to the explanation of inward FDI in Malaysia. It supports the theoretical expectation from the view of FDI as a substitute to trade in that low exports of Malaysia will encourage more home country investments to flow into the host country.

5.1.8 Malaysia's Real Imports from Home Country (MFHM)

The estimated coefficient of MFHM variable (β_8) is 1.2051. It means that if the MFHM increases by 1 per cent, the mean value of total FDI in Malaysia would be increased by 1.2051 per cent if other variables in the model hold constant.

Null hypothesis	$H_0: \beta_8 = 0$
Alternative hypothesis	$H_1: \beta_8 \neq 0$

Since the coefficient's p value is zero, which is lower than 0.05 level of significance, the null hypothesis can be rejected. There is a relation between XTHM and FDI. This variable is statistically significant to the explanation of inward FDI in Malaysia. It supports the theoretical expectation in the sense that imports of capital are needed for running operations of the home country firms in Malaysia. The high value of the coefficient indicates that inward FDI is very sensitive to real imports from the home country.

5.1.9 Relative Openness Index (OPIN)

The estimated coefficient of OPIN variable (β_9) is 0.2119. It means that if the OPIN increases by 1 per cent, the mean value of total FDI in Malaysia would be increased by 0.2119 per cent, holding other variables in the model constant.

Null hypothesis	$H_0: \beta_9 = 0$
Alternative hypothesis	$H_1: \beta_9 \neq 0$

Since the coefficient's p value is 0.415, which is considerably higher than 0.10 level of significance, the null hypothesis cannot be rejected. There is no relation between OPIN and FDI. Thus, OPIN is not statistically significant to the explanation of inward FDI in Malaysia.

5.2 *Model Fitness*

The value of R-Square of the model is used to check the percentage level of the variation of FDI that can be explained by all the stated explanatory variables. The significance of the overall model itself is tested too.

5.2.1 *R-Square*

The model of FDI has an R-Square of 0.8704, which implies that 87.04 per cent of the variation in FDI (Y) can be explained by all the stated explanatory variables (Xs) and the remaining 12.86 per cent of the variation in the FDI is explained by factors other than Xs as specified in the model. The model has well fitted the data.

5.2.2 *Testing of Joint Hypothesis*

This hypothesis is to have the overall test of significance of the estimated regression. The null hypothesis states that all coefficients in the model of FDI are simultaneously or jointly equal to zero.

Null hypothesis $H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$
Alternative hypothesis $H_1 : \text{Not all coefficients are simultaneously equal to zero}$

The hypothesis is also conducted by looking at the p value of F statistics. The calculated p value is 0.000, which is lower than 0.05 level of significance. From the result, the null hypothesis can be rejected. It shows that the model of FDI is overall significant.

6. **Conclusions**

This study shows that five out of nine explanatory variables are statistically significant in influencing the level of FDI inflows into the manufacturing sector of Malaysia. The five are real GDP, real home country interest rate, real labour productivity, real exports to home country and real imports from home country. Among the five, the most elastic is real labour productivity with 1.3759. It is followed by real imports from home country with 1.2051. The rest are inelastic. The elasticity of real GDP is the lowest with -0.4134.

The four insignificant variables are real exchange rate, exchange rate variation, real wage and openness index. FDI is a long-term investment, which is not the same as private short-term borrowings and portfolio investment. The characteristic of foreign firms towards this type of investment is more neutral-risk. In other words, they are not risk-averse. More particularly, the eleven selected home countries in the sample were from the groups of industrialised and high-performance East-Asian countries. Considering these characteristics, factors related to exchange rates do not significantly influence their investment decision to Malaysia.

The real wage variable is no longer an important factor to influence the level of FDI in Malaysia. Rather, foreign firms are now more particular about the performance of labour productivity in the country's economic sectors. It is due to the policies of

government to promote the Malaysian economy to be more capital-intensive than labour-intensive. These policies are established because labour cost in Malaysia is increasing compared with some other developing countries like China and Vietnam.

The last insignificant variable is the openness index. From the import side, a high openness index could mean low import tariff or non-tariff barriers in the host country. This may lead to a decrease in FDI because the host country prefers to have high imports than to have a high level of FDI. But this variable does not significantly determine the level of FDI because high levels of imports of machine components and other types of capital equipment are necessary for home country firms to increase their investment activities in Malaysia.

APPENDIX I

The cross-sectionally heteroskedastic and timewise autoregressive econometric model used in this study is that discussed in Greene (1993, section 16.3). The model is estimated using the POOL command in Shazam Version 8.0 (1997, page 269). The assumptions of the model are:

$$E(\varepsilon^2) = \sigma_i^2 \quad \text{heteroskedasticity} \quad (1)$$

$$E(\varepsilon_{it}\varepsilon_{jt}) = 0 \quad \text{for } i \neq j, \text{ cross- section independence} \quad (2)$$

$$\varepsilon_{it} = \rho_i \varepsilon_{i, t-1} + v_{it} \quad \text{autoregression} \quad (3)$$

where

$$\begin{aligned} E(v_{it}) &= 0, E(v_{it}^2) = \phi_{ii}, \\ E(v_{it}v_{jt}) &= 0 \text{ for } i \neq j, E(v_{it}v_{js}) = 0 \text{ for } t \neq s, \text{ and} \\ E(\varepsilon_{i, t-1}v_{jt}) &= 0 \end{aligned}$$

The assumptions are extended to allow for cross-section correlation.

$$E(\varepsilon_{it}\varepsilon_{jt}) = \sigma_{ij}, E(v_{it}v_{jt}) = \phi_{ij}, \text{ and } E(v_{it}v_{js}) = 0 \text{ for } t \neq s. \quad (4)$$

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