Nexus of Foreign Direct Investment, Domestic Investment, Trade on Economic Growth: A Cointegration Analysis

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ABSTRACT

Objective: As Malaysia is an upper-middle-income country since 1992, it aspires to achieve high-income nation status by 2028. This paper aims to examine the interrelation of foreign direct investment inflows (FDI), domestic investment (GFCF), trade openness (TO), and economic growth (GDP) in Malaysia from 1979 to 2019.

Methodology: The econometric model and techniques applied are unit root test, Johansen-Juselius co-integration analysis, and vector error correction mechanism. The unit root test result indicated the stationarity of all series at the first difference.

Findings: Subsequently, co-integration analysis depicted a presence of one co-integration among the series at 5% level of significance, thus VECM is an appropriate technique to apply. In the long run, VECM findings indicated 1% increase in FDI caused a decline in GDP by 0.1338%, while 1% increase in GFCF will increase GDP by 0.8136%. Also, GDP has a weak unilateral effect on FDI in the short run based on VECM causality findings.

Implications: This paper certainly provides new literature and evidence for the Malaysian context through advanced techniques applied.

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Introduction

Malaysia has successfully leapfrogged from an agricultural economy-based to an open and industrialized economy. Now, Malaysia is a transition to become a high-income nation with required bold and targeted policies (BNM, 2020). In the past, the economic transformation in Malaysia was primarily due to the success of effective policies underpinned by strong investment from both foreign and domestic sources (BNM, 2020). Foreign and domestic investments are crucial to Malaysian economic growth over the years. However, past commendable investment growth rate in Malaysia has markedly slower in recent years due to tight competition in attracting FDI globally (BNM, 2021). In recent years, the domestic investment
plunging from being modest over the last decades. The recorded growth of private investment was the lowest in 2019 since the Global Financial Crisis due to expansion of investment by only 1.5% (BNM, 2020). Also, real gross fixed capital formation declined to 0.3% in 2019, and it further impacted in 2020 due to strict local containment measures during pandemic that led to supply and demand shocks (BNM, 2021).

In 2019, FDI remained sustained, although investments by private and public sectors were affected with an uncertain global outlook and weakening in the domestic property market. The net FDI inflow account registered in 2019 at RM9.4 billion declined from RM11.3 billion in 2018 due to subdued global sentiments. A recent slowdown in capital expenditure is not unique to Malaysia since the trend in global FDI growth has been lackluster since 2008 due to weak growth performance, geopolitical tensions, and policy uncertainty bouts in most economies (BNM, 2020). Moreover, the Great Lockdown in 2020 has been the worst economic downturn due to coronavirus that has slowed down Malaysian economic growth than during the Asian financial crisis (BNM, 2021). Although investors from China have halted and revised most of the contracts signed with Malaysia in the past years, World Bank (2021) ascertained that Malaysia should attract more quality FDI to sustain its competitiveness and maximize local benefits (MIDA, 2021). However, BNM (2020) affirmed there is evidence that quality investments diminished over the last decades since lack of quality in investment can impede the transition progress of Malaysia (BNM, 2020). Hence, this paper is motivated to analyse the linkage between FDI, domestic investment, trade, and economic growth in short and long-run. By using VECM technique, this paper aims to provide new evidence and literature in the relevant field of study.

**Literature Review**

Numerous studies provide contradictory and ambiguous findings about the linkage between FDI, domestic investment, trade, and economic growth. For Malaysia case, some studies ascertained FDI is one of primary sources for its economic growth (Azam, Khan, & Bakhtyar, 2017; Mustafa, Hassan, Hassan, & Zainudin, 2021). That implies attracting more quality foreign investors to invest in the country could reinforce its development to become a high-income nation (Awad, 2020). Moreover, ASEAN+3 countries were considered successful in attracting FDI as one of the integral parts of the global economy in augmenting the social and economic development process (Lee & Huruta, 2020). Multinational companies (MNCs) are critical to transfer FDI positive externalities and technological advances to sustain the country’s economic growth (Aribowo, Boaeng, Nisar, Wu, & Hua, 2018). In contrast, FDI has no long-run equilibrium relationship with economic growth (Vlatka Bilas, 2019). Also, economic growth will become slower if attracting more foreign investors due to many benefits reaped by the foreign countries that could disrupt the competition edge (Meivitawanli, 2021; Sharma, Kaur, Sharma, & Sandhu, 2020).

Moreover, various studies support domestic investment is significant and positively influence economic growth (Kutasi, Lorincz, & Szabó, 2019; Mohamed, Liu, & Nie, 2021). In the long run, it was revealed that domestic investment positively impact economic growth in Malaysia, however, become insignificant in the short run (Bakari, 2017). However, some argues that domestic investment is significant and positively influence the Malaysian economic growth in both short and long run (Alzaidy, Ahmad, & Lacheheb, 2017). The effectiveness of domestic investment in strengthening the Malaysian economic growth due to excellent technological development and infrastructure (Bakari, 2017). Numerous recent studies support the claim of the trade-induced or export-led growth hypothesis based on co-integration analysis results (Anaman, 2018; Lee & Huruta, 2020). In Malaysia, trade has a positive relationship with economic growth since MNCs prefer to export to Malaysia rather than invest due to its strategic geographical location as it is an open economy (Awad, 2020; Bakari, 2017). However, some studies argue trade negatively associated with economic growth since the trade openness could hinder economic growth in the long run (Cakerri, Muharremi, & Madani, 2020).
Most studies provide evidence on the positive bidirectional causality between FDI and GDP in most Asian developing countries (Ali & Mingque, 2018). Besides, FDI and domestic investment indicated a strong bidirectional causality with GDP in the long run (Abdul Rahim, Nor Asmat, & Abdul Fattah, 2017). In contrast, several studies obtained unidirectional causality from FDI to GDP (Cakerri et al., 2020; Sothan, 2017), whilst GDP has unidirectional causality on FDI in the long term (Joshua, Adedoyin, & Sarkodie, 2020). Some studies found FDI and GDP have no causal relationship in the short run (Sothan, 2017). Also, a study showed domestic investments have unidirectional causality to the GDP in both short and long run (Sothan, 2017). Besides, some studies ascertained FDI has a bilateral effect on domestic investments in the long term. Also, Malaysia’s GDP has unidirectional causality with FDI that implies strengthening its economic growth would attract more inward FDI to reap the positive spillover and potentially reinforce outward FDI indirectly (Al-Shawaf & Almsafir, 2016). Due to inadequate literature review for the Malaysia case, this paper aims to fill the literature gap by using recent data and VECM approach to investigate and discuss the relationship between macroeconomic variables in both short and long run.

**Research Methodology**

**Data and Variables**

A total of 41 years of time series data were gathered from 1979 to 2019 that obtained from UNCTAD for FDI inflows, and the World Development Indicator for the gross domestic product (GDP), gross fixed capital formation (GFCF), and trade openness (TO) data. The indicator used for GDP is GDP per capita data measured as GDP divided by midyear population in constant 2010 USD. FDI is the net inflows of investment from the reporting economy to another economy in the balance of payments (BOP), current USD. The variable GFCF is a proxy domestic investment measured in constant 2010 USD, and variable TO is a sum of exports and imports of goods and services divided by GDP.

**Econometrics Model**

The endogenous growth model introduced by Barro and Sala-i-Martin (1995) is applied. The model extent the Cobb-Douglas production function by introducing the standard augmented Cobb-Douglas production function with FDI as an additional variable in the extended production function along with capital and labour as specified in the Equation (1) (Abdul Rahim et al., 2017).

\[ Y_t = \alpha_0 K^{\alpha_1} L^{\alpha_2} FDI^{\alpha_3} e^{\mu_t} \]  

(1)

where \( Y_t \) is output, \( K \) is capital, and \( L \) is labour. \( \alpha_0, \alpha_1, \alpha_2 \) and \( \alpha_3 \) are the coefficients, \( \mu_t \) is a stochastic error term, and \( e \) is the base of natural logarithm. From the Equation (1), the model is log-transform and extended to include the selected variables as expressed in the Equation (2).

\[ \log(GDP_t) = \beta_0 + \beta_1 \log(FDI_t) + \beta_2 \log(GFCF_t) + \beta_3 \log(TO_t) + \mu_t \]  

(2)

where \( \beta_0 \) is an intercept coefficient. \( \log(GDP_t), \log(FDI_t), \log(GFCF_t), \) and \( \log(TO_t) \) is the natural logarithm of GDP, FDI, GFCF, and TO at time \( t \), respectively. \( \beta_1, \beta_2, \) and \( \beta_3 \) are slope coefficients for the respective variables, and \( \mu_t \) is the error term.

**Estimation Procedures**

The augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test are applied to examine the stationarity of all series. The ADF formula is expressed as in Equation (3).

\[ \Delta Y_t = \beta_1 + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \epsilon_t \]  

(3)

Where \( \Delta \) is the changes and \( Y_t \) refers to all four series (GDP, FDI, GFCF, and TO). \( Y_{t-1} \) refers to the lagged value of all four series by one year. \( \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} \) is an augmented term, where \( m \) is the number of lag length. Parameter \( \beta_1 \) (a constant) and \( \delta \) are estimated, and \( \epsilon_t \) is the error term. Also, PP test is a non-
parametric test where it allows to estimate the smaller sample size precisely. The Equation (4) expresses the PP formula.

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \varepsilon_t$$  \hspace{1cm} (4)$$

where $\Delta Y_t$ is the first difference of series $LGDPT_t$, $LFDI_t$, $LGFCF_t$, and $LTO_t$. $Y_{t-1}$ is the lagged value of series $LGDPT_t$, $LFDI_t$, $LGFCF_t$, and $LTO_t$ by one year. Parameter $\delta$ refers to the coefficient of lagged $Y_{t-1}$ is estimated and $\varepsilon_t$ is an error term. Before delving into further analysis, the optimal lag length is chosen based on the lowest value of SIC using VAR model because it treats all the variables endogenously in a system of equation. The Equation (5) shows a general VAR model equation with $p^{th}$ order.

$$γ_t = ω + A_1γ_{t-1} + A_2γ_{t-2} + A_3γ_{t-3} + \cdots + A_pγ_{t-p} + U_t$$  \hspace{1cm} (5)$$

where $γ_t$ is a $4 \times 1$ vector of the endogenous variables (GDP, FDI, GFCF, and TO), $ω$ is the $4 \times 1$ vector of constant terms, $A_i$ is the $4 \times 4$ autoregressive matrices with $i = 1, ..., p$ where $p$ is the lag length, and $U_t$ represent the $4 \times 1$ vector of the residuals at time $t$. VAR model in Equation (5) can be rewritten in the general VECM equation as shown in the Equation (6).

$$\Delta Y_t = ω + Πγ_{t-1} + \sum_{i=1}^{p-1} \Gamma_i ΔY_{t-i} + \varepsilon_t$$  \hspace{1cm} (6)$$

where $Π = -(I - \sum_{i=1}^{p} A_i)$, $\Gamma_i = -\sum_{j=i+1}^{p} A_j$, $ω$ is a vector of constant terms, and $\varepsilon_t$ is a vector of residuals at time $t$. The matrix $Π$ represents the relationship between variables in a long-run. If all endogenous variables in $γ_t$ are co-integrated of order one or rank($Π$) = 1, there is a single co-integrating vector. The expression $Πγ_{t-1}$ is the error-correction term (ECT). The co-integrating rank, $r$, is given by rank of $Π = αβ'$ in which $α = (α_1, α_2, ..., α_n)$ is the $k \times r$ correction matrix that represents as the speed of adjustment parameter, and rank $β = r < k$ with $k = 4$ represents the number of endogenous variables. $β'$ is the co-integrating vector of $β = (β_1, β_2, ..., β_n)$ with a matrix of $k \times r$. Meanwhile, $Γ_i$ is endogenous coefficients of variable $i$ in a matrix order of $4 \times 4$ that consists of $ΔY_{t-i}$ as the endogenous vector variables with its lagged values of $i = 1, 2, ..., p - 1$, where $p$ is lag length. If it was found $1 < \text{rank}(Π) < n$, then it has multiple co-integrating vectors, whereas $r = n$ shows the variables are not co-integrated.

Both the trace and maximum-eigen value tests are employed to examine the co-integrating equations among variables. The trace ($λ_{trace}$) and maximum eigen value ($λ_{max}$) statistics can be defined as in the Equation (7-8).

$$λ_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \hat{λ}_i)$$  \hspace{1cm} (7)$$

$$λ_{max}(r, r+1) = -T \ln(1 - \hat{λ}_{r+1})$$  \hspace{1cm} (8)$$

where $T$ refers to the number of usable observations, $\hat{λ}_i$ and $\hat{λ}_{r+1}$ is the estimated eigenvalues. The null hypothesis of $λ_{trace}$ is $r = 0$, $r \leq 1$, $r \leq 2$, and $r \leq 3$ against an alternative hypothesis of $r > 0$, $r > 1$, $r > 2$, and $r > 3$, respectively. Meanwhile, the null hypothesis of $λ_{max}$ is $r = 0$, $r = 1$, $r = 2$, and $r = 3$ against the respective alternative hypothesis of $r = 1$, $r = 2$, $r = 3$, and $r = 4$. The null hypothesis of no co-integration can be rejected if $λ_{trace}$ and $λ_{max}$ statistics greater than their respective critical values.

Next, VECM or known as restricted VAR is applied to analyse the long-run equilibrium relationship and causality between variables. If variables are co-integrated, then error correction mechanism (ECM) could examine the causality between variables in the short and long run since the standard Granger causality test can be mis-specified (Sahu, Bandopadhyay, & Mondal, 2014). ECM with lagged parameter ($ECT_{t-1}$) can
be used to measure the short-term dispersal from the long run equilibrium (Amiruddin, Mohd Nor, & Ismail, 2007). General VECM equation is expressed in equation (9).

\[ \Delta X_t = \theta + \sum_{i=1}^{m} \Phi_i \Delta X_{t-i} + \sum_{j=1}^{n} \Psi_j \Delta Y_{t-j} + \lambda ECT_{t-1} + \epsilon_t \]  

(9)

where \( \Delta X_t \) is a \( 4 \times 1 \) vector of endogenous variables, \( \theta \) is intercept vectors of \( 4 \times 1 \), and \( \lambda \) is a short-run coefficient of ECM that should be negative. \( ECT_{t-1} \) is lagged of ECM and both \( m \) and \( n \) is equal to \( p - 1 \) where \( p \) is a lag order selected using VAR. \( \Phi_i \) is a coefficient matrix of \( 4 \times 4 \) for the lagged of endogenous variables \( (\Delta X_{t-i}) \). \( \Psi_j \) is a coefficient matrix of \( 4 \times k \) for the matrix of \( k \times 1 \) vector of the lagged changes in exogenous variables \( (\Delta Y_{t-j}) \), where \( k \) is a number of exogenous variables. \( \epsilon_t \) is a matrix \( 4 \times 1 \) vector of error terms. The Equation (10-13) are the specified VECM equation for all variables.

\[ \Delta LGDP_t = \theta + \sum_{i=1}^{m} \Phi_i \Delta LGDP_{t-i} + \sum_{j=1}^{n} \Psi_j \Delta LFDI_t-j + \sum_{k=1}^{n} \xi_k \Delta LGFCF_{t-k} + \sum_{m=1}^{n} \theta_m \Delta LTO_{t-m} + \lambda_1 ECT_{t-1} + \epsilon_{t1} \]  

(10)

\[ \Delta LFDI_t = \Phi + \sum_{i=1}^{m} \alpha_i \Delta LFDI_{t-i} + \sum_{j=1}^{n} \beta_j \Delta LGDP_{t-j} + \sum_{k=1}^{n} \gamma_k \Delta LGFCF_{t-k} + \sum_{m=1}^{n} \delta_m \Delta LTO_{t-m} + \lambda_2 ECT_{t-1} + \epsilon_{t2} \]  

(11)

\[ \Delta LGFCF_t = \Gamma + \sum_{i=1}^{m} \alpha_i \Delta LGFCF_{t-i} + \sum_{j=1}^{n} \psi_j \Delta LGDP_{t-j} + \sum_{k=1}^{n} \chi_k \Delta LFDI_{t-k} + \sum_{m=1}^{n} \nu_m \Delta LTO_{t-m} + \lambda_3 ECT_{t-1} + \epsilon_{t3} \]  

(12)

\[ \Delta LTO_t = \Psi + \sum_{i=1}^{m} \phi_i \Delta LTO_{t-i} + \sum_{j=1}^{n} \psi_j \Delta LGDP_{t-j} + \sum_{k=1}^{n} \phi_k \Delta LFDI_{t-k} + \sum_{m=1}^{n} \omega_m \Delta LGFCF_{t-m} + \lambda_4 ECT_{t-1} + \epsilon_{t4} \]  

(13)

Findings and Discussion

Table 1 shows the ADF and PP test results by using a random walk with drift specification. For ADF test, the chosen optimal lag length was one (\( m = 1 \)) based on the lowest SIC value. Based on both findings, the null hypothesis cannot be rejected for all series due to smaller \( \tau \)-statistic than their respective critical value of \( \tau \)-statistic at 5% level of significance. Thus, all series were not stationary in level.

Table 1: ADF and PP tests for stationarity in level and the first difference results

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF Test</th>
<th>PP Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>First Difference</td>
</tr>
<tr>
<td>LGDP_t</td>
<td>-0.49308</td>
<td>-4.4561***</td>
</tr>
<tr>
<td>LFDI_t</td>
<td>-1.77853</td>
<td>-5.63863***</td>
</tr>
<tr>
<td>LGFCF_t</td>
<td>-1.18025</td>
<td>-4.24123***</td>
</tr>
<tr>
<td>LTO_t</td>
<td>-1.12900</td>
<td>-3.28071***</td>
</tr>
</tbody>
</table>

Note: ** and *** refers to stationarity of the series based on \( \tau \)-statistic at 5% and 1% level of significance, respectively.

At the first difference, ADF test results were consistent to PP test results that suggest all series were stationary and integrated of order one at 5% level of significance. Thus, JJ co-integration analysis is appropriate to be applied. Next, Table 2 shows the VAR model results where lag one is the optimal lag length chosen based on the SIC.

Table 2: Results of lag order selection by using VAR model

<table>
<thead>
<tr>
<th>Lag</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SIC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>337.4341*</td>
<td>3.90 x10^-9</td>
<td>-8.0161</td>
<td>-7.1542*</td>
<td>-7.7094*</td>
</tr>
<tr>
<td>2</td>
<td>25.8296</td>
<td>3.83x10^-9</td>
<td>-8.0646*</td>
<td>-6.5132</td>
<td>-7.5127</td>
</tr>
<tr>
<td>3</td>
<td>19.5526</td>
<td>4.40 x10^-9</td>
<td>-8.0046</td>
<td>-5.7637</td>
<td>-7.2073</td>
</tr>
</tbody>
</table>

Note: * indicates the selected optimal lag length based on the criterion.
**Co-integration and VECM Results**

By assuming a linear deterministic trend, the trace and maximum eigenvalue test results for JJ co-integration analysis was shown in the Table 3. Both findings suggest one co-integration relationship exists among variable FDI, GFCF, TO, and GDP due to greater trace statistic ($\lambda_{trace} = 48.4797$) and maximum eigenvalue statistic ($\lambda_{max} = 29.2496$) than their respective 5% critical value.

<table>
<thead>
<tr>
<th>Trace Test</th>
<th>$\lambda_{trace}$</th>
<th>5% critical value</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$r = 0$</td>
<td>48.4797*</td>
<td>47.8561</td>
<td>0.0436</td>
</tr>
<tr>
<td>$r \leq 1$</td>
<td>19.2301</td>
<td>29.7971</td>
<td>0.4765</td>
</tr>
<tr>
<td>$r \leq 2$</td>
<td>5.7672</td>
<td>15.4947</td>
<td>0.7228</td>
</tr>
<tr>
<td>$r \leq 3$</td>
<td>0.0384</td>
<td>3.8415</td>
<td>0.8446</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum Eigen-Value Test</th>
<th>$\lambda_{max}$</th>
<th>5% critical value</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$r = 0$</td>
<td>29.2496*</td>
<td>27.5843</td>
<td>0.0303</td>
</tr>
<tr>
<td>$r = 1$</td>
<td>13.4630</td>
<td>21.1316</td>
<td>0.4106</td>
</tr>
<tr>
<td>$r = 2$</td>
<td>5.7288</td>
<td>14.2646</td>
<td>0.6482</td>
</tr>
<tr>
<td>$r = 3$</td>
<td>0.0384</td>
<td>3.8415</td>
<td>0.8446</td>
</tr>
</tbody>
</table>

Table 3: Johansen and Juselius co-integration results

Note: * denotes rejection of the null hypothesis at 5% level of significance; Trace test indicates one co-integrating eq. at 0.05 level; Max-eigenvalue test indicates one co-integrating eq. at the 0.05 level; **MacKinnon-Haug-Michelis (1999) $p$-values.

The empirical findings confirm a presence of a long-run equilibrium relationship between FDI, GFCF, TO, and GDP where it is possible for the variables to have a co-movement in the long-term (Gondo, Masron, Ibrahim, & Azman, 2021). Thus, Table 4 shows the VECM results.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>$t$-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>7.5381</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$LFDI_{t-1}$</td>
<td>0.1338*</td>
<td>-0.0415</td>
<td>3.2219</td>
</tr>
<tr>
<td>$LGFCF_{t-1}$</td>
<td>-0.8136*</td>
<td>-0.0631</td>
<td>-12.8903</td>
</tr>
<tr>
<td>$LTO_{t-1}$</td>
<td>0.1033</td>
<td>-0.0707</td>
<td>1.4606</td>
</tr>
</tbody>
</table>

Note: * denotes the respective variable is significant at 5 per cent level of significance

The results indicate FDI has a significant negative relationship with economic growth since the null hypothesis was rejected at 5% level of significance. The coefficient of FDI was 0.1338 suggest that 1% increase in FDI will cause a decline in GDP by 0.1338% in the long run. This is similar to the findings of some studies, such as Meivitawanli (2021) for the case of Indonesia, and Belloumi and Alshehry (2018) for the case of Saudi Arabia. This explains the Malaysian economy could be harmed if the government relies much in attracting foreign investors in the long run. Furthermore, domestic investment has a significant positive impact on Malaysian economic growth since the null hypothesis was rejected at 5% level of significance. The positive coefficient of variable GFCF of -0.8136 suggest that an increase in GFCF by 1% will increase GDP by 0.8136% in the long run. This finding consistent with most empirical studies, such as by Mohamed et al. (2021) for the case of Egypt and Bakari (2017) for the case of Malaysia. Surprisingly, trade openness was insignificant on the economic growth in the long run.

Next, Table 5 depicts the VECM Granger causality test results. It shows the coefficient of lagged ECT for variable GDP was positive but not statistically significant at 5% level of significance. This means it cannot explain the changes in economic growth as there may be disequilibrium in the short run. Besides, the coefficients of lagged ECT for both variables FDI and TO were negative, but they were not statistically significant at 5% level of significance. These imply there may be disequilibrium in the short run due to the insignificant in speed of adjustments. Although lagged ECT for variable GFCF was statistically
significant at 1% level of significance, but its coefficient was positive which suggest domestic investment is diverging from its long-run equilibrium instead of converging to the long-run equilibrium. Since most of the coefficient of lagged ECT were positive and not statistically significant, thus no long-run causality found between the variables. Based on Table 5, GDP has a weak unilateral effect on FDI in the short run since the variable was statistically significant at 10% level of significance and it explains an increase in GDP by 1% will cause a decline in FDI by 12.4822% in the short-run. This implies that promoting economic growth in Malaysia would affect negatively in attracting a greater number of FDI inflows in the short term.

**Table 5: VECM causality test results**

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Lag length = 1</th>
<th>ECT_{t-1} [t-statistic]</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\Delta LGDP_{t-1})</td>
<td>(\Delta LFDI)</td>
<td>(\Delta LGFCF)</td>
<td>(\Delta LTO)</td>
</tr>
<tr>
<td>0.00006</td>
<td>0.03140</td>
<td>0.13093</td>
<td>0.03883</td>
</tr>
<tr>
<td>(0.9962)</td>
<td>(0.7041)</td>
<td>(0.1902)</td>
<td>[0.59369]</td>
</tr>
<tr>
<td>(-12.48224^*)</td>
<td>(\Delta LFDI_{t-1})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.0867)</td>
<td>2.32773</td>
<td>1.48225</td>
<td>-0.62923</td>
</tr>
<tr>
<td>(\Delta LGFCF_{t-1})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.67272</td>
<td>-0.04753</td>
<td>0.46550</td>
<td>0.647931***</td>
</tr>
<tr>
<td>(0.6296)</td>
<td>(0.2969)</td>
<td>(0.1974)</td>
<td>[2.74117]</td>
</tr>
<tr>
<td>(\Delta LTO_{t-1})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.34880</td>
<td>-0.00250</td>
<td>-0.10481</td>
<td>-0.10972</td>
</tr>
<tr>
<td>(0.5707)</td>
<td>(0.9002)</td>
<td>(0.4279)</td>
<td>[-1.05317]</td>
</tr>
</tbody>
</table>

Note: * and *** denotes the variable significant at 10% and 1% level of significance, respectively. The figure in the squared brackets […] represent t-statistic and the figure in the parenthesis (…) denotes p-value. ECT is the short run adjustment coefficient of the VECM.

**Impulse Response Function and The Variance Decomposition Results**

Figure 1 depicts the graphs of IRF of one standard deviation innovations for four endogenous variables (GDP, FDI, GFCF, and TO) in 10 year-horizon by using the Cholesky decomposition method.
The first graph shows the response of GDP to the shocks in FDI, GFCF, and TO was relatively not significant and persistent as they almost reaching steady state value. However, a shock to GDP was relatively significant and has a persistent effect on FDI since the positive response of LFDI was sharply and gradually declines due to innovations in LGDP. Meanwhile, the response of LFDI to the shock in LGFCF and LTO almost stabilized over 10-year horizon which implies the impact was not persistent. Also, one standard deviation innovation to LGDP initially has a positive impact on LGFCF in the 2nd period but it gradually declines afterwards which implies that the response of GFCF to the shock in GDP was relatively significant and persistent, but not for the case of FDI and TO as the impact were not persistent. Moreover, the response of TO on the innovations in FDI, GFCF, and GDP does not have relatively persistent effect and significant. However, the response of LTO on a shock in LGDP was negative after passing the steady state value on the 8th period although the initial response was positive. This implies a shock to economic growth will have asymmetric impacts on trade in both short and long run.

Besides, Table 6 shows VD results for a ten-year horizon. It suggests 97.30% of the variations in forecast errors for LGDP over the 10-year horizon can be explained by its own shocks. Decomposition of variance in LGDP can be explained by variations of LFDI with 1.55% although it has a weak influence on LGDP. This implies that LFDI, LGFCF, and LTO exhibits a strong exogeneity since they exert a weak influence in predicting LGDP in the future. Forecast error variance in LGDP has a strong influence and has the least exogenous impact on LFDI by 62.13% in the long run. Thus, decomposition of variance in LFDI can be explained by LGDP and its own variable. Otherwise, variables LGFCF and LTO exhibits a strong exogeneity as it has a weak influence in predicting LFDI in both short and long run.
Also, variance decomposition in LGFCF can be explained by LGDP since the forecast error variance is increasing to 86.79% at the 10th period. The results suggest only LGDP exhibits strong endogeneity as it has a strong influence in forecasting LGFCF, whereas its own variable, LFDI, and LTO have a weak
influence in predicting LGFCF in the long run. Meanwhile, variance decomposition of LTO can be explained by its own variable by 95.85% in the 10-year horizon. Whilst, LGDP, LFDI, and LGFCF exhibits a strong exogeneity as they have a weak influence on LTO in the long run. Hence, VD results suggest that economic growth is more significant in explaining the variance decomposition of FDI and domestic investment in both short and long run.

**Diagnostic Tests**

Table 7 shows the Breusch-Godfrey LM test results which suggest no serial correlation based on a larger probability value of likelihood ratio Edgeworth (LRE) statistic and Rao F-stat at lag 1 to 4 than 5% level of significance. Therefore, VECM results provide reliable results.

<table>
<thead>
<tr>
<th>Lag</th>
<th>LRE* stat</th>
<th>d.f.</th>
<th>Prob. value</th>
<th>Rao F-stat</th>
<th>d.f.</th>
<th>Prob. value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15.06842</td>
<td>16</td>
<td>0.5196</td>
<td>0.94552</td>
<td>(16, 80.1)</td>
<td>0.5224</td>
</tr>
<tr>
<td>2</td>
<td>16.22141</td>
<td>16</td>
<td>0.4376</td>
<td>1.02483</td>
<td>(16, 80.1)</td>
<td>0.4406</td>
</tr>
<tr>
<td>3</td>
<td>12.15106</td>
<td>16</td>
<td>0.7335</td>
<td>0.74947</td>
<td>(16, 80.1)</td>
<td>0.7355</td>
</tr>
<tr>
<td>4</td>
<td>17.75670</td>
<td>16</td>
<td>0.3383</td>
<td>1.13209</td>
<td>(16, 80.1)</td>
<td>0.3413</td>
</tr>
</tbody>
</table>

Note: * denotes Edgeworth expansion corrected likelihood ratio statistic

Moreover, Figure 2 shows the inverse roots of AR characteristics polynomial results where the roots of characteristic polynomial lie within the unit of a circle. Thus, it shows the VAR system was stable as the model satisfies the stability condition. However, some roots in the graph lies on the line of the unit circle which it can be uncertain if the VAR system was stable. Thus, the Table 8 shows roots of characteristics polynomial results where the modulus for all roots were less than one. Thus, the VAR model was stable and provided results are valid.

Figure 2: The inverse roots of AR characteristics polynomial graph

<table>
<thead>
<tr>
<th>Root</th>
<th>Modulus</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.997591 - 0.017620i</td>
<td>0.997746</td>
</tr>
<tr>
<td>0.997591 + 0.017620i</td>
<td>0.997746</td>
</tr>
<tr>
<td>0.774051</td>
<td>0.774051</td>
</tr>
<tr>
<td>0.156646</td>
<td>0.156646</td>
</tr>
</tbody>
</table>

Note: VAR satisfies the stability condition – no root lies outside the unit circle
Conclusion and Policy Recommendations
VECM results implies FDI has a negative relationship with economic growth, whereas domestic investment positively influences Malaysia’s GDP in the long-run. However, trade openness has no impact on economic growth in the long run. Moreover, no long-run causality between FDI, GFCF, TO, and GDP was discovered since their ECT coefficients were positive and not statistically significant at 5% level of significance. Likewise, FDI has a unidirectional causal relationship with GDP in the short run. The empirical findings suggest domestic investment is a primary engine to strengthen growth of economy in Malaysia in the long-run, while FDI negatively impact GDP in the short-run. Also, IRF and VD findings enable to provide some policy recommendations. Some studies affirmed the government of Malaysia should increase incentives to attract quality FDI inflows, particularly for the manufacturing industry to facilitate the trade, fiscal, and financial barriers that will restrict exports (Al-Shawaf & Almsafir, 2016; Lee & Huruta, 2020).

Besides, Malaysia should learn from Singapore as the country has relied on FDI to develop and strengthen the skill base (UNCTAD, 2011). Since Singapore has liberalized most of its sectors for international trade, they also have formulated investment facilitation, education, training, and migration policies to attract foreign investment by relying at first on foreign workers and then enhancing the training on the local staff. Singapore’s skill development model has successfully implemented in enhancing long-term skills development. Also, Singapore encourages FDI in education and training infrastructure for skills shortages. Malaysia should learn a model from Singapore, France and Japan in developing centres that can provide long-term and hands-on help from knowledgeable local experts to minimize the potential of support from over interventions (Koen, Asada, Nixon, Rahuman, & Arif, 2017). In addition, the government should eradicate corruption and implement stringent governance and reporting standards to bolster a transparency since the government is crucial in governing the country (Akisik, Gal, & Mangaliso, 2020). Policymakers should be attentive to its macroeconomic policies to gain the benefits of international trade and provide an attractive environment for investments (Awad, 2020). Hence, government, policymakers, and regulatory authorities should impose a lawful framework that can regulate FDI, domestic investment, and trade to reinforce economic growth in Malaysia to achieve its target in becoming a high-income country by 2028.

References


