Journal of Business and Policy Research
Vol. 12. No. 1. July 2017. Pp. 72 – 87

Causal Interaction between FDI, Capital Formation, Trade and Economic Growth: Evidence from Dynamic Panel Analysis

Meta Ayu Kurniawati*

This paper investigates the significance of FDI, capital formation, trade openness, and economic growth in the international scope by classifying data into six regions. The annual datasets consist of 169 countries over the period 1990-2015 were employed. Panel cointegration, panel causality, variance decomposition, and impulse response were deployed to document long- and short-run relationships, to establish the most important macroeconomic variables for economic growth and to assign the proportion of them that explain economic growth. The results show that FDI, CP, TRD, and GDP are linked over the long-run, whereas short-run analysis presents attractive mixed results over six geographic classifications.

JEL Codes: F10, F21, F23, F43 and O19

1. Introduction

The nexus between foreign direct investment (FDI), financial development, and economic growth has gained a substantial deal of attention in the past few decades. Nevertheless, there are debating paradigms dealing with the role in which a financial system engages economic growth. For instance, the modern theoretical literature on the linkage of financial development and economic growth incorporates the endogenous growth theory and microeconomics of financial systems (Grossman & Helpman, 1991; Khan, 2001; Lucas, 1988; Pagano, 1993; Rebelo, 1991; Romer, 1986). In the case of the relationship between FDI and economic growth, FDI drives economic growth in a capital sporadis economy by enlarging volume as well as through physical investment efficiency, which is emphasized by the neoclassical and endogenous growth theories (Baro & Salai-I-Martin, 1995; Grosman & Helpman, 1991; Lucas, 1988; Romer, 1986). FDI also reveals a positive impact on economic growth, such as the result of studies by Carkovic & Levine (2002) and Lunn (1980).

There are several paths for FDI to contribute to economic growth. First, it is predicted that FDI helps achieve economic development over capital accumulation through more inputs being incorporated into the process of production and under the presence of a broader range of intermediate goods (Buckley et al., 2002; Carkovic & Levine, 2002; Feenstra & Markusen 1994). Second, FDI is a paramount source of improving human capital and changing technology and also has an impact of supporting modern technology in the host country (Borensztein et al., 1998). In fact, FDI still has other positive impacts between the introduction of new processes, managerial skills, technological transfers in the domestic market, international production networks, employee training, and international financial integration (Barro & Sala-I-Martin, 1997; Grossman & Helpman, 1991).

The motivation for this study comes from several factors. First, there is a requirement to recognize the linkages among economic growth, FDI, and financial development by using

*Meta Ayu Kurniawati, Department of Finance and Information, National Kaohsiung University of Applied Sciences, Taiwan. Email: metaayu.kurniawati@gmail.com

the most recent secondary data. Second, this paper utilizes unbalanced panel estimations and some time-series analysis techniques to set up the direction, timing, and strength of the causal relation among variables across geographic regions, which allow us to present some policy implications. Third, this study separately investigates distinct geographic regions, whereby each one has a relatively homogeneous sample of countries. This is sufficient to evaluate the nexus between economic growth, FDI, and financial development by using World Bank classifications.

The goal of this paper is to investigate the likelihood of a cointegrating relationship and the direction of causality among FDI, trade openness, capital formation, and economic growth across six geographic regions. This paper also tests the impulse response function (IRF) and forecast error variance decomposition (FEVD) between the four variables. This paper is structured as follows. Section 2 reviews the relevant literature. Section 3 explains the methodology and modelling. Section 4 discusses the results and policy implications. Finally, the conclusion is in section 5.

2. Literature Review

The linkage between FDI and some other important measurements such as political regime and international trade has attracted wide attention from many scholars worldwide, resulting in the growth of related literature. According to the theoretical fondation, the relationships between foreign direct investment (FDI), capital formation, trade openness, and economic growth tend to be positive. Referring to De Gregorio (1992) who notes a positive influence of FDI on growth for the period 1950-1985 in twelve Latin American countries. Neoclassical economists also view FDI as a more reliable and less volatile source of capital for developing economies as it can enhance economic growth (Balasubramanyam et al., 1996; Blomstorm et al., 1994; Borenzstein et al., 1995; Lipsey, 1999; Moosa, 2002; Moosa & Cardak, 2006). On the contrary, the endogenous growth model focuses on incorporating organizational, managerial, technical, and human skills, innovation and technological progress, and accumulation of knowledge endogenously in the growth theories that are often brought forth by FDI (Lucas, 1988; Mankiw et al., 1992; Romer, 1986). In addition, FDI inflows can encourage growth for the host countries by escalating the capital stock, creating new job opportunities, and easing the transfer of technology (Borensztein et al., 1998; De Gregorio, 2003; De Mello, 1997).

It is widely known that FDI and domestic financial markets are the prominent targets of capital investment funds for manufacturers. In this case, FDI may impact economic growth in a negative way through a poor distribution of resources or certain distortions that are present in the commercial sector (Boyd and Smith, 1992). FDI has negative effects on economic growth by crowding out domestic investment, increasing external vulnerability, and causing dependence (Aitken and Harrison, 1999; Lipsey, 2002). The dependency theories also discuss that large foreign players may cause a negative effect on the growth and development of domestic firms of a host country in the long run, because they have a greater volume of capital, superior technologies, higher market access, advanced marketing networks, and better managerial and human relation skills (Agosin & Mayer, 2000; Kumar & Pradhan, 2002; Marksun & Venables, 1999).

In regards to the relationship between trade openness and economic growth, the endogenous growth theory (Romer, 1986; Lucas, 1988), transaction cost theory (Coase, 1937; Williamson, 1981), and international product life cycle theory (Vernon, 1966) have been established. Concerning the risk-return relationship, the degree of trade openness

possibly affects the flows of international capital. The level of trade openness also shows the rate of comparative benefit of a country in the way of investment. This paradigm basically builds upon the transaction cost theory (Coase, 1937; Williamson, 1981) that postulates a low transaction cost environment generates financial incentives (higher return on investment) for both domestic and foreign players by supplying large irreversible investments like FDI. Romer (1989) argues that as factor endowments are better used due to trade openness, the endogenous theory also underlines that a higher equilibrium growth rate can be achieved in the long run through growing specialization and declining cost of inputs. Solow (1957) illustrates that trade openness can help further technological progress and efficiency in the allocation of inputs by eliminating protection for import substitution industries, thus in turn influencing economic growth. Barro & Sala-I-Martin (1995) and Grossman & Helpman (1991) mention that a country with a higher degree of openness has a greater ability to absorb technological developments generated in the leading nations, and this absorption capability leads it to grow more rapidly than a country with a lower degree of openness. In addition, absorbing new technologies at a faster rate than a country with a lower degree of openness makes a country with a higher level of economic openness grow and develop faster (Edwards, 1992).

The rate of capital formation also potentially influences FDI and economic growth. Developing economies that have a slighly initial degree of capital stock inherit larger marginal rates of return (productivity) and growth rates if sufficient capital stock is injected based on the neo-classical growth model. In empirical analysis, Barro (1991), Levine & Renalt (1992), and Kormendi & Meguire (1985) exhibit that the rate of physical capital formation influences the rate of a country’s economic growth. Moreover, by elevating the efficiency of investment, FDI establishes a comparative positive side to capital scarce economies to reach or to converge with richer economies in the long run based on new endogenous growth theories (Romer 1986). On the other hand, Kendrick (1993) conclude that the mere formation of capital does not lead to economic prosperity; rather the efficiency in allocating capital from less productive to more productive sectors influences economic growth.

3. The Methodology

3.1 Data

The dataset used herein is retrieved from World Development Indicators (WDI, July 2016) published by the World Bank, which consist of cross-country observations for 169 countries over the period 1990-2015. The variables employed in estimations are as follows: GDP per capita (current US$) as a proxy of economic growth; foreign direct investment net inflows as a percentage of GDP; trade openness calculated by exports and imports over GDP by following Gries et al. (2009) and Yanikkaya (2003); and capital formation as a proportion of gross fixed capital formation over GDP, which is adopted by Levine & Renelt (1992), and Barro (1991). All variables are taken in natural logarithms. As part of the empirical design, the base estimating equation in log-linear form is specified as follows:

$$\ln GDP_t = \alpha + \beta \ln FDI_t + \Psi \ln CP_t + \Omega \ln TRD_t + \varepsilon_t \quad (1)$$

Here, GDP = GDP per capita (current US$); FDI = foreign direct investment as a percentage of GDP; CP = gross fixed capital formation over GDP; and TRD = trade over GDP. The reason why variables are converted into natural logs is as follows. First, the cointegrating vector coefficients can be interpreted as long-term elasticities if the variables are in logs.

Second, the first differences can be interpreted as growth rates if the variables are in logs. The expected signs of the parameters are: $\alpha>0$, $\beta>0$, $\Psi>0$, and $\Omega>0$. The error term (ε) is assumed to be independently and identically distributed. The subscript ($_t$) means the time indicator.

3.2 Panel Unit Root Test

The panel unit root test is used to examine the degree of integration between FDI, financial development, and economic growth. This paper applies the panel-based methods proposed by Levine, Lin & Chu (2002) and Dickey-Fuller (1979). The LLC test assumes that the individual time series in the panel are cross-sectional independently distributed, while the Augmented Dickey-Fuller (ADF) unit root test examines the hypothesis that each panel data series has a common unit root process. The test follows the estimation using the following equation:

$$\Delta Y_t = \mu_i + \gamma_i Y_{it-1} + \sum_{i=1}^{pi} \beta_{ij} \Delta Y_{it-j} + \lambda_{it} + \varepsilon_{it} \quad \ldots\ldots (2)$$

Here, i = 1, 2…N; t = 1, 2… T; Yit is the series for country i in the panel over period t; pi is the number of lags selected for the ADF regression; Δ is the first difference filter (*I* - *L*); and εit refers to independently and normally distributed random variables for all i and t with zero means and finite heterogeneous variances (σ_i^2). LLC consider the coefficients of the autoregressive term as homogenous across all individuals; in other words, $\gamma_i = \gamma \forall_i$ LLC test the null hypothesis that each individual in the panel has an integrated time series; in other words, H_0: $\gamma_i = \gamma = 0$ $\forall i$ against an alternative H_A: $\gamma_i = \gamma < 0$ $\forall i$. LLC consider pooling the cross-section time series data, and the test is based on the following t-statistics, whereby in the LLC test, γ is restricted by being kept identical across regions under both the null and alternative hypotheses:

$$t_y^* = \frac{\hat{\gamma}}{s.e.(\hat{\gamma})} \quad \ldots\ldots (3)$$

3.3 Panel Cointegration

Certain tests are constructed via panels: Bai & Ng (2004), Kao (1999), and Pedroni (1995, 1997, 1999, 2004) who indicate that tests of no cointegration panel data are identical residual tests which tested by Engle & Granger (1987) as a part of time series. Johansen (1988, 1991, 1995) inspires Larsson et al. (2001) and Groen & Kleibergen (2003) to establish tests based on the likelihood ratio in a system where a previous relationship's cointegration number is unknown.

This study employs the panel cointegration technique proposed by Pedroni (1999, 2000, 2004) to investigate the long-run relationship between economic growth and three explicative variables, which allows for heterogeneity among individual members of the panel and is thus an improvement over conventional cointegration tests. Pedroni (2000, 2004) considers the following type of regression:

$$GDP_{it} = \beta_{0i} + \beta_{1it} + \beta_{2i} FDI_{it} + \beta_{3i} CP_{it} + \beta_{4i} TRD_{it} + \varepsilon_{it} \quad \ldots\ldots (4)$$

And

$$\varepsilon_{it} = \gamma_i \varepsilon_{it-1} + \xi_{it} \quad \ldots\ldots (5)$$

Here, *i* =1, 2, …, N; *t* =1, 2…, T; GDP is per capita economic growth rate; FDI captures foreign direct investment inflows; CP is gross fixed capital formation and TRD is the degree of trade openness measured by total trade. Moreover, β_{0i} is a member-specific intercept or fixed-effects parameter that is allowed to vary across individual cross-sectional units; β_{1it} is a deterministic time trend specific to the individual countries in the panel. The slope coefficients (β_{ki}; for k=1, …, 4) can differ from one individual to another, allowing the cointegrating vectors to be heterogeneous across countries.

3.4 Panel Granger Causality

The purpose to use the panel cointegration method is for testing the presence or absence of long-run relationships between variables. However, the drawback of this method is a lack of causality direction. When variables succeed in building cointegration, a dynamic error correction model proposed by Engle and Granger (1987) should be modelled to examine the causal relationship among them.

3.5 Variance Decomposition and Response Function

Impulse response function (IRF) analysis is established by providing a shock of one standard deviation to FDI, trade openness, capital formation, and economic growth so as to visualize the duration of their effects on GDP. IRF illustrates how one variable responds over time to a single innovation in itself or in another variable. Innovations in the variables are reflected by shocks to the error terms in the equations with the structural VAR form. In addition, a variance decomposition analysis is arranged to reach additional insights for policy makers. This paper analyses the forecast error variance decompositions of GDP to examine which proxy measures are the most important in economic growth over time and how much they contribute to economic growth.

4. The Findings

4.1 Panel Unit Root Test

Table 1 presents that panel unit root tests for all variables are stationary at their levels. After differentiation into first-level data, both tests reject the joint null hypothesis for each variable at the 1% level. Thus, from two tests, the panel unit root tests indicate that each variable is integrated of order one I(1). These results lead to a logical way to test for the presence or absence of a long-term relationship by applying the panel cointegration test.

Table 1: Panel unit root test results

	Level		First Difference		Level		First Difference	
	LLC	ADF	LLC	ADF	LLC	ADF	LLC	ADF
East Asia-Pacific					Middle East-North Africa			
GDP	-0.304	6.534	-15.910***	218.984***	-0.637	2.309	-14.779***	179.241***
FDI	-1.184	18.790	-13.618***	213.748***	-0.292	1.777	-9.852***	112.354***
CP	0.787	12.269	-11.918***	171.254***	-0.168	9.113	-11.231***	142.642***
TRD	2.066	9.965	-12.852***	195.772***	0.707	10.931	-9.770***	122.044***
Europe-Central Asia					South Asia			
GDP	-0.476	2.644	-13.621***	205.043***	0.246	7.151	-10.973***	102.280***
FDI	2.042	38.361	-19.740***	285.516***	-1.445	9.661	-10.269***	104.456***
CP	-0.064	18.854	-16.926***	295.390***	1.892	3.523	-5.964***	60.054***
TRD	1.130	14.870	-24.301***	376.451***	0.769	5.130	-8.567***	85.495***
Latin America-Caribbean					Sub-Saharan Africa			
GDP	0.331	11.782	-18.943***	318.729***	0.197	7.851	-18.512***	285.495***
FDI	2.832	11.582	-20.510***	391.017***	-0.857	7.505	-16.672***	270.206***
CP	1.113	21.085	-17.707***	338.813***	0.212	16.882	-16.054***	270.933***
TRD	-0.746	31.287	-16.898***	324.987***	0.370	14.531	-15.789***	255.240***

Note: The signs ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

4.2 Panel Cointegration Test

In Table 2 the “within” dimension (panel statistics) is calculated by the first four test statistics, while the “between” dimension (group statistics) is calculated by the other statistic tests. Cointegration exists if the null hypothesis of no cointegration is rejected. The statistics in Table 2 show inconsistent results; at the 1% and 5% significant levels, six statistics are significant in East Asia-Pacific, Latin America-Caribbean, Middle East-North Africa, and Sub-Saharan Africa, while Group rho-Stat shows an insignificant result for these regions. As to the results of Europe-Central Asia, 5 statistic tests are significant at the 1%, 5% and 10% significance level, but there lacks a significant test in Group rho-Stat and Group ADF-Stat tests. Furthermore, Panel v-Stat fails to present a significant value in South Asia. These inconsistent results can be caused by the distinct linkages between economic growth and other macroeconomic variables in the 169 countries. However, most results of Pedroni’s panel cointegration tests suggest that the null hypothesis of no cointegration is rejected at the 1% and 5% significant levels. Thus, this result suggests that there is cointegration between variables in the six areas.

Table 2: Panel cointegration test results

	East Asia-Pacific	Europe-Central Asia	Latin America-Caribbean	Middle East-North Africa	South Asia	Sub-Saharan Africa
Panel v-Stat	48.958	18.545	60.257	0.6143	0.5832	20.101
	0.0000***	0.0318**	0.0000***	0.2695	0.2799	0.0222**
Panel rho-Stat	-29.209	-15.121	-37.841	-21.336	-23.482	-25.278
	0.0017***	0.0653*	0.0001***	0.0164***	0.0094***	0.0057***
Panel PP-Stat	-77.781	-50.286	-65.930	-70.196	-50.272	-84.991
	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Panel ADF-Stat	-29.270	-35.495	-72.468	-44.837	-45.493	-69.108
	0.0017***	0.0002***	0.0000***	0.0000***	0.0000***	0.0000***
Group rho-Stat	0.1400	0.6255	-12.704	-0.3038	-13.393	-0.1892
	0.5557	0.7342	0.1020	0.3807	0.0902*	0.4250
Group PP-Stat	-44.985	-45.424	-71.039	-77.057	-59.118	-120.047
	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Group ADF-Stat	-18.912	-0.3402	-83.255	-41.470	-44.151	-75.407
	0.0293**	0.3668	0.0000***	0.0000***	0.0000***	0.0000***

Note: The signs ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

4.3 Forecast Error Variance

Table 3 shows the forecast error variance decompositions of economic growth across geographic classifications. It is common that a variable explains a big part of its forecast error variance, which in this analysis is why economic growth (GDP) variation explains the biggest part of itself in all panel classifications. FDI plays an important role in explaining growth in East Asia-Pacific and Middle East-North Africa. Furthermore, trade openness explains a high proportion of economic growth variation in South Asia. Three of the other panel classification parts represent that capital formation clarifies an important component of economic growth from two until ten years ahead.

Table 3: Forecast error decomposition results

Period	GDP	FDI	CP	TRD
East Asia-Pacific				
2 years ahead	92.62	7.01	0.38	0.00
5 years ahead	88.59	5.38	5.44	0.58
10 years ahead	89.27	4.61	5.14	0.98
Europe-Central Asia				
2 years ahead	99.64	0.03	0.32	0.00
5 years ahead	99.14	0.47	0.38	0.01
10 years ahead	98.52	0.58	0.88	0.02
Latin America-Caribbean				
2 years ahead	99.70	0.20	0.01	0.09
5 years ahead	98.50	0.35	0.85	0.30
10 years ahead	97.22	0.42	1.85	0.50
Middle East-North Africa				
2 years ahead	93.20	5.91	0.75	0.14
5 years ahead	91.94	5.78	1.82	0.46
10 years ahead	89.60	5.72	3.34	1.34
South Asia				
2 years ahead	99.79	0.09	0.03	0.09
5 years ahead	99.02	0.27	0.20	0.51
10 years ahead	98.05	0.30	0.53	1.12
Sub-Saharan Africa				
2 years ahead	95.74	0.11	4.12	0.03
5 years ahead	92.50	1.82	5.52	0.16
10 years ahead	89.96	2.42	7.19	0.43

Note: This table summarizes error variance decompositions of economic growth for the six geographic regions classified according to the World Bank.

4.4 Panel Causality

This paper reports the results of the Granger causality test in Table 4. The first column reveals *p*-values of the hypothesis that every *i* variable does not cause GDP, where *i* = {FDI, CP, TRD}. FDI is significant at the 5% significant level in Middle East-North Africa and Sub-Saharan Africa, implying that FDI Granger-causes growth there. Capital formation is insignificant for all regions except Sub-Saharan Africa, meaning that capital formation Granger-causes economic growth in those regions. In addition, TRD has a significant value in Middle East-North Africa and Sub-Saharan Africa, representing that in those areas TRD Granger-causes economic growth.

The second column shows Granger causality tests for FDI. FDI does not Granger-cause GDP for all regions, except Sub-Saharan Africa. Thus, Granger causality tests imply bidirectional causality between FDI and economic growth in Sub-Saharan Africa and support unidirectional causality in Middle East-North Africa. where the direction is from economic growth to FDI.

Table 4: Panel causality results

H0: The variable i {FDI, CP, TRD} does not cause GDP		H0: The variable i {GDP, CP, TRD} does not cause FDI		H0: The variable i {GDP, FDI, TRD} does not cause CP		H0: The variable i {GDP, FDI, CP} does not cause TRD	
East Asia-Pacific							
FDI	0.3315	GDP	0.2106	GDP	0.0090***	GDP	0.9704
CP	0.4549	CP	0.7852	FDI	0.0672*	FDI	0.8495
TRD	0.3363	TRD	0.4239	TRD	0.0516*	CP	0.2392
Europe-Central Asia							
FDI	0.6464	GDP	0.3898	GDP	0.5263	GDP	0.2828
CP	0.2612	CP	0.0835*	FDI	0.0108**	FDI	0.3123
TRD	0.9677	TRD	0.0004***	TRD	0.7766	CP	0.0044***
Latin America-Caribbean							
FDI	0.3596	GDP	0.3557	GDP	0.0059***	GDP	0.0809*
CP	0.5489	CP	0.0301**	FDI	0.4049	FDI	0.0882*
TRD	0.3091	TRD	0.0124**	TRD	0.0029***	CP	0.0080***
Middle East-North Africa							
FDI	0.0072***	GDP	0.3850	GDP	0.0591*	GDP	0.0146**
CP	0.4952	CP	0.4101	FDI	0.2255	FDI	0.0551**
TRD	0.0009***	TRD	0.0027***	TRD	0.6722	CP	0.5936
South Asia							
FDI	0.2396	GDP	0.1930	GDP	0.0204**	GDP	0.0045***
CP	0.1109	CP	0.9594	FDI	0.9574	FDI	0.6249
TRD	0.2440	TRD	0.3629	TRD	0.5482	CP	0.0223**
Sub-Saharan Africa							
FDI	0.0422**	GDP	0.0228**	GDP	0.5569	GDP	0.9798
CP	0.0001***	CP	0.0172**	FDI	0.1003	FDI	0.1092
TRD	0.0179**	TRD	0.0279**	TRD	0.0032***	CP	0.6660

Note: The signs ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

The third and fourth columns denote Granger causality tests for financial development (CP and TRD, respectively). There is absence of two-way causality for CP in all regions, but there is presence of one-way causality where the direction is from economic growth to CP in Sub-Saharan Africa. In addition, one-way causality also appears in East Asia-Pacific, Latin America-Caribbean, Middle East-North Africa and South Asia, where the direction is from capital formation to economic growth. Middle East-North Africa represents bidirectional causality for economic growth and trade openness, and unidirectional causality appears in Latin America-Caribbean, South Asia, and Sub-Saharan Africa.

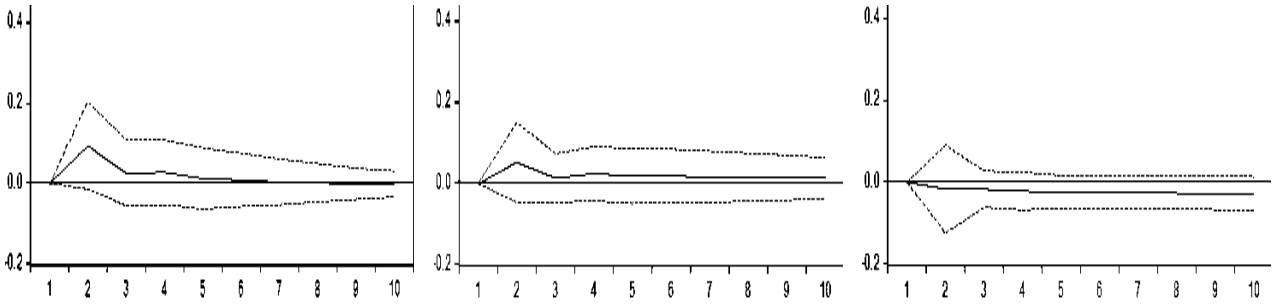
4.5 Impulse Response

The next step is investigating the dynamic relationships between variables and how to measure the effect of FDI and financial development variables on economic growth across geographies over time. To obtain the impulse response function, Choleski decomposition is ordinarily used to recognize the system of equations. Figure 1 illustrates how economic growth responds over time to shock innovation in FDI, CP, and TRD, respectively.

Figure 1: Generalized impulse response functions of growth

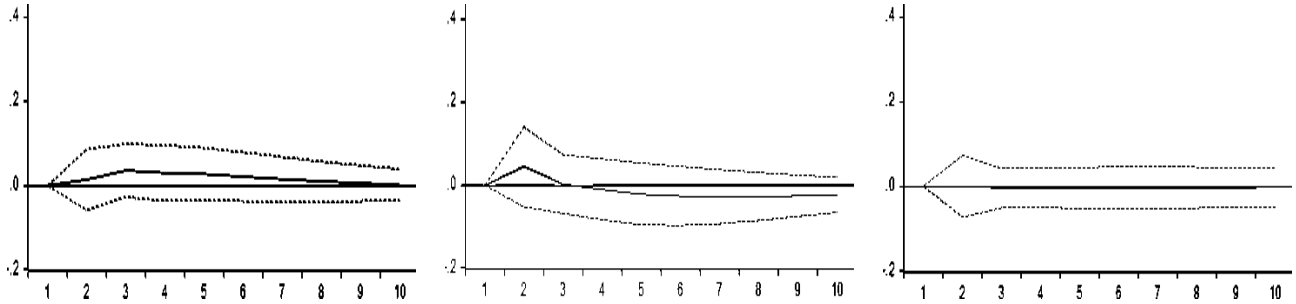
Panel A. East Asia-Pacific

GDP response to FDI GDP response to CP GDP response to TRD



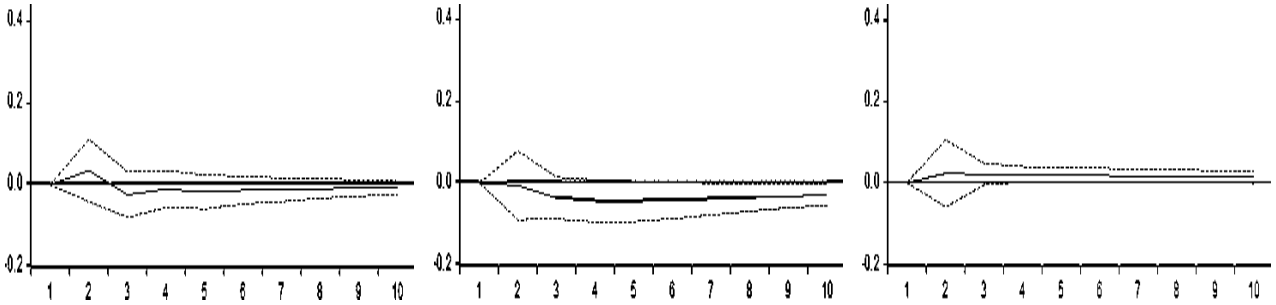
Panel B. Europe-Central Asia

GDP response to FDI GDP response to CP GDP response to TRD



Panel C. Latin America-Caribbean

GDP response to FDI GDP response to CP GDP response to TRD



Panel D. Middle East-North Africa

GDP response to FDI GDP response to CP GDP response to TRD

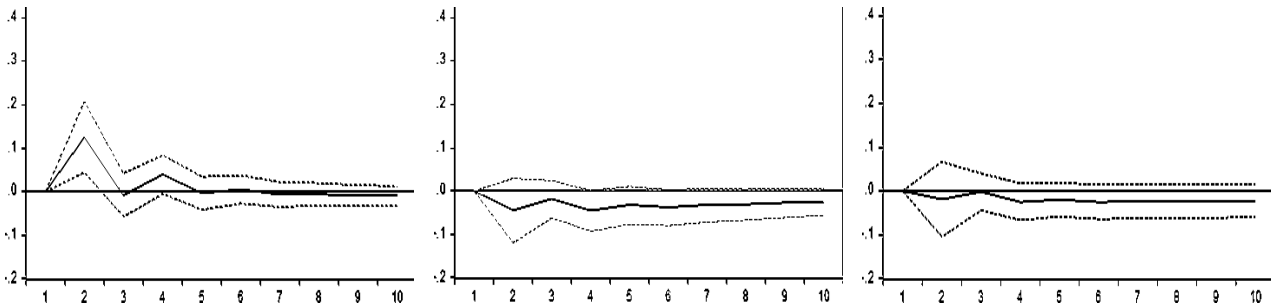
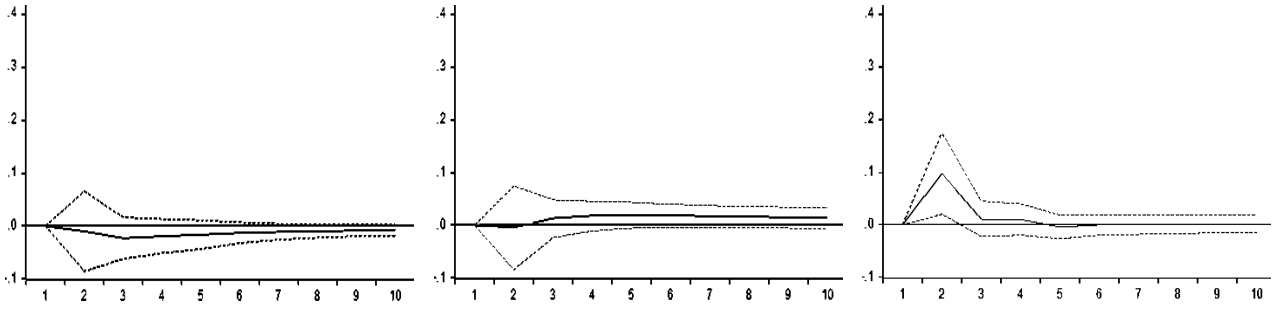


Figure 1 (continued)

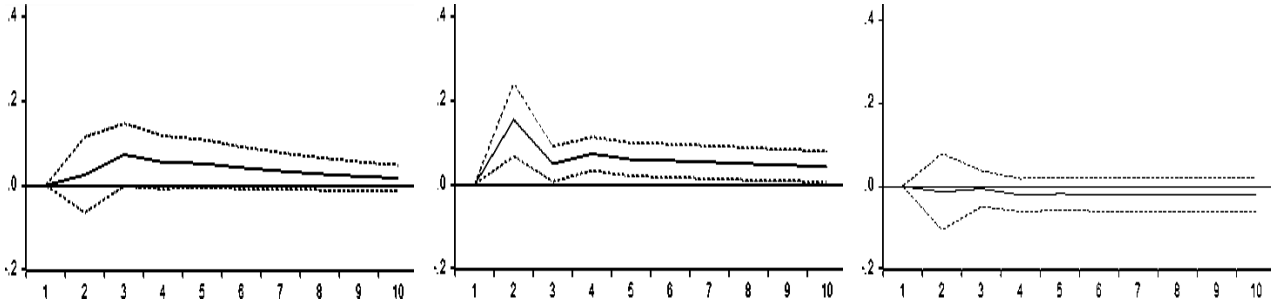
Panel E. South Asia

GDP response to FDI GDP response to CP GDP response to TRD



Panel F. Sub-Saharan Africa

GDP response to FDI GDP response to CP GDP response to TRD



There is an emergence of a positive shock on FDI positively impacting GDP in the first few years for most regions except South Asia. The top jumps in FDI magnitude take place in East Asia-Pacific and Middle East-North Africa. In addition, CP has a positive effect on growth during the first few years in most panel categories except Latin America-Caribbean and Middle East-North Africa. In those two regions, FDI has a negative shock on GDP over 10 years ahead. Europe-Central Asia also denotes a positive effect on GDP during the first three years, but turns negative in the long-run observation. Furthermore, GDP response to a TRD shock indicates negative outcome on GDP in five areas, while the highest impact of trade openness shock on economic growth is seen in South Asia.

In further sub-sections this paper analyses some policy implications for each area. Accordingly, this paper refers to Granger causality tests between FDI, financial development, and economic growth, as well as the forecast error variance decomposition of economic growth and impulse response function of growth shocks in FDI and finance (Tables 3 and 4, and Fig. 1, respectively) simultaneously for each region.

4.5.1 East Asia-Pacific

FDI explains 7.01% of variation in the economic growth rate after two years in East Asia Pacific countries, but decreases about 2.40% in the next one decade. Moreover, Fig. 1 represents a shock in FDI causing GDP to grow in the short run (the highest enhancement for all regions), which later starts to decrease and become steady for a long-run economic growth rate. In addition, there is an absence of a significant value of FDI Granger-causing

economic growth and vice versa in the short run (refer to Granger causality test), implying a lack of causality.

Capital formation explains 5.14% of the variation in GDP after 10 years, which is 4.16% higher than trade openness. Hereafter, there is no significant Granger causality from GDP to CP, but there is significant causality from CP to GDP. Moreover, TRD as a proxy of financial development illustrates that a shock in TRD causes economic growth to decline in the long run. It emerges that policies designed to enlarge CP and TRD have not had any significant effect in East Asia-Pacific. Hence, the increased FDI might continue to preserve economic growth in this area.

4.5.2 Europe-Central Asia

FDI, CP, and TRD account for 0.58%, 0.88% and 0.02%, respectively, of the variation in GDP after 10 years in Europe-Central Asia. In this region, both the FDI and financial development variables see an absence of causality with economic growth. As referenced in the impulse response function, FDI will cause GDP to increase, but CP will cause GDP to decrease and turn to a negative shock after rising in the first two years. Furthermore, Fig. 1 illustrates that a shock in TRD causes GDP to be equal in a positive position from beginning until the end of the observation period. In summary, both FDI and financial development do not have any support to contribute economic growth in this region; as a consequence, this region may not catch any advantages from policies designed to improve FDI and the financial system.

4.5.3 Latin America-Caribbean

FDI, CP, and TRD explain a very weak proportion of the variation of economic growth in this area (0.42%, 1.85%, and 0.50%, respectively). According to the impulse response function, the shocks of these variables have an insignificant impact on GDP. A shock in FDI causes GDP to rise, but later this variable dies out quickly, while a shock in CP causes GDP to decrease in the long run. As matter of fact, there is presence of CP Granger-causing GDP and TRD Granger-causing GDP (unidirectional causality). Hence, policies focused on improving FDI and financial development indicators might not lead to increased economic growth in Latin America-Caribbean.

4.5.4 Middle East-North Africa

The variance decomposition implies that proxy measures for FDI play a more important role in explaining GDP fluctuations compared to financial development indicators for Middle East-North Africa. FDI shock explains 5.72% of the variation in economic growth, whereas CP and TRD explain 3.34% and 1.34% of the variation, respectively, in 10 years. In addition, an FDI shock causes the GDP rate to rapidly rise and then die out after five years. There is a lack of a recovery period when a shock in TRD Granger-causes GDP for the whole period. Granger causality tests exhibit one-way causality from GDP to FDI. However, there is no evidence that GDP Granger-causes CP, but TRD does, implying two-way causality. In conclusion, policies adjusted to push FDI should attract a substantial level of investment to enlarge long-run economic growth.

4.5.5 South Asia

FDI and CP explain only a small part of the variation compared with trade openness (0.30% and 0.53%, respectively). The case of the impulse response function shows that innovations of FDI affect a short-run drop in GDP, which gradually then climbs higher in the long run. A shock in TRD causes economic growth to jump up in the first initial period, but then slowly disappears in the long term. Furthermore, there is no signal about the presence of FDI Granger-causing GDP and GDP Granger-causing FDI (bidirectional causality). Nevertheless, unidirectional causality from financial development variables have been established with the direction from CP and TRD to economic growth. The results denote that attempts to enhance the financial system in South Asia countries would demonstrate some rewards if accompanied by establishing an incentive to develop trade openness policies.

4.5.6 Sub-Saharan Africa

FDI explains the second highest proportion of economic growth variation in this region at 2.42%. On the contrary, capital formation explains 7.19% of economic growth variation in Sub-Saharan Africa, which is significantly higher than other geographic regions. FDI Granger-causes GDP and GDP Granger-causes FDI, meaning that there is two-way causality between FDI and GDP, whereas there is one-way causality from economic growth to financial development in the Sub-Saharan Africa area. An FDI shock causes the economic growth rate to rapidly rise and then further decline after three years. The impulse response function shows that a CP shock reaches a peak in the second year, while culminating in a long-term decline in this area. It seems that countries in Sub-Saharan Africa should pay more attention to developing greater capital formation and FDI and to avoid openness policies so as to lead to better economic growth.

5. Summary and Conclusions

This paper has employed panel unit root and cointegration tests, using a dataset of cross-sectional countries and time-series proxy measures, to document the nexus between FDI, capital formation, trade openness, and economic growth in six geographic regions as classified by the World Bank in July 2016. This study also performed forecast error variance decompositions, impulse response functions, and Granger causality tests to examine the direction and relationship between the variables in these countries with the purpose of catching the progress in their respective financial systems and exploring some policy implications.

First, the results of Pedroni's panel cointegration tests support that there is a long-run relationship between FDI, CP, TRD and GDP over the six distinguishable regions. Second, using Granger causality tests, in the short run there exists two-way causality in Sub-Saharan Africa between FDI and economic growth, while bidirectional causality exists between trade openness and economic growth in Middle East-North Africa. On the other hand, one-way causality is established in most regions, except Europe and central Asia.

Given the evidence in this empirical analysis, policies adjusted at increasing FDI should attract a substantial level of investment to enlarge long-run economic growth in East Asia-Pacific, Middle East-North Africa. FDI, CP, and TRD explain a very weak proportion of variation of economic growth in Latin America-Caribbean and Europe-Central Asia. Therefore, FDI and financial development do not have any power to support economic growth in both of these regions. As a consequence, these two regions might not catch any

advantages from policies designed to improve FDI and the financial system. Moreover, the results show that establishing an incentive to develop trade openness policies would demonstrate some achievements in South Asia, whereas promoting capital formation in Sub-Saharan Africa might lead to better economic growth. The limitation of this paper is insufficiency to explain economic growth because the restriction of using only three explanatory variables. Further observation can be done by extending other variables such as government expenditure, stock market development, financial liberalization, money supply, etc.

References

Agosin, MR & Mayer, R 2000, *Foreign investment in developing countries: does it crowd in domestic investment?*, UNCTAD Discussion Paper no. 146, Geneva, Switzerland.

Aitken, B & Harrison, A 1999, 'Do domestic firms benefit from direct foreign investment? Evidence from Venezuela', *American Economic Review*, vol. 3, no. 89, pp.605–618.

Bai, J & Ng, S 2004, 'A panic attack on unit roots and cointegration', *Econometrica*, vol.72, no. 4, pp.1127-1177.

Balasubramanyam, VN, Salisu, M & Sapsford, D 1996, 'Foreign direct investment and growth in EP and IS countries', *The Economic Journal*, vol.106, no. 434, pp.92-105.

Barro, RJ 1991, 'Economic growth in cross section of countries', *Quarterly Journal of Economics*, vol.106, pp.407-444.

Barro, RJ, Mankiw, NG & Sala-I-Martin, X 1995, 'Capital mobility in neoclassical models of growth', *The American Economic Review*, vol. 85, no.1, pp.103-115.

Barro, RJ & Sala-i-Martin, X 1997, 'Technology diffusion, convergence and growth', *Journal of Economic Growth*, vol. 2, Issue. 1, pp. 1–26.

Borensztein, E, De Gregorio, J & Lee, JW 1998, 'How does foreign direct investment affect economic growth?', *Journal of International Economics*, vol. 45, issue. 1, pp. 115-135.

Buckley, P, Clegg, J, Wang, C & Cross, A 2002, 'FDI, regional differences and economic growth: panel data evidence from China', *Transnational Corporations,* vol. 1, no.1, pp. 115-135.

Carkovic, M & Levine, R 2002, *Does foreign direct investment accelerate economic growth?*, Institute of International Economics Press, Washington DC, pp.195-221.

Coase, RH 1937, 'The nature of the firm', *Econometrica*, vol. 4, no. 16, pp. 386-405.

De Gregorio, J 1992, 'Economic growth in Latin America', Journal of Development Economics, vol. 39, no. 1, pp. 59-84.

De Gregorio, J 2003, *The role of foreign direct investment and natural resources in economic development*, Working Paper no. 196, Central Bank of Chile, Santiago.

De Mello, Jr. LR 1997, 'Foreign direct investment in developing countries and growth: a selective survey', *The Journal of Development Studies*; vol. 34, issue. 1, pp. 1-34.

Dickey, DA & Fuller, WA 1979, 'Distributions of the estimators for autoregressive time series with a unit root', *Journal of the American Statistical Association*, vol. 74, no. 366, pp. 427-431.

Edwards, S 1992, 'Trade orientation, distortions and growth in developing countries', *Journal of Development Economies*, vol. 39, no. 1, pp. 31-57.

Engle, RF & Granger, CWJ 1987, 'Co-integration and error correction: representation, estimation, and testing', *Econometrica,* vol. 55, no. 2, pp. 251-276.

Feenstra, RC & Markusen, JR 1994, 'Accounting for growth with new inputs', *International Economic Review*, vol. 35, no. 2, pp. 429-447.

Gries, T, Kraft, M & Meierrieks, D 2009, 'Linkages between financial deepening, trade openness and economic development: causality evidence from Sub-Saharan Africa', *World Development*, vol. 37, issue. 12, pp.1849-1860.

Groen, JJJ & Kleibergen, F 2003, 'Likelihood-based cointegration analysis in panels of vector error-correction models', *Journal of Business and Economic Statistics*, vol. 2, no.21, pp.295-318.

Grossman, GM & Helpman, E 1991, *Innovation and growth in the global economy*, MIT Press, Cambridge, pp. 359.

Grossman, GM & Helpman, E 1991, 'Quality ladders in the theory of growth', *Review of Economic Studies*, vol. 58, issue. 1, pp. 43-61.

Johansen, S 1988, 'Statistical analysis of cointegrating vectors', *Journal of Economic Dynamic and Control*, vol. 12, issue 2-3, pp. 231-254.

Johansen, S 1991, 'Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models', *Econometrica*, vol. 59, no. 6, pp. 1551-1580.

Johansen, S 1995, *Likelihood-based inference in cointegrated vector autoregressive models*, Oxford University Press, Oxford.

Kao, C 1999, 'Spurious regression and residual-based tests for cointegration in panel data', *Journal of Econometrics*, vol. 90, issue. 1, pp. 1-44.

Kendrick, JW 1993, 'How much does capital explain?' In A. Szirmai, B. Van Ark & D, Pilat (Eds.), *Explaining Economic Growth*, Essays in Honour of Angus Maddison, Amsterdam, North Holland, pp.129-146.

Khan, A 2001, 'Financial development and economic growth', *Macroeconomics Dynamics*, vol.5, issue. 3, pp.413-433.

Kormendi, RC & Meguire PG 1985, 'Macroeconomic determinants of growth: cross-country evidence', *Journal of Monetary Economics*, vol. 16, issue. 2, pp. 141-163.

Kumar, N & Pradhan, JP 2002, *Foreign direct investment, externalities and economic growth in developing countries: some empirical explorations and implications for WTO negotiations on investment*, RIS Discussion Papers 27/2002, New Delhi.

Larsson, R, Lyhagen, J & Lothgren, M 2001, 'Likelihood-based cointegration tests in heterogeneous panels', *The Econometric Journal*, vol. 4, issue. 1, pp.109-142.

Levin, A, Lin, CF & Chu, CSJ 2002, 'Unit root tests in panel data: asymptotic and finite-sample properties', *Journal of Econometrics*, vol. 108, issue 1, pp.1-24.

Levine, R & Renelt, D 1992, 'A sensitivity analysis of cross-country growth regressions', *The American Economic Review*, vol. 82, no. 4, pp. 942-963.

Lipsey, RE 1999, 'The role of FDI in international capital flows', in M Feldstein (ed.), *International Capital Flows*, Chicago University Press, Chicago, pp.307–331.

Lipsey, RE 2002, *Home and host country effects of FDI*, NBER Working Paper no. 9293, National Bureau of Economic Research, Cambridge.

Lucas, RE 1988, 'On the mechanics of economic development', *Journal of Monetary Economics*, vol. 22, issue 1, pp. 3-42.

Lunn, J 1980, 'Determinats of U.S. direct investment in the E.E.C.: further evidence', *European Economic Review*, vol. 13, issue. 1, pp. 93-101.

Mankiw, NG, David, R & David, NW 1992, 'A contribution to the empirics of economic growth', *Quarterly Journal of Economics*, vol. 107, issue. 2, pp.407-438.

Marksun, JR & Venables, AJ 1999, 'Foreign direct investment as a catalyst for industrial development', *European Economic Review*, vol. 43, issue 2, pp. 335-356.

Moosa, IA 2002, *Foreign direct investment: theory, evidence and practice*, Palgrave, London.

Moosa, IA & Cardak, BA 2006, 'The determinants of foreign direct investment: an extreme bound analysis', *Journal of Multinational Financial Management*, vol. 16, no. 2, pp. 199-211.

Pagano, M 1993, 'Financial markets and growth: an overview', *European Economic Review*, vol. 37, issue 2-3, pp. 613-622.

Pedroni, P 1995, *Panel cointegration, asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis*, Working Paper in Economics, pp. 92-013, Indiana University.

Pedroni, P 1997, *Panel cointegration, asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis: new results*, Working Paper in Economics, Indiana University.

Pedroni, P 1999, 'Critical values for cointegration tests in heterogeneous panels with multiple regressors', *Oxford Bulletin of Economics and Statistics*, pp. 653-670.

Pedroni, P 2000, *Fully modified OLS for heterogeneous cointegrated panels*, Working Papers 2000-03, Department of Economics, Williams College.

Pedroni, P 2004, 'Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis', *Econometric Theory*, Cambridge University Press, vol. 20, no. 03, pp. 597-625.

Rebelo, ST 1991, 'Long-run policy analysis and long-run growth', *Journal of Political Economy*, vol. 99, no. 3, pp. 500-521.

Romer, PM 1986, 'Increasing returns and long-run growth', *Journal of Political Economy*, vol. 94, issue. 5, pp. 1002-37.

Romer, PM 1989, *What determines the rate of growth and technological change*, World Bank Working Paper no. 279.

Solow, RM 1957, 'Technical change and the aggregate production function', *The Review of Economics and Statistics*, vol. 39, no. 3, pp. 312-320.

Vernon, R 1966, 'International investment and international trade in the product cycle', *The Quarterly Journal of Economics*, vol. 80, issue. 2, pp. 190-207.

Williamson, OE 1981, 'The economics of organization: the transaction cost approach', *The American Journal of Sociology*, vol. 87, no. 3, pp. 548-577.

Yanikkaya, H 2003, 'Trade openness and economic growth: a cross-country empirical investigation', Journal of Development Economics, vol. 72, issue. 1, pp. 57-89.