FDI, FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH: PANEL COINTEGRATION ANALYSIS

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ABSTRACT

This study examines the long-run relationship between foreign direct investment (FDI) and financial development with economic growth for nine countries from 1982 to 2011 by utilizing panel cointegration analysis. The findings show the presence of long run relationships between FDI and financial development with the economic growth. The study also discovers that financial development indicators have a significantly positive and larger effect on growth than FDI does. Overall, this study provides more evidence on the important role of financial development in realizing the country's growth effects of FDI in the long run. Some efforts for the improvement of financial development should be made with an effective economic policy in order to benefit more from the presence of FDI in the recipient countries in the long run.

Keywords: Financial Development, Foreign Direct Investment, Economic Growth, Panel Cointegration.

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1. Introduction

Extensive studies have explored the impact of foreign direct investment (FDI) to economic growth. The studies focus on the direct contribution and the channels that may enable the growth effects of FDI to the recipient countries. Overall, studies on the impact of FDI on economic growth have produced incompatible results. Although FDI inflows are discovered as an engine of economic growth, where their benefits of knowledge and technology spillovers could contribute to the economic growth of the recipient countries, the empirical findings on the growth effects of FDI are still inconclusive and remain ambiguous.

Recent empirical literature has brought forth the assertion that financial development is a key explanation for the inconclusive and ambiguous findings in the FDI-growth nexus. Financial development is found to serve as a precondition in enabling the positive growth effects of FDI to be realized. It is recognized as an important absorptive capacity due to its major functions in the country's financial system that includes both banking and stock market sectors. According to Levine (2005), growing evidence shows that financial institutions and financial markets can exert a strong influence on economic development. Alfaro et al. (2009) provide evidence that financial markets act as a channel in facilitating the positive growth effects of FDI to be realized where the study finds that countries with well-developed financial markets gains significantly from FDI through total factor productivity improvements.

Theoretically, it is well known that FDI and financial development are important sources of capital investment funds that would contribute to economic growth. Levine (2005) provides detailed discussion on the five major functions of a financial system: producing information and allocating capital; monitoring firms and implementing corporate governance; ameliorating risk; pooling of savings; and easing exchange, all of which contribute to stimulating economic growth. Meanwhile, OECD (2003) reports that positive spillover effects of FDI can become advantageous to the country through the companies' development and restructuring, the enhancement of international trade and smart integration into the world economy, as well as an increase in the competition and human capital development. Thus, both FDI and financial development are shown to be important and complement in their relation to promote economic growth. Further, this study investigates the relationship between financial development and FDI with economic growth using panel cointegration analysis for a sample of 9 countries over a period 1982 to 2011.

This paper is organized as follows: Section II provides discussion on past literature of FDI to growth and financial development to growth. Section III presents the econometric data and data source. Section IV provides methodology that includes the analysis and robustness test. Section V discusses the empirical findings. Finally, Section VI summarizes the conclusions.

2. Past Literature

It is established that burgeoning studies that investigate the impact of FDI on economic growth have resulted to mixed findings. Although theoretically FDI has been recognized as one of the external sources that can promote economic growth, the results from empirical studies still vary. From the theoretical perspective, Aghion and Howitt (1998) who significantly contributes to the new growth theory highlight the fact that the innovations generated from technological knowledge take one step ahead in the form of new goods, new markets or new processes towards sustaining a positive growth rate of output per capita in the long run. Thus, leaning on the features of capital and its spillovers, FDI is seen as another potential source for economic growth where it would generate direct and indirect impacts through the positive spillovers. In another perspective of causality, Gao (2005) in his theoretical study of FDI and economic growth in a two-country endogenous growth model, views that although there are positive correlations often noted between inward FDI and economic growth, the relationship may not be causal. Gao (2005) finds that in the core-periphery or developed country, the economic integration which gives rise to FDI leads to an expansion of research and development activity, as well as increases the growth rate, while periphery or less developed countries benefit from the increases in the living standards. Liu (2008) proposes that FDI spillovers could decrease the short-term level of productivity but increase the long-term productivity growth rate of local firms. In the long run, technology spillovers serve as a source of knowledge that can make productivity growth rate sustainable, as well as functioning as an ultimate engine of economic growth.

The empirical studies on FDI-growth nexus have resulted to mixed findings. De Mello (1999) empirically finds that FDI inflows positively affect an output growth. Sadik and Bolbol (2001) present evidence where the study finds that FDI has been found to be an added advantage of generating technological spillovers for the positive growth in the countries of the Arab world. It is also identified that by facilitating the technology transfer in a global economy, it can hone the technology edge of other countries involved in the various international endeavors. Similarly, Chakraborty and Nunnenkamp (2008) who examine the effect of FDI in the Indian post-reform within a panel co-integration framework, also find that FDI stock and output are positively related through cross-sector spillovers from the service sector to the manufacturing sector. On the other hand, study by Aitken and Harrison (1999) empirically finds that FDI has a negative consequence on the productivity of domestically owned plants. Meanwhile, Konings (2001) finds negative effects of FDI on domestic firms and Görg and Greenaway (2004) conclude in their study that the effects of FDI on growth are mostly negative.

Extensive literature has discovered the absorptive capacity as a key explanation to the ambiguous results in the FDI-growth nexus. Financial development has been introduced as a crucial channel that would enable the growth effects of FDI to be realized. Collectively past studies empirically find that higher level of financial development serves as a precondition to stimulate the positive growth effects of FDI. Study by Hermes and Lensink (2003) discovers that the development of banks and stock markets are important pre-requisite for positive growth effects of FDI to be materialized. Hermes and Lensink (2003) utilize the regressions of growth equation and cross section of the data set of 67 of less developed countries for the period of 1970 to 1995. Following Hermes and Lensink (2003), Alfaro et al. (2004), Azman-Saini et al. (2010) and Choong (2012) also find the similar findings on the important role of financial development in the FDI-growth nexus. Alfaro et al. (2004) employ cross-country data for the period of 1975-95 for OECD countries. Meanwhile Azman-Saini et al. (2010) utilize cross-country observation for 91 countries for the period of 1975-2005. Some other studies for examples, Lee and Chang (2009) and Ang (2009) also consistently establish the same finding of the positive link of FDI-growth with the financial development as a pre-condition.

Theoretically, financial development would serves as an effective precondition in the FDI-growth nexus due to its major functions. The role of financial development in the economy has been well acknowledged since decades ago. The evidence becomes even more convincing after studies by Levine (1997) and Levine and Zervos (1996) that find the level of financial development as a good predictor for future economic growth, capital accumulation and technological change. According to Levine (1997), major functions of financial system provide different implication in every dimension of the activities in the economy. Levine (1997) highlights five functions of financial system i.e. facilitate risk management, allocate resources, exert corporate control, mobilize savings and ease trading of goods and services which consequently channels capital accumulation as well as technological innovation to growth. The more efficient the functions the more developed financial development will be which impliedly ameliorate market frictions of information and transaction costs. As a result, the economic growth can be promoted through the well-functioning and developed financial development.

Although recent studies discover that financial development serves as a precondition for the positive growth effects of FDI to be realized, the long run relationship between the variables including FDI, financial development and economic growth have not been adequately addressed in the existing studies. Therefore, this paper attempts to contribute to the existing literature in the different dimensions. This study investigates the long run relationship between foreign direct investment and financial development with economic growth using panel cointegration analysis for a sample of 9 countries over the period 1982 to 2011.

3. Econometric Model and Data Source

Following Lee and Chang (2009), the relationship between economic growth (*Y*), foreign direct investment (*FDI*) and financial development (*FD*) is modelled as follows:

$$Y_{it} = f\,(FDI_{it}, FinDev_{it}, w_i) \qquad (1)$$

$$Y_{it} = \alpha_0 + \alpha_{1i}FDI_{it} + \alpha_{2i}FinDev_{it} + \mathrm{w}_i + u_{it} \qquad (2)$$

In equation (2), cross-sections are denoted by subscript i ($i = 1, 2, \ldots, N$) and time period by subscript t ($t = 1, 2, \ldots, T$), w is the country fixed effect and u is the stochastic random term. Domestic credit to private sector by banks as a percentage share of GDP and liquid liabilities (as % of GDP) used as a proxy for financial development.

We further modify Lee and Chang's (2009) model with test the Model 3 by using an interest rate spread (IRS) as additional proxy for financial development with data observation from 1982 till 2011 for nine selected developing countries. In addition, we use Kao cointegration test to make robustness checking with Pedroni cointegration test result to test the panel cointegration. We use both Fully Modified OLS (FMOLS) and Dynamic OLS (DOLS) to estimate the long run relationship in the specification. Panel vector autoregressive (VAR) causality is used to test the direction of causality among the variables.

Real GDP per capita in constant international dollar (US$) is used to measure economic growth and foreign direct investment net inflows in dollar is used to measure foreign direct investment. Domestic credit to private sector by banks as a percentage share of GDP (*DCPS*), liquid liabilities (as % of GDP) (*LIAB*) and interest rate spread where the percentage of lending rate minus deposit rate (*IRS*) are used as proxies for financial development, and each proxy is employ in $FinDev_{it}$ as Model 1, Model 2 and Model 3 respectively. All series are in natural logarithm form.

Nine countries are selected for the estimation of the econometric model on the basis of data availability and use balanced panel. Our sample focused on developing countries, included Dominica, Grenada, Guatemala, Honduras, Nigeria, St. Lucia, St. Vincent and the Grenadines, Thailand, and Vanuatu. The study covers the period of 1982 – 2011. All data are obtained from World Development Indicators (2015) of the World Bank, UNCTAD Database and Financial Structure Dataset.

4. Methodology

4.1 Panel Unit Roots

We apply Levin et al. (1993) (LLC), Im et al. (1997) (IPS) and Maddala and Wu (1999) (MW, ADF) panel unit root tests to check the stationary properties of the variables. These tests apply to a balanced panel but the LLC can be considered a pooled panel unit test, IPS represents a heterogeneous panel test and MW panel unit root test is a non-parametric test.

4.1.1 LLC Unit Root Test

Levin et al. (1993) developed a number of pooled panel unit root tests with various specifications depending upon the treatment of the individual specific intercepts and time trends. Their test imposes homogeneity on the autoregressive coefficient that indicates the presence or absence of unit root problem while the intercept and the trend can vary across individual series. Abuaf and Jorion (1990) point out that the power of unit root tests may increase by using cross-sectional information. Expanding on the work of Levin and Lin

(1992), Levin et al. (2002) propose a panel-based ADF test that restricts parameters δ_i by keeping them identical across cross-sectional regions as follows:

$$\Delta y_{i,t} = \alpha_i + \delta_i y_{i,t-1} + \sum_{j=1}^{p_i} \alpha_{i,j}\, \Delta y_{i,t-j} + \varepsilon_{i,t} \quad (3)$$

Equation (3) implement a separate ADF regression for each country. The lag order p_i is allowable across individual countries. The appropriate lag length is chosen by allowing the maximum lag order and then uses the t-statistics for ij to determine if a smaller lag order is preferred.

Two separate ADF regression is generated with different residuals $\tilde{\eta}_{it}$ and $\tilde{\mu}_{i,t-1}$.

$$\Delta y_{i,t} = \lambda_i + \sum_{j=1}^{p_i} \gamma_{i,t-j}\, \Delta y_{i,t-j} + \eta_{i,t} \;\Rightarrow\; \tilde{\eta}_{it} \quad (4)$$

$$y_{i,t-1} = \partial_i + \sum_{j=1}^{p_i} \varphi_{i,t-j}\, \Delta y_{i,t-j} + \mu_{i,t-1} \Rightarrow\; \tilde{\mu}_{i,t-1} \quad (5)$$

LLC procedure suggests standardize the errors $\tilde{\eta}_{it}$ and $\tilde{\mu}_{i,t-1}$ by regressing the standard error the ADF regression provided above:

$$\tilde{\eta}_{it} = \frac{\tilde{\eta}_{it}}{\hat{\sigma}_{\varepsilon i}},\; \tilde{\eta}_{it-1} = \frac{\tilde{\eta}_{i,t-1}}{\hat{\sigma}_{\varepsilon i}} \quad (6)$$

Regression can be run to compute the panel test statistics following equation (5):

$$\tilde{\eta}_{it} = \phi\tilde{\eta}_{i,t-1} + \omega_{it} \quad (7)$$

The null hypothesis for LLC testing is as follows: $H_0 : \delta_1, \ldots = \ldots \delta_n = \delta = 0$ (non-stationary) and alternative hypothesis is $H_A : \delta_1, \ldots = \ldots \delta_n = \delta < 0$ (stationary).

4.1.2 IPS Unit Root Test

Im et al. (IPS) (1997) introduced a panel unit root test in the context of a heterogeneous panel. This test basically applies the ADF test to individual series thus allowing each series to have its own short-run dynamics. But the overall *t*-test statistics is based on the arithmetical mean of all individual countries' ADF statistics. Suppose a series can be represented by the ADF (without trend).

$$\Delta x_{i,t} = \varpi_j + \varpi_i x_{i,t-1} + \sum_{j=1}^{p_i} \theta_{i,j}\, \Delta x_{i,t-j} + \upsilon_{i,t} \quad (8)$$

After the ADF regression has different augmentation lags for each country in finite samples, the terms $E(t_T)$ and var(t_T) are replaced by the corresponding group averages of the tabulated values of $E(t_T, P_i)$ and var(t_T, P_i), respectively. The IPS test allows for the heterogeneity in the value ϖ_i under the alternative hypothesis. This is a more efficient and powerful test than usual single time series test (Nasreen, S. & Anwar, S., 2014). The estimable equation of IPS unit root test is modelled as follows:

$$t_{NT} = \frac{1}{N} \sum_{i=1}^{N} t_{i,t}\, (P_i) \quad (9)$$

where $t_{i,t}$ is the ADF regression and test statistics can be calculated as follows:

$$A_t = \frac{\sqrt{N(T)}\,[\overline{t_T} - E(t_T)]}{\sqrt{var\,(t_T)}} \quad (10)$$

As t_{NT} is explained above and values for $E[t_{iT}(P_{i,}0)]$ can be obtained from the results of Monte Carlo simulation carried out by IPS, they have the calculated and tabulated them for various time periods and lags. When the ADF has different augmentation lags ($P_{i,}$), the two terms $E(t_T)$ and var(t_T) in the equation above are replaced by corresponding group averages of the tabulated values of $E(t_T, P_{i,})$ and var(t_T, P_i), respectively.

4.1.3 MW Unit Root Test

The Fisher-type test was developed by Maddala and Wu (1999), which pools the probability values obtained from unit root tests for every cross-section i. this is a non-parametric test and has a chi-square distribution in a panel. The test statistics are given by

$$\lambda = -2 \sum_{i=1}^{n} log_e(p_i) \sim \chi^2_{2n}\,(d.f.) \quad (11)$$

where p_i is the probability value from ADF unit root tests for unit i. The MW unit root test is superior to the IPS unit root test because the MW unit root test is sensitive to lag length selection in individual ADF regressions. Maddala and Wu (1999) performed Monte Carlo simulations to prove that their test is more advanced than the developed by IPS (2003).

4.2 The Panel Cointegration Tests

Advance panel cointegration tests can be expected to have a higher power than the traditional tests. The tests applied for long-run examination are developed by Pedroni (1999, 2004). Pedroni uses the following cointegration equation:

$$x_{it} = \alpha_i + \rho_i t + \beta_{1i} Z_{1i,t} + \ldots + \beta_{mi} Z_{mi,t} + u_{it} \quad (12)$$

where x and Z are assumed to be integrated of order one. The specific intercept term α_i and slope coefficients β_{1i}, β_{2i}, ..., β_{mi} vary across individual members of the panel. Pedroni(1999, 2004) proposed seven different statistics to test for cointegration relationship in a heterogeneous panel. The seven test statistics of Pedroni are classified into within dimension and between dimension statistics. Within dimension statistics are referred to as panel cointegration statistics, while between dimension statistics are called group mean panel cointegration statistics.

We also using Kao cointegration test for robustness. Kao (1999) presents DF and ADF-types tests for cointegration in panel data. The null hypothesis for this test as well as for DF tests is that of no cointegration. Kao's test imposes homogeneous cointegrating vectors and AR coefficients, but it does not allow for multiple exogenous variables in the cointgerating vector.

4.2.3 Estimation of Panel Cointegration Regression

When all variables are cointegrated, the next step is to calculate the long-run estimates. In the presence of cointegration, OLS estimates do not give efficient results. For this reason, several estimators have been proposed. For example, Kao and Chiang (2000) argue that their parametric panel Dynamic OLS (DOLS) estimator pools the data along the within dimension of the panel. However, the panel DOLS of Kao and Chiang (2000) does not consider the importance of cross-sectional heterogeneity in the alternative hypothesis. To allow for cross-sectional heterogeneity in the alternative hypothesis, endogeneity and serial correlation problems to obtain consistent and asymptotically unbiased estimates of the cointegrating vectors, therefore, FMOLS presented by Pedroni (2000, 2001) is applied to estimate long-run coefficients. The panel FMOLS estimator for the coefficient β is defined as:

$$\beta_{NT}^{*} = N^{-1}\sum_{i=1}^{N}\left[\sum_{t=1}^{T}(X_{it}-\bar{X}_1)^2\right]^{-1}\left[\sum_{t=1}^{T}(X_{it}-\bar{X}_1)Y_{it}^{*}-T\hat{\tau}_i\right] \quad (13)$$

The associated t-statistic is assumed to be normally distributed.

4.3 Panel VAR Causality

If evidence of cointegration is found, a panel vector autoregression (VAR) under the maximum likelihood approach of Johansen (1988) can be estimated to perform Granger causality tests. Evidence of cointegration between variables implies that there exists causality in at least one direction (Granger, 1969). The following VECM models are used to test the causality between variables:

$$\Delta LGDPPP_{\mathrm{it}} = \mathrm{c}_{1\mathrm{j}} + \sum_{i=1}^{p}\varphi_{1ij}\Delta LGDPPP_{it-j} + \sum_{i=1}^{p}\theta_{1ij}\Delta LFDI_{it-j} + \sum_{i=1}^{p}\gamma_{1ij}\Delta LFinDev_{it-j} + \varepsilon_{1\mathrm{t}} \quad (14)$$

$$\Delta LFDI_{\mathrm{it}} = \mathrm{c}_{1\mathrm{j}} + \sum_{i=1}^{p}\varphi_{2ij}\Delta LGDPPP_{it-j} + \sum_{i=1}^{p}\theta_{2ij}\Delta LFDI_{it-j} + \sum_{i=1}^{p}\gamma_{2ij}\Delta LFinDev_{it-j} + \varepsilon_{1\mathrm{t}} \quad (15)$$

$$\Delta LFinDev_{\mathrm{it}} = \mathrm{c}_{1\mathrm{j}} + \sum_{i=1}^{p}\varphi_{3ij}\Delta LGDPPP_{it-j} + \sum_{i=1}^{p}\theta_{3ij}\Delta LFDI_{it-j} + \sum_{i=1}^{p}\gamma_{3ij}\Delta LFinDev_{it-j} + \varepsilon_{1\mathrm{t}} \quad (16)$$

All the variables here are as previously defined, Δ denoted the first difference of the variables, j = 1,2,3) represent fixed country effect, and p is the lag length. Term ε is the disturbance assumed to be uncorrelated with mean zero. The short-run adjustment coefficients are constrained to be the same for all countries. We take the first differences of equations (14)-(16) to eliminate the country-specific effects. The directions of causation can be identified by testing for the significance of the coefficient of each of the dependent variables in equations (14)-(16). For short-run causality, we test H_0: θ_{1ij} = 0 for LFDI or γ_{1ij} = 0 for LFinDev for all p in equation (14); H_0: φ_{2ij} = 0 for LGDPPP or γ_{2ij} = 0 for LFinDev for all p in equation (15); and); H_0: φ_{3ij} = 0 for LGDPPP or θ_{3ij} = 0 for LFDI for all p in equation (15).

5. Empirical Findings

5.1 Descriptive Statistics

This study examines the long-run relationship between foreign direct investment and financial development with economic growth for 9 countries from 1982 to 2011 by using panel co-integration analysis. Table 1 shows descriptive statistics of LGDPPP, LFDI, LDCPS, LLIAB and LIRS series for panel data. Mean values of all variables are positive where the mean value for LGDPPP is the highest at 7.746 while the lowest mean value is LIRS at 1.813. However, LIRS has the highest kurtosis where exceed the normal form. Besides, LFDI has a highest gap between maximum and minimum compared with other variables. Jarque-Bera test shows only LFDI and LDCPS has normal distribution.

Table 1: Descriptive Statistics

	LGDPPP	LFDI	LDCPS	LLIAB	LIRS
Mean	7.745859	4.552256	3.683060	3.984002	1.813263
Median	7.699244	4.116112	3.750470	4.129911	1.924127
Maximum	8.836571	9.337803	5.110294	5.002108	2.712485
Minimum	6.203019	-1.609438	2.162516	2.554056	-1.149906
Std. Dev.	0.686182	2.129847	0.607328	0.549065	0.487541
Skewness	-0.388808	0.286468	-0.316708	-0.575688	-1.777940
Kurtosis	2.382144	2.787837	2.800676	2.380247	9.236693
Jarque-Bera	11.09735	4.199269	4.960637	19.23478	579.8319
Probability	0.003893	0.122501	0.083717	0.000067	0.000000

5.2 Panel Unit Root Results

Table 2 presents the results from the panel unit root tests at level and first difference. These results are calculated by applying three panel unit root test: LLC, IPS and MW panel unit root test. The optimal lag length used for conducting these tests statistic was selected based on Asymptotic t-statistic (p=0.1): 0 to 6. Automatic bandwidth selection is based on Newey-West and Bartlett kernel. The result shows that LGDPPP and LIRS are stationary at level using LLC and LFDI is stationary at level using both LLC and MW. However, our empirical findings reveal that all variables are stationary at first difference when use IPS test. IPS is more powerful than LLC since it considered the heterogeneity on the variables coefficient and the IPS test provides separate estimation for each *i* section, allowing different specification of the parametric value, the residual variance and the lag length. Thus, we reject the null hypothesis of non-stationary at 1% level of significance and conclude that all series are integrated of order one or $I(1)$ in the panel of 9 selected developing countries. Using these results, we proceed to test LGDPPP, LFDI, LDCPS, LLIAB and LIRS for cointegration to determine if there is a long-run relationship in the econometric specifications (Model 1, Model 2 and Model 3).

Table 2: Panel Unit Root Tests

Variables	Level			1st Differences		
	LLC	IPS	MW	LLC	IPS	MW
LGDPPP	-2.266**	0.809	21.758	-7.085***	-7.049***	88.120***
LFDI	-3.615***	-1.396	35.345***	-8.396***	-9.513***	120.470***
LDCPS	0.011	1.689	7.898	-9.288***	-9.289***	112.734***
LLIAB	-1.279	0.437	11.223	-9.002***	-10.539***	127.696***
LIRS	-2.257**	-1.375	27.165	-14.649***	-15.241***	188.315***

Trend Assumption: No deterministic trend
***, ** indicates the coefficient significant at the 1% and 5% level respectively

5.3 Panel Cointegration Results

The results of Pedroni (1999, 2004) panel cointegration tests are reported in Table 3. There are seven different cointegration statistics proposed by Pedroni's to capture the within and between effects in panel. It can be classified in two categories which are within dimension and between dimension. From the results, two of seven panel cointegration tests for Model 1 indicate that the null hypothesis of no cointegration is rejected at 1% significance level. However, for Model 2 only one of seven panel cointegration tests indicates that the null hypothesis of no cointegration is rejected at 5% significance level. But interestingly, Model 3 shows five of the seven panel cointegration tests indicate that the null hypothesis of no cointegration is rejected at 1% and 5% significance level.

In addition, Kao test are used in this analysis for robustness. The results of Kao (1999) that presented DF and ADF-type for panel cointegration tests are reported at Table 4. The results shows that the residuals are stationary at 1% significant level for Model 1 and Model 2 while null hypothesis of no-cointegration is rejected at 5% significant level for Model 3 indicating there exists cointegration among variables in panel context. Thus, we can estimate a long-run coefficient from the given variables in all models.

Table 3: Pedroni Panel Cointegration Tests Results

	Model 1: (*LGDP, LFDI, LDCPS)*	**Model 2: *(LGDP, LFDI, LLIAB)***	**Model 3: *(LGDP, LFDI, LIRS)***
Within dimension			
Panel v	2.419***	1.979**	2.668***
Panel ρ	1.623	1.443	-0.374
Panel PP	1.014	0.128	-2.519***
Panel ADF	0.747	-0.169	-2.709***
Between dimension			
Group ρ	1.598	1.947	0.683
Group PP	-0.274	-0.005	-2.013**
Group ADF	-2.110***	-0.491	-2.655***

Trend Assumption: Deterministic intercept and trend
Automatic lag length selection based on AIC with a max lag of 6
***, ** indicates the coefficient significant at the 1% and 5% level respectively

Table 4: Kao Panel Cointegration Tests

	ADF	
Series	**t-statistics**	**Probability**
Model 1: LLGDPPP, LFDI, LDCPS	-2.602***	0.005
Model 2: LLGDPPP, LFDI, LLIAB	-2.818***	0.002
Model 3: LLGDPPP, LFDI, LIRS	-2.244**	0.012

Null Hypothesis: No co-integration
Trend Assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 7
Newey-West automatic bandwith selection and Bartlett Kernel
***, ** indicates the coefficient significant at the 1% and 5% level respectively

5.4 Panel Long-Run Estimation

To deal with endogeneity bias in regressors, we further consider the bias-corrected estimation methods. Table 5 and 6 presents the results of the country-by-country using the FMOLS and DOLS estimation on long run equation for three models: (LGDPPP, LFDI, LDCPS), (LGDPP, LFDI, LLIAB) and (LGDPPP, LFDI, LIRS). On a per country basis of Model 1 and Model 2, FDI has a significantly positive impact on LGDPPP at 1% and 5% significant level in 8 of the 9 countries in FMOLS estimation but only 7 of the 9 countries for DOLS estimation. However, when the financial development proxy is LIRS as shown in Model 3, all countries reject the null hypothesis of LFDI has no effect on LGDPPP at 1%, 5% and 10% for both estimations. In 4 of the 9 countries LDCPS has a significantly positive impact on LGDPPP at 1%, 5% and 10% significant level in FMOLS estimation but DOLS estimation shows significantly positive and negative impact LDCPS on LGDPPP. FMOLS estimation shows LLIAB has significantly positive impact on LGDPPP at 1% significant level for 3 of the 9 countries, but contradict with the result shows by DOLS estimation where it has different of significantly positive and negative impact LLIAB to LGDPPP. Similarly, Model 3 shows positively and negatively significant impact LIRS to LGDPPP for both estimations.

Table 5: Fully Modified OLS Estimates

Country	LGDPPP is the dependent variable					
	Model 1		Model 2		Model 3	
	LFDI	LDCPS	LFDI	LLIAB	LFDI	LIRS
Dominica	0.155***	0.252	0.063**	0.904***	0.174***	-0.025
Grenada	0.226***	0.053	0.209***	0.174	0.236***	0.015
Guatemala	0.067***	0.193**	0.089***	0.031	0.084***	0.050**
Honduras	0.061***	0.161*	0.084***	-0.031	0.088***	-0.048
Nigeria	0.129***	0.390***	0.172***	0.407***	0.260***	-0.179***
St. Lucia	0.183**	0.326	0.021	1.162***	0.172***	0.546***
St. Vincent and the Grenadines	0.258***	-0.277	0.240***	-0.461	0.237***	-0.367
Thailand	0.251***	0.206	0.173**	0.480	0.281***	0.088
Vanuatu	0.015	0.164**	0.047**	-0.154	0.029*	-0.107***
Panel	**0.133*** **	**0.304*** **	**0.146*** **	**0.285*** **	**0.183*** **	**-0.006**

Trend Assumption: No deterministic trend
***, **, * indicates the coefficient significant at the 1%, 5% and 10% level respectively

Table 6: Dynamic OLS Estimates

Country	LGDPPP is the dependent variable					
	Model 1		Model 2		Model 3	
	LFDI	LDCPS	LFDI	LLIAB	LFDI	LIRS
Dominica	0.222***	0.054	0.110**	0.738***	0.218***	-0.015
Grenada	0.264***	-0.122*	0.272***	-0.199***	0.257***	-0.106*
Guatemala	0.088***	0.098	0.115***	-0.035	0.090***	0.058***
Honduras	0.060***	0.131	0.106	-0.180	0.088***	-0.029
Nigeria	0.128***	0.519***	0.196***	0.433***	0.303***	-0.220***
St. Lucia	0.216	0.202	-0.012	1.246**	0.158***	0.588***
St. Vincent and the Grenadines	0.359***	-1.150***	0.248***	-0.714*	0.239***	-0.525
Thailand	0.275***	0.152	0.253***	0.064	0.294***	-0.054
Vanuatu	0.000	0.331***	0.027	-0.290	0.033*	-0.105**
Panel	**0.143*** **	**0.262*** **	**0.155*** **	**0.163** **	**0.195*** **	**-0.019**

Trend Assumption: No deterministic trend
***, **, * indicates the coefficient significant at the 1%, 5% and 10% level respectively

Panel long run estimation results using panel Ordinary Least Square (OLS), panel Dynamic OLS (DOLS) and panel Fully Modified OLS (FMOLS) estimation on long run equation for three models presents at Table 7. Empirical results indicate the existence of positive relationship between LFDI with LGDPPP for all models as the coefficients are statistically significant at 1 % level. Based on the FMOLS results for Model 1, a 1% increase in LFDI and LDCPS will increase LGDPPP by 0.133% and 0.304% respectively. While 1%

increase in LFDI and LLIAB will increase LGDPPP by 0.146% and 0.285% respectively for Model 2. The expected sign for FMOLS and DOLS for all models are consistent compared to OLS. However, it shows that FMOLS is better because all variables are significance at 1% significance level for all models compared to DOLS where LLIAB is statistically significant at 5% at Model 2. In addition, Table 7 illustrates that LDCPS and LLIAB for financial development indicators have a greater impact on LGDPPP than does LFDI. Thus, our findings are consistent with the finding as Lee and Chang (2009).

Table 7: Panel Long Run Estimation

Variable LGDPPP is the dependent variable	**OLS**	**DOLS**	**FMOLS**
	Model 1		
LFDI	-0.129***	0.143***	0.133***
LDCPS	0.753***	0.262***	0.304***
Constant	5.562***		
	Model 2		
LFDI	-0.088***	0.155***	0.146***
LLIAB	0.713***	0.163**	0.285***
Constant	5.304***		
	Model 3		
LFDI	-0.125***	0.195***	0.183***
LIRS	0.168**	-0.019	-0.006
Constant	8.011***		

Trend Assumption: No deterministic trend
***, ** indicates the coefficient significant at the 1% and 5% level respectively

5.5 Panel Causality Results

Table 8: Panel Granger Causality Based on VAR

Dependent variables	**ΔLGDPPP F-test**	**ΔLFDI F-test**	**ΔLDCPS F-test**	**ΔLLIAB F-test**	**ΔLIRS F-test**
			Model 1		
ΔLGDPPP	-	2.212	3.515		
ΔLFDI	10.505***	-	1.833		
ΔLDCPS	10.465***	1.633	-		
			Model 2		
ΔLGDPPP	-	3.855	-	8.178*	-
ΔLFDI	9.643**	-	-	1.299	-
ΔLDCPS	12.510**	4.694	-	-	-
			Model 3		
ΔLGDPPP	-	2.622	-	-	2.920
ΔLFDI	7.825*	-	-	-	4.454
ΔLDCPS	26.630***	2.222	-	-	-

***, **, * indicates the coefficient significant at the 1%, 5% and 10% level respectively

Once these variables are cointegrated, we continue with the causality tests. We use a panel-based vector autoregression (VAR) to identify the direction of causality in the short run. The results of Granger causality reported in Table 8. With respect to short-run causality tests, there is evidence of Granger causality running from LGDPPP to LFDI and LDCPS in Model 1.

However, Model 2 shows bi-directional of Granger causality between LGDPPP and LLIAB. Apparently, LGDPPP Granger cause to FDI and financial development for all models in the short-run.

6. Conclusion

Panel cointegration testing results of the Pedroni (1999) and Kao (1999) provide essential evidence that there is a long-run relationship among LGDPP, LFDI, LDCPS, LLIAB, and LIRS. Apart from this, our panel FMOLS and DOLS indicate that LDCPS and LLIAB as financial indicators have a significantly positive and larger effect on growth than does FDI. However, from our panel causality tests, there is uni-directional of LGDPP Granger cause to financial development in all models except LLIAB has bi-directional with LGDPP. In addition, LGDPP Granger cause to LFDI in all models in the short-run. Overall, this study provides evidence that financial development plays an important role in enabling the growth effects of FDI. In attracting the FDI inflows, the country should take into account the development as well as the improvement of the financial development. The higher level of financial development will assist the country to effectively realize benefits from FDI spillovers in the long run. In other words, countries with well-developed financial development have better capacities in the long run to absorb the positive effects of FDI which consequently promote the economic growth.

References

Aitken, B. J. & Harrison, A. E. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *The American Economic Review* 89: 605-618.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S. & Sayek, S. (2004). FDI and economic growth: the role of local financial markets. *Journal of International Economics* 64: 89-112.

Alfaro, L., Kalemli-Ozcan, S. & Sayek, S. (2009). FDI, productivity and financial development. *The World Economy* 32(1): 111-135.

Ang, J. B. (2009). Foreign direct investment and its impact on the Thai economy: the role of financial development. *Journal of Economics and Finance* 33: 316-323.

Azman-Saini, W. N. W., Law, S. H. & Abdul Halim, A. (2010). FDI and economic growth: new evidence of the role of financial markets. *Economics Letters* 210: 211-213.

Chakraborty, C. & Nunnenkamp, P. (2008). Economic reforms, FDI and economic growth in India: a sector level analysis. *World Development* 36(7): 1192-1212.

Choong, C. K. (2012). Does the domestic financial development enhance the linkages between foreign direct investment and economic growth? *Empirical Economics* 42: 819-834.

Christopoulos, Dimitris, K., and Efthymios G. Tsionas (2004). Financial development and economic growth: Evidence from panel unit root and cointegration tests, *Journal of Development Economics* 73: 55–74.

De Mello, Luiz R. (1999). Foreign direct investment-led growth: Evidence from time series and panel data, *Oxford Economic Papers* 51: 133–151.

Engle, Robert, F., and Clive W J Granger (1987). Cointegration and error correction: representation, estimation, and testing, *Econometrica* 55: 257–276.

Gao, T. (2005). Foreign direct investment and growth under economic integration. *Journal of International Economics* 67: 157-174.

Görg, H. & Greenaway, D. (2004). Much ado about nothing? Do domestic firms really benefit from foreign direct investment? *The World Bank Research Observer* 19(2): 171-197.

Gutierrez, Luciano (2003). On the power of panel cointegration tests: A Monte Carlo comparison, *Economics Letters* 80: 105–111.

Hermes, N. & Lensink, R. (2003). Foreign direct investment, financial development and economic growth. *The Journal of Development Studies* 40(1): 142-163.

Im, Kyung, So., M. Hashem Pesaran, and Yongcheol Shin (2003). Testing for unit roots in heterogeneous panels, *Journal of Econometrics* 115: 53–74.

Kao, Chihwa (1999). Spurious regression and residual-based tests for cointegration in panel data, *Journal of Econometrics* 90: 1–44.

Kao, Chihwa, and Min-Hsien Chiang (1999). International R&D spillovers: An application of estimation and inference in panel cointegration, *Oxford Bulletin of Economics and Statistics* 61: 691–709.

Kao, Chihwa, and Min-Hsien Chiang (2000). On the estimation and inference of a cointegrated regression in panel data, *Advances of Econometrics* 15: 7–51.

Konings, J. (2001). The effects o foreign direct investment on domestic firms: evidence from firm-level panel datain emerging economies. *Economics of Transition* 9(3): 619-633.

Lee, Chien-Chiang & Chang, Chun-Ping (2009). FDI, financial development and economic growth: international evidence. *Journal of Applied Economics* 12(2): 249-271.

Levin, Andrew, and Chien-Fu Lin (2002). Unit Root tests in panel data: Asymptotic and finite-sample properties, *Journal of Econometrics* 108: 1–24.

Levine, R. (1997). Financial development and economic growth: views and agenda. *Journal of Economic Literature* 35: 688-726.

Levine, R. (2005). *Finance and growth: theory & evidence*, in Aghion, P. & Durlaff, S. (eds), Handbook of economic Growth. Elsevier Science. The Netherlands.

Levine, R. & Zervos, S. (1996). Stock market development and long-run growth. Policy Research Working Paper WPS1582. The World Bank Policy Research Department.

Liu, Z. (2008.) Foreign direct investment and technology spillovers: theory and evidence. *Journal of Development Economics* 85: 176-193.

Maddala, G.S and S. Wu (1999). A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test', *Oxford Bulletin of Economics and Statistics, special issue*, 61, pp. 631-652,

OECD. (2003). *Checklist for Foreign Direct Investment Incentive Policies.* France: OECD Publications.

Pedroni, Peter (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors, *Oxford Bulletin of Economics and Statistics* 61: 653–670.

Pedroni, Peter (2000). Full modified OLS for heterogeneous cointegrated panels, in B. H. Baltagi, ed.,

Nonstationary panel cointegration and dynamic panels (vol. 15 of *Advances in Econometrics*), Amsterdam, Elsevier Science.

Pedroni, Peter (2004). Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis, *Econometric Theory* 20: 597–625.

Sadik, A. T. & Bolbol, A. A. (2001). Capital flows, FDI and technology spillovers: evidence from Arab countries. *World Development*. 29 (12): 2111-2125.

Appendices

Figure 1: Graphical analysis of each variable for 9 countries, 1982 – 2011

Figure 1a): Plot of LGDPPP, 1982 – 2011

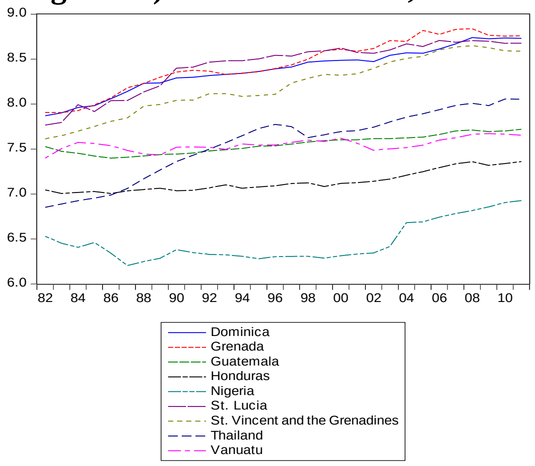

Figure 1b): Plot of LFDI, 1982 – 2011

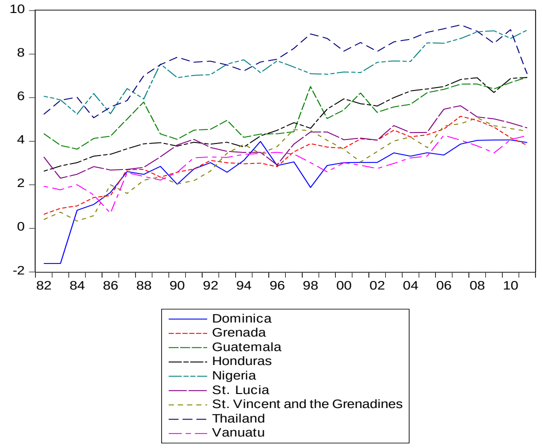

Figure 1c): Plot of LDCPS, 1982 – 2011

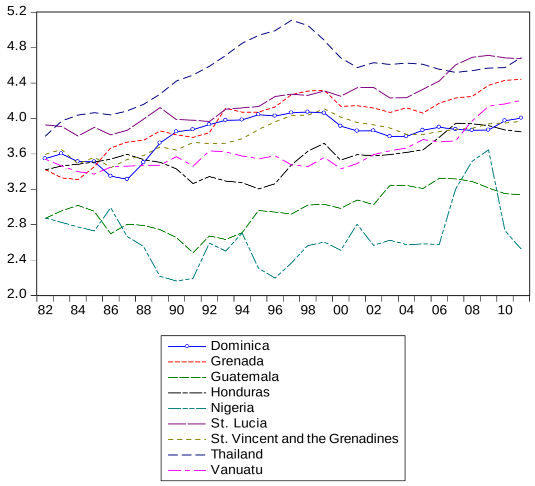

Figure 1d): Plot of LLIAB, 1982 – 2011

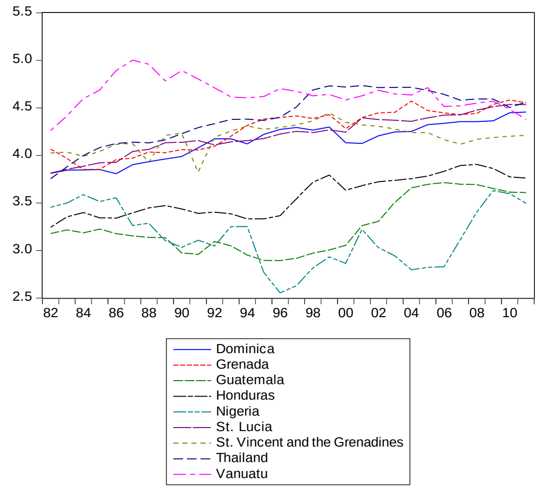

Figure 1e): Plot of LIRS, 1982 – 2011

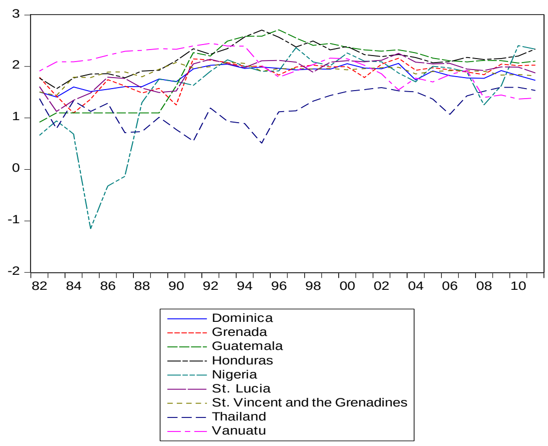

Figure 2: Scatter plot and regression line between each independent variable to dependent variable