Do public investment and FDI crowd in or crowd out private domestic investment in Malaysia?

James B Ang, Nanyang Technological University
Do public investment and FDI crowd in or crowd out private domestic investment in Malaysia?

James B. Ang *

* Department of Economics, Monash University, Vic 3145, Australia

First Published: March 2009
Do public investment and FDI crowd in or crowd out private domestic investment in Malaysia?

James B. Ang

Department of Economics, Monash University, Vic 3145, Australia
E-mail: james.ang@buseco.monash.edu.au

Motivated by the concern of a persistent decline in total investment in Malaysia during the post-crisis era, this article examines the long-run relationship between private domestic investment (PDI), public investment and foreign direct investment (FDI) in Malaysia. Using multivariate cointegration techniques, the results indicate a fairly robust cointegrated relationship between these variables during the period 1960 to 2003. Both public investment and FDI are found to be complementary to, rather than competing with, PDI.

I. Introduction

There has been a sharp decline in total investment in Malaysia following the onset of the Asian financial crisis in 1997–98. This decline has emanated predominantly from private investment while public investment is boosted as part of the crisis management programme. However, it is not clear whether such government pump-priming efforts are complementary to or competing with capital formation in the private sector. Therefore, this pattern of development has become a major concern of researchers and policy makers, and this warrants an investigation into the relationship between private and public investment in Malaysia.

In an influential study, Aschauer (1989) shows that an expansion in public investment leads to higher rate of return of private investment, thereby stimulating private investment in the United States. Hence, a crowding-in effect of public investment is found.

Following the seminal work of Aschauer (1989), a number of studies have investigated the relationship between private and public investment. While most studies find a positive impact of public investment, a negative effect is found in several cases. Against this backdrop, this article investigates the debatable issue of whether public investment complements or displaces capital formation in the private sector in the light of the Malaysian experience, over the period 1960 to 2003. It is hoped that the results of this study will add to our understanding of the subject issue.

Empirical studies on this issue have so far focused on analysing the broad relationship between private and public investment. However, for a large foreign direct investment (FDI) recipient country like Malaysia, the separation of FDI from private investment is necessary to avoid aggregation bias. Hence, the analysis in this article considers PDI, public investment and FDI, where private domestic investment is defined as private investment less FDI.

This article proceeds as follows. Section II provides an overview of the trends and patterns of investment in Malaysia. Model and data are described in Section III. Section IV sets out the econometric techniques employed in this study. The results are presented and analysed in Section V and the last section concludes.

II. Trends and Patterns of Investment

Policy context and investment patterns

This section describes investment behaviour in Malaysia over the period 1960 to 2003. After achieving independence in 1957, the country inherited a relatively well-developed infrastructure and an efficient administrative system from the British government, which appeared to be conducive for capital formation. Given that capital formation is an important driver for sustained economic development, the Malaysian government enacted the Pioneer Industries Ordinance of 1958 to stimulate private investment. Malaysia started 1960 with a moderate level of both private and public investment where the shares of private and public investment in GDP were 8.2 and 1.9%, respectively. However, this total investment rate of 10.1% was much lower than the average of lower and middle income countries which stood at 21.3% in the same year. The total investment rate in Malaysia increased rapidly to about 17% by the mid-1960s, prior to declining in the late 1960s due to the higher economic uncertainty triggered by the racial riots of 1969.

The government attributed the poor performance of investment activities to inadequacies of the 1958 Ordinance, and many of its weaknesses were corrected in the Investment Incentives Act of 1968. The 1970s saw a massive increase in capital formation, reaching a record high level in the early 1980s. Nevertheless, investment rates were significantly curtailed when the global economic recession hit the country in 1985. Confronted with huge government budget deficits and current account deficits following the recession, as well as decreasing domestic and foreign investment, Malaysia began to grant attractive investment incentives to attract local and foreign investors through the Promotion of Investment Act 1986.

Composition of investment

Figure 2 reflects the shares of FDI, PDI and public investment in total investment. Private investment (which includes both FDI and PDI) accounted for more than 80% of the total in 1960. This share declined dramatically over the next two decades before picking up again in the 1980s. On the whole, private investment dominated total investment in

---

2 For an analysis of the dynamic relationship between domestic saving and investment rates in Malaysia, see Ang (2007a).

3 Ang and McKibbin (2007) provide an analysis of the dynamic relationship between financial development and economic growth in Malaysia. Their results show that financial depth and economic development are positively related. Similar findings are also obtained by Ang (2007b).
Malaysia prior to the 1997–98 crisis. However, as would be expected, the share of private investment declined sharply after the crisis. From the above analysis, it appears the behaviour of investment in Malaysia is predominantly influenced by private, rather than by public investment, except when the latter is counter-cyclical. Noticeably, the post-crisis investment contraction has been entirely driven by a decline in private investment.

Inflows of FDI constitute an important component of total domestic investment given that Malaysia is one of the most successful developing countries in attracting a large amount of FDI. According to the inward FDI potential index (a measure of the attractiveness of the host economy to foreign investors) published by UNCTAD (2004), Malaysia was ranked first among the Asian developing countries in 2003. The importance of FDI to domestic economic development is therefore undeniable. Hence, the separation of FDI from private investment is necessary.

III. Model and Data

It is a widely accepted view that public investment \( \text{PUB}_t \) may be complementary to, rather than competing with, private investment in developing countries. Public investment may facilitate and stimulate private investment through the provision of infrastructural support (Sundararajan and Thakur, 1980; Blejer and Khan, 1984; Greene and Villanueva, 1991). This can raise the productivity of capital, and expand the overall resource availability by increasing output. On the other hand, public investment may also crowd out private investment. This occurs when additional public investment requires raising future tax and domestic interest rates, or if the public sector produces investment goods that directly compete with private goods. In addition, the utilization of additional physical and financial resources, which would otherwise be available to the private sector, may also depress private investment (Blejer and Khan, 1984; Aschauer, 1989). Thus, it appears that economic theory provides no \textit{a priori} argument for or against the effect of public investment on private investment.

FDI can have both positive and negative effects on \( \text{PDI} \). It can stimulate domestic investment by providing new investment opportunities for local firms through the provision of machinery and technology which cannot otherwise be produced domestically (Sun, 1998). Local firms can emulate the new technology introduced by foreign firms, which may stimulate domestic investment (Noorzoy, 1979). Besides, an increase in domestic investment is likely to be accompanied by an increase in FDI inflows when there are more joint venture activities between local firms and foreign firms (Jansen, 1995). FDI may also contribute to higher domestic investment through introducing new industries to the host country (Lipsey, 2004). In this way, FDI and \( \text{PDI} \) are complementary to each other.

On the other hand, FDI may crowd out domestic investment if foreign firms compete with local firms for the use of domestic scarce resources, such as skilled labour, financial resources, etc. (Jansen, 1995). FDI may also disrupt backward linkages in domestic manufacturing through the substitution of imports for domestic goods. Furthermore, FDI may substitute for domestic investment if foreign firms have an edge in technological or managerial expertise, or tax benefits provided by the host country (Noorzoy, 1979). These new technologies embodied in FDI may accelerate technological obsolescence of traditional technologies used in developing countries and therefore crowd out domestic investment (Kim and Seo, 2003; Lipsey, 2004).

These suggest that the effects of FDI on \( \text{PDI} \) may vary from country to country, depending on the types of FDI, the trade policies adopted in the host country, and the strengths of the domestic firms. Therefore, the impact of FDI inflows on \( \text{PDI} \) is ultimately an empirical matter.

The above theoretical considerations lead to formulation of the following empirical specification of the long-run \( \text{PDI} \) equation:

\[
\text{PDI}_t = f(\text{PUB}_t, \text{FDI}_t)
\]  

where \( \text{PDI}_t \) is the steady-state private domestic investment, \( \text{PUB}_t \) is public investment and \( \text{FDI}_t \) refers to foreign direct investment. The expected signs on \( \text{PUB}_t \) and \( \text{FDI}_t \) are indeterminate.
Three dummy variables are incorporated into the above specification to account for the racial riots in 1969, the global economic recession that hit Malaysia in 1985–1986, and the 1997–1998 Asian financial crisis, defined as:

\[ D_{69} = \begin{cases} 1 & \text{if } t = 1969 \\ 0 & \text{otherwise;} \end{cases} \]

\[ D_{85-86} = \begin{cases} 1 & \text{if } t = 1985 - 86 \\ 0 & \text{otherwise;} \end{cases} \]

\[ D_{97-98} = \begin{cases} 1 & \text{if } t = 1997 - 98 \\ 0 & \text{otherwise} \end{cases} \]

Private investment is measured by gross fixed private capital formation, public investment (PUB), is measured by gross fixed public capital formation, and private domestic investment (PDI) is measured by private investment minus foreign direct investment (FDI). FDI includes equity capital, reinvested earnings, and other short- and long-term capital. It represents the net inflows of investment to acquire a lasting interest in an enterprise operating in the Malaysian economy.

Annual data covering the period 1960 to 2003 are used in the analysis. The data series are directly obtained or compiled from the domestic sources, including the Money and Banking in Malaysia (BNM, 1994) of Bank Negara Malaysia and various issues of Monthly Statistical Bulletin of Bank Negara Malaysia. Logarithms are taken on all the investment series for the usual statistical reasons, and to express in real terms, these series are deflated by the gross capital formation deflator.

However, it must be highlighted that the estimation for PDI may be subjected to some measurement issues, since the data sources for private investment are not compatible with those obtained for FDI. In Malaysia, like many other countries, data on private investment are obtained directly from the national account statistics. Data on FDI are taken from the balance of payment accounts, which are estimated by BNM using capital flow data from commercial bank records, and supplemented by information directly obtained from a company survey on reinvested earnings of foreign-invested firms (multi-national enterprise subsidiaries). Although the incompatibility of data sources may be a concern, it is unlikely to distort the estimation results significantly.

IV. Methodology

The objective of our empirical estimation is to examine how the variables are related in the long-run.

We construct a trivariate vector autoregressive (VAR) model for the estimation purpose. The testing procedure involves three steps. We begin by performing an integration analysis using the augmented Dickey–Fuller (ADF) test. The second step is to test for cointegration using the Johansen approach for the VARs constructed in levels. If cointegration is detected, the third step is to estimate the long-run relationship in a vector error correction framework.

We begin our analysis by maintaining the assumption that the data generating process for the relationship between PDI, PUB, and FDI is a log-linear VAR model at levels. The use of a VAR model is appropriate in this case since the underlying variables may be endogenous. The VAR model is given as:

\[ x_t = \mu + \sum_{j=1}^{p} \phi_j x_{t-j} + \epsilon_t \]  

where \( x_t = [\text{PDI}_t, \text{PUB}_t, \text{FDI}_t]' \), \( \mu \) is a vector of constant terms where \( \mu = [\mu_{\text{PDI}}, \mu_{\text{PUB}}, \mu_{\text{FDI}}]' \) and \( \phi_j \) is a matrix of VAR parameters for lag \( j \). The vector of error terms \( \epsilon_t = [\epsilon_{\text{PDI}}, \epsilon_{\text{PUB}}, \epsilon_{\text{FDI}}]' \sim \mathcal{IN}(0, \Omega) \), where \( \Omega \) is the variance-covariance matrix of the residuals.

The VAR model in Equation 2 can be transformed into a vector error correction model (VECM) after some mathematical manipulation, as given in Equation 3.

\[ \Delta x_t = \mu + x_{t-1} + \lambda \sum_{j=1}^{p-1} \gamma_j \Delta x_{t-j} + \epsilon_t \]

where \( \Delta = 1 - L \), \( \lambda \) is the long-run multiplier matrix.

The above econometric specification hinges upon the assumption that the disturbance term \( \epsilon_t \) is serially uncorrelated. Hence, it is critical to ensure that optimal lag order \( p \) of the underlying VAR is chosen appropriately in order to strike a satisfactory balance between the two competing concerns, in which the lag order is high enough to ameliorate the residual serial correlation problems while low enough so that the estimation is not subjected to over-parameterization problems. This is particularly important given that a small sample is used in the estimation of this study.

V. Results

The ADF test results are reported in the Table 1 show that all variables are nonstationary in their levels but become stationary after taking the first difference. Hence, we conclude that all series are I(1) at the 5% level of significance.
Table 1. Augmented Dickey–Fuller tests

<table>
<thead>
<tr>
<th></th>
<th>Levels</th>
<th>First-difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDI&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-1.972&lt;sup&gt;*&lt;/sup&gt;</td>
<td>-5.775***</td>
</tr>
<tr>
<td>PUB&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-2.667&lt;sup&gt;*&lt;/sup&gt;</td>
<td>-8.091***</td>
</tr>
<tr>
<td>FDI&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-3.160&lt;sup&gt;*&lt;/sup&gt;</td>
<td>-8.491***</td>
</tr>
</tbody>
</table>

Notes: AIC is used to select the lag length. The maximum number of lags is set to be four.
*** Indicates 1% level of significance.

Given that PDI<sub>t</sub>, PUB<sub>t</sub>, and FDI<sub>t</sub> share common integration properties, we can now proceed to testing for the presence of a long-run cointegrating relationship between the variables. Since the Johansen approach is sensitive to the lag length used, we conduct a series of nested likelihood ratio tests on first-differenced VARs to determine the optimal lag length (<i>p</i>) prior to performing cointegration tests. Given the sample size, we have considered a maximum lag length of 4. The optimal lag length is found to be 2. To provide some robustness checks, we have also reported results from lag 1 to lag 4. Cointegration tests are performed for each VAR models at levels. In Table 2, both the results of trace test and maximum eigenvalue test unanimously point to the same conclusion that there is one cointegrated equation, irrespective of the choice of lag length.

Table 2 presents the cointegrating vectors and speed of adjustment coefficients for each model. Multivariate normality test shows that the residuals are Gaussian for each model, except for Model D which assumes four lags. Lagrange Multiplier (LM) tests are performed to examine for evidence of serial correlation in the residuals. The results show that there is no evidence of serial correlation in each model up to the third order. By normalizing the coefficient of PDI<sub>t</sub> to 1, we obtain the long-run elasticities of PDI<sub>t</sub> with respect to other variables. Both PUB<sub>t</sub> and FDI<sub>t</sub> enter the equation significantly when one or two lags are assumed. However, only FDI<sub>t</sub> is statistically significant when three or four lags are used. Hence, it appears that the results produced based on three or four lags are less robust. This is probably due to the small sample size used in the estimation. In the remaining discussion, we will focus on the results based on two lags (i.e. Model B), which is the preferred model chosen based on the likelihood ratio tests.

The coefficients on ECT<sub>t-1</sub> are statistically significant at the 5% level in all models and have the correct sign, providing further evidence for the use of a VECM framework. In Model B, PDI<sub>t</sub> adjusts at the speed of 30% every year, or it takes about 3.3 years, to restore equilibrium when there is a shock on the steady-state PDI relationship.

There is evidence that public investment crowds in PDI. Specifically, a one percentage point increase in public investment will result in a 0.281 percentage point increase in PDI. The finding of a crowding-in effect from government investment is in line with a majority of the empirical studies, including Aschauer (1989) and Erenburg (1993) for the United States, Greene and Villanueva (1991) for 23 developing countries, Shafik (1992) for Egypt, Odedokun (1997) for 48 developing countries, Laopodis (2001) for three newly industrialized countries, Athukorala and Sen (2002) for India and Narayan (2004) for Fiji, which have consistently found public investment to play a complementary role in private domestic capital formation. Hence, this finding is not unique to the Malaysian experience.

Public investment expenditure has been used in Malaysia as a key policy tool to stimulate economic growth, particularly after the Asian financial crisis. The evidence obtained in this study seems to suggest public investment is complementary to private investment given that a rise in government investment is associated with an increase in private sector investment. Hence, the ongoing pump-priming efforts made by the Malaysian government to revive total investment appear to be effective for private capital formation. The sharp decline in private investment during the post-crisis period may be attributable to other factors.

The coefficient on FDI<sub>t</sub> is statistically significant with a positive sign. In particular, a 1% increase in FDI inflows will lead to a 0.985% increase in PDI. Using the likelihood ratio tests, the restriction of one for the parameter on FDI<sub>t</sub> cannot be rejected at the 1% level for Model B, suggesting that the crowding-in effect of FDI appears to be one-to-one.

The results that FDI has a complementary role to play in domestic capital formation are consistent with the findings of van Loo (1977) and Noorzoy (1979).

By examining the sectoral composition of FDI in Malaysia, Min (2003) found that FDI in the manufacturing industry has increased the speed of the relocation of labour from the nontradable to the tradable sectors. This may have enhanced export capacity and therefore benefited capital formation in the private sector. The crowding-in effect observed in Malaysia may imply that the domestic financial markets are not too tight. In cases where there are difficulties in raising funds in the domestic market, a crowding-out effect is likely to be observed (Jansen, 1995).

The dummy variables which capture the effects of the racial riots of 1969, i.e. $D_{89}$, global economic recession, i.e. $D_{85–86}$ and the Asian financial crisis, i.e. $D_{97–98}$, are found to be statistically insignificant and therefore excluded in the estimation.

### VI. Conclusions

This article examines the long-run cointegrating relationship between PDI, public investment and FDI in Malaysia for the period 1960 to 2003.

---

**References**


