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Empirical Analysis of Employment and Foreign Direct Investment in Malaysia: An ARDL Bounds Testing Approach to Cointegration

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Abstract

This study examines the relationships between the employment and foreign direct investment (FDI) in Malaysia. The Malaysian government continues to put efforts in attracting more FDI inflows as it seems that FDI plays a major role in the economic development of Malaysia. Besides, there is general perception that the FDI inflow contributes to increase the employment opportunity in the country. Hence, we apply an empirical analysis to study the effect of FDI on the employment in Malaysia. The data span from 1970 to 2007. Several econometric models are applied including the bounds testing (ARDL) approach, and ECM-ARDL model. The results show that there is no cointegration relationship between employment and the FDI in the long-run. However, there is a causal

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relation between employment and FDI running from FDI to the employment. This study concluded that the FDI is found to be the significant factor contributing to the employment growth in Malaysia, but not the other way round.

JEL classification numbers: C12, C22, E22, E24
Keywords: Employment, FDI, Cointegration, Causality, Malaysia

1 Introduction

According to [10], a direct relationship between employment and investment does exist. But this theoretical statement had been criticized by some economists that the relationship of those variables can be insignificant in some circumstances (see [18] and [3]). In general, the effect of FDI on employment can be viewed in three scenarios. Firstly, FDI inflow can increase employment directly through creation of new businesses or indirectly by stimulating employment in the distribution stage of production. Secondly, FDI can maintain employment by acquiring and restructuring the existing firms. Thirdly, FDI can reduce employment through disinvestment and the closure of domestic firms because of the intense competitions. The third situation is very common for developing country such as Malaysia. Nevertheless, the issue of contribution of FDI to employment creation in host country is still debated among economists.

[20] analyzed the employment effects of multinational corporations (MNCs) with reference to four characteristics, namely, scale, concentration, foreignness, and transnationality. His analysis indicated that the effects of the activities of MNCs on the employment in the host countries are small. [5] argued that many evidences are showing that the total employment was not affected by the volume of FDI in an economy with a well-functioning labor market. [7] on the other hand concluded that the net impact of FDI on the US employment is approximately zero.

[14] examined the role of FDI in job creation and job preservation. Their study focused on the countries of central Europe which includes Czech Republic, Hungary, Slovakia, and Estonia. Their findings indicate that Hungary is relatively the most successful in terms creating and preserving employment through FDI. This is mainly because its employment structure is similar to developed economies. Besides that, the evidence from their study also support that FDI can do more in generating and recovering domestic employment rather than stimulating growth and increasing the volume of employment. [9] in his study of the impact of FDI on employment in Vietnam found that direct employment generated as the effects of FDI is not very significant. This is because most of the labor force is still in the agricultural sector and other service sectors such as transport and retail trades where FDI has been minimal. In addition, the study also showed that the indirect effects of FDI on the employment in Vietnam have been minimal and depending on the balance between the crowding-in effects of FDI of creating new markets for local investors, and the crowding-out effects of FDI of foreign affiliates displacing the local competitors.

Other study done by [11] on the impact of FDI on the employment in China found that FDI inflow promotes employment in both foreign investment enterprises (FIEs) and the country as a whole in the long run. When FDI grows up by 1 percent, the growth rate of employment in FIEs rises by 1.27 percent and the growth rate of total employment in China rises by 0.04 percent. Another study on the effect of FDI on the employment in China done by [22] found that the FDI inflows have positively increased the employment in China. [15] study in Mexico found that FDI had a significant positive impact on the employment of manufacturing over the period of 1994 to 2006 but the impact was not very strong. [8] in their study of the impact of FDI on the employment in Fiji found that there was a unidirectional long run causality running from FDI to employment over the period of 1970 to 2003. [1] in their study on the effect of FDI on employment in Ghana found that the increased FDI flows can lead to high levels of employment and this is because FDI has brought in large-scale production and increases the demand for labors. [2] studied on whether the unemployment problem can be solved by the FDI in Turkey found that FDI did not have contribution to reduce the unemployment rate over the period of 2001 to 2007.

Based on the above findings and discussion, it is clear that FDI can have positive effect on employment in some recipient countries and in some cases FDI does not play a significant role to increase employment. The results are somewhat mixed. Thus, the relationship between employment and FDI is still remained controversial. Therefore, even if Malaysia had the highest share of foreign associate on manufacturing among the developing countries [19], and the Malaysian government continues to put great efforts to attract more FDI inflows into the country, we are skeptical on the validity of whether there is significant relationship between employment and FDI as well as FDI can contribute to the development of employment in this country.

2 Data and Methodology

The data used in this study consists of total employment (N) and inward foreign direct investment (FDI). These annual data covered the period from 1970 to 2007. The data of total employment is obtained from the Economic Report 1978/79-2007/08, Economic Division, Ministry of Finance Malaysia, while the data of FDI is obtained from the United Nation Conference on Trade and Development (UNCTAD), and International Financial Statistics (IFS). In addition all the variables are transformed into logarithm form.

The augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests are carried out to examine the presence of unit roots in lnN and lnFDI. It is noted that the ARDL bounds test can be applied without the pre-testing of the variables for unit root tests. Nevertheless, it is rational to perform the unit root tests as to ensure the variables are not $I(2)$ or beyond because the bounds test is based on the assumption that the variables are $I(0)$ or $I(1)$.

The augmented Dickey-Fuller (ADF) is an extension to the simple Dickey-Fuller (DF) for unit root test [4]. This extension is raised by the problem where the error term is unlikely to be white noise. Thus, this augmented version of the test includes extra lagged terms of the dependent variable as to eliminate the autocorrelation problem. The lag length on the extra terms is determined by the Schwarz Information Criterion (SIC). The three possible forms of the ADF test are expressed as follows;

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \mu_t \qquad (1)$$

$$\Delta y_t = \alpha_0 + \delta y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \mu_t \qquad (2)$$

$$\Delta y_t = \alpha_0 + \delta y_{t-1} + \alpha_2 t + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \mu_t \qquad (3)$$

The [12] tabulated appropriate critical values for each of the three models. If the ADF statistic value is greater than the critical value in absolute terms then the null hypothesis of a unit root will be rejected and it is concluded that y_t is a stationary process. [17] developed a generalization of the ADF test procedure that allows for fairly mild assumptions concerning the distribution of errors. The test regression for the PP test is the AR(1) process which is expressed as follows;

$$\Delta y_{t-1} = \alpha_0 + \delta y_{t-1} + \varepsilon_t \qquad (4)$$

The PP test corrects for the t-statistic of the coefficient δ from the AR(1) regression to account for the serial correlation in ε_t . Therefore, the Phillips-Perron (PP) test is a modification of the ADF test where it takes into account the less restrictive nature of the error process. The [12] critical values are applicable for the PP test. The PP test is robust to general forms of heteroskedasticity in the error term and it can be used without specifying a lag length for the regression.

Next, the cointegration test based on bounds testing procedure is used to test empirically the long-run relationship between the variables of interest. This test is fairly simple to use as compared with other cointegration methods because it allows the cointegration relationship to be estimated by OLS after determining the lag order in the model. Besides, ARDL bounds testing approach is considered to be more robust and appropriate when dealing with small sample data. The ARDL (p, q) model can be expressed as follows;

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \beta_1 x_{t-1} + \sum_{i=1}^{p} \delta_i \Delta y_{t-i} + \sum_{j=0}^{q} \theta_j \Delta x_{t-j} + \varepsilon_t \tag{5}$$

Alternatively, the equation (5) can be specified as (6);

$$\Delta \ln N_t = \alpha_0 + \alpha_1 \ln N_{t-1} + \beta_1 \ln FDI_{t-1} + \sum_{i=1}^{p} \delta_i \Delta \ln N_{t-i} + \sum_{j=0}^{q} \theta_j \Delta \ln FDI_{t-j} + \varepsilon_t \tag{6}$$

where α_1 and β_1 are the long-run coefficients, α_0 is the drift and ε_t are white noise errors.

The bounds test procedure involve estimating the equation (6) by ordinary least squares (OLS) as to test the existence of a long-run relationship between the variables by conducting F-test for the joint significance test of the α_1 and β_1 coefficients. Accordingly, the null hypothesis of no cointegration $(H_0 : \alpha_1 = \beta_1 = 0)$ is tested against the alternative $(H_1 : \alpha_1 \neq \beta_1 \neq 0)$. [16] provided two asymptotic critical values for cointegration test when the independent variables are I(m) where $0 \le m \le 1$. A lower value assumes the regressors are I(0) and an upper value assumes that the regressors are purely I(1). If the computed F-statistic (test statistic) is above the upper bound critical value, then the null hypothesis will be rejected irrespective of the orders of integration for the time series. On the other hand, if the test statistic falls below the lower bound critical value, then the null hypothesis cannot be rejected. Lastly, if the test statistic falls within the critical value bounds, the result is inconclusive.

Once the cointegration is determined, the conditional ARDL (p,q) long-run model for N_t can be estimated as follows;

$$\ln N_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \ln N_{t-i} + \sum_{i=0}^{q} \beta_1 \ln FDI_{t-i} + \varepsilon_t \tag{7}$$

Equation (7) is estimated by using OLS, and the estimated error $\hat{\varepsilon}_t$ can be obtained to apply in the equation (8) as an error correction term. The orders of the ARDL (p,q) model in the two variables are selected by using Schwarz information criterion (SIC). The final step is the estimation based on ECM-ARDL (thereafter ECM) model. If there is a cointegration between the two variables, then the ECM model can be utilized. This model is derived from obtaining the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates. This is expressed as follows;

$$\Delta \ln N_t = \alpha_0 + \sum_{i=1}^{p} \delta_i \Delta \ln N_{t-i} + \sum_{j=0}^{q} \theta_j \Delta \ln FDI_{t-j} + \varphi ecm_{t-1} + \varepsilon_t \tag{8}$$

If there is no cointegration exists between the two variables, then the ECM model without error correction term can be used as follows;

$$\Delta \ln N_t = \alpha_0 + \sum_{i=1}^{p} \delta_i \Delta \ln N_{t-i} + \sum_{j=0}^{q} \theta_j \Delta \ln FDI_{t-j} + \varepsilon_t \tag{9}$$

where δ and θ are the short-run dynamic coefficients of the model and φ is the speed of adjustment as in equation (8).

3 Results

The ADF and PP tests are carried out to test the presence of unit root in the variable series. The variables are tested with both “intercept” as in equation (2) and “intercept and trend” as in equation (3). The results are shown in Table 1.

Interestingly enough, both ADF and PP tests produced similar results (see

Table 1). It shows that the two series of $\ln N$ and $\ln FDI$ are non-stationary at level with their test statistics are greater (negative value) than the critical values when the only intercept is hold. However, when the assumption of both intercept and trend are hold, the $\ln FDI$ is significant at the 10 percent level. Furthermore, the two series are stationary at the first difference regardless whether the assumption of both intercept and intercept and trend are hold. Thus, it is obvious that the first difference series of $\ln N$ and $\ln FDI$ are stationary with their test statistics being smaller (negative value) than the critical values. Based on these results, the two annual time series of $\ln N$ and $\ln FDI$ are likely to be integrated at order one, $I(1)$.

The presence of long-run relationships between the two variables is tested by using the equation (5) or equation (6). The determination of the appropriate lag length for each equation is necessary in order to whiten the residuals. The Wald tests (*F* tests) for joint null hypothesis that the coefficients of the lagged variables in level form are zero (no cointegration between the variables), and the results of the calculated *F*-statistics when each variable is considered as a dependent variable are shown in Table 2.

The *F*-statistics, $F_N(N \mid FDI) = 0.474$ is less than the lower bound critical values, 3.17, 3.79, and 5.15 at the 10, 5, and 1 percent levels respectively. Thus, the null hypothesis of no cointegration cannot be rejected and this indicates that there is no long-run relationship between *N* and *FDI*. For the second equation, the *F*-statistics, $F_{FDI}(FDI \mid N) = 9.349$ is higher than the upper bound critical value, 6.36 at the 1 percent level. Hence, the null hypothesis can be rejected and there is a long-run relationship between *FDI* and *N*. However, the main focus throughout this study is that *N* is used as the dependent variable.

The diagnostic tests for the two equations are presented in Table 3. The two regressions for the underlying ARDL equation (6) have passed the diagnostic tests of which there are no serial correlations, no ARCH effects and no heteroskedasticity. Since there is no long-run cointegration relationship between *N* and *FDI*, thus, the ECM model without error term is used to test the causality among the variables by using the equation (9) instead of equation (8). The results of causality test are shown in Table 4.

Based on the results in Table 4, the Wald statistic (*F*-Granger statistic) for the first model is 8.574 and it is significant at the 5 percent level. Thus, the null hypothesis of *FDI* does not Granger cause *N* $(\Delta \ln FDI \neq> \Delta \ln N)$ is rejected and this indicates that *FDI* does Granger cause *N*. On the other hand, the *F*-Granger statistic for the second model is 6.254 and it is not significant at any level. Therefore, the null hypothesis of *N* does not Granger cause *FDI* $(\Delta \ln N \neq> \Delta \ln FDI)$ cannot be rejected and thus, the *N* does not Granger cause *FDI*. The two models based on the equation (9) have passed the diagnostic tests of which there are no serial correlations, no ARCH effects and no heteroskedasticity (see Table 5).

The overall results of this study indicate that there is a causal relationship between employment and *FDI* running from the *FDI* to the *N*, but not on the other way round. Therefore, it can be concluded that *FDI* played important role in contributing to the employment in Malaysia.

4 Discussion and Conclusion

Most of the *FDI* in Malaysia is in the manufacturing sector and it is dominated by projects which are related to electronics. Majority of the foreign investors are from Japan and newly-industrializing economies of Asia. Therefore, when these foreign investors invest in Malaysia to carry out new projects or expand the existing businesses, they need local manpower to realize the investment. These increased production requirements that will directly lead to an increase in the demand for labor which is more elastic than the capital as well as indirectly in the distribution stage of production. However, the non-existence of cointegration relationship between employment and FDI in the long-run might be explained that many foreign investment projects in Malaysia are capital-intensive in nature, and will most probably not intensively affecting the demand for labors. Moreover, capital in the long-run is flexibly adjustable in accordance to the requirement of the projects.

Nevertheless, the relationship between the employment and FDI in Malaysia is not very substantial as a whole especially in the long run. This might be due to the fact that FDI can cause the skilled-biased technical change in the country and thus, increase the demand for skilled-labor force which is relatively minimal in Malaysia. Besides, some of the FDI are in the form of acquiring the existing businesses in the country and this will not probably directly generating new demand for labors. For instance, the FDI in Malaysia had been increased substantially in the period of 2006 and 2007 mainly due to mergers and acquisitions (M&A) of existing multinational companies (MNCs). [21] argued that when FDI is in the forms of merger and acquisition, it is likely to create job losses because of rationalization of the operations of the enlarged firm. Hence, the increased FDI in Malaysia in these forms are likely to maintain rather than to generate new employment.

However, the finding of this study shows that the FDI can contribute to the employment in Malaysia. Therefore, this study proposed that the Malaysian government should continue to make efforts and find ways to attract more foreign investments into the country. This is because FDI is potentially providing benefits to the recipient country in the forms of technology transfers and industrial upgrading. In addition, Malaysia is focused on the export-oriented policy and FDI is one of the driving forces to push up the export-led growth. When FDI increases in the country, the production capacity will increase and the excess outputs can be exported. [13] pointed out that greater openness in the policy of a developing country do not guarantee greater FDI inflows, but policy which is lacking of openness will see a reduction in FDI inflows. Hence, the Malaysian government should create a good environment to attract more foreign investors by upgrading the existing infrastructures, financial services, and other supportive measures such as imposing income tax reduction and also introducing more liberal investment policies. Moreover, the political stable and economic resilient are paramount in attracting *FDI* inflows because these are the most important indicators to show that the country is stable and most favorable to foreign investors.

Besides, it is also recommended that the Malaysian government should implement more training programs and continues its efforts to further improve the education system so that the country will produce more qualified and skilled-workers. Hence, the domestic labor force will be more capable to absorb technology transfers and fully utilize the benefits brought about by the *FDI* inflows. This will also increase the employment as *FDI* is relatively high in demanding for skilled-workers. The New Economic Model stresses the modernization of the education to create a world-class workforce. It is undoubtedly a right direction. Furthermore, the Malaysian government should implement policy that is not only towards maximizing the scale of *FDI* inflows but also to attract diverse types of *FDI* to create various types of spillovers and skill transfers. We believe it will lead to more value-added productions and thus creating more employment opportunities along with growth-generating effect. This will surely be a great contribution towards the realization of the Malaysian Vision 2020.

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Table 1: Results of Unit Root Test

Variables	ADF Statistic			
	Level		First Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
lnN	-1.011(0)	-3.060(0)	-6.479(0)***	-6.518(0)***
lnFDI	-2.199(0)	-3.486(0)*	-8.163(0)***	-8.094(0)***
Variables	PP Statistic			
	Level		First Difference	
	Intercept	Intercept & Trend	Intercept	Intercept and Trend
lnN	-1.463[6]	-3.081[1]	-6.726[4]***	-7.189[6]***
lnFDI	-2.198[2]	-3.535[3]*	-8.175[1]***	-8.104[1]***

Notes: Figures in ( ) and [ ] indicates number of lag and bandwidth structures respectively. ***, **, * indicates significance at 1, 5 and 10 percent levels respectively.

Table 2: Results of Bounds Test

Equation	ARDL(p, q)	F-statistic	Result
F_N(N|FDI)	ARDL(4, 5)	0.474	No Cointegration
F_{FDI}(FDI|N)	ARDL(2, 3)	9.349***	Cointegration

Notes: ***, **, * denote significance at 1, 5 and 10 percent levels respectively. Asymptotic critical value bounds are obtained from Table C1. iii, Case III: unrestricted intercept and no trend for k = 2 (M. H. Pesaran, Y. Shin, and R.J. Smith, 1999). Lower bound $I(0) = 5.15$ and upper bound $I(1) = 6.36$ at the 1 percent significance level.

Table 3: Diagnostic Tests for the Two Equations of Bounds Test

Equation: $F_N(N\|FDI)$ – ARDL(4, 5)	
R^2 = 0.388	LM(4)/(5) = 5.083/6.045
Sum of Squared Residual = 0.007	White Statistic = 5.188
Schwarz Criterion = -4.223	ARCH(4)/(5) = 4.442/5.912
Equation: $F_{FDI}(FDI\|N)$ – ARDL(2, 3)	
R^2 = 0.482	LM(2)/(3) = 0.019/0.769
Sum of Squared Residual = 6.107	White Statistic = 4.310
Schwarz Criterion = 2.054	ARCH(2)/(3) = 0.405/1.178

Notes: ***, **, * denote significant and rejected at the 1, 5 and 10 percent levels respectively. LM = Breusch-Godfrey Lagrange Multiplier, and ARCH = Autoregressive Conditional Heteroskedasticity. Figures in ( ) indicates number of lag structures selected based on the SIC.

Table 4: Results of Causality Test

$\Delta \ln FDI \neq> \Delta \ln N$		
Wald Statistic	(p, q)	P-Value
8.574**	(2, 2)	0.036
$\Delta \ln N \neq> \Delta \ln FDI$		
Wald Statistic	(p, q)	P-Value
6.254	(3, 3)	0.181

Notes: ***, **, * denote significance at the 1, 5 and 10 percent levels respectively.

Table 5: Diagnostic Tests for the Two Models of Causality Test

$\Delta \ln FDI \neq> \Delta \ln N$	
R^2 = 0.291	LM(2) = 1.346
Sum of Squared Residual = 0.008	White Statistic = 1.208
Schwarz Criterion = -4.959	ARCH(2) = 0.279
$\Delta \ln N \neq> \Delta \ln FDI$	
R^2 = 0.289	LM(3) = 2.347
Sum of Squared Residual = 8.386	White Statistic = 4.277
Schwarz Criterion = 2.268	ARCH(3) = 1.284

Notes: ***, **, * denote significant and rejected at the 1, 5 and 10 percent levels respectively. LM = Breusch-Godfrey Lagrange Multiplier, and ARCH = Autoregressive Conditional Heteroskedasticity. Figures in ( ) indicates number of lag structures selected based on the SIC.