

Empirical Evidence on the Causality Relationship between Foreign Direct Investment and Economic Growth in the Developing Countries

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ABSTRACT

The causality relationship between economic growth and foreign direct investment has generated intense research interest. The empirical study investigates the causal relationship between economic growth and foreign direct investment in 37 developing countries in multivariate framework. The major findings are, in most cases, foreign direct investment has no effect on economic growth. The study also found little evidence that economic growth causes the inflow of foreign direct investment to the developing countries.

Keywords: Economic growth; Foreign Direct Investment; Causality; developing countries

INTRODUCTION

Many policy makers in developing countries believe that Foreign Direct Investment (FDI) has several positive effects. These include productivity gains, technology transfers and the introduction of new processes, managerial skills and expertise, employee training, international production networks, and access to international markets. This has encouraged developing countries to ease restrictions on inward FDI and in many cases provide special incentives to attract FDI. They also believe that FDI can benefit domestic firms through the spillover effects of knowledge and new technologies through the direct or indirect contact between foreign firms and local firms or through labour turnover from foreign to domestic firms. The spillover effects may also take place when the entrance of foreign firms forces domestic firms to become more efficient by upgrading their existing technology and managerial skills.

Several literatures have highlighted the role of FDI in the technological progress and hence economic growth of the host country especially in the developing countries (Findlay 1978; Wang 1990; De Mello 1999; Obwona 2001). These authors argue that FDI may increase the rate of technical progress in the host country through the advanced technology introduced by the foreign firms. Thus, the objective of this study is to empirically investigate this argument by examine the causal relationship between FDI and economic growth. Specifically, this paper examines two competing hypotheses regarding the causal relationship between FDI and economic growth. In the first hypothesis, FDI is assumed to have a positive effect on economic growth of the host country. In the second hypothesis, the economic growth is seen as one of the main determinants of FDI. Thus, a country with a better economic growth is expected to attract more FDI.

Many existing works on the direction of causality between FDI and economic growth use Granger-causality test in a bivariate framework, which could result in spurious causality. To solve this problem, the causality tests in this study will be carried out in the framework of a multivariate model. This study will also add to the existing literature by investigating the causal relationship between FDI and economic growth in large number of developing countries. The existing time series studies of the causal relationship between FDI and growth usually focus on a specific country or only on a few countries. In this study, causality tests have been carried out for 37 developing countries. With a different history of macroeconomic episodes, policy regimes, the level of the economy openness and growth pattern among countries in the sample, this study is expected to provide more information on the nature of the causal relationship between FDI and economic growth.

LITERATURE REVIEW

In the 1950s and 1960s, the role of FDI was not considered seriously as an engine for economic growth by mainstream economics. However, starting from the mid 80s, in the light of the endogenous growth theory, the role of FDI has been approached from a new angle. In endogenous growth theory, the importance of technological change for economic growth has been emphasised. The endogenous growth theory focused on the creation of technological knowledge and its transmission, and views innovation and imitation efforts as major engines for economic growth. Therefore, it emphasises the role of Research and Development (R&D), human capital

accumulation, and externalities on economic growth (Romer 1990). In this regard, the growth rate of developing countries is perceived to be highly dependent on the extent to which these countries can adopt and implement new technologies available in developed countries. One important channel through which adoption and implementation of new technologies and ideas by developing countries may take place is through FDI.

Theoretical literature has developed various arguments that explain why FDI may potentially enhance economic growth in the host country. FDI can be considered as one of the main transmission vehicles of advanced technology from leaders to developing countries (Borensztein et al. 1998). In general, developing countries lack the necessary background in order to be able to innovate and generate new discoveries and designs. Therefore, these countries have to adopt technology that is produced elsewhere, and one of the ways whereby advanced technology may spread out to developing countries is through the channel of FDI. The technological advances brought in by foreign firms may conceivably spillover to other firms in the country, therefore originating externalities and encouraging the flourishing of domestic private activity.

The effects of FDI on economic growth could also take place through its effects on domestic investment. Some literature suggests that FDI has a 'crowding-in' effect on domestic investment. De Mello (1999), for example, using time series and panel data for a sample of 32 OECD and non-OECD countries covering the period 1970-1990, found that: (1) FDI has a positive impact on output growth; (2) there is a dominant complementarity effect between FDI and domestic investment; and (3) FDI appears to have a positive impact on the technological change in OECD countries but, a negative relationship exists between FDI and TFP in non-OECD countries. The last finding suggests that for technological followers (non-OECD countries), FDI may reduce TFP growth by fostering producer capital accumulation given the complementarities effect.

The existing theoretical studies on the relationship between FDI and growth indicate that FDI and growth can 'cause' each other. In other words, the causality between FDI and economic growth could run in either direction. First, FDI could promote further growth. In this regard, FDI is expected to help boost economic growth by encouraging the incorporation of new inputs and foreign technologies in the production function of the recipient economy. Second, rapid economic growth could induce the inflow of FDI (Dowling and Hiemenz 1982; Lee and Rana 1986). This is because rapid growth will usually create high levels of capital requirements in the host country and hence the host country will demand more FDI by offering

concessional terms for FDI to attract overseas investors. Rapid economic growth in the host country will also build the confidence for overseas investors investing in the host country. From this point of views, both FDI and economic growth are positively interdependent and could lead to bi-directional causality.

Several studies have been conducted to examine empirically the causality between these two variables. Ericsson and Irandoust (2001) have examined the causal effects between FDI growth and output growth for four OECD countries: Denmark, Finland, Norway, and Sweden. Using a multivariate VAR model including FDI, output and TFP growth the authors failed to detect any causal relationship between FDI and output growth for Denmark and Finland. They suggested that the specific dynamics and nature of FDI entering these countries could be responsible for these no-causality results. For Norway, they found a long-run unidirectional causal relationship running from FDI growth to GDP growth. This finding supports the argument that FDI inflows could stimulate economic growth. In the case of Sweden, they found support the existence of a bi-directional causal relationship, which provides evidence that FDI affects economic growth and economic growth itself exerts a major influence to the extent of FDI inflows.

In the case of developing countries, empirical studies on the causal relationship between FDI and growth also show mixed results. De Mello (1996), for example, in his study used Granger-causality tests to test the hypothesis of increasing returns to domestic capital due to FDI flows for five Latin American economies: Brazil, Mexico, Venezuela, Chile, and Colombia. Using data covering 1970-1991, his findings support the existence of causality for both directions depending on the recipient economy's trade regime, open economy performance variables, and domestic policy variables. His findings show that capital accumulation in Brazil appears to have preceded output growth while TFP growth seems to precede FDI flows. Meanwhile, in Chile, evidence revealed that FDI precedes both output and TFP growth. De Mello's findings suggest that the direction of causation depends on existing factor endowments and scale effects in such a way that larger economies are more attractive to FDI than smaller ones.

Mixed results on the causal relationship between FDI and growth can also be found in the empirical studies for the developing countries in other regions. Gyapong and Karikari (1999), by using Granger-causality tests have examined the causal relationship between FDI and economic performance in two Sub-Saharan African countries (Ghana and Ivory Coast),

from the 1960s to 1980. The results from the bivariate causality tests show that in Ivory Coast, a superior economic performance enhanced the inflow of export-oriented FDI, while in Ghana, where FDI took the form of market-development in response to an import-substitution strategy, the effect is ambiguous. Meanwhile, Zhang (2001) by using a cointegration approach has investigated the causal relationship between the two variables for 11 economies in East Asia and Latin America. His findings show that FDI tends to be more likely to promote economic growth in East Asia than Latin America. He concluded that the extent to which FDI is growth enhancing appears to depend on country-specific characteristics.

Others like Chowdhury and Mavrotas (2003) have examined the causal relationship between FDI and economic growth for three developing countries, namely Chile, Malaysia and Thailand. The study used time-series data covering the period 1969-2000, and econometric methodology proposed by Toda and Yamamoto (1995). Their empirical findings suggest that it is GDP that causes FDI in Chile and not vice versa. In the case of Malaysia and Thailand, they found a strong evidence of a bi-directional causality between GDP and FDI. Empirical studies have also been carried out to investigate the causal relationship between FDI and growth in specific developing countries. For India, Chakraborty and Basu (2002) have examined the link between FDI and output growth using annual data over the period 1974-1996. Their model consists of net inflow of FDI, real GDP, and unit cost of labour as endogenous variables while the proportion of import duties in tax revenue is treated as an exogenous variable. Using a cointegration model with a Vector Error Correction Mechanism (VECM), they concluded that real GDP in India is not Granger caused by FDI and the causality runs from real GDP to FDI. Shan et al. (1997) in their study have investigated the FDI-led growth hypothesis for China. The study used quarterly time series data over the period 1988-1996, a vector autoregression (VAR) model and the Granger-causality procedure developed by Toda and Yamamoto (1995). Shan et al. (1997) found a bi-directional causality running from industrial growth and FDI growth for China. In other words, the inflows of FDI and rapid industrial growth in China have reinforced each other. Liu et al. (2002) in their study also investigated the existence of causal relationships among economic growth, foreign direct investment and trade in China. The study used a cointegration approach with quarterly data over the period 1981 to 1997. Similarly, they found that the causal relationship among these variables is bi-directional.

In summary, the empirical studies reviewed above use different models and econometric techniques to test the causal relationship between FDI

and economic growth and/or the magnitude of the impact of FDI flow on economic growth. The results from these studies generally point to an FDI-led economic growth hypothesis for the countries examined, while others suggest a feedback and long-run equilibrium relationship between FDI and economic growth. Some studies, however, did not find any causal relationship between FDI and growth.

METHODOLOGY

This study uses Granger-causality tests to examine the direction of causal relationships between FDI and economic growth (G). The tests are based on the following vector autoregressive (VAR) representations:

$$V' = [FDI, G, FD, GOV, TRADE] \quad (1)$$

where FD is indicator for financial development, GOV is government expenditure, and TRADE is trade openness; the control variables in this study. The data for FDI is measured by net foreign direct investment, that is, the net inflows of foreign direct investment into the country. Specifically, FDI is measured as a ratio to Gross Domestic Product (GDP). Meanwhile, the growth rate of output is measured as the growth of real per capita GDP in constant dollars. For the financial development, two indicators that were introduced by King and Levine (1993) will be used. The indicators are, first, liquid liabilities of the financial system (henceforth, B1), which is currency plus demand deposits and interest-bearing liabilities of banks and non-financial intermediaries divided by GDP. B1 provides a measure for the overall size of the financial sector. The second indicator is the value of credit by financial intermediaries to the private sector divided by GDP (henceforth, B2). The variable trade openness is measured by taking the sum of exports and imports divided by GDP. The variable government expenditure that attempts to describe fiscal policy and measures the role of government in economic activity is measured by the ratio of government consumption expenditure to GDP.

The econometric methodology firstly will examine the stationarity properties of the time series. For this purpose, two unit root tests will be used; the Augmented Dickey Fuller (ADF) and the Phillips-Perron (PP) tests. Subsequently, the time series will be examined for the order of integration. Conditional on the outcome of the test, the second stage involves investigating bivariate cointegration utilising the Johansen maximum likelihood approach. If bivariate cointegration exists then either unidirectional or bi-directional Granger-causality must also exist. The third

stage involves constructing standard Granger-causality tests, augmented where appropriate with a lagged error correction (EC) term. In all tests and regressions, the lag length is determined by using Akaike Information Criteria (AIC).

The strategy for causality testing is as follows: If there are no unit roots, the series is stationary, thus, the standard Granger causality tests will be used in levels VAR framework. If there are unit roots, but the variables are not cointegrated, causality tests will be performed in the first differenced VAR framework without the error correction term. If the variables are cointegrated, the EC term will be included in the regression. In this study, causality tests will be carried out on individual countries. Study of individual countries will give more information about the causality relationship between FDI and economic growth. The sample in this study consists of 37 developing countries and covering the period from 1970 to 1999. The countries included in the sample are listed in Table 1. The main source of data is the World Development Indicators (WDI 2001) of World Bank.

TABLE 1. List of countries

Algeria	Malaysia
Argentina	Mauritania
Barbados	Mauritius
Bolivia	Mexico
Brazil	Morocco
Central Africa	Nigeria
Chile	Pakistan
Colombia	Panama
Congo Republic	Paraguay
Costa Rica	Philippines
El Salvador	Peru
Ghana	Singapore
Guatemala	South Africa
Honduras	Sri Lanka
India	Thailand
Indonesia	Tunisia
Israel	Venezuela
Jamaica	Zambia
Kenya	

EMPIRICAL ANALYSIS

This section presents the result from the unit root tests for testing the stationarity properties and the order of integration of the variables being studied. For these purposes, two types of unit root tests have been conducted and reported, the Augmented Dickey Fuller tests (ADF) and Phillips-Perron tests (PP). The null hypothesis for the test is that there is a unit root in the series against the alternative that the series are stationary. The results of unit root tests are presented in Table 2. Table 2 shows that FDI is stationary at levels in 19 countries suggesting that that FDI in these countries is $I(0)$. Meanwhile, in 18 countries, FDI is stationary in first differences suggesting that FDI in these countries is $I(1)$. With regard to economic growth, in most of the cases, the result of unit root tests shows that the variable is stationary at level, suggesting that G is $I(0)$. Specifically, unit root tests show that G is stationary at level in the 32 out of 37 countries in the sample, while in 5 countries, G is stationary at first differences. The countries in which G is stationary at first differences were Bolivia, Colombia, Congo Republic, Guatemala, and Paraguay.

TABLE 2. Unit Root Tests

Country (1)	Variables (2)	Levels		First Differences	
		ADF (3)	PP (4)	ADF (5)	PP (6)
Algeria	FDI	-4.8972(5)*	-4.9327(5)*	-	-
	G	-2.7577(2)	-7.1045(1)*	-	-
Argentina	FDI	2.1771(1)	2.3629(1)	-2.5770(1)	-4.1350(1)*
	G	-4.5577(1)*	-4.9401(1)*	-	-
Barbados	FDI	-5.2249(5)*	-2.5044(5)	-3.8105(7)*	-7.6284(7)*
	G	-4.2757(3)*	-4.2658(3)*	-	-
Bolivia	FDI	1.2248(1)	-1.1880(1)	-3.2964(1)*	-7.1004(1)*
	G	-1.8904(1)	-2.3041(1)	-3.9219(1)*	-10.0453(1)*
Brazil	FDI	-1.1915(4)	0.3295(4)	0.2481(3)	-4.3342(3)*
	G	-2.2546(1)	-3.0524(1)*	-	-
Central Africa	FDI	-3.2225(1)*	-3.8422(1)*	-	-
	G	-3.8389(1)*	-6.1482(1)*	-	-
Chile	FDI	2.4381(2)	1.9487(2)	-2.2051(3)	-7.2599(3)*
	G	-3.2014(1)*	-3.6512(1)*	-	-
Colombia	FDI	-0.6159(2)	-2.3396(2)	-6.2129(1)*	-4.4192(1)*
	G	-1.7711(1)	-2.1703(1)	-3.7554(1)*	-5.4177(1)*
Congo Republic	FDI	-3.6429(4)*	-3.9301(4)*	-	-
	G	-2.1649(1)	-2.5387(1)	-3.7292(1)*	-6.3067(1)*
Costa Rica	FDI	0.6095(1)	-0.1839(1)	-3.5531(1)*	-8.0209(1)*
	G	-3.0094(1)*	-3.2008(1)*	-	-

Table 2. continued

El Salvador	FDI	-1.9299(1)	-4.4333(1)*	-	-
	G	-4.3658(1)*	-6.9339(1)*	-	-
Ghana	FDI	-2.6613(1)	-3.9452(1)*	-	-
	G	-3.6613(1)*	-3.9948(1)*	-	-
Guatemala	FDI	-3.8223(1)*	-4.6863(1)*	-	-
	G	-2.1085(1)	-2.2496(1)	-4.8299(1)*	-5.5849(1)*
Honduras	FDI	0.3148(1)	0.0751(1)	-4.2092(1)*	-6.0739(1)*
	G	-3.7012(1)*	-3.7448(1)*	-	-
India	FDI	-2.8142(3)	-1.1166(3)	-4.0673(4)*	-5.2486(4)*
	G	-3.3745(1)*	-5.4226(1)*	-	-
Indonesia	FDI	-2.3309(3)	-1.7894(3)	-2.4677(3)	-3.4225(3)*
	G	-2.0497(1)	-3.4837(1)*	-	-
Israel	FDI	-0.2094(2)	-0.3460(2)	-1.1732(5)	-4.8873(5)*
	G	-4.5105(2)*	-3.1804(2)*	-	-
Jamaica	FDI	-1.0812(2)	-2.5683(2)	-2.9282(3)	-4.6498(3)*
	G	-2.4855(1)	-4.1535(1)*	-	-
Kenya	FDI	-2.6053(1)	-3.9489(1)*	-	-
	G	-3.3997(1)*	-4.4307(1)*	-	-
Malaysia	FDI	-2.4472(1)	-2.0775(1)	-2.5472(4)	-4.1112(4)*
	G	-3.0999(1)*	-3.8876(1)*	-	-
Mauritania	FDI	-3.2258(1)*	-3.9903(1)*	-	-
	G	-2.4480(4)	-9.8772(4)*	-	-
Mauritius	FDI	-2.1971(1)	-2.5367(1)	-4.8168(1)*	-5.7170(1)*
	G	-3.6165(1)*	-5.2249(1)*	-	-
Mexico	FDI	-1.4556(1)	-1.4411(1)	-4.4265(1)*	-5.1313(1)*
	G	-2.9731(1)*	-3.7425(1)*	-	-
Morocco	FDI	-2.3708(1)	-2.0927(1)	-3.3521(1)*	-4.4981(1)*
	G	-3.0704(2)*	-8.9689(2)*	-	-
Nigeria	FDI	-2.0736(1)	-3.0003(1)*	-	-
	G	-1.9467(4)	-4.2000(4)*	-	-
Pakistan	FDI	0.1529(3)	-2.6883(3)*	-	-
	G	-3.2694(1)*	-3.9421(1)*	-	-
Panama	FDI	-3.1162(1)*	-2.8289(1)**	-	-
	G	-4.1643(1)*	-3.9421(1)*	-	-
Paraguay	FDI	-2.6074(1)	-3.4356(1)*	-	-
	G	-2.7734(1)	-2.2632(1)	-5.5050(1)*	-4.8398(1)*
Peru	FDI	-1.2641(1)	-1.7567(1)	-3.6066(1)*	-7.6091(1)*
	G	-3.7819(1)*	-3.7004(1)*	-	-
Philippines	FDI	-1.6257(1)	-2.7743(1)**	-	-
	G	-3.1975(1)*	-3.1182(1)*	-	-
Singapore	FDI	-2.7599(1)	-3.0403(1)*	-	-
	G	-3.4895(1)*	-3.1798(1)*	-	-
South Africa	FDI	-2.7061(1)	-4.0221(1)*	-	-
	G	-4.1861(1)*	-4.5248(1)*	-	-
Sri Lanka	FDI	-1.1826(2)	-2.7868(2)**	-	-
	G	-4.4242(2)*	-4.9195(2)*	-	-

Table 2. *continued*

Thailand	FDI	-0.9616(1)	-1.0228(1)	-3.1762(1)*	-5.3121(1)*
	G	-3.0793(1)*	-3.0695(1)*	-	-
Tunisia	FDI	-3.1561(1)*	-4.6115(1)*	-	-
	G	-1.8144(3)	-4.8748(3)*	-	-
Venezuela	FDI	-1.2510(1)	-2.2397(1)	-3.6148(5)*	-9.8569(5)*
	G	-3.3149(1)*	-4.4677(1)*	-	-
Zambia	FDI	-2.1812(1)	-8.7897(1)*	-	-
	G	-4.2471(1)*	-7.1686(1)*	-	-

Note: *Indicates rejection of the null hypothesis at the 5% levels of significance.

**Indicates rejection of the null hypothesis at the 10% levels of significance.

With the order of integration tests complete, the next step is to conduct a cointegration test to examine the existence of a stable long-run relationship between FDI and economic growth. In this study, the cointegration tests are performed by using Johansen (1988) tests, and the results from this test are presented in Table 3. Specifically, Table 3 presents the Johansen trace statistics for testing the existence of bivariate cointegration between FDI and economic growth (G). The null hypothesis for cointegration tests is that there is zero cointegrating vectors among the pairs of variables against the alternative that there is at least 1 cointegrating vector. The results of cointegration tests in Table 3 shows that FDI and economic growth are significantly cointegrated in 31 out of 37 countries being studied. The countries in which FDI and G are not cointegrated were Bolivia, Brazil, Honduras, Israel, Mexico, and Philippines.

TABLE 3. Cointegration Tests between FDI and Growth

Country	Null Hypothesis	Test Statistics	Conclusion
Algeria	$r=0$	48.32*	C
	$r \leq 1$	6.89*	
Argentina	$r=0$	25.39*	C
	$r \leq 1$	4.31*	
Barbados	$r=0$	25.66*	C
	$r \leq 1$	9.73*	
Bolivia	$r=0$	7.45	NC
	$r \leq 1$	0.17	
Brazil	$r=0$	7.45	NC
	$r \leq 1$	0.17	
Central Africa	$r=0$	23.49*	C
	$r \leq 1$	8.41*	

Table 3. continued

Chile	$\pi=0$	14.34**	C
	$\pi \leq 1$	2.53	
Colombia	$\pi=0$	14.5**	C
	$\pi \leq 1$	0.49	
Congo republic	$\pi=0$	18.70*	C
	$\pi \leq 1$	5.59*	
Costa Rica	$\pi=0$	15.09*	C
	$\pi \leq 1$	0.59	
El Salvador	$\pi=0$	22.26*	C
	$\pi \leq 1$	4.17*	
Ghana	$\pi=0$	18.44*	C
	$\pi \leq 1$	6.49*	
Guatemala	$\pi=0$	18.44*	C
	$\pi \leq 1$	4.35*	
Honduras	$\pi=0$	13.27	NC
	$\pi \leq 1$	0.21	
India	$\pi=0$	12.87*	C
	$\pi \leq 1$	0.86	
Indonesia	$\pi=0$	23.53*	C
	$\pi \leq 1$	9.13*	
Israel	$\pi=0$	9.4	NC
	$\pi \leq 1$	0.01	
Jamaica	$\pi=0$	16.04*	C
	$\pi \leq 1$	6.69*	
Kenya	$\pi=0$	25.91*	C
	$\pi \leq 1$	7.17*	
Malaysia	$\pi=0$	17.66*	C
	$\pi \leq 1$	5.56*	
Mauritania	$\pi=0$	31.22*	C
	$\pi \leq 1$	8.95*	
Mauritius	$\pi=0$	18.41*	C
	$\pi \leq 1$	4.67*	
Mexico	$\pi=0$	13.29	NC
	$\pi \leq 1$	2.89**	
Morocco	$\pi=0$	28.89*	C
	$\pi \leq 1$	6.49*	
Nigeria	$\pi=0$	22.26*	C
	$\pi \leq 1$	3.62**	
Pakistan	$\pi=0$	15.61*	C
	$\pi \leq 1$	1.45	
Panama	$\pi=0$	26.06*	C
	$\pi \leq 1$	9.19*	

Table 3. continued

Paraguay	$\tau=0$	13.9**	C
	$\tau \leq 1$	6.31*	
Peru	$\tau=0$	18.27*	C
	$\tau \leq 1$	1.95	
Philippines	$\tau=0$	11.96	NC
	$\tau \leq 1$	2.21	
Singapore	$\tau=0$	24.04*	C
	$\tau \leq 1$	7.67*	
South Africa	$\tau=0$	22.98*	C
	$\tau \leq 1$	6.55*	
Sri Lanka	$\tau=0$	19.37*	C
	$\tau \leq 1$	7.67*	
Thailand	$\tau=0$	13.03**	C
	$\tau \leq 1$	0.65	
Tunisia	$\tau=0$	25.51*	C
	$\tau \leq 1$	6.14*	
Venezuela	$\tau=0$	13.84**	C
	$\tau \leq 1$	0.5	
Zambia	$\tau=0$	24.99*	C
	$\tau \leq 1$	4.57*	

Note: *Significant at 5% levels
 **Significant at 10% levels
 C – cointegrated
 NC – not cointegrated

This section presents the estimation results from bivariate Granger-causality tests between FDI and economic growth. In this study, the bivariate causality tests between FDI and economic growth were carried out by using two methods of estimation, the first difference VAR and the VECM. This is based on the results of unit root test, which found that most of the cases variables FDI are not stationary at level but become stationary at first differences. The findings imply that the appropriate method of estimation for causality tests in this situation is a first difference VAR. Meanwhile, in most of the countries, results from the cointegration tests show that FDI is cointegrated with the variable economic growth. In this situation, a VAR with error correction is the appropriate method of estimation for causality test. Thus, the discussion in this paper only focuses on the results that obtained from VECM approach (Table 4). Meanwhile, results from first difference VAR approach are presented in Table 5. In both estimation methods, Wald statistics were used to test the existence of causal relationships between variables.

TABLE 4. Granger-Causality Tests between FDI and Economic Growth: The VECM Approach

Country	Null hypothesis	Wald Statistics		
		Bivariate	Multivariate (B1)	Multivariate (B2)
(1)	(2)	(3)	(4)	(5)
Algeria	FDI does not	7.34(0.0254)*	95.80(0.0001)*	7.34(0.0254)*
	Granger-cause	45.80(0.0001)*	7.34(0.0254)*	95.80(0.0001)*
	G			
Argentina	FDI does not	0.02(0.8813)	0.63(0.4271)	0.02(0.8813)
	Granger-cause	0.63(0.4271)	0.02(0.8813)	0.63(0.4271)
	G			
Barbados	FDI does not	1.40(0.9248)	10.40(0.0647)**	0.00(0.9420)
	Granger-cause	0.87(0.3507)	0.42(0.8111)	5.18(0.0750)**
	G			
Bolivia	FDI does not	0.02(0.8968)	1.13(0.2873)	5.09(0.2780)
	Granger-cause	2.53(0.6387)	5.09(0.2780)	2.53(0.6397)
	G			
Brazil	FDI does not	12.13(0.0164)*	5.40(0.2491)	12.13(0.0164)*
	Granger-cause	5.40(0.2481)	12.13(0.0164)*	5.40(0.2481)
	G			
Central Africa	FDI does not	0.52(0.2179)	0.07(0.7886)	1.52(0.2179)
	Granger-cause	0.07(0.7886)	1.52(0.2179)	0.07(0.7886)
	G			
Chile	FDI does not	2.84(0.0921)**	0.22(0.6395)	6.52(0.1635)
	Granger-cause	1.94(0.7461)	6.52(0.1635)	1.94(0.7461)
	G			
	G does not			

Table 4. continued

	Granger-cause FDI			
Colombia	FDI does not	22.18(0.0001)*	1.01(0.6027)	34.18(0.0001)*
	Granger-cause	1.68(0.7941)	34.18(0.0001)*	1.68(0.7941)
	G			
	G does not			
	Granger-cause FDI			
Congo Republic	FDI does not	34.89(0.0001)*	20.19(0.0012)*	23.17(0.0001)*
	Granger-cause	9.54(0.0490)*	23.17(0.0001)*	9.54(0.0490)*
	G			
	G does not			
	Granger-cause FDI			
Costa Rica	FDI does not	2.72(0.0990)**	0.42(0.5161)	2.72(0.0990)**
	Granger-cause	0.42(0.5161)	2.72(0.0990)**	0.42(0.5161)
	G			
	G does not			
	Granger-cause FDI			
El Salvador	FDI does not	3.06(0.0800)*	0.08(0.7734)	3.06(0.0800)*
	Granger-cause	0.08(0.7734)	3.06(0.0800)*	0.08(0.7734)
	G			
	G does not			
	Granger-cause FDI			
Ghana	FDI does not	0.00(0.9640)	4.80(0.0284)*	4.47(0.3460)
	Granger-cause	5.52(0.2377)	0.00(0.9640)	4.80(0.0284)*
	G			
	G does not			
	Granger-cause FDI			
Guatemala	FDI does not	0.81(0.9373)	14.36(0.0062)*	0.81(0.9373)
	Granger-cause	14.36(0.0062)*	0.81(0.9373)	14.36(0.0062)*
	G			
	G does not			
	Granger-cause FDI			
Honduras	FDI does not	7.68(0.1042)	3.70(0.4480)	7.68(0.1042)
	Granger-cause	3.70(0.4480)	7.68(0.1042)	3.70(0.4480)
	G			
	G does not			
	Granger-cause FDI			
India	FDI does not	20.22(0.0005)*	2.86(0.5823)	20.22(0.0005)*
	Granger-cause	2.86(0.5823)	20.22(0.0005)*	2.86(0.5823)

Table 4. continued

	G			
	G does not			
	Granger-cause			
	FDI			
Indonesia	FDI does not	0.40(0.8183)	7.78(0.0204)*	3.97(0.4095)
	Granger-cause	7.97(0.0926)*	0.02(0.8871)	1.92(0.1658)
	G			
	G does not			
	Granger-cause			
	FDI			
Israel	FDI does not	4.24(0.3740)	6.55(0.1619)	4.24(0.3740)
	Granger-cause	6.55(0.1619)	4.24(0.3740)	6.55(0.1619)
	G			
	G does not			
	Granger-cause			
	FDI			
Jamaica	FDI does not	0.51(0.9167)	4.82(0.1857)	3.56(0.0590)*
	Granger-cause	3.45(0.0634)*	10.15(0.0063)*	0.75(0.6858)
	G			
	G does not			
	Granger-cause			
	FDI			
Kenya	FDI does not	1.44(0.2300)	0.07(0.7953)	1.44(0.2300)
	Granger-cause	0.07(0.7953)	1.44(0.2300)	0.07(0.7953)
	G			
	G does not			
	Granger-cause			
	FDI			
Malaysia	FDI does not	1.06(0.7005)	7.12(0.1298)	1.06(0.9005)
	Granger-cause	7.12(0.1298)	1.06(0.9005)	7.12(0.1298)
	G			
	G does not			
	Granger-cause			
	FDI			
Mauritania	FDI does not	7.69(0.1035)	25.16(0.0001)*	2.92(0.0874)**
	Granger-cause	0.69(0.4067)	2.92(0.0874)**	0.69(0.4067)
	G			
	G does not			
	Granger-cause			
	FDI			
Mauritius	FDI does not	5.85(0.2104)	5.60(0.2313)	5.85(0.2104)
	Granger-cause	5.60(0.2313)	5.85(0.2104)	5.60(0.2313)
	G			
	G does not			
	Granger-cause			
	FDI			

Table 4. continued

Mexico	FDI does not	5.96(0.2021)	1.11(0.8922)	5.96(0.2021)
	Granger-cause G	1.11(0.8922)	5.96(0.2021)	1.11(0.8922)
Morocco	FDI does not	2.07(0.1498)	1.98(0.1593)	2.07(0.1497)
	Granger-cause G	1.98(0.1593)	2.07(0.1498)	1.98(0.1593)
Nigeria	FDI does not	1.97(0.3725)	0.11(0.9444)	7.67(0.1045)
	Granger-cause G	1.17(0.8825)	7.67(0.1045)	1.17(0.8825)
Pakistan	FDI does not	2.71(0.2583)	4.46(0.1078)	2.71(0.2583)
	Granger-cause G	4.46(0.1078)	2.71(0.2583)	4.46(0.1078)
Panama	FDI does not	0.69(0.9530)	8.12(0.0874)**	0.86(0.9530)
	Granger-cause G	8.12(0.0874)**	0.69(0.9530)	8.12(0.0874)**
Paraguay	FDI does not	1.85(0.7631)	1.59(0.8101)	1.85(0.7631)
	Granger-cause G	1.59(0.8101)	1.85(0.7631)	1.59(0.8101)
Peru	FDI does not	4.96(0.2915)	3.57(0.4679)	4.96(0.2915)
	Granger-cause G	3.57(0.4679)	4.96(0.2915)	3.57(0.4679)
Philippines	FDI does not	1.15(0.2834)	3.18(0.0747)**	3.60(0.4628)
	Granger-cause G	18.91(0.0008)*	1.15(0.2834)	3.18(0.0747)**
	G does not			

Table 4. continued

	Granger-cause FDI			
Singapore	FDI does not	3.10(0.5410)	4.35(0.3604)	3.10(0.5410)
	Granger-cause	4.35(0.3604)	3.10(0.5410)	4.35(0.3604)
	G			
	G does not			
	Granger-cause FDI			
South Africa	FDI does not	3.76(0.0526)**	3.79(0.0514)**	7.38(0.1169)
	Granger-cause	9.51(0.0496)*	7.38(0.1169)	9.51(0.0496)*
	G			
	G docs not			
	Granger-cause FDI			
Sri Lanka	FDI does not	2.11(0.5494)	0.95(0.8122)	2.09(0.7184)
	Granger-cause	6.89(0.1419)	2.09(0.7184)	6.89(0.1419)
	G			
	G does not			
	Granger-cause FDI			
Thailand	FDI does not	18.57(0.0010)*	3.97(0.4104)	4.66(0.0308)*
	Granger-cause	0.18(0.6724)	4.66(0.0308)*	0.18(0.6724)
	G			
	G does not			
	Granger-cause FDI			
Tunisia	FDI does not	8.39(0.0783)**	12.79(0.0123)*	0.01(0.9104)
	Granger-cause	5.92(0.0150)*	8.39(0.0783)**	12.79(0.0123)*
	G			
	G docs not			
	Granger-cause FDI			
Venezuela	FDI does not	0.37(0.5412)	0.52(0.4692)	0.37(0.5412)
	Granger-cause	0.52(0.4692)	0.37(0.5412)	0.52(0.4692)
	G			
	G docs not			
	Granger-cause FDI			
Zambia	FDI does not	2.22(0.1364)	0.40(0.5270)	2.22(0.1364)
	Granger-cause	0.40(0.5270)	2.22(0.1364)	0.40(0.5270)
	GG docs not			
	Granger-cause FDI			

Note: *Significant at 5 percent levels

**Significant at 10 percent levels

In all regressions, lag lengths are determined by AIC. Multivariate estimations in column 4 used B1 as one of the dependent variables, while in multivariate estimations in column 5, B1 has been replaced by B2.

TABLE 5. Granger-Causality Tests between FDI and Economic Growth: The First Differences VAR Approach

Country	Null hypothesis	Wald Statistics		
		Bivariate	Multivariate (B1)	Multivariate (B2)
(1)	(2)	(3)	(4)	(5)
Algeria	FDI does not Granger-cause G	5.98(0.0502)** 78.06(0.0001)*	78.06(0.0001)* 5.98(0.0502)*	5.98(0.0502)** 78.06(0.0001)
	G does not Granger-cause FDI			
Argentina	FDI does not Granger-cause G	0.02(0.8878) 0.70(0.7062)	0.56(0.4530) 0.02(0.8878)	1.33(0.5143) 0.56(0.4530)
	G does not Granger-cause FDI			
Barbados	FDI does not Granger-cause G	1.40(0.8436) 4.22(0.1212)	0.89(0.9262) 0.34(0.8432)	0.34(0.8432) 4.22(0.1212)
	G does not Granger-cause FDI			
Bolivia	FDI does not Granger-cause G	0.02(0.9024) 1.01(0.3147)	1.78(0.1821) 0.47(0.7907)	0.02(0.9024) 1.36(0.5079)
	G does not Granger-cause FDI			
Brazil	FDI does not Granger-cause G	0.99(0.3204) 1.72(0.1860)	1.78(0.1821) 3.00(0.2234)	1.42(0.2326) 1.84(0.3984)
	G does not Granger-cause FDI			
Central Africa	FDI does not Granger-cause G	2.82(0.2444) 0.06(0.8000)	1.12(0.5700) 3.02(0.5548)	1.36(0.2493) 2.73(0.6037)
	G does not Granger-cause FDI			
Chile	FDI does not Granger-cause G	0.12(0.9429) 0.20(0.6580)	0.35(0.8387) 2.53(0.1115)	2.53(0.1115) 0.20(0.6580)
	G does not			

Table 5. continued

	Granger-cause FDI			
Colombia	FDI does not	16.76(0.0001)*	4.05(0.0443)*	18.07(0.0001)*
	Granger-cause	0.83(0.6620)	18.07(0.0001)*	0.83(0.6620)
	G			
	G does not			
	Granger-cause FDI			
Congo	FDI does not	1.93(0.1645)	0.08(0.7816)	1.93(0.1645)
Republic	Granger-cause	0.08(0.7816)	1.93(0.1645)	0.08(0.7816)
	G			
	G does not			
	Granger-cause FDI			
Costa Rica	FDI does not	0.40(0.5260)	0.02(0.9005)	0.40(0.5266)
	Granger-cause	0.02(0.9005)	0.46(0.5260)	0.02(0.9005)
	G			
	G does not			
	Granger-cause FDI			
El Salvador	FDI does not	2.74(0.0981)**	0.07(0.7856)	2.74(0.0981)**
	Granger-cause	0.07(0.7856)	4.39(0.1112)	0.23(0.8921)
	G			
	G does not			
	Granger-cause FDI			
Ghana	FDI does not	1.97(0.3741)	3.03(0.2200)	1.97(0.3741)
	Granger-cause	3.03(0.2200)	1.97(0.3741)	3.03(0.2200)
	G			
	G does not			
	Granger-cause FDI			
Guatemala	FDI does not	0.05(0.8151)	6.58(0.0103)*	0.37(0.8292)
	Granger-cause	7.08(0.0290)*	0.37(0.8292)	7.08(0.0290)*
	G			
	G does not			
	Granger-cause FDI			
Honduras	FDI does not	0.52(0.8151)	0.03(0.8724)	0.52(0.4693)
	Granger-cause	0.03(0.8724)	0.52(0.4693)	0.03(0.8724)
	G			
	G does not			
	Granger-cause FDI			
India	FDI does not	0.01(0.9167)	2.28(0.1310)	0.00(0.9782)
	Granger-cause	0.40(0.5246)	0.00(0.9782)	0.40(0.5246)
	G			

Table 5. continued

	G does not Granger-cause FDI			
Indonesia	FDI does not Granger-cause G	1.59(0.6611) 1.71(0.1904)	7.03(0.0709)** 1.59(0.6611)	0.02(0.8933) 7.03(0.0709)**
	G does not Granger-cause FDI			
Israel	FDI does not Granger-cause G	1.86(0.1723) 5.40(0.0201)*	5.40(0.0201)* 1.36(0.1723)	1.86(0.1723) 5.40(0.0201)*
	G does not Granger-cause FDI			
Jamaica	FDI does not Granger-cause G	0.37(0.9459) 0.93(0.9204)	3.52(0.3182) 0.37(0.9459)	0.43(0.9800) 3.52(0.3182)
	G does not Granger-cause FDI			
Kenya	FDI does not Granger-cause G	4.15(0.2454) 0.63(0.8869)	0.63(0.8889) 1.29(0.2567)	4.15(0.2454) 0.06(0.8064)
	G does not Granger-cause FDI			
Malaysia	FDI does not Granger-cause G	0.58(0.4460) 3.37(0.0666)**	3.37(0.0666)** 0.58(0.4460)	0.58(0.4460) 3.37(0.0666)**
	G does not Granger-cause FDI			
Mauritania	FDI does not Granger-cause G	4.92(0.2952) 16.10(0.0021)*	16.10(0.0029)* 3.99(0.1362)	4.92(0.2952) 9.11(0.0105)*
	G does not Granger-cause FDI			
Mauritius	FDI does not Granger-cause G	0.03(0.8714) 0.20(0.9048)	0.17(0.6761) 0.03(0.6714)	0.54(0.7627) 0.17(0.6761)
	G does not Granger-cause FDI			
Mexico	FDI does not Granger-cause	1.05(0.3055) 0.13(0.7140)	0.08(0.7733) 1.18(0.2780)	1.18(0.2780) 0.13(0.7140)

Table 5. continued

	G			
	G does not			
	Granger-cause			
	FDI			
Morocco	FDI does not	2.25(0.3242)	5.37(0.0584)**	1.84(0.1745)
	Granger-cause	1.76(0.1845)	1.84(0.1745)	1.76(0.1845)
	G			
	G does not			
	Granger-cause			
	FDI			
Nigeria	FDI does not	4.51(0.2111)	0.20(0.9769)	4.91(0.2969)
	Granger-cause	0.75(0.9449)	4.51(0.2111)	0.20(0.9769)
	G			
	G does not			
	Granger-cause			
	FDI			
Pakistan	FDI does not	1.49(0.6835)	3.75(0.2900)	2.21(0.3319)
	Granger-cause	3.63(0.1628)	1.32(0.8575)	6.63(0.1567)
	G			
	G does not			
	Granger-cause			
	FDI			
Panama	FDI does not	0.57(0.7506)	0.26(0.8762)	0.57(0.7506)
	Granger-cause	0.26(0.8762)	0.44(0.9791)	5.19(0.2079)
	G			
	G does not			
	Granger-cause			
	FDI			
Paraguay	FDI does not	0.02(0.8937)	0.18(0.6691)	0.02(0.8937)
	Granger-cause	0.18(0.6691)	0.02(0.8937)	0.18(0.6691)
	G			
	G does not			
	Granger-cause			
	FDI			
Peru	FDI does not	1.02(0.3133)	0.47(0.4939)	1.02(0.3133)
	Granger-cause	0.47(0.4934)	1.02(0.3133)	0.47(0.4934)
	G			
	G does not			
	Granger-cause			
	FDI			
Philippines	FDI does not	1.45(0.2287)	3.39(0.0655)**	1.69(0.4293)
	Granger-cause	7.51(0.0234)*	1.69(0.4293)	7.51(0.0234)*
	G			
	G does not			
	Granger-cause			
	FDI			

Table 5. continued

Singapore	FDI does not	0.07(0.7876)	0.36(0.5470)	1.99(0.7385)
	Granger-cause	2.79(0.5943)	0.77(0.6791)	0.75(0.6883)
	G			
South Africa	FDI does not	3.35(0.0670)**	3.39(0.0657)**	3.35(0.0670)**
	Granger-cause	3.39(0.0657)**	3.35(0.0670)**	3.39(0.0657)**
	G			
Sri Lanka	FDI does not	1.54(0.6722)	0.70(0.8737)	1.34(0.8545)
	Granger-cause	4.41(0.3535)	1.34(0.8545)	4.41(0.3535)
	G			
Thailand	FDI does not	8.61(0.0034)*	1.75(0.1862)	4.16(0.0413)*
	Granger-cause	0.16(0.6895)	11.89(0.0182)*	2.54(0.6376)
	G			
Tunisia	FDI does not	5.37(0.2515)	8.198(0.0850)**	5.37(0.2515)
	Granger-cause	8.19(0.0850)**	5.37(0.2515)	8.19(0.0850)**
	G			
Venezuela	FDI does not	0.32(0.5693)	1.36(0.2442)	0.33(0.5637)
	Granger-cause	0.47(0.4941)	0.33(0.5637)	0.47(0.4941)
	G			
Zambia	FDI does not	6.41(0.0933)**	4.00(0.2611)	1.98(0.1594)
	Granger-cause	0.36(0.5500)	1.98(0.1594)	0.36(0.5500)
	G			
	G does not			
	Granger-cause			
	FDI			

Note: *Indicates significant at 5% levels

**Indicates significant at 10% levels

Figures in parentheses are p-value. In all regressions, the lag lengths are determined by using AIC. In the multivariate model, variable trade openness has been included in the regressions.

Table 4 presents the Wald statistics for causality testing on the relationship between FDI and economic growth that were obtained from the VECM estimation. In general, from column 3 of Table 4, we find that FDI does not cause G in 19 out of 37 countries being studied. This study finds that only in Algeria, Congo Republic, South Africa, and Tunisia, the direction of causality between FDI and G is bi-directional. In 7 countries, Brazil, Chile, Colombia, Costa Rica, El Salvador, India, and Thailand, the causality is from FDI to G, and not vice versa. Meanwhile, a unidirectional causality that runs from G to FDI is found statistically significant in 7 countries (Barbados, Ghana, Guatemala, Indonesia, Mauritania, Panama and Philippines).

The bivariate causality between FDI and economic growth has also been tested in the multivariate VECM in which two control variables (banking development indicators and trade openness) have been included in the model in addition to FDI and G. The Wald statistics for causality tests from the multivariate VECM estimation are presented in column 4 and 5 of Table 4. In column 4, banking development indicator, B1 has been used as one of the variables in the regressions, while in the fifth column B1 has been replaced by B2. This study finds that the findings of causality test that were generated from the multivariate model produce similar results with the bivariate approach in most of the cases being investigated. The causality tests from the multivariate VECM also find that, generally, FDI does not cause G. The differences, however, can be observed in the case of Barbados, Chile, and Ghana where the results from the multivariate model show that FDI and G is not causally related in these countries. In South Africa and Tunisia, the results from the multivariate model show that the causality is from G to FDI, while in Mauritania, FDI causes G. In Jamaica, the causality between FDI and G is bi-directional, and this is in contrast with the no causality relationship that was produced by the bivariate model. We also find that the results of causality tests from the multivariate model with B2 as one of variables are consistent with the results that were produced by the multivariate model with B1 except in the case of Barbados, Ghana, Indonesia, Jamaica, and Tunisia.

The causality between FDI and G, this paper finds that the results from the multivariate VECM are slightly different with the results that were obtained from the first-difference multivariate VAR model. However, in general, both estimation methods show that FDI and G are not causally related in the majority of countries being studied. Specifically, from the multivariate first-differences VAR approach, FDI and G was found not causally related in 25 countries, while from the VECM multivariate approach, in 19 countries.

CONCLUSION

This study investigates the causal relationship between foreign direct investment and economic growth. The major findings of this study were that the bivariate causality tests between FDI and economic growth produced mixed results. Only in some countries, we find evidence that FDI causes economic growth. Similarly, only in some countries, we find evidence of reverse causality that runs from economic growth to FDI. In most of the cases, bivariate causality tests show that FDI and economic growth are not causally related. The results from bivariate causality tests give little support on the hypothesis that the inflows of FDI can contribute to better economic growth in the developing countries. In the majority of developing countries, this study finds that FDI has no effect on the economic growth. Only in some developing countries, FDI was found significantly to affect the economic growth.

The finding of this study is consistent with the findings from other empirical studies which argued that the spillover effect of FDI on economic growth can only be successful if certain characteristics exist in the host country. Borensztein et al. (1998), for example, show that the adoption of new technologies and management skills is possible only when there is a certain minimum, or threshold level of human capital available in the host country. Meanwhile, Balasubramanyan et al. (1996) show the process of technologies spillover may be more efficient in the presence of well-functioning markets. Recently, empirical studies have found that the level of development of the domestic financial system could also partly determine the positive effects of FDI on economic growth (Hermes and Lensink 2000; Alfaro et al. 2004). The absence of these characteristics in most of the developing countries being studied could partly explain why FDI does not cause growth in these countries. Thus, to fully exploit the benefits of FDI, policies that emphasize on the development of human resources and the development of the domestic financial market especially the stock market should be implemented.

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