# REGIONAL DISTRIBUTION OF FOREIGN DIRECT INVESTMENT INFLOWS IN THE MANUFACTURING SECTOR IN MALAYSIA

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**Abstract**

This paper analyzes the regional distribution of foreign direct investment (FDI) inflows into the manufacturing sector across 13 states and one federal territory using data for the years 1990, 1995 and 2000. The empirical results indicate that expanding market demand for output, higher labor productivity, more socio-economic development and increasing the area of industrial estates in the host state are significant determinants of FDI inflows in the sector. Of the four explanatory variables, FDI inflows are most sensitive to labor productivity. They are highly insensitive to the level of social and economic development of a state.

*Keywords:* Regional development; foreign direct investment; manufacturing sector.

## 1. Background of Analysis

Economic growth in Malaysia has not benefited all states and territories evenly. The issue prompts the Government of Malaysia to devise ways of creating more balanced regional development. Malaysia has 13 states and three federal territories. Perlis, Kedah, Penang, Perak, Selangor, Negeri Sembilan, Melaka and Johor are the states located in the western part of Peninsular Malaysia while Kelantan, Pahang and Terengganu are located in the east part of Peninsular Malaysia. Sabah and Sarawak, the other two states, are located on Borneo Island. The three federal territories are Kuala Lumpur and Putrajaya, located in the west part of Peninsular Malaysia, and Labuan Island, located near Sabah. Kuala Lumpur and Labuan Island were proclaimed federal territories on 1 February 1974 and 16 April 1984, respectively. Putrajaya, the third federal territory, was declared on 1 February 2001.

One means of achieving the outcome of regional development policy is to create an environment that encourages foreign firms to increase their investment heavily in less developed states. A factor perpetuating uneven economic growth has been the regionally

skewed distribution of foreign direct investment (FDI) inflows. Inward FDI in the manufacturing sector, in particular, has been unevenly spread across states and territories in Malaysia. The ten states, Selangor, Penang, Perak, Johor, Negeri Sembilan, Melaka, Kedah, Pahang, Terengganu and Sarawak received 97 per cent of total real FDI inflows in approved manufacturing projects during the ten years, 1991 to 2000. Each of these states received more than five per cent of the total.

The purpose of this analysis is to examine determinants of FDI inflows in the manufacturing sector across Malaysian states and territories. Specifically, it is to identify some key variables that the Government of Malaysia can influence to create a more even regional distribution of FDI. Annual time series data on explanatory variables for all states and federal territories were not available in the Department of Statistics in Kuala Lumpur. As a result, this analysis uses FDI data only during the years 1990, 1995 and 2000. FDI data for Labuan Island and Sabah state are summed because Labuan Island's data on explanatory variables is included in Sabah's data. Labuan Island was part of Sabah before being declared as a federal territory. Putrajaya is also excluded from this analysis because it is new as a federal territory and has no FDI data. Data on its explanatory variables are incorporated in Selangor's data.

## 2. Economic Model

In the economic model of FDI inflows in the manufacturing sector across the 13 states and one territory (Kuala Lumpur), the selected explanatory variables are gross domestic product, labor productivity, development composite index and industrial estates. With expected signs of coefficients on explanatory variables, the model of FDI is shown as

$$\text{FDI} = f(\underset{+}{\text{SGDP}}, \underset{+}{\text{LP}}, \underset{+}{\text{DCI}}, \underset{+}{\text{IE}}). \quad (1)$$

where

FDI is the inflow of real FDI in approved manufacturing projects by state and federal territory in Malaysia (in ringgit),

SGDP is the real state gross domestic product by state and federal territory in Malaysia (in million ringgit),

LP is the real labor productivity by state and federal territory in Malaysia (in ringgit),

DCI is the development composite index by state and federal territory in Malaysia, and

IE is the total hectares of industrial estates saleable to manufacturing firms by state and federal territory in Malaysia.

Data on FDI in real terms were calculated by using data on the national GDP deflator at the base year 1990=100. The relevant data on explanatory variables were also valued in real terms at the same base year. Data on the national GDP deflator published by the International Monetary Fund (IMF) were utilized in the computation.

The definitions of the four explanatory variables and their expected signs are further explained. Reasons are given to support their inclusion.

### 2.1. *State Gross Domestic Product*

It is a priority of Malaysia's regional development policy that the income gap between the less developed states and more developed states should be narrowed. It is to improve the capability of the households in the less developed states to purchase in their markets of goods and services.

The positive influence of market size on FDI inflows in a host economy was posited by Vernon (1974), Caves (1982) and Dunning (1993) in the theory of location. Strong market demand encourages oligopolistic multinational firms to locate their industrial innovation activities outside their home countries. The factor of market size was also considered by Johanson and Wiedersheim-Paul (1975) and Bell and Young (1998). It highlights the important role of regional development strategies in strengthening income levels of host economies. Increasing income levels of people leads to an increase in the level of aggregate demand for output because consumption demand increases with income. This, in turn, leads to an increase in the aggregate supply of output to achieve market equilibrium (Dornbusch, Fischer and Kearney, 1995:61-63).

Gross domestic product (GDP) is a common proxy for market demand under the market hypothesis. It is the total final expenditures that include public and private consumptions, investment spending and net foreign demand. SGDP in our model of FDI is defined as the share of GDP contributed by a state or territory. Data on SGDP in real terms were calculated by using the same method as for calculating the data on real FDI.

The sign of the coefficient on SGDP in this analysis is expected to be positive. The positive sign means larger market size should encourage more foreign investment to flow into a state or federal territory. Foreign firms are stimulated to increase their supply of output in the state's manufacturing sector when there is a high demand for output in the state market.

### 2.2. *Labor Productivity*

Foreign firms may be induced to establish their production facilities in a host economy that has a relatively high level of productivity. In the appropriability theory, Magee (1977) put forward a positive relationship between productivity and FDI. Multinational firms cannot appropriate high returns from their investment activities if productivity is low in the host economy. In the eclectic paradigm of FDI provided by Dunning (1993), productivity is regarded as one of the locational advantages that must be possessed by a host economy. If labor productivity increases in a state or federal territory in Malaysia, foreign firms should be willing to increase their investment activities to benefit from lower average cost of labor. Thus, a higher level of productivity should lead to a larger size of FDI inflows in the state or federal territory.

Data on real labor productivity in the manufacturing sector across states and federal territory were initially sought. However, because total employment figures in the sector were not available, data on real labor productivity in the general economy were obtained by dividing real SGDP by total employment at base year 1990=100.

### 2.3. *Development Composite Index*

The more developed a state is, the greater the confidence it would be expected that foreign investors have in their capacity to earn profits from their production activities.

Since the major thrust of Malaysia's regional development policy is to reduce regional disparities in social and economic development, the Government is attempting to orchestrate more rapid development of the less developed states. Major strategies include the diversification of their economic base, increased human capital and the provision of better infrastructure and modern amenities. These should provide opportunities for people to increase their income and improve their quality of life.

The definition of the development composite index (DCI) is taken from the national report of the Third Outline Perspective Plan 2001-2010 (Malaysia, Government 2001a:107-108). In the report, the index is defined as an average score of ten selected socio-economic indicators. Per capita SGDP (in ringgit), unemployment rate (%), urbanization rate (%), registered cars and motorcycles per 1,000 population and telephone per 1,000 population are categorized as economic indicators while poverty incidence (%), population provided with piped water (%), population provided with electricity (%), infant mortality rate per 1,000 live births and number of doctors per 10,000 population are categorized as social indicators. DCI data (base year 1990=100) by state and federal territory for the years 1990 and 2000 were taken directly from the same report.

The DCI is used by the Government of Malaysia to measure the states' level of development. Based on the index, Kuala Lumpur, Selangor, Penang, Perak, Johor, Negeri Sembilan and Melaka are categorized as more developed states. Less developed states comprise Kedah, Pahang Kelantan, Terengganu, Perlis, Sabah and Sarawak.

### 2.4. *Industrial Estates*

Provision of infrastructure is important to increase inward FDI in a host economy by enabling foreign firms to minimize transportation and communication costs in their production activities. Dunning (1993) argued that low costs of transport and communication are another locational factor that can explain FDI in a host economy. In Krugman's (1991) model of geographic concentration of production activities, transportation network is highlighted as a factor for gaining wider access to input and product markets to the firms operating in a manufacturing belt.

The provision of industrial estates is one important avenue for state governments to increase their FDI inflows in the manufacturing sector. Improved infrastructural facilities can provide an impetus for easy access to markets by foreign manufacturing corporations. In industrial estates, all firms are fully-equipped with roads, electricity, water supplies and telecommunications. These facilities create a conducive environment for the firms' activities in industrial areas through lower costs of capital investment. An increase in industrial estates is therefore expected to contribute to more foreign investment flows into the state or federal territory.

Data on total hectares of industrial estates developed by the government agencies (i.e. the State Economic Development Corporations as well as Regional Development and Port Authorities and Municipalities) were obtained to be a proxy for the localized provision of infrastructure facilities. Several kinds of data on industrial estates in Malaysia are provided by the agencies. They include number of industrial estates in various sizes, planned total hectares of industrial estates that exclude housing areas, total hectares of industrial estates that have been developed, total hectares of industrial estates saleable and total hectares of industrial estates that have been allocated or sold to

manufacturing firms. In this analysis, we selected the data on total hectares of industrial estates that can readily be sold to manufacturing firms. This indicator has the most comprehensive definition of local infrastructure facilities provided to manufacturing firms.

## 3. Sources of Data

Data on FDI inflows and industrial estates were obtained from the Malaysian Industrial Development Authority (MIDA) in Kuala Lumpur. Sources of data on SGDP, labor productivity and DCI are from national reports in the Seventh and Eighth Malaysia Plans (1996-2000 and 2001–2005, respectively) (Government of Malaysia 1996, 2001a) and the Second and Third Outline Perspective Plans (OPP2 1991-2000 and OPP3 2001-2010, respectively) (Government of Malaysia 1991, 2001b). These reports were prepared by the Department of Prime Minister.

Data on DCI for 1995 had to be interpolated due to their unavailability in the report of the Third Outline Perspective Plan 2001-2010. To estimate the missing observations of DCI in 1995, the original data on every socio-economic component in 1990, 1995 and 2000 were firstly gathered from all the national reports mentioned above. The 1990 data at base year 1978=100 and the 1995 and 2000 data at base year 1987=100 for the component of per capita SGDP were recalculated to be at the standardized base year 1990=100.

DCI component data on the urbanization rate in 1990 were available only in an index form. To obtain its original data for each state, the urbanization rate of 2000 was multiplied by the ratio of the urbanization indices for 1990 and 2000.

Original data on the other six components in 2000, namely telephones per 1,000 population, incidence of poverty, population provided with piped water, population provided with electricity, infant mortality rate per 1000 live births and number of doctors per 10 000 population were also not available for all states. Component data on their available indices were calculated following a similar procedure to that used for the 1990 urbanization rate. The original component data in 1990 were multiplied by the ratio of the respective 2000 and 1990 indices.

Data on the ten DCI components for 1995 were obtained by estimating a model of DCI in 1990 and 2000:

$$DCI_{i1990,2000} = \beta_0 + \beta_1 X_{1i1990,2000} + \ldots\ldots\ldots + \beta_{10} X_{10i1990,2000} + u_{i1990,2000}. \quad (2)$$

where $\beta_0$ is the constant term and $\beta_1$, $\beta_2$ ..., $\beta_{10}$ are the coefficients that measure the DCI with respect to its ten components (explanatory variables), $X_1$, $X_2$....., $X_{10}$ at the cross-sectional unit of $i$. The stochastic disturbance term, $u$, is assumed to be independently and normally distributed with zero mean and constant variance.

A pooled regression (White, 1997) was run on the DCI model to obtain the estimated coefficients. A large Buse $R$-square of 0.9998 suggests the model as a good estimator for DCI data on 1995. There is only 0.02 per cent of the variation in DCI explained by other factors outside the model for 1990 and 2000.

After having the ten estimated coefficients, the DCI model for 1995 was set up:

$$DCI_{i1995} = \beta_0 + \beta_1 X_{1\,i1995} + \ldots\ldots\ldots + \beta_{10} X_{10\,i1995} + u_{i1995}. \quad (3)$$

Eq. (3) was applied to predict the missing DCI data on 1995 for each state and territory.

## 4. Econometric Model

The panel data on FDI across states were fitted to the form of a single linear model:

$$FDI_{it} = \beta_0 + \beta_1 SGDP_{it} + \beta_2 LP_{it} + \beta_3 DCI_{it} + \beta_4 IE_{it} + u_{it}. \quad (4)$$

where $\beta_0$ is the intercept and $\beta_1$, $\beta_2$, $\beta_3$ and $\beta_4$ are the coefficients that measure the FDI responsiveness with respect to the explanatory variables at cross-sectional unit $i$ and time period $t$ ($i = 1, \ldots 14$; $t = 1990, 1995, 2000$).

The model estimation was undertaken using a feasible generalized least squares procedure. It allows for cross-sectional heteroskedasticity and time-wise autoregressive behavior in the error term (White, 1997:269).

Before running the estimation, two $F$-tests were carried out to test whether intercept dummies and interaction terms should be included in the FDI model. For this purpose, two additional ordinary least squares (OLS) regressions were run on the following models:

$$FDI_{it} = \beta_0 + \beta_1 SGDP_{it} + \beta_2 LP_{it} + \beta_3 DCI_{it} + \beta_4 IE_{it} + \gamma_1 D_{1t} + \ldots + \gamma_{13} D_{13t} + \varphi_1 (T_{it} * SGDP_{it}) + \varphi_2 (T_{it} * LP_{it}) + \varphi_3 (T_{it} * DCI_{it}) + \varphi_4 (T_{it} * IE_{it}) + u_{it}. \quad (5)$$

$$FDI_{it} = \beta_0 + \beta_1 SGDP_{it} + \beta_2 LP_{it} + \beta_3 DCI_{it} + \beta_4 IE_{it} + \gamma_1 D_{1t} + \ldots + \gamma_{13} D_{13t} + u_{it}. \quad (6)$$

where $D_1$, ..... , $D_{13}$ are 13 dummy variables for states with Kuala Lumpur as the designated base. Their slope coefficients are represented by $\gamma_1$, ....., $\gamma_{13}$. $T_{it} * SGDP_{it}$, $T_{it} * LP_{it}$, $T_{it} * DCI_{it}$ and $T_{it} * IE_{it}$ are the interaction terms between the time factor and the explanatory variables, respectively. Their slope coefficients are represented by $\varphi_1$, $\varphi_2$, $\varphi_3$ and $\varphi_4$.

Results showed no evidence to suggest an intercept effect in the FDI model. It indicates that the intercepts are homogeneous across states. There is also no evidence to suggest an interaction effect, indicating that the slopes with the time factor are simultaneously homogeneous across states.

## 5. Results and Discussion

In the model of FDI, a major component of DCI, per capita SGDP, is already represented by the SGDP variable. A measure was taken to purge DCI of the per capita SGDP's influence. This component was regressed on DCI. Data on residuals were then obtained

to designate the variable of DCI Residual (DCIR). It is the adjusted DCI variable that replaces the DCI variable in the specified model of FDI in Eq. (1).

The estimated coefficients of the least squares regression function are displayed in Table 1. Using one-tailed tests, the coefficients on all four explanatory variables are statistically significant at least at the five per cent level. The Buse $R$-square value of 0.642 implies that 64.2 per cent of the variation in FDI across Malaysian states is explained by all the explanatory variables. The model has therefore fitted the data quite well.

### 5.1. *Real State Gross Domestic Product*

The SGDP variable has an estimated elasticity at means of 0.32, which means a 10 per cent increase in SGDP results in a 3.2 per cent increase in FDI flows into that state. This result is consistent with the market hypothesis in that a positive sign implies that foreign firms have higher investments in those states that have expanding market demand for their output. Increasing market size in a Malaysian state is therefore quite an effective way of encouraging FDI.

**Table 1: Estimates of the Determinants of FDI Inflows, 1990, 1995 and 2000**

| Variable | Estimated coefficient | Standard error | $t$-ratio | $p$-value | Elasticity at means |
|---|---|---|---|---|---|
| Real state gross domestic product (SGDP) | 37626* | 22320 | 1.686 | 0.046 | 0.3192 |
| Real labor productivity (LP) | 53502** | 17330 | 3.088 | 0.001 | 0.8065 |
| Adjusted development composite index (DCIR) | 0.271E+09* | 0.132E+09 | 2.053 | 0.020 | 0.0086 |
| Industrial Estates (IE) | 351780** | 111400 | 3.158 | 0.001 | 0.3854 |
| Constant | -0.79E+09** | 0.218E+09 | -3.628 | 0.000 | -0.7102 |

Notes: Buse $R$-square = 0.642.
$F$ (from mean) = 18.832 ($p$-value = 0.000).
* Significant at the 5 per cent level.
** Significant at the 1 per cent level.
The $p$-values are appropriate for one-sided hypothesis tests for all variables.

### 5.2. *Real Labor Productivity*

The estimated elasticity at means of labor productivity is 0.81. It is the highest among those of the four coefficients on the explanatory variables. Its positive sign supports the theoretical expectation that increasing labor productivity influences foreign firms to increase investment because they can expect a lower cost of production in the host state. This result is consistent with analyses on the effects of labor productivity and total factor productivity on FDI flows into Malaysia by country of origin, and across the Malaysian manufacturing industries, respectively (Abdul Karim, 2004).

Labor productivity can be improved by upgrading labor skills and efficiency in the production of goods and services. The state governments that are lagging in their ability to promote FDI could provide various training programs for workers in their states so that they can be accepted in the manufacturing job market. Private firms in such states could also be encouraged to undertake their own in-house and on-the-job training programs to improve the skills of their workers.

### 5.3. *Adjusted Development Composite Index*

The positive sign of the adjusted DCI suggests that foreign firms will engage in more investment activities in those states that are more developed socio-economically. This result provides the Government of Malaysia with hope that it could create a virtuous circle by investing in development programs in less developed states to encourage foreign investment activities that in turn creates further development.

Unfortunately, the adjusted DCI variable has an estimated elasticity at means of only 0.009. Its very low elasticity, which is easily the weakest among those of the explanatory variables, suggests that such development programs would take a long time to have a noticeable impact on inward FDI in a Malaysian state. A more cost-effective approach for the Government is thus to focus on infrastructural development more sharply through industrial estates.

### 5.4. *Industrial Estates*

The estimated elasticity at means for industrial estates, 0.39, suggests that a 3.9 per cent increase in inward FDI results from a 10 per cent increase in the area of industrial estates. Foreign firms expect to be able to reduce the cost of capital in their investment operations if they can take advantage of various facilities provided by the Government in the industrial estates.

This elasticity is much higher than the elasticity for DCIR, reported above. It suggests that, from the viewpoint of Malaysia's regional development policy, more projects on industrial estates should be established in the less developed states. The private sector should also be encouraged to develop more industrial estates. Increasing the number and size of industrial estates is expected to expand FDI activities that create more job opportunities for local people. In addition, maintaining good-quality infrastructural facilities in existing industrial estates should also fulfill the strategy of promoting FDI flows into a state. Industrial estates can have spillover effects by providing townships in rural areas with better infrastructure and services thereby encouraging more domestic investment, especially among small- and medium-sized industries in these areas. This process can in turn provide an impetus for more FDI in industrial activities.

## 6. Conclusion

This analysis of FDI inflows across 13 states and one federal territory in Malaysia uses data for the years 1990, 1995 and 2000. All the four explanatory variables in the estimated linear model of FDI were found statistically significant in influencing FDI inflows in the expected positive direction.

The empirical results indicate that expanding market demand for output, higher labor productivity, more socio-economic development and increasing the area of industrial estates in the host state are important determinants of FDI inflows in the manufacturing sector in Malaysia. Overall, the model of FDI is reasonably reliable.

Of the four explanatory variables, FDI is most sensitive to labor productivity but it is also quite sensitive to GDP of a state and the area of industrial estates. It is highly insensitive to the host state's level of economic and social development other than GDP. Raising labor productivity and increasing the area of industrial estates in less developed states appear the most cost-effective ways to increase FDI inflows in the short to medium term. These measures, along with the stimulatory economic effects of the increased FDI, should in turn increase market size and overall state development, setting in train a virtuous cycle of raising the living standards of people in less developed states.

## References


Abdul Karim, N. A.-H. (2004). Determinants of Foreign Direct Investment in Malaysia: Empirical Evidence from the Manufacturing Sector. Unpublished PhD Thesis, University of New England, Armidale.

Bell, J. and S. Young (1998). Towards An Integrative framework of the Internationalization of the Firm. In G. Hooley, R. Loveridge and D. Wilson (eds.), *Internationalization: Process, Context and Markets,* Macmillan Press, London.

Bhagwati, J.H. (ed.) (1977). *The New International Economic Order: The North South Debate,* MIT Press, Cambridge.

Caves, R.E. (1982). *Multinational Enterprise and Economic Analysis,* Cambridge University Press, Cambridge.

Dornbusch, R., S. Fischer and C. Kearney (1995). *Macroeconomics,* Australian Edition, McGraw-Hill, Sydney.

Dunning, J.H. (1974). *Economic Analysis and the Multinational Enterprise,* Allen & Unwin, London.

Dunning, J.H. (1993). *Multinational Enterprises and the Global Economy,* Addison-Wesley, Wokingham.

Government of Malaysia (1991). *The Second Outline Perspective Plan 1991-2000,* Government Press, Kuala Lumpur.

Government of Malaysia (1996). *Seventh Malaysia Plan 1996-2000,* Government Press, Kuala Lumpur.

Government of Malaysia (2001a). *Eighth Malaysia Plan 2001-2005,* Government Press, Putrajaya.

Government of Malaysia (2001b). *The Third Outline Perspective Plan 2001-2010,* Government Press, Putrajaya.

Hooley, G., R. Loveridge and D. Wilson (eds.) (1998). *Internationalization: Process, Context and Markets,* Macmillan Press, London.

IMF (various issues). *International Financial Statistics Yearbook,* Washington, D.C.

Johanson, J. and F. Wiedersheim-Paul (1975). The Internationalization of the Firm — Four Swedish Cases. *Journal of Management Studies,* 12, pp. 305-322.

Krugman, P. (1991). *Geography and Trade,* MIT Press, Cambridge.

Magee, S.P. (1977). Information and the Multinational Corporation: An Appropriability Theory of Direct Foreign Investment. In J.N. Bhagwati (ed.), *The New International Economic Order: The North South Debate,* MIT Press, Cambridge.

Vernon, R. (1974). The Location of Economic Activity. In J.H. Dunning (ed.), *Economic Analysis and the Multinational Enterprise,* Allen & Unwin, London.

White, K.J. (1997). *SHAZAM: Econometrics Computer User's Reference Manual Version 8.0,* McGraw-Hill, Vancouver.