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The FDI- Led- Growth Hypothesis in ASEAN- 5 Countries: Evidence from Cointegrated Panel Analysis

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Abstract

The paper works out the relationship between foreign direct investment (FDI) and economic growth in the five ASEAN countries namely, namely Indonesia, Malaysia, Philippines, Singapore and Thailand over the period 1970-2007. The empirical analysis is based on cointegration and causality test, both at the individual level and panel level. The results confirm that foreign direct investment and economic growth are cointegrated at the panel level, indicating the presence of long run equilibrium relationship between them. This is, however, true only for Singapore and Thailand at the individual country level. The Granger causality test further gives evidence that there is bidirectional causality between foreign direct investment and economic growth both at the panel level as well as individual country level except Malaysia.

Keywords: Economic growth, FDI, Panel cointegration

1. Introduction

Foreign direct investment (FDI) is widely accepted as a vehicle for country's economic growth. The importance of FDI is, in fact, much higher in the developing countries. This is because of their inability to generate internal savings in response to their investment needs. Moreover, one of the most cited reasons for the high economic growth in Asia in the recent era is due to the inflows of foreign direct investment. It is considerably true that FDI is one of the most effective ways by which developing economies are integrated with rest of the world, as it provides not only capital but also technology and management know-how necessary for restructuring the firms in the host countries (Pradhan, 2006; Borensztein et al., 1998; Chao and Yu, 1994; Grossman and Helpman, 1991; Barro and Sala-I-Martin, 1995). FDI usually fills up at least three developmental goals such as (1) saving investment gap by contributing the much needed capital for domestic investment (Vadlamannati et al. 2009); (2) foreign exchange gap by generating foreign currency through initial investments and subsequent export earnings; and (3) tax-revenue gap by accumulating tax revenues through additional socio- economic activities (Noorbakhsh et al., 2001; Smith, 1997). The positive impact of FDI on economic growth is driven by transferring knowledge and other firm assets (Sethi et al., 2003; Hermes and Lensink, 2003) relating to productivity improvement or the spillover effects of FDI (see Figure 1). Hence, the increasingly significant role of FDI in the growth dynamics of developing countries has created much research interest among the development economists (Quazi, 2007) and is debated quite extensively in the development literature.

There are two ways we can work out the relationship between FDI and economic growth. First, the production function approach (Harms and Ursprung, 2004; Lipesy, 2000; Zapata and Rambaldi, 1997; Lin, 1995; Tsai, 1994; Wang, 1990; Feder, 1983; Tyler, 1981; Balassa, 1978); second, the time series approach (Nair-Reichert and Weinhold, 2001; Bahmani-Oskooee and Niroomand, 1999; De Mello, 1999; Kasibhatla and Sahney, 1996; Saltz, 1992; Jung et al., 1985). The paper, however, explores the time series approach of FDI-growth relationship. There are number of research papers that explore the relationship between FDI and economic growth. The empirical evidence is, however, very mixed and inconclusive. They are obtained in three different forms: unidirectional causality (either from FDI to economic growth or from economic growth to FDI), bidirectional (from FDI to economic growth and vice versa) and no causality between the two. It varies across countries and time periods.

The purpose of this study is to empirically re-investigate the relationship between FDI and economic growth in the ASEAN-5 countries, namely Indonesia, Malaysia, Philippines, Singapore and Thailand. Though the goal of this study is similar to those of previous studies in this area of research, the method of analysis is different at least in one ground. That is the use of panel cointegration and causality, rather than simple univariate time series analysis. The rest of the

paper is organized as follows: section 2 describes literature review; section 3 provides econometric setting and database; section 4 analyses the results; and section 5 provides conclusion.

2. Literature Review

The two-way link between foreign direct investment and economic growth stems from the fact that higher foreign direct investment stimulates high economic growth in the host country and higher economic growth in the host countries attract more foreign direct investment. Theoretically, there is no difference prediction on the nexus between FDI and economic growth. The empirical analysis, however, provides very contradictory results.

Borensztein et al. (1998) examined the relationship between FDI and economic growth in 69 developing countries over the period 1970-1989. They find that FDI has a positive impact on economic growth, but the nexus is partly dependent on the availability of human capital in the host country. The Li and Liu (2005) find similar results from the sample of 84 countries over the period 1970-1999. Obwona (2001) and Bengoa and Sanchez-Robles (2003) suggest that, for FDI to have positive impacts on economic growth, the host country must have macroeconomic and political stability, policy credibility and an increase in the openness of an economy. Coe et al. (1997) detect the positive association between FDI and economic growth, but suggest that the host country should have an attained level of development that helps it reap the benefits of higher productivity.

Dua and Rashid (1998) find the causality from FDI to economic growth in India during 1992-1998, while Chakraborty and Basu (2002) find the reverse causality from economic growth to FDI. De Mello (1999) detects positive effects of FDI on economic growth in 32 OECD and non-OECD countries over the period 1970-1990. Ericsson and Irandoust (2001) examined the causality between FDI and growth for four OECD countries, namely Denmark, Finland, Norway and Sweden. They, however, do not find any causality between FDI and economic growth in Denmark and Finland, but suggest that specific dynamics and nature of FDI entering these countries could be responsible for these no-causality results. Zhang (2001) has tested the FDI-led growth hypothesis in East Asian and Latin American countries. He finds the mixed results. That means FDI causes economic growth in some countries and economic growth causes FDI in some other countries. Carkovic and Levine (2002) analyzed the relationship between FDI and economic growth for a sample of 72 countries. They conclude that FDI do not exert any independent influence on economic growth for both developed and developing countries.

Liu et al. (2002) examined the presence of long run relationship among FDI, growth and exports in China during 1981-1997. They find the existence of bidirectional causality among them. Wang (2002) examined the nexus between FDI and economic growth in the sample of 12 Asian countries over the period 1987-1997. He suggests that FDI in the manufacturing sector has a significant positive impact on economic growth and attributes this positive contribution to FDI's spillover effects. Campos and Kinoshita (2002) explored the effects of FDI on economic growth for 25 Central and Eastern European and former Soviet Union economies. They find that FDI had a significant positive effect on the economic growth of each selected country. De Gregorio (1992) finds similar results for Latin American economies and Blomstrom et al. (1992) finds similar results from 78 developing countries. Hsiao and Shen (2003) find a feedback association between FDI and economic growth in China. Choe (2003) finds a bi-directional causality between FDI and growth for a sample of 80 countries over the period 1971-1995, but suggest that the effect is more apparent from economic growth to FDI. Chowdhury and Marvrotas (2005) examined the causal association between FDI and growth from Chile, Malaysia and Thailand. They find the unidirectional causality from economic growth to FDI in Chile and a two-way causation between the two from other two countries. Duasa (2007) detects no causality between FDI and economic growth in Malaysia, but suggested that FDI does contribute to stability of growth. The above earlier findings give the evidence that the nexus between foreign direct investment and economic growth is far from straightforward (Vu and Noy, 2009). It varies from country to country and even within a country with different time periods.

3. Econometric Setting and Database

The FDI- led- growth hypothesis will be performed in three steps: (1) test for order of integration; (2) test for cointegration; and (3) test for direction of causality. We conduct these three tests at the individual as well as panel level. The detail descriptions of these three tests are mentioned below.

3.1 Panel Unit Root Test

The traditional Augmented Dickey Fuller (Dickey and Fuller, 1981) and Phillips and Perron (Phillips and Perron, 1988) unit root test is usually used to check the stationarity of time series variables. But the limitation of this technique is that it has a problem of low power in rejecting the null hypothesis of stationarity of the time series, particularly for small size of data. The literature suggests that panel unit root test has higher power than the unit root test based on univariate time series. A number of such tests are available in the literature. However, we use LLC (Levin et al., 2002) and IPS (Im et al., 2003) unit root tests for the present analysis. They are very popular and are based on the lines of ADF principle. The LIC assumes homogeneity in the dynamics of the autoregressive coefficients for all panel numbers, while

IPS assumes for heterogeneity in these dynamics. Therefore, it is otherwise called as "heterogeneous panel unit root tests".

LIC proposes a panel-base augmented Dickey-Fuller (ADF) test with a panel setting and restricts γ to keep it identical across cross-sectional regions. The test imposes homogeneity on the autoregressive coefficient that indicates the presence or absence of a unit root whereas the intercept and trend can vary across individual series. The model only allows for heterogeneity in the intercept and is given by

$$\Delta Y_{i,t} = \alpha_i + \gamma Y_{i,t-i} + \sum_{j=1}^{p_i} \beta_j \Delta Y_{i,t-j} + \varepsilon_{i,t} \quad \text{..... (1)}$$

Where Yi, t is a series for panel member (country) i (i = 1, 2,..N) over period t (t = 1, 2, …T), pi is the number of lags in the ADF regression and the error term εi, t are assumed to be IID (0, σ2) and to be independent across the units of the sample. The model allows for fixed effects, unit specific time trends and common time effects. The coefficient of the lagged dependent variable is restricted to be homogenous across all units of the panel. Hence, the null hypothesis of non-stationary is as follows:

H0: γi = 0, is tested against the alternative,

$$H_A: \gamma_i = \gamma < 0 \quad \text{for all i} \quad \text{..... (2)}$$

Where, the fixed effect model in equation 1 is based on the usual t-statistics.

$$t_\gamma = \frac{\hat{\gamma}}{s.e(\hat{\gamma})} \quad \text{..... (3)}$$

Where, γ is restricted by being kept identical across regions under both null and alternative hypothesis.

The IPS begins by specifying a separate ADF regression for each cross section (country):

$$\Delta Y_{i,t} = \alpha_i + \gamma_i Y_{i,t-i} + \sum_{j=1}^{p_i} \beta_{i,j} \Delta Y_{i,t-j} + \varepsilon_{i,t} \quad \text{..... (4)}$$

Where series yi,t (i = 1, 2,…,N; t = 1, 2, …, T) is the series for panel member (country) i over period, pi is the number of lags in the ADF regression and the error terms εi, t are assumed to be IID (0, σi2) for all i and t. Both γi and the lag order β in equation (4) are allowed to vary across sections (countries). IPS relaxes the assumption of homogeneity of the coefficient of the lagged dependent variable. They test the null hypothesis that each series in the panel has a unit root for all cross-section units against the alternative that at least one of the series is stationary.

H0: γi = 0 for all i, is tested against the alternative,

H_A: $\gamma_i = \gamma_i < 0$ for i = 1, 2, …., N_1, $\gamma_i = 0$,

$$i = N_1 + 1, N_1 + 2, \ldots, N \quad \text{..... (5)}$$

The alternative hypothesis simply implies that some or all of the individual series are stationary. IPS developed two test statistics and called then the LM-bar and the t-bar tests. The IPS t-bar statistics is calculated using the average of the individual Dickey-Fuller τ statistics.

$$\bar{t} = \frac{1}{N} \sum_{i=1}^{N} \tau_i \quad \text{..... (6)}$$

$$\tau_i = \frac{\hat{\gamma}_i}{s.e(\hat{\gamma}_i)} \quad \text{..... (7)}$$

Assuming that the cross sections are independent, IPS proposes the use of the standardized t-bar statistic as shown below.

$$\overline{Z} = \frac{\sqrt{N}\left(\bar{t} - E\left(\bar{t}\right)\right)}{\sqrt{Var\left(\bar{t}\right)}} \quad \text{……..…… (8)}$$

The term $E\left(\bar{t}\right)$ and $Var\left(\bar{t}\right)$ are the mean and variance of τ statistic. They are generated by simulations and are tabulated in IPS (Im et al., 2003).

3.2 Panel Cointegration Test

When the series becomes stationary only after being differenced once, they might have linear combinations that are stationary without differencing. Such series are usually called cointegrated (Granger, 1988). If integration of order one is obtained, the next step is to use cointegartion technique in order to know whether there exists a long run relationship among the set of the integrated variables. The Johansen's Vector Auto regression (VAR) test of integration (Johansen, 1988) is usually used for this above problem. The VAR is a systemic approach to cointegration that allows determination of up to *r* linearly independent cointegrating vectors (*r <= g -1*, where *g* is the number of variables tested for cointegration). The estimated cointegration equation is of the following form:

$$Y_{it} = \beta_{i0} + \beta_{i1}X_{i1t} + \beta_{i2}X_{i2t} + ... + \beta_{ik}X_{ikt} + \varepsilon_{it} \quad \text{……..…… (9)}$$

The equation can be re-written as

$$\varepsilon_{it} = Y_{it} - (\beta_{i0} + \beta_{i1}X_{i1t} + \beta_{i2}X_{i2t} + ... + \beta_{ik}X_{ikt}) \quad \text{……..…… (10)}$$

And the cointegration vector is

$$\left[1 - \beta_{i0} - \beta_{i1} - \beta_{i2} .... - \beta_{ik}\right] \quad \text{……..…… (11)}$$

Johansen's procedure is useful in conducting individual cointegration tests, but does not deal with cointegration test in panel settings. Instead, the recently developed panel cointegration tests by Pedroni (2004; 1999) provide a technique that allows for using panel data and thereby, overcoming the problem of small samples, in addition to allowing for heterogeneity in the intercepts and slopes of the cointegrating equation. The test starts with the following time series panel regression.

$$Y_{i,t} = \alpha_i + \sum_{j=1}^{p_i} \beta_{ji} X_{jit} + \varepsilon_{it} \quad \text{……..…… (12)}$$

$$\varepsilon_{it} = \rho_i \varepsilon_{i(t-1)} + w_{it} \quad \text{……..…… (13)}$$

Where Y_{it} and X_{jit} are the observable variables with dimension of (N* T)) X 1 and (N* T) X m respectively; ε_{it} represents the disturbance term from the panel regression; α_i allows for the possibility of country-specific fixed effects and the coefficients of β_{ji} allows for the variation across individual countries.

The null hypothesis of no cointegration of the pooled (within-dimension) estimation is

$$H_0: \rho_i = 1 \text{ for all i against } H_0: \rho_i = \rho < 1 \quad \text{……..…… (14)}$$

Here, under alternative hypothesis, the within-dimensional estimation assumes a common value for ρi = ρ. That means it does not allow an additional source of possible heterogeneity across individual country members of the panel.

The null hypothesis of no-cointegration of the pooled (between-dimension) estimation is

$$H_0: \rho_i = 1 \text{ for all i against } H_0: \rho_i < 1 \quad \text{……..…… (15)}$$

Here, under alternative hypothesis, the between-dimensional estimation does not assume a common value for ρi = ρ. That means it allows an additional source of possible heterogeneity across individual country members of the panel.

Pedroni suggested two types of test to know the existence of heterogeneity of cointegration vector. First, the test based on within- dimension approach (i.e. panel test). It includes four statistics such as panel v- statistic, panel ρ- statistic, panel PP- statistic and panel ADF- statistic. These statistics pool the autoregressive coefficients across different members for the unit root tests on the estimated residuals. Second, the test based on between- dimensional approaches (group test). It includes three statistics such as group ρ-statistic, group PP-statistic and group ADF-statistic. These

statistics are based on estimators that simply average the individually estimated coefficients for each member. The details of heterogeneous panel and heterogeneous group mean panel cointegration statistics are calculated as follows:

Panel v- statistic

$$Z_v = \left[\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{it-1}^{2} \right]^{-1} \quad \text{……..…… (16)}$$

Panel ρ- statistic

$$Z_\rho = \left[\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{it-1}^{2} \right]^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} L_{11i}^{-2} \left(\hat{\varepsilon}_{it-1} \Delta \hat{\varepsilon}_{it} - \hat{\lambda}_i \right) \quad \text{…..…… (17)}$$

Panel PP- statistic

$$Z_t = \left[\hat{\sigma}^2 \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{it-1}^{2} \right]^{-0.5} \sum_{i=1}^{N} \sum_{t=1}^{T} L_{11i}^{-2} \left(\hat{\varepsilon}_{it-1} \Delta \hat{\varepsilon}_{it} - \hat{\lambda}_i \right) \quad \text{…..…… (18)}$$

Panel ADF- statistic

$$Z_t^* = \left[\hat{s}^{*2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{it-1}^{*2} \right]^{-0.5} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{it-1}^{*} \Delta \hat{\varepsilon}_{it}^{*} \quad \text{…..…… (19)}$$

Group ρ- statistic

$$\tilde{Z}_\rho = \sum_{i=1}^{N} \left(\sum_{t=1}^{T} \hat{\varepsilon}_{it-1}^{2} \right)^{-1} \sum_{t=1}^{T} \left(\hat{\varepsilon}_{it-1} \Delta \hat{\varepsilon}_{it} - \hat{\lambda}_i \right) \quad \text{……..…… (20)}$$

Group PP- statistic

$$\tilde{Z}_t = \sum_{i=1}^{N} \left(\hat{\sigma}^2 \sum_{t=1}^{T} \hat{\varepsilon}_{it-1}^{2} \right)^{-0.5} \sum_{t=1}^{T} \left(\hat{\varepsilon}_{it-1} \Delta \hat{\varepsilon}_{it} - \hat{\lambda}_i \right) \quad \text{……..…… (21)}$$

Group ADF- statistic

$$\tilde{Z}_t^* = \sum_{i=1}^{N} \left(\sum_{t=1}^{T} \hat{s}_i^2 \hat{\varepsilon}_{it-1}^{*2} \right)^{-0.5} \sum_{t=1}^{T} \left(\hat{\varepsilon}_{it-1}^{*} \Delta \hat{\varepsilon}_{it}^{*} \right) \quad \text{……..…… (22)}$$

Where, $\hat{\varepsilon}_{it}$ is the estimated residual from equation (12) and $\hat{L}_{11i}^{-2}$ is the estimated long run covariance matrix for $\Delta \hat{\varepsilon}_{it}$. Similarly, $\hat{\sigma}_i^2$ and $\hat{s}_i^2 \left(\hat{s}_i^{*2} \right)$ are the long run and contemporaneous variances for individual i. All seven tests are asymptotically standard normal distribution given by the respective panel/ group cointegration statistic. The panel v is a one sided test where large positive values reject the null hypothesis of no cointegration. The other remaining statistics diverge to negative infinite, which means that large negative values reject the null hypothesis. These tests are able to accommodate individual specific short-run dynamics, individual specific fixed effects and deterministic trends as well as individual specific slope coefficients (Pedroni, 2004).

3.3 Panel Granger Causality Test

Traditionally we use the standard Engle- Granger two step procedures to examine the direction of causality. The present study, however, uses panel causality test, as proposed by Holtz- Eakin et al. (1988). Two different models can be used to investigate the relationship.

Model 1: If the time series variables are 1 (1) and not cointegrated, we can use the following causality model:

$$\Delta GDP_{it} = \eta_j + \sum_{k=1}^{p} \alpha_{ik} \Delta GDP_{it-k} + \sum_{k=1}^{q} \beta_{ik} \Delta FDI_{it-k} + \Delta \varepsilon_{it} \quad \text{……..……. (23)}$$

$$\Delta FDI_{it} = \eta_j + \sum_{k=1}^{p} \alpha_{ik} \Delta FDI_{it-k} + \sum_{k=1}^{q} \beta_{ik} \Delta GDP_{it-k} + \Delta \varepsilon_{it} \quad \text{……..……. (24)}$$

Where, GDP represents economic growth and FDI represents the inflows of foreign direct investment.

Model 2: If X and Y are 1 (1) and cointegrated, then the causality is tested by using error correction model. This is represented as follows:

$$\Delta GDP_{it} = \eta_j + \sum_{k=1}^{p} \alpha_{ik} \Delta GDP_{it-k} + \sum_{k=1}^{q} \beta_{ik} \Delta FDI_{it-k} + \lambda_i EC_{1it-k} + \Delta \varepsilon_{1it} \quad \text{…….. (25)}$$

$$\Delta GDP_{it} = \eta_j + \sum_{k=1}^{p} \alpha_{ik} \Delta GDP_{it-k} + \sum_{k=1}^{q} \beta_{ik} \Delta FDI_{it-k} + \lambda_i EC_{3it-k} + \Delta \varepsilon_{3it} \quad \text{…….. (26)}$$

Where EC is error correction term and that is obtained from the cointegrating equation.

The empirical analysis is based on a panel of three emerging countries, namely Indonesia, Malaysia, Philippines, Singapore and Thailand, over the period 1970-2006. The choice of countries is randomly selected and the span of data reflects data availability. The data are obtained from World Investment Report, UNCTAD, Geneva. The data are used in normalized form. The following formula has been used for the normalization.

$$I_i(X_i) = X_i \Big/ X_i^{\max} \quad \text{……..……. (27)}$$

Where, $X_i^{\max}$ denotes maximum of variable i.

4. Results and Discussion

In the light of econometric setting presented in the previous section, the empirical results are discussed in this section. The analysis is started by the test of the stationarity properties of the data series. This is the prime requirement for cointegration and causality test. There are two ways we establish the integration properties of the data: univariate unit root test and panel unit root test. The Phillips and Perron test has been applied to individual series, while LLC and IPS test have been applied to panel of five countries, namely Indonesia, Malaysia, Philippines, Singapore and Thailand. Table 1 presents the results of unit root tests, both at the individual level and panel level. The results indicate that all the time series variables that used in the study have unit roots. The estimated PP statistics cannot reject the null hypothesis of non-stationarity at 10% level of significance. However, they are stationary at the first difference level, as the null hypothesis of non-stationarity is rejected at 5% level of significance. This represents that the variables are integrated of order one, 1 (1).

Having confirmed the existence of unit roots for all the data series, the next step is to check possibility of long run equilibrium relationship between them. The cointegration test is applied for the same at the individual level as well as panel level. The Johansen's maximum likelihood test has been applied for each country in the panel and Pedroni's panel cointegration test has been applied to the three countries panel. The estimated results of Johansen's test for individual countries are reported in Table 3, while the results of the panel cointegration tests (Pedroni's test) from the seven statistics are reported in Table 4. The results reflect that there is cointegration between foreign direct investment and economic growth at Singapore and Thailand at the individual level and the panel of five ASEAN countries. That means the results confirmed that foreign direct investment and economic growth are share a long run equilibrium relationship in the ASEAN countries. This indicates that there is possibility of causality between foreign direct investment and economic growth. Moreover, the existence of no cointegration between the two in the Indonesia, Malaysia and Philippines does not mean the absence of causality or any relation in the short run. For those countries whose economic growth and foreign direct investment do not move together in the long run (i.e. cointegration), but they may affect each other in the short run. We use Error Correction Model (ECM), where there is presence of cointegration and simple Granger causality, where there is no cointegration, to know the direction of causality between foreign direct investment and economic growth.

The Table 4 presents the results of causality test, both at the individual level and panel level. The results showed that there is presence of bidirectional causality between foreign direct investment and economic growth in all the five ASEAN countries except Malaysia, where there is no causality between the two, at the individual level and panel level. This is because the F-statistics for these cases indicate that the null hypothesis that economic growth does not Granger cause foreign direct investment and foreign direct investment does not Granger cause economic growth are rejected at 1% significance level. That means foreign direct investment causes economic growth and economic growth causes foreign direct investment, indicating the feedback between these two variables. The evidence from this empirical analysis is very clear that foreign direct investment causes economic growth and vice versa in the case where all the five countries are included in the sample. However, this is not true, when we go for individual country analysis. That means panel data analysis is very powerful in overcoming the problem of small samples, in addition to allowing for heterogeneity in the intercepts and slopes in the cointegration and causality equations. The finding of Malaysia is not so exceptional. In fact, it is very similar to the findings of Karimi and Yusop (2009), who examine the relationship between foreign direct investment and economic growth in Malaysia over a period 1970-2005.

5. Conclusion

The present work explores the relationship between foreign direct investment and economic growth over the period 1970- 2007. Using univariate and panel cointegration, it suggests the following findings:

1. Economic growth and foreign direct investment are integrated of order one for the five ASEAN countries, namely Indonesia, Malaysia, Philippines, Singapore and Thailand, at the individual level and group level.

2. Pedroni's panel cointegration test confirmed the existence of a long run equilibrium relationship between foreign direct investment and economic growth. However, at the individual level, Johansen's multivariate cointegration test confirms the presence of cointegration only in Singapore and Thailand.

3. Granger causality test, both at the individual level and panel level, confirms the presence bidirectional causality between foreign direct investment and economic growth, both at the individual level (except Malaysia) and group level. In the case of Malaysia, we do not find any causality between foreign direct investment and economic growth.

The results suggest a high level of foreign direct investment can generate high level of economic growth and a high level of economic growth can generate high level of foreign direct investment. That means the policy implications are very straightforward. To get more economic growth, we need to bring more foreign direct investment. And to get more foreign direct investment, there is need of sustainable economic growth in the economy. The lack of foreign direct investment may constraint to economic growth and vice versa.

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Table 1. Results of Unit Root Test

	GDP		**FDI**		
	LD	**FD**	**LD**	**FD**	**Conclusion**
Indonesia	0.814	-4.75*	-2.34	-4.82*	1 (1)
Malaysia	1.63	-3.78*	-1.27	-7.20*	1 (1)
Philippines	1.05	-4.06*	-0.86	-7.41*	1 (1)
Singapore	1.54	-2.96**	-0.88	-7.73*	1 (1)
Thailand	0.192	-3.07*	-0.73	-6.18*	1 (1)
Panel Unit Root Test					
LLC	4.181	-2.993*	1.774	-2.921*	1 (1)
IPS	5.582	-3.935*	0.733	-5.340*	1 (1)

Note: GDP: Economic Growth; FDI: Foreign Direct Investment; LD: level data; FD: First difference LLC: LLC statistics; IPS: IPS statistics; *: indicates the variable significant at 1% significance level.

Table 2. Results of Johansen's Cointegration Test

Countries	Null Hypothesis	Trace Statistics		MEV Statistics	
Indonesia	None	12.87	[0.12]	12.87	[0.08]
	At most 1	0.001	[0.98]	0.001	[0.98]
Malaysia	None	9.77	[0.30]	6.04	[0.61]
	At most 1	3.72	[0.05]	3.72	[0.05]
Philippines	None	12.49	[0.14]	11.97	[0.11]
	At most 1	0.52	[0.47]	0.52	[0.47]
Singapore	None	17.38	[0.03]	17.14	[0.02]
	At most 1	0.24	[0.62]	0.24	[0.62]
Thailand	None	15.93	[0.04]	20.35	[0.04]
	At most 1	0.002	[0.96]	7.570	[0.96]

Note: Parentheses indicate the probability of significance.

Table 3. Results of Pedroni's Panel Cointegration Test

Test Statistics	Calculated Value	Probability
Panel v- statistic	4.357	[0.00]
Panel ρ- statistic	-3.655	[0.00]
Panel PP- statistic	-3.032	[0.00]
Panel ADF- statistic	-3.376	[0.00]
Group ρ- statistic	-2.689	[0.00]
Group PP- statistic	-3.687	[0.00]
Group ADF- statistic	-3.523	[0.02]

Note: The parentheses indicate the probability of significance.

Table 4. Granger Causality Test based on ECM

		Dependent Variables	
		GDP	**FDI**
Indonesia	**GDP**	--------	√
	FDI	√	--------
Malaysia	**GDP**	--------	X
	FDI	X	--------
Philippines	**GDP**	--------	√
	FDI	√	--------
Singapore	**GDP**	--------	√
	FDI	√	--------
Thailand	**GDP**	--------	√
	FDI	√	--------
Panel Granger			
Causality	**GDP**	--------	√
	FDI	√	--------

Note: √: Represents the presence of causality; X: Represents the absence of causality

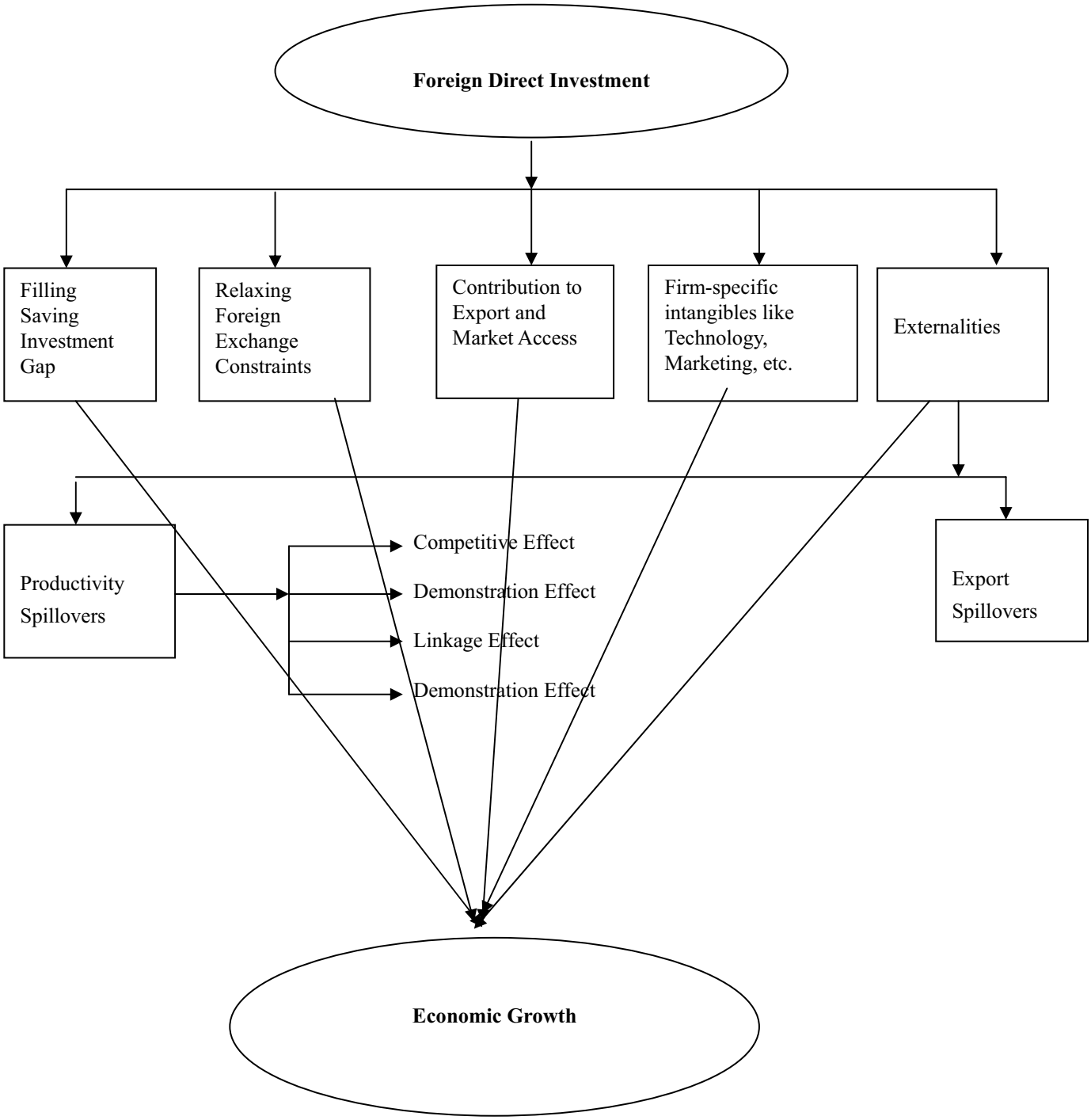

Figure 1. Linkage between Foreign Direct Investment and Economic Growth