The Role of FDI Inflows in Economic Growth in Malaysia (Time Series: 1975-2010)

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Abstract:

Recently, Malaysia has been recognized as one of the most popular destinations for Foreign Direct Investment (FDI) in Southeast Asia. But how do these FDI inflows affect Malaysia economy? This paper aims to identify the role of FDI inflows in Malaysia economic growth through a proposed endogenous growth model. Annual data covers from 1975 to 2010. Unit root test and Johansen Co-integration test are adopted to respectively verify the time series data is stable and the linear combination of the variables is stationary. Hierarchical Multiple Regressions (HMR) Analysis is then conducted to find out the momentum of the Malaysia economic growth including FDI inflows. The results show that the FDI inflows together with the human capital development contribute strongly to the host country’s economic growth. But the technology spillovers of FDI inflows are still not sufficiently combined with human capital to contribute to the economic growth. Thus, it suggests government make more efforts to develop national human capital to attract and serve for FDI inflows. Moreover, the openness of the economy and the foreign exchange environment shall continue moving in favourable track.

Keywords: Economic Growth; FDI inflows; Endogenous Growth; Johansen Co-integration Test; Hierarchical Multiple Regressions

1. Introduction

The issues of economic growth and Foreign Direct Investment (FDI) inflows have been sparkling for several decades. For developed countries, inward FDI has been believed as a significant contributor to their national economic growth.
sustainable economic development; while for developing countries, it is also regarded an indispensable external power to promote their own economic growth especially under the current backdrop of globalization. However, there hardly exist consistent conclusions.

Abramovitz (1986) argued that human capital resource, economic and political stabilities as well as market openness are the necessities for the host countries to benefit from FDI inflows. (Borensztein, De Gregorio, & Lee, 1998) believed that FDI could exert higher producing efficiency only when the developing host countries reached the lowest level of human capital accumulation (Markusen & Maskus, 2002), from the developed countries’ view, emphasized long-term decisive factors for FDI activities such as absolute/comparative national factor endowment, market scale/distance and trading and investing cost in the objective host countries. According to (Bengoa & Sanchez-Robles, 2003) recipient economies require human capital, economic stability, and liberalized markets in order to benefit from long term FDI inflows.

For the case of Malaysia, (Chowdhury & Mavrotas, 2006) examined the causal relationship between FDI and economic growth for three developing countries, namely Chile, Malaysia and Thailand and found that in Malaysia, there is a strong evidence of a bi-directional causality between the two variables (Duasa, 2007) examined the causality between FDI and output growth in Malaysia, but the study found no strong evidence of causal relationship between FDI and economic growth. However, (Omer & Yao, 2011) have empirically analyzed Malaysia annual data (1970 to 2008.) and again proved the bi-directional causality and long-run relationships between inward FDI and economic growth.

Given the conflicting conclusions, this paper chose Malaysia to further discuss the impact of inward FDI activities on Malaysia economic growth by analyzing the 1975–2010 authorized annual statistic data. In the following, Section 2 initially constructs an Endogenous Growth model by deducing Barro’s Production model to unveil potential relevant explanatory variables. In section 3, data and statistic descriptions are presented. Section 4 conducts empirical analysis by examining Unit Root test, Correlation test and Hierarchical Multiple Regressions (HMR) through Eviews 6.0. Some conclusions are drawn in section 5.

1.1 Literature review

The relationship between FDI with some other important parameters such as and political regime and international trade get attract many researchers a round worldwide and get a large and growing literature. (Hanson, Mataloni, & Slaughter, 2001) argues that evidence that FDI generates positive spillovers for host countries is weak. (Mansfield, Milner, & Rosendorff, 2000) find that pairs of democratic countries set lower trade barriers and therefore engage in more open trade relations. (Borensztein et al., 1998), examined empirically the relationship of FDI and economic growth in developing countries. They showed that FDI allowed for transferring technology and for higher growth when the host country had a minimum threshold stock of human capital. (Busse, 2003) use both cross-section and panel data analysis and found that democracy raises FDI inflows in emerging countries. (Méon & Sekkat, 2004), focusing on MENA countries, also examine the relationship between institutions and FDI. (Milner & Kubota, 2005) argue that regime change towards democracy reduces the scope for the political elites to build support upon trade barriers, hence that it is democratization that enhances trade openness. (Bénassy Quérié, Coupet, & Mayer, 2005) examine the institutional determinants of FDI, mainly focusing on ‘institutional quality’ and ‘institutional distance’ concepts. (Kamaly, 2002) found that FDI response to macroeconomic fundamentals is very sluggish stressing the long term impact of macroeconomic policy. (H & Mukherjee, 2007) have argued that democratization leads to skill-biased trade liberalization, as the ruling elites have an interest in reducing the revenues accruing to the middle class as the latter could become a political challenge. (Busse & hefeker, 2007) show that government stability, absence of internal conflict, and basic democratic rights are significant determinants of foreign direct investment inflows. They find that ‘good institutions’ almost always increase the amount of FDI. This effect, they argue, is independent of the effect of GDP per capita. (Meon & Sekkat, 2007) find that institutional quality enhances FDI inflows, although reverse causality might be responsible for the weakening of the statistical relation. Also al (Jallab & Sandretto, 2008) found that macroeconomic stability is essential to translate the impact of FDI on economic growth.
1.2 Model Construction

Firstly, the study reconstructs and dynamically transforms (Barro & Sala, 1997) Production Function into a general production function:

\[ Y_t = \alpha H_t K_t^{1-\alpha} \]  

(1)

In which:

\[ K = \left[ \int_0^N x(j)^{1-\alpha} \, dj \right]^{\frac{1}{1-\alpha}} \]  

(2)

\[ N = n + n^* \]  

(3)

A denotes exogenous economic environmental factor (e.g. evolving of systems, transforming of policies, etc.). H represents human capital. Here assume that human capital H is a given endowment. K is physical capital, consisting of lots of various capital goods, each one being denoted by x(j). The total number of capital goods is N, n out of which is produced by Domestic firms and n* out of which is created by foreign firms. Assume that suppliers rent the unfinished capital goods to final goods producers at a rental rate \( m(j) \). Thus, the optimization condition for the demand of capital good, \( x(j) \), is to equate the marginal cost and the marginal benefit. Then the rental income from selling unfinished products equals the marginal productivity of producing the final goods, that is:

\[ m(j) = \frac{\partial y(j)}{\partial x(j)} = (1 - \alpha)\alpha H^\alpha x^{-\alpha} \]  

(4)

In which:

\[ Y(j) = \alpha H^\alpha X(j)^{1-\alpha} \]

In small or developing countries, technology diffusion mostly attributes to multinational enterprises which hold advanced technology. Thus, to absorb or adopt this kind of technology requires the host countries to offer technical supporting and related infrastructure and this kind of offer is called the fixed costs \( F \). Suppose \( F \) represents the gap between the current domestic foreign capital ratio and the general level of domestic technology (see Eq. 6). Thus, \( F \) depends negatively on the former part \((n^*/N)\) which captures the notion that the bigger the proportion of foreign companies is, the lower the cost of absorbing technology will be. Meanwhile, \( F \) is positive to the latter part \((N/N^*)\), i.e. \( N^* \) represents the number of capital-producing companies from other countries. That is, the worse the host country’s technology is, the lower the absorbing cost would be.

Thus, for each period, the profit function of the unfinished goods supplier comes to:

\[ \hat{\lambda}(j) = \left[ (m(j) - 1)x(j) \right] - F\left( n^*/N, N/N^* \right) \]  

(5)

\[ F = F\left( n^*/N, N/N^* \right) \]  

(6)

\[ \frac{\partial F}{\partial \left( n^*/N \right)} < 0, \quad \frac{\partial F}{\partial \left( N/N^* \right)} > 0 \]

To a certain extent, the unfinished goods supplier, as Monopoly, would set price \( m(j) \) in every period to optimize it’s benefits \( P(j) \). Thus, the derived monopoly price is:

\[ x(j) = H\alpha^2 \left( 1 - \alpha \right)^2 \]  

\[ m(j) = (1 - \alpha)^{-1} \]  

(7)

To dynamically transform it, we can get:
\[
\lambda(j) = \int_0^\infty \left[ \left( m(j) \alpha(j) - x(j) \right) e^{-r(s-t)} \right] ds - F\left( n^*/N, N/N^* \right)
\]

(8)

Suppose there is free entry to produce the unfinished goods, then, from a long-term standpoint, the rate of return tends to be zero. Thus, the interest rate \( r \) can be computed as:

\[
r = A^a \phi(F)^{-1} H
\]

Where \( \phi = \alpha(1 - \alpha)^{2-\alpha} / \alpha \)

(9)

Same like other Endogenous Growth models, this one should also be finalized under some Constraint Condition resolving Consumption Function (Ramsey, 1928) by employing Pontrygain Maximum Principle, that is, to optimize consumers’ utility and realize equilibrium.

Ramsey Consumption Function is:

\[
U_t = \int_1^{\infty} \frac{c_t^{1-\alpha}}{1 - \sigma} e^{-r(s-t)} ds
\]

(10)

Where \( c(t) \) is consumption at time \( t \); \( \rho \) is rate of discount, which indicates the patience of people’s delaying consumption and the higher the \( \rho \) value, the lower the consumers’ evaluation towards future Consumption compared with present consumption; \( \sigma \) is the negative value of the Marginal Effect Elasticity or called relative risk-averse coefficient (\( \sigma > 0 \)). By employing Pontrygain Maximum Principle, the optimal balanced growth path of the whole economic system is obtained:

\[
g = \frac{\partial c(t)}{\partial t} / c(t) = \frac{1}{\sigma} (r - \rho) = \frac{1}{\sigma} \left[ A^a \phi F\left( n^*/N, N/N^* \right)^{-1} H - \rho \right]
\]

(11)

Eq. (11) shows that the balanced economic growth rate \( g \) primarily depends on: the evolving of systems (\( A \)), the human capital accumulation (\( H \)), the cost of introducing/absorbing/imitating advanced technologies (\( F \)), and the value of the time discount rate (\( \rho \)). More specifically, the growth rate \( g \) is positive to \( H \). That is, the higher production efficiency of human capital department is, the bigger the human capital accumulation is, then, the faster the economic growth will be. The growth rate \( g \) is negative to \( F \). As FDI measured by \( n^*/N \) is negative to \( F \), FDI is positive to \( g \), which means the more the host country absorbs FDI, the narrower the technical gap becomes, the lower the cost of acquiring foreign technology is, then the higher the growth rate will be. Moreover, as \( N/N^* \) is positive to \( F \), countries with lower \( N/N^* \) (that produce fewer capital goods than the leading countries) can grow faster through the lower technology absorbing cost. Furthermore, the effect of FDI on \( g \) is positively interacted with the human capital accumulation (\( H \)), that is, the higher the human capital level of the host country, the more the contribution of FDI onto the economic growth rate will be. The growth rate \( g \) is negative to \( \rho \). It means that the higher the current deposit rate (i.e. the more patient that consumers could delay consumption), the higher the growth rate will be.

2. Variables and Data

Based on the theoretical model above, the following basic formulation is utilized to empirically evaluate the effect of FDI on economic growth:

\[
g = c_a + c_1 \text{FGDP} + c_2 H + c_3 \left( \text{FGDP}^* H \right) + Y_a + c_4 \text{TGDP} + c_5 \text{EXR} + \xi
\]
Where, $c_o$ is a country-specific parameter; g indicates the growth rate of annual GDP, representing the growing speed of the country. FGDP is the ratio of annual FDI inflow to annual GDP. Theoretically, FGDP is positive to g, which reflects the effects of Technology Spillovers of FDI on economic growth. H is the human capital accumulation. As there is no authorized method so far in Malaysia to measure human capital and considering the data availability, this study takes the total mean years of schooling as H. Theoretically, if the economic growth belongs to be intensive, H would be positively related to $g$. FGDP*H is the interaction variable of FDI flow and the proportion of public spending on education in annual GDP. If its coefficient is positive, it means that to employ the technology spillovers of FDI needs to combine human capital. Yo is the initial GDP per capita. TGDP is the trade proportion of GDP to roughly reflect the openness of the country. Theoretically, TGDP is supposed to be positive towards $g$. EXR is the real effective exchange rate index (2005 = 100).

The data and statistics used in the study are mainly taken from the World Bank’s World Development Indicators (WDI) & Global Development Financial (GDF) from World Bank website, covering the period 1975-2010, available at http://databank.worldbank.org/ddp/home.do?Step=1&id=4Annual time series data.

3. Results and Discussion

3.1 Unit Root Test

Since most of the economic time series data are unstable, the prerequisite of conducting regression approach is to ensure that the objective time series data is stabilized; otherwise, the obtained regression results would be susceptible. As Unit Root Tests is aimed to test the stationarity of time series data of interest, this section employed the Augmented Dickey-Fuller (ADF) Unit Root Testing approach by running Eviews 6.0. The outputs are provided in Table 1.

Table 1: Augmented Dickey-Fuller Unit Root Test

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF Test Statistic</th>
<th>Significance level and critical value</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>-3.940153</td>
<td>1% Critical Value: -3.6353</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5% Critical Value: -2.9499</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% Critical Value: -2.6133</td>
</tr>
<tr>
<td>FGDP</td>
<td>-2.476566</td>
<td>1% Critical Value: -3.6353</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5% Critical Value: -2.9499</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% Critical Value: -2.6133</td>
</tr>
<tr>
<td>LNFGDP</td>
<td>-2.684991</td>
<td>1% Critical Value: -3.6353</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5% Critical Value: -2.9499</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% Critical Value: -2.6133</td>
</tr>
</tbody>
</table>

The results show that the ADF Test Statistic of the annual GDP growth rate g is -3.940153, which is less than all the critical values at the three levels of 1%, 5% and 10%, thus, the NULL hypothesis of no unit root should be accepted, that is, this time series does not exist unit root and it is stable. The ADF Test Statistic of FGDP (the ratio of annual FDI inflow to annual GDP) is -2.476566, which is even larger than the 10% critical value of -2.6133. Thus, the NULL hypothesis of no unit root should be rejected, which means there does exist unit root and this time series is unstable. Thus, loginization of the time series noted as LNFGDP was resorted for further ADF Test. From the new result it can be seen that the ADF observation of LNFGDP, -2.684991, is at last smaller than the critical value -2.6133 at 10% level. Thus, it can be said that LNFGDP do not exist unit root, that is, LNFGDP series is stable now.

3.2 Co-integration Test

After ensuring the stationarity of series g and LNFGDP, this section considers cointegration test, which helps to check whether or not the linear combination of the variables is stationary, or in other words, whether or not there is
an equilibrium or long-term relationship between them. Below, Johansen co-integration method is employed and the output from running Eviews 6.0 is presented in Figure 1.

![Fig.1. Johansen Co-integration Test Result](image)

The up part of Figure 1 offers the basic information of processing Johansen cointegration test, amongst which the lags interval was set from period 1 to period 3. The following two rows firstly verify whether there is no long-term equilibrium relation. Since the probability rate (likelihood ratio) 26.04037 is higher than the critical value 20.04 at the significance level of 1%, it is proved that the two variables do have co-integration relationship. Secondly, the rows verify the NULL hypothesis “whether there at most exists one co-integration vector”. The probability rate (likelihood ratio) 6.708346 is even larger than 6.65 at the significance level of 1%, thus, the Null hypothesis is accepted. The Normalized Co-integrating Coefficients result shows the normalized cointegrating vectors under the precondition of one existing co-integration relation, that is, \( g = -0.633 + 5.555 \text{LNFGDP} \).

3.3 Hierarchical Multiple Regressions (HMR)

Analysis Finally, the role of FDI inflows in Malaysia economic growth was identified through Hierarchical Multiple Regressions (HMR) Analysis. HMR is conducted by entering variables one by one into the regression equation. In this way, it allows to examine the contributions before and beyond the first group of independent variables. Thus, by observing the changing processes and comparing the different induced results, it could clearly discover any strengthening or weakening effects behind the general regression relationship analysis. Table 2 displays the obtained results in detail.
Table 2: Analysis on FDI and decisive factors in economic growth

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constant</td>
<td>1.647101</td>
<td>-16.18851**</td>
<td>-29.36245</td>
<td>-40.68387</td>
<td>-32.86707</td>
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<tr>
<td></td>
<td></td>
<td>(1.250171)</td>
<td>(-3.467541)</td>
<td>(-1.384852)</td>
<td>(-1.663888)</td>
<td>(-0.603803)</td>
</tr>
<tr>
<td></td>
<td>LNFGDP</td>
<td>3.738556**</td>
<td>11.57055**</td>
<td>22.06650</td>
<td>26.63039</td>
<td>22.18091</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.804272)</td>
<td>(4.367251)</td>
<td>(1.324348)</td>
<td>(1.522692)</td>
<td>(0.661060)</td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>0.922310*</td>
<td>2.407076</td>
<td>4.118271</td>
<td>2.914309</td>
<td>7.643710</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.108799)</td>
<td>(1.015970)</td>
<td>(1.379889)</td>
<td>(0.368658)</td>
<td>(1.221569)</td>
</tr>
<tr>
<td></td>
<td>H*FGDP</td>
<td>-0.406880</td>
<td>-0.563615</td>
<td>-0.417425</td>
<td>-1.333304</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.639158)</td>
<td>(-0.849564)</td>
<td>(-0.355612)</td>
<td>(-1.346708)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yo</td>
<td></td>
<td>0.002582</td>
<td>-0.001807</td>
<td>-0.002197</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-0.959532)</td>
<td>(-0.323815)</td>
<td>(-0.552850)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.4081)</td>
<td>(0.7708)</td>
<td>(0.6785)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tgdp</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>R2</td>
<td>0.298571</td>
<td>0.833484</td>
<td>0.848915</td>
<td>0.884394</td>
<td>0.886068</td>
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<tr>
<td></td>
<td>Adjusted R2</td>
<td>0.277941</td>
<td>0.766878</td>
<td>0.735601</td>
<td>0.730253</td>
<td>0.601239</td>
</tr>
<tr>
<td></td>
<td>Prob(F-statistic)</td>
<td>0.000056</td>
<td>0.011315</td>
<td>0.040580</td>
<td>0.091451</td>
<td>0.260960</td>
</tr>
<tr>
<td></td>
<td>Sample size</td>
<td>36</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

To Note: 1) All results are derived from Eviews3.1. The numerical value in ( ) represents the corresponding coefficient’s T-statistic and Prob. respectively. 2)* and ** indicate the significance at the significant level of 5% and 1%, respectively.

In Model I (Table 2), LNFGDP is the solo explanatory variable. According to the result, it is significantly and positively related to g at 1% significant level. Model II enters H, which is also significantly and positively related to LNFGDP at the significance level of 5%; meanwhile LNFGDP keeps same significance and positive sign. But from Model III to Model VI, since the variable H*FGDP was added in, LNFGDP and H lost their significance and no significances of other variables appear. More particularly, the signs of H*FGDP and Yo keep being negative. The results of R2 continue increasing from Model I (0.299) to Model VI (0.971), which means as more variables entered the momentum of the economic growth of Malaysia with the role of FDI inflows included are better and better regressed. And from Prob (F-statistic), it can be recognized that most of the Models (Model I-IV) are robust. In the following are the more specific indications.

The ratio of annual FDI inflow to annual GDP has a significant and positive impact on the growth rate of annual GDP. Referring to Model I, the estimated coefficient (3.74) of the logarithm of FGDp implies that the share of inward FDI in GDP increases 1%, the annual GDP will correspondingly increase 3.74% through technology spillovers. But the R2 (0.299) is quite low.
Comparing with Model II when H added in, the R2 surges to 0.833, which means the change of Independent Variable (LNFGDP and H) explained almost 83% of the change of the dependent variable (g). This indicates that FDI inflows together with the host country’s human capital development contribute strongly to the host country’s economic growth.

The interaction variable of the ratio of FDI inflows to GDP and the ratio of the public spending on education in GDP has estimated a negative coefficient once added into the models. It means that the technology spillovers of FDI inflows are still not sufficiently combined with human capital to contribute to the economic growth. Thus, it needs more efforts of authorities to accumulate national human capital to attract and serve for FDI inflows to contribute to the national economy.

The initial GDP per capita variable (Yo) represents the initial income. In these models, the obtained coefficient appears to be negative, which is theoretically conflict as there has no obvious population boom (annual population growth rate is round 2-3%) in Malaysia during the time series period. Moreover, if further checking, the co-relation between the growth rate g and Yo shows positively strong. Thus, it implies that the original positive effects of Yo on economy is over-offset by other variables under these models.

The trade proportion of GDP (TGDP) and the the real effective exchange rate index (EXR) are both positively related to g. But their coefficients of 0.043 and 0.131 are quite small compared with the coefficients of LNFGDP (50.399) and H (7.644), which means the openness and the foreign exchange environment in Malaysia are favorable to the national economic development, although their contributions to the economy are limited.

4. Conclusion

This paper examined the effect of FDI inflows on economic growth in the case of Malaysia based on a deducted endogenous growth model. Statistical analyses were carried out through a systematical way of Unit root test, Johansen Co-integration test and Hierarchical Multiple Regressions. The time period was renewed from 1975 up to 2010. It was found that the larger part of effects onto the host country’s economic growth attribute to the FDI inflows together with the human capital accumulation. However, the technology spillovers of FDI inflows are still not sufficiently associated with human capital to contribute to the economic growth. Thus, it suggests government commit more political and fiscal supports in developing national human capital to attract and better serve for FDI inflows which would in turn to contribute more to the whole country’s economy. Moreover, the openness of the economy and the foreign exchange environment are favorable to the growth of Malaysia economy, thus, shall continue moving in the track.

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