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Does FDI Cause Economic Growth? Evidence from South-East Asia and Latin America

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Abstract

This paper investigates the direction of causal link between foreign direct investment (FDI) and economic growth measured in GDP in nineteen developing countries of South-East Asia and Latin America using Cointegration technique, Granger causality test and Error Correction Model (ECM). This paper finds that five countries in Latin America and one country in East and South East Asia have long run relation and exhibit unidirectional causality running from GDP to FDI. Seven countries, two from Latin America and five from East and South East Asia, demonstrates bidirectional short run causal link between GDP and FDI. Four countries, one from Lain America and three from East and South East Asia, exhibit that there exists unidirectional short run causal link running from GDP to FDI.

Keywords: FDI, Economic growth, Granger causality
JEL: F21, F23

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I. Introduction

There are few issues which have long been debated and have not been resolved in the literature of development economics. The causal link of foreign direct investment (FDI) is one of them. There are findings which support that FDI tends to promote economic growth. FDI provides essential ingredients that are necessary for economic growth. By providing new production process, techniques, managerial skills and new varieties of capital goods, FDI promotes economic growth of the less developed countries (LDC). The transfer of new techniques and technology spill over from the subsidiaries of multinational to domestic firms and enhances economic growth. On the other hand, others found that FDI follow economic growth. Economic growth first provides necessary and conducive economic factors for FDI to play a positive role for economic development. For example, the spill over effect of technology transfer though FDI can only be successful if the absorbing capacity of host countries is developed.

Secondly, an investigation of causal link between FDI and economic growth has strategic and policy implications for developing economics (LDC). FDI and economic growth may be linked in one the three possible ways: (1) Causal link may run from economic growth to FDI. If the causal link runs from economic growth to FDI, it means that economic growth is a prerequisite for attracting and absorbing FDI. In such a case, the policy implication is that developing countries (LDC) must lay emphasis on economic growth rather than going after FDI. (2) Causal link may run from FDI to economic growth. If there is unidirectional causality from FDI to economic growth, it leads

credence that FDI not only leads capital formation and employment generation but also provides economic growth to host counties. The policy implication, in such case, suggests that corporate rules and regulations of host countries must address to attract FDI. (3) Causal relation may run in both ways. If the causal link is bidirectional, that is, both economic growth and FDI have reinforcing effects on each other.

Issues such as whether FDI causes economic growth and what is the causal direction between economic growth and FDI are not resolved. Such an important and unsolved issue deserves further investigation. This paper aims to examine the causal link between FDI and economic growth in the context of 16 LDC of South-East Asia and Latin America.

This paper is organized as follows: Section II provides the survey of literature. Section III discusses the data and empirical methodology. Results of empirical investigation and conclusion are reported in Section IV.

II. Recent Literature

During the last two decades a large number of studies focused on the role of FDI in stimulating economic growth in the LDC. But there is no consensus with regard to the direction of causality. Hansen and Rand (2006) found strong causal link from FDI to GDP for a group 31 developing countries during 1970-2000. Bloomstrom, Lipsey and Zejan (1996) found evidence that FDI Granger caused economic growth. However, FDI's positive contribution is conditional. According to them, FDI is growth enhancing if the country is sufficiently reach measured in term of high per capita income. DeMello (1997) found that FDI had significantly positive effect on economic growth for the countries with high income.

Borensztein, Gregorio, and Lee (1998) found that FDI contributed economic growth to countries when the labor force has attained certain level of educational standard. Carkovic and Levine (2002) examined the effect of FDI on economic growth and concluded that FDI had no impact on long term economic growth. They argued that the lack of positive impact of FDI on economic growth is not conditional upon human capital, level of economic development or openness of the economy.

Zhang (2001) examined 11 countries of Asia and South America and found no uniform pattern of direction with regard to FDI and economic growth. In their words, "patterns of FDI-growth link display significant differences between East Asia and Latin America" (p.185) and he concluded in his paper with a note that "further work can be done" in this field. Zhang (2000) argued that economic growth lead to FDI growth. Rapid economic growth in the host country increases aggregate demand which stimulates higher demand for investments including FDI. Hermes and Lensink (2003) examined role of financial system of 67 countries and concluded that the development of financial system was an important factor for FDI to have a positive impact on economic growth. According to them, 37 countries of 67 had "a sufficiently developed financial system in order to let FDI contribute positively to economic growth" (p.142).

Caves (1996) found bidirectional relationship. FDI and economic growth are positively interdependent. Large economic growth provides high profit opportunities attracting higher domestic and foreign direct investments. On the other hand, FDI through its spill over effect have direct positive economic growth of the host countries. Chowdhry and Mavrotas (2006) found relationship of bidirectional causality between FDI and economic growth. Kholdy and Sohrabian (2005) found no causal link between FDI and

economic growth. Thus, the empirical evidence on the causal link between FDI and economic growth is mixed that deserves fresh enquiry into this issue.

III. Methodology

GDP and FDI data are annual and current dollar. They are obtained from IFM and UNTAD source. In exploring causal relationship between GDP and FDI, this paper uses cointegration and Error Correction model. Before implementing cointegration and Error Correction model, some econometric procedures/steps are undertaken.

First, the statistical properties of the time series data are examined. In particular, we need to find the order of integration for the time series. A variable is said to be integrated of order d, written I(d), if it needs differencing d time to achieve stationary. Since the publication of Nelson and Plosser (1982), it is widely recognized that most time series macroeconomic variables contain unit root or are I(1) processes. Augmented Dicky-Fuller (ADF) test is performed to check the order of integration i.e. whether the variables are stationary. The ADF test is based on the following regression:

$$\Delta Y_t = \beta_1 + \beta_1 t + \delta Y_{t-1} + \sum_{i=1}^{t} \Delta Y_{t-1} + \varepsilon_1 \qquad (1)$$

The result of the ADF test is provided in Table 1.

Second, the cointegration properties of the variables are examined. If the variables are found to be non stationary and yet their linear combination may be stationary, they are said to be cointegrated. The presence of cointegration means two things. First, “if two variables are found to be cointegrated, the possibility of no causation is ruled out and there must be at least one way of causations of either unidirectional or bidirectional” Mash and Mashi(1994, p36). Second, the variables have long term relationship in that they will not deviate arbitrarily from each other and that their deviations from long run

equilibrium path are corrected. To test for cointegration, this paper applies two most commonly used tests—the residual based test of Engle and Granger (EG), (1987) and the VAR based Johansen (1988) test.

According to EG test, we estimate the following regression and obtain the residuals:

$$Y_t = \beta_1 + \gamma X_t + Z_t \qquad (2)$$

Where Z_t are residuals and

$$Z_t = Y_t - \beta_1 - \gamma X_t \qquad (3)$$

We apply EG or AEG test on Z. Cointegration occurs if there exits a constant such that Z is I(0), meaning the residual series (Z_t) is stationary. The logic is that "if X and Y are I(1) but move together in the long run, it is necessary that Z_t be I(0) as otherwise the two series will drift apart without bound" (Granger, 1986).

Johansen (1991 and 1995a) cointegration is a VAR test. We may write the VAR as:

$$\Delta Yt = \pi Yt - 1 + \sum_{i=1}^{p-1} \tau i \Delta Yt - i + \beta Xt + \varepsilon t \qquad (4)$$

Where $\Pi = \sum_{i=1}^{p} \beta i - I$ and $\tau = -\sum_{j=i+1}^{P} \beta j$

Based on Granger's theorem, if the coefficient matrix Π has reduced rank r<k, then there exists k x r matrices α and β each rank r such that $\Pi = \alpha\beta'$ and $\beta' yt$ is I(0). r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. The null hypothesis is that number of cointegration:

H_0 : r=0

H_0 : r=1

Results of Cointegration test based on (3) and (4) are provided in Table 2. If X and Y are cointegrated, there exists a long run equilibrium and there exists a valid error correction mechanism which takes the form:

$$\Delta GDPt = \sum_{i=1}^{n} \alpha i \Delta GDPt - i + \sum_{i=1}^{n} \psi i \Delta FDIt - i + \lambda Zt - 1 + \varepsilon t \qquad (5)$$

Where GDP and FDI are stationary processes, Z represents one period lagged error correction term captured from the cointegrated regression from (3). α, ψ and λ are constant, and ε is error term. The standard Granger causality regression is based on (5) without the error correction term $Z_{t-1.}$ The null hypothesis that FDI does not Granger cause GDP is rejected not only if $\sum \psi i$ are jointly significant but also if the coefficient of Z-1 is significant (Miller and Russek, 2001). But in the Error Correction Model, the causality inference is obtained through the significance of λ. That is, the null hypothesis that FDI does not Granger cause GDP is rejected if λ is statistically significant even if α_i are not jointly significant.

On the other hand, if X and Y (GDP and FDI) are not cointegrated, there might be short term relationship and short run equilibrium. It is possible that GDP and FDI might affect each other in the short run. Standard Granger causality test on first difference is performed to find the direction of causality. The Granger test is performed on:

$$\Delta GDPt = \sum_{i=1}^{n} \alpha i \Delta GDPt - i + \sum_{i=1}^{n} \psi i \Delta FDIt - i + \varepsilon, \qquad (6)$$

$$\Delta FDIt = \sum_{i=1}^{n} \alpha i \Delta FDIt - i + \sum_{i=1}^{n} \psi i \Delta GDPt - i + \varepsilon, \qquad (7)$$

for all possible pairs of (GDP and FDI) series. The reported F-statistics are the Wald statistics. The null hypothesis that FDI does not Granger cause is rejected if ψ_i are jointly significant and α_i are jointly insignificant from (6) and that GDP does not Granger cause FDP is rejected if ψ_i are jointly significant and α_i are jointly insignificant from (7). Results of causality direction based on Granger causality and Error correction are provided in Table 3.

IV. Empirical Results

The ADF unit root test in Table 1 indicates that both series of GDP and FDI at level the null hypothesis that they have unit root can not be rejected for all countries. The test rejects the null hypothesis of nonstationarity in the first difference at the conventional significance level for countries such as Argentina, Brazil, Bolivia, Guatemala, Honduras, Philippines, Malaysia, Indonesia, Bangladesh, and Thailand. That is, GDP and FDI series are stationary at first difference, I(0) for these countries. However, countries such as Chile, Ecuador, Singapore, India, Sri Lanka, and Pakistan GDP is stationary when I(2) i.e. at second difference. Similarly, FDI series are stationary at I(2) for countries such as Columbia, Ecuador, Mexico, El-Salvador, Singapore, and Pakistan.

As two series (GDP and FDI) are nonstationary with time-dependent means and variances, the tests of cointegration are necessary to establish long term relations between the two series (Engle and Granger, 1987). Table 2 provides result of cointegration.

Table 1: Results of Test for Unit Roots

ADF Tests for Unit Roots				
	GDP		FDI	
Countries	Levels	First Difference	Levels	First Difference
Latin America				
Argentina	-1.38	-5.33*	-2.84*	-7.27*
Brazil	-0.17	-2.95***	-2.48	-4.09*
Bolivia	0.60	-3.41**	-1.62	-4.23*
Chile	1.08	-1.70	-0.63	-7.17*
Columbia	1.11	-3.58*	.49	-1.7
Ecuador	1.19	-3.58	4.87	-0.58
Guatemala	3.51	-3.16**	-4.54**	-5.57*
Honduras	1.10	-4.98*	2.12	-5.48*
Mexico	1.12	-4.54*	-1.30	-0.94
El Salvador	1.74	-5.46*	-4.04*	-7.82
East Asia				
Singapore	1.53	-2.12	1.60	-1.11
Philippines	1.02	-4.04*	-0.63	-10.81*
Malaysia	1.48	-3.91*	-1.49	-6.98*
Indonesia	0.28	-4.91*	-4.58**	-5.54*
South East Asia				
India	5.05	-1.86	6.44	1.40
Bangladesh	1.83	-3.61**	-0.68	-6.59*
Sri Lanka	3.52	-1.86	-1.13	-5.95*
Thailand	-015	-2.99**	3.23	-6.75*
Pakistan	0.95	-1.99	2.81	-0.86

*Level of significance less than 1%
** Level of Significance less than 5%
*** Level of significance less than 10%
Note: The Augmented Dicky-Fuller (ADF) test is based on the following regression

$$\Delta Y_t = \beta_1 + \beta_1 t + \delta Y_{t-1} + \sum_{i=1}^{t} \Delta Y_{t-1} + \varepsilon_i$$

Table 2: Results of Cointegration tests

Test For Cointegration				
	ADF Residual Test		Johansen Test	
Countries	Equations X on Y	t-Statistics	Hypothesized No of CE	Trace Statistic
Latin America				
Argentina	GDP on FDI	-4.67*	r=0	19.31*
	FDI on GDP	-5.07*		
Brazil	GDP on FDI	-2.64	r=0	16.56**
	FDI on GDP	-3.57**		
Bolivia	GDP on FDI	-5.8*	r=0	14.03
	FDI on GDP	-2.13		
Chile	GDP on FDI	-4.26*	r=0	17.80**
	FDI on GDP	-4.49*		
Columbia	GDP on FDI	3.47*	r=0	12.48
	FDI on GDP	-0.19		
Ecuador	GDP on FDI	-3.05	r=0	12.41
	FDI on GDP	-2.51		
Guatemala	GDP on FDI	-4.61*	r=0	19.27*
	FDI on GDP	-5.90*		
Honduras	GDP on FDI	-2.99	r=0	11.87
	FDI on GDP	-2.83		
Mexico	GDP on FDI	-3.21***	r=0	10.12
	FDI on GDP	-3.36***		
El Salvador	GDP on FDI	-6.10*	r=0	24.14*
	FDI on GDP	-6.08*		
East Asia				
Singapore	GDP on FDI	-1.16	r=0	11.95
	FDI on GDP	-0.79		
Philippines	GDP on FDI	-2.71	r=0	8.65
	FDI on GDP	-5.73*		
Malaysia	GDP on FDI	-2.13	r=0	8.10
	FDI on GDP	-2.39		
Indonesia	GDP on FDI	-3.24***	r=0	14.49
	FDI on GDP	-2.78		
South East Asia				
India	GDP on FDI	-1.08	r=0	15.28
	FDI on GDP	-0.38		
Bangladesh	GDP on FDI	-2.89	r=0	7.74
	FDI on GDP	-2.71		
Sri Lanka	GDP on FDI	6.11*	r=0	29.04*
	FDI on GDP	-6.01*		
Thailand	GDP on FDI	-2.46	r=0	14.29
	FDI on GDP	-2.43		
Pakistan	GDP on FDI	1.79	r=0	7.60
	FDI on GDP	1.93		

*, **, *** significant at ≤1%, ≤5% and ≤ 10% levels respectively

Table 2 indicates that both GDP and FDI series are cointegrated for Argentina, Brazil, Chile, Guatemala, El-Salvador, and Sri Lanka. The null hypothesis that there is no cointegration is rejected at a significant level of less or equal to 5%. This is supported by both EG residual and Johansen trace tests. The establishment of cointegration between the two series suggests that there exits long run relation or equilibrium for these six counties. For the rest of the countries, Johansen trace test indicates that two series (GDP and FDI) are not cointegrated, although EG residual test suggests cointegration of the series for some counties. Both EG and Johansen tests suggest that GDP and FDI series are not cointegrated for Ecuador, Honduras, Singapore, Malaysia, India, Bangladesh, Thailand, and Pakistan. The null hypothesis that there is no cointegration cannot be rejected. Thus, the establishment of no cointegration suggests that there is no long run relation or equilibrium for these countries. That is, except six countries, there is no long run relation.

The existence of no cointegration between the two series for these countries does not mean absence of causality or relation in the short run. For those countries whose GDP and FDI do no move together in the long run (i.e. no cointegration), it is possible for GDP and FDI affect each other in the short run. The conventional Granger causality test is the most appropriate tool in determining causal relation. The results of the Granger causality test for these countries are provided in the column 1, 2 and 3 of Table 3.

Error Correction model (ECM) is the appropriate tool and applied for those six countries where GDP and FDI are cointegrated (i.e. have long run relationship) in determining causal relation. Results of ECM are provided in the last three columns of Table 3.

Table 3: Results for short term and long term causality between GDP and FDI

Granger Test for Short Run causality			ECM Test for Long Run Causality		
Countries	Null hypothesis	F-statistics	Countries	GDP on FDI t-statistics[A]	FDI on GDP t-statistics[A]
Latin America					
Bolivia	GDP does not Granger cause FDI	3.06**	Argentina	-5.06*	-2.00
	FDI does not Granger cause GDP	3.19**	Brazil	-0.59	-2.9**
Columbia	GDP does not Granger cause FDI	2.47***	Chile	-0.31	-3.95*
	FDI does not Granger cause GDP	3.58**	Guatemala	-0.70	-2.73**
Ecuador	GDP does not Granger cause FDI	2.73***	El-Salvador	-0.72	-3.63*
	FDI does not Granger cause GDP	0.31	Sri Lanka	-0.75	-4.17*
Honduras	GDP does not Granger cause FDI	1.7			
	FDI does not Granger cause GDP	0.72			
Mexico	GDP does not Granger cause FDI	0.81			
	FDI does not Granger cause GDP	1.11			
Singapore	GDP does not Granger cause FDI	8.77*			
	FDI does not Granger cause GDP	3.90*			
Philippines	GDP does not Granger cause FDI	10.9*			
	FDI does not Granger cause GDP	1.19			
Malaysia	GDP does not Granger cause FDI	1.33			
	FDI does not Granger cause GDP	1.10			
Indonesia	GDP does not Granger cause FDI	6.6*			
	FDI does not Granger cause GDP	2.2**			
India	GDP does not Granger cause FDI	2.8***			
	FDI does not Granger cause GDP	4.63*			
Bangladesh	GDP does not Granger cause FDI	3.74*			
	FDI does not Granger cause GDP	0.20			
Thailand	GDP does not Granger cause FDI	19.9*			
	FDI does not Granger cause GDP	4.9”*			
Pakistan	GDP does not Granger cause FDI	2.9**			
	FDI does not Granger cause GDP	3.3**			

[A] = t-statistics for the coefficient of Error Correction Term, Z from (5)
*, **, *** significant at ≤1%, ≤5% and ≤ 10% levels respectively

The results of the Granger causality, reported in Table 3, indicate that GDP and FDI are independent of each other for Honduras, Mexico, and Malaysia. GDP and FDI do not affect each other in these three countries. F-statistics for these countries indicate that the null hypothesis that GDP does not Granger cause FDI and FDI does not Granger cause GDP cannot be rejected.

The Granger causality results in Table 3 indicate bidirectional relation between GDP and FDI for seven countries, namely, Bolivia, Columbia, Singapore, Indonesia, and India, Thailand, and Pakistan. The F-statistics for these countries suggest that the null hypothesis of bidirectional Granger causality cannot be rejected at a conventional level of significance. Both GDP and FDI interacts each other in providing feed back for these countries.

Three countries exhibit unidirectional and positive short run causal effects from GDP to FDI, namely, Ecuador, Philippines, and Bangladesh. F-statistics for these three countries indicated that the null hypothesis that GDP does not Granger cause FDI is rejected at significant level of 1%. GDP growth in these countries provides market and attracts foreign investment.

The long run causality between GDP and FDI is investigated for the six countries in which GFP and FDI are cointegrated. The EC results in Table 3 indicate that unidirectional causality runs from GDP to FDI for five countries, namely, Brazil, Chile, Guatemala, El-Salvador, and Singapore. The EC results indicate that unidirectional causality from FDI to GDP runs for one country, namely, Argentina.

The main finding of this paper may be summarized as:

1. In Latin America, five countries, namely, Argentina, Brazil, Chile, Guatemala, El-Salvador out of ten have long run relation between GDP and FDI (Table 2). In these countries, unidirectional causality runs from GDP to FDI excepting Argentina where causality runs from FDI to GDP (Table 3).
2. Only one country out of nine countries, namely Sri Lanka, in the East and South East Asia exhibits long run relation between GDP and FDI and causality runs from GDP to FDI (Table 3).
3. Five countries in Latin America, namely, Bolivia, Columbia, Ecuador, Honduras, and Mexico GDP and FDI are not cointegrated (Table 2) and, thus, exhibiting short run relation. Bidirectional Granger causality running between GDP and FDI are found in two countries, namely, Bolivia and Columbia (Table 3). Only Ecuador exhibits unidirectional causal link running from GDP to FDI. No causal link between GDP and FDI is found for Honduras and Mexico (Table 3).
4. In East and South East Asia, out of nine countries, bidirectional (i.e. both ways) short run causal link between GDP and FDI is found in five countries, namely, Singapore, Indonesia, India, Thailand, and Pakistan. Unidirectional short run link running from GDP to FDI is found in Philippines and Bangladesh Table 3).

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