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ARTICLE

Impacts of Foreign Direct Investment on Economic Growth in the East African Community (EAC): Empirical Evidence from Burundi

Eric Irakoze Baorong Yu*

School of Insurance and Economics, University of International Business and Economics, Beijing, 100029, China

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ABSTRACT

This study analyzes how Foreign Direct Investment affects the rate of economic development among nations in the EAC with the empirical evidence of Burundi. The paper indicates that there is a link between foreign direct investment(FDI), gross domestic product(GDP), human capital, and openness with support of yearly time-series data from 1989 to 2017. The results from the Vector Error Correction Model (VECM) analysis technics discover that all the variables in long-term they move together. The findings also discovered that there is short-term causality running from GDP and human capital to FDI and no short-run causality found from openness to FDI as a result of Burundi's policies that do not implement market seeker FDI. For VECM validation, the paper went through some post estimation diagnostic tests such as Lagrange multiplier tests and Jarque-Bera test, the results did not indicate any autocorrelation among the variables as the residuals were normally distributed. Openness being an important factor to attracting foreign investors, it is very crucial for Burundi to revise its trade policies and encourage a conducive environment that promotes foreign investment penetration by promoting and encouraging both domestic and foreign investors and keep improving human capital for more FDI attraction as a goal for Burundi economic growth.

1. Introduction

Burundi as one of the states in the East African Community, it has traveled through different challenges such as civil wars which slowed down its economy since the period before and after its independence in 1962. As a result, this left behind the total destruction of infrastructures and caused poverty which put Burundi's economic situation in critical condition. Burundi like other East African countries exposes a potential land of doing business. Furthermore, Burundi Investment Promotion Agency was created in order to develop and promote investment in the country by welcoming, assisting, and supporting investors. The willingness of Burundians is attract foreign investors to exploit developmental sectors in services such as; tourism, minerals, and agricultural sectors so as to enhance economic growth and openness of the economy.

However, the liberalization of the investment environment for African countries has not succeeded to capture much FDI, and globalization provides a good working

**Corresponding Author:*
Baorong Yu,
School of Insurance and Economics, University of International Business and Economics, Huixin Dongjie Chaoyang District, Beijing, 100029, China;
Email: bryu@uibe.edu.cn

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atmosphere when investors want to invest abroad. Generally, according to [27] the concern is that Burundi like other African countries still welcome FDI inflow in order to respond to its reform toward foreign investment. But political instabilities, corruption, etc. have remained the big challenges that prevented meaningful investors' interest. Foreign direct Investment appeared to be beneficial in different ways, it contributed to the integration of economic networks, increased exports and improved productivity which stimulates investment of human capital which all must depend on factors of a favorable business atmosphere [12]. Moreover, foreign direct investment attraction in developing countries has a significant role in their economies' sustainability and development once they implement the right policies which prevent barriers and promote investment [1].

However, as developing countries have been facing various challenges in developing a sustainable environment for FDI, through the reform to open up their economies to the private investment, a country may succeed to capture some amount of FDI in some sectors but it may be limited to other sectors due to different reasons [18]. Offering strong business opportunities for work creates a relationship with human capital formation in order to attract foreign direct investment [2].

Burundi being a member of the East African Community (EAC), makes FDI attraction key as a concern for development strategy, and then to encourage the economic growth for better competitiveness in the region [33]. Taken as a modernized tool to upgrade technological level lead to human capital formation, FDI was considered to be a remedy of economic development barriers [9]. FDI inflow is mentioned by previous studies to improve economic growth, ameliorate working environment conditions by enhancing the quality of education [27]. As Burundi needs to operate its economic activities regionally and internationally, FDI is necessary to advance its growth at the preferable level that at the end of the day, turns to be determined by a supply of Human capital. On the other hand, Human capital is one of the key elements required to attract FDI [21]. In globalization, the developing countries get help from the developed countries and the help ends up by being shared in both side, it is in that way foreign direct investment intervene by playing an important role in economic growth [19]. This study takes an advantage to explore whether FDI can overall affect economic growth, Human Capital, and openness in Burundi. However, since Burundi like other East African Countries avoids to receiving foreign aid which has hugely contributed to its economy, highlights the importance of FDI in rapid economic development, it would determine the way to bridge the economical gap made by those foreign aids in order to substitute them to FDI and continue to advance the pace for Burundi economic growth [6]. Furthermore, this research helps as guidance of how FDI can be used to improve economic growth in Burundi as it is located in a potential zone for investment. Since no other study has been conducted to evaluate the relationship of FDI on economic growth in Burundi. This study would rely on the past empirical and literature developed by different scholars to show how a country can use FDI to achieve its desired economic growth as it is indicated by the countries which have managed to attract it [7]. The paper also demonstrates the importance of openness, FDI, and human capital in strengthening the development of economic ties and the improvement of better trade relations with the rest of the world. For contribution, this study also comes to clarify the importance associated with FDI in economic growth once Burundi accepts all foreign direct investment to flow in its different sectors. This paper would be dedicated to the government of Burundi especially the policymakers and to researchers or academicians by enriching existing literature in the research field. The following part is described as the following: literature review, methodology, results, and conclusion.

2. Literature Review

Foreign direct investment in BURUNDI essential in reestablishing its economic growth. since the country adopted the law favoring foreign investors whose aim was to develop its relations with the local investors in order to attract more foreign direct investment. As the impact of FDI on economic growth appeared to depend on the nature of the growth and the characteristics of the recipient country [8,22]. Burundi has an unpredictable environment for foreign investors, this is in the logic that the impact of FDI on economic growth through microeconomic aggregate scale appears to be uncertain [23]. As different studies demonstrated that FDI contribution is seen in various aspects such as international trade, business environment competitiveness, technology development, human capital formation, and Enterprise development these come together as a tool to enhance economy especially in developing countries [19,24,25]. Thus, FDI in developing countries does not limit on development only it goes beyond on the non-economic activities and imposes some strict security policies for a hosting country which drives to a conducive business environment, rigorous control for heavy industries and may cause the loss of political sovereignty once FDI is abundant [5]. Therefore, Foreign Direct Investment(FDI) is one of the medium of investment in emerging countries, considered as the most source of funding

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for the economic growth of less developed countries [13,16].

[28] assessed the effect FDI may have on economic growth in Pakistan. They seek to find out the movement of GDP growth performance, the historical trends of FDI, and CPI, using the data ranging from 1980-2010. The results suggest that an increase of FDI leads to a rise in GDP which demonstrates a positive effect of FDI on GDP. Additionally, for the purpose of examining why Pakistan was unsuccessful in attracting FDI instead of its policy reform. The study sought to discover the determinant of FDI, taken FDI as Independent variable and GDP, terrorism, GNP, infrastructure, and exchange rate as independent variables over the period of 1970-2010. The findings showed that all independent variables have a positive and significant impact on FDI [32].

Due to inconclusive empirical evidence on the plausible theoretical grounds of a positive relationship of FDI and economic growth, [35] examined the relationship between FDI and the rate of growth of GDP in 45 countries during the period of 1997-2003. Using a scholastic frontier model, the study found only a positive impact of FDI inflow on economic growth in the presence of great skilled labor. Similarly, [4] examined the causality relationship between economic growth, foreign direct investment, and labor productivity in 19 OECD countries. Error correction model, via application of the generalized method of moments (GMM), applied for analysis to data got from nineteen OECD countries from the period 1980-2009; indicated a short-run causality establishes in the relationship between foreign direct investment, and economic growth. Moreover, the study found a long-run causality exists between foreign direct investment and economic growth. This is explained by the interaction role played by labor productivity in the link of FDI and economic growth in OECD countries.

[3] documented on FDI inflow and poverty reduction in two economies regions bloc such as the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC) economies. Using the data covering the period of 1990 to 2014. Due to the unavailability of poverty data, the study helped by Human Development Index (HDI) to overcome the challenge by taking welfare variable which captured the health, education, and income of a given country to measure poverty. Moreover, the regression analysis method was adopted to measure three FDI variables such as per capita FDI, the ratio of FDI to GDP, and the ratio of FDI to GCF which determines the effect FDI has on welfare. After applying different techniques, a continuity causality test indicates a positive impact of FDI on GDP. Overall, the results are seen to be positive to GDP except for debt ratio that showed a negative impact on GDP. In the same vain, multiple regression models by [29], explored the impact of foreign direct investment on growth (GDP) in SAARC countries using the data ranging from 2001 to 2010. The empirical results revealed also a positive and significant link between GDP and FDI. Although, human capital formation is the most important factor to determine FDI especially in developing countries, it also contributes to their economic growth. however, the study found that human capital formation alone can't determine the development of a country in order to continue to attract FDI; the important policies must be taken into consideration to attract more investment [26].

A study conducted by [10], in five countries of SAARC such as Bangladesh, India, Nepal, Pakistan, and Sri Lanka, investigated the relationship between GDP, FDI, openness, investment, tax policy and inflation over the period of 1990 to 2010. Their Co-integration analysis indicates the absence significance of investment and openness to international trade, and FDI on economic growth promotion. [36] evaluated the relationship between FDI and economic growth in nineteen countries of South-East Asia and Latin America. Using different technics such as the co-integration method, Granger causality test, and Error Correction Model, the study indicates that there is a unidirectional causality running from FDI to economic growth in five countries of Latin America and one from South East Asia. However, the paper showed a bi-directional short-run causality in the relationship between economic growth and FDI in five countries of East and South-East and in two countries of Latin America. Zhang found out that the recipient countries benefit from FDI through technology transfer and the benefit depends on the recipient countries' absorptive capabilities, which consider a liberal trade policy, a high human capital development state, and a conducive environment of export-oriented FDI policy. Additionally, [21] documented the association between FDI, trade, and growth rate per capita of GDP helped by the yearly time series data ranging from 1973-2014. The study applied the Vector Error Correction Model (VECM) which indicated a long-run relationship between FDI, trade, and growth rate per capita in Bangladesh. The study after passing through the post- estimation diagnostic tests, identified that the residuals of the regressions were normally distributed and no autocorrelation found among the variables. The findings highlighted that trade and FDI influences significantly the growth rate of GDP per capita in Bangladesh.

[31] analyzed the effects of foreign direct investment on economic growth in Mauritania using quarterly data covering the period from 1976-1995. The empirical findings

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stated that an increasing trend of FDI also increased the GDP. Moreover, the study mentioned that the Granger Causality test's result found no causality between the variables. In the same vain, [17] examined the causal connection between FDI and GDP growth for Ghana for the pre- and post-Structural Adjustment Program (SAP) periods using time series data for 1970-2002. The study applied different methods such as Toda-Yammoto (1995) Granger no-causality test which permit Granger test in an integrated system. The results uncovered no causality in the link of foreign direct investment and growth for the pre-SAP period. While the study indicated a contrast results in the post-SAP period. Similarly, [11] assessed the effect of FDI on economic growth in fourteen East African countries. After all diagnostic tests, the dynamic generalized method of moment (GMM) estimator employed to a panel data from 1996-2015; revealed a positive and marginally significant influence of FDI on economic growth in East African countries in the long run. Thus, a pairwise Granger causality test exhibited a unidirectional causality running from economic growth to FDI.

Furthermore, [20] evaluated FDI's determinant in Ethiopia for the period of 1981-2007. The study examined the data based on the two regime period (Socialist regime and the current region). After employing ordinary least square regression, a socialist regime the empirical results indicated a positive link between FDI, GDP per capita, and growth rate but which was statistically insignificant due to the reason that the most investment in a developing country has non-market-seeking FDI. But, openness and Credit played their roles in attracting investment were positive and statistically significant. However, in the current regime, GDP per capita expressed a negative sign in the coefficient but statistically significant while openness's coefficient was significant and positive.

[7] investigated the effects of foreign direct investment on growth in Africa by selecting randomly different African countries in the different parts of Africa in the following way: Nigeria by representing West Africa, Egypt in North Africa, Kenya (East Africa), South Africa (Southern Africa),and Central African Republic (Central Africa) using the data stretching from 1980 to 2013. By employing both ordinary least square (OLS) and generalized method of the moments (GMM) for analysis. The findings indicated that gross capital formation, human capital, and international technology transfer variables were not statistically significant to influence economic growth in central Africa. Overall, the results discovered that the effect of FDI on economic growth is limited or negligible. The statistic results described that an increase of one percent of FDI led to an increase of 0.12 percent of GDP in South Africa, 0.05 percent in Egypt, 0.03 percent in Nigeria, 0.02 percent of GDP in Kenya, and a one percent increase of GDP in the Central African Republic. The study mentioned that South Africa's economic growth was highly influenced by FDI comparable to the rest of countries due to its better use of FDI. The paper suggested that other African countries should take an example to South Africa as African economies in whole expose a great potential to attract the inflow of FDI.

[30] investigated the determinants of FDI and their effect on economic growth in one of East African Community countries; "Uganda", using the time series data spanning from 1975 to 1991. The study stated that Uganda promotes FDI through privatization and generous incentive packages like tax holidays and exemption. The concern of creating a favorable business environment, policy consistency, and improvement of political stability is more important for the government of Uganda to encourage FDI inflow than offering incentive schemes. However, the empirical result found that there is a positive impact of FDI on GDP growth in Uganda. Similarly, [34] examined the impact of FDI on economic growth, employment, and poverty reduction in Uganda over the period of 1985-2014. The study identified tourism as one of the sectors which contributed more foreign exchange to the country. For achieving more economic growth, the government of Uganda implemented fiscal, monetary, and commercial policies that favor openness, human capital, and inflation control. FDI was considered in Uganda as a solution to private capital limitations. After applying different technics for data analysis such as Vector Auto-regression (VAR) through Vector Error Correction Model (VECM), the empirical result demonstrated that FDI contributes to economic growth, employment opportunities, and poverty reduction in Uganda but the coefficient indicated a negative sign which mean that FDI negatively contributes to Uganda's economic growth in long and short-run. Whilst, tourism plays its role in promoting FDI and taken as well as a tool for openness which indirectly affects economic growth and improvement of Human capital in Uganda. Unfortunately, the study found that Uganda tourism FDI in short-run, negatively contributes to economic growth but the effect becomes positive and small in the long-run. In contrast, in the East African Community zone, [15] analyzed the contribution of FDI in the agricultural sector as one of the contributors to real GDP growth and employs more than seventy percent of the total labor force in Tanzania during the period of 1990-2015. The empirical results indicated no significant impact found in the relationship between FDI inflow and agriculture added value to GDP ratio in Tanzania due to the outstanding of FDI in-

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flow in Tanzania's economy during the two past decades. However, the study demonstrated a positive correlation of FDI inflows to GDP ratio and GDP growth rate. The existing mixture of findings enriches and improves the empirical growth literature.

3. Methodology

Model Specification

This study uses annual data got from the World Bank online database, United Nations Conference on Trade and Development (UNCTAD), and Burundi Investment Promotion Agency (API) which is arranging from the period of 1989 to 2017. The study employed the Johansen technique and Vector Error Correction Model (VECM) to assess the short-term and long-term association between Foreign Direct Investment (net inflows), Human Capital (Average of secondary and primary enrollment), Openness (openness was exhibited in Burundi foreign exchange law state, trade restriction policies, taxes) and Gross Domestic Product (GDP). For testing the related time series variables, we use STATA Software (stataMP-64). We firstly, pass through lag selection (optimal lag length (n) have been chosen), we continue by testing the stationarity of the variables, under Johansen test condition which states that variables must be non-stationary at level but after converting them into the first differenced level, they must be stationary. Secondly, we perform Johansen co-integration test with determined (n) lags, then we proceed by assuming that if there is no co-integration, we estimate the unrestricted VAR model but if we find co-integration, we specify the VECM with (n) lags. We write VAR structure as U = (FDI, Hum Cap, Openness, and GDP). Once the time series are integrated in the same order, the estimation of the following co-integration regression are:

$$\boldsymbol{FDI} = \alpha_{11} + \beta_{11}\text{GDP} + \beta_{12}\text{Hum Cap} + \beta_{13}\text{Openness} \quad (1)$$

$$\boldsymbol{GDP} = \alpha_{21} + \beta_{21}\text{FDI} + \beta_{22}\text{Hum cap} + \beta_{23}\text{Openness} \quad (2)$$

$$\boldsymbol{Hum\ cap} = \alpha_{31} + \beta_{31}\text{GDP} + \beta_{32}\text{FDI} + \beta_{33}\text{Openness} \quad (3)$$

$$\boldsymbol{Openness} = \alpha_{41} + \beta_{41}\text{GDP} + \beta_{42}\text{Hum cap} + \beta_{43}\text{FDI} \quad (4)$$

The Vector Error Correction Model;

According to [14], if it is nonstationary but L (1) time series are co-integrated, We can run the VECM to assess both the short and long-terms dynamics of the series.

Conventional VECM for co-integrated series is presented in the following model:

$$\Delta \boldsymbol{Y}_t = \boldsymbol{\sigma} + \sum_{i=1}^{n-1} \boldsymbol{\beta}_i \Delta \boldsymbol{Y}_{t-i} + \sum_{j=1}^{n-1} \boldsymbol{\delta}_i \Delta \boldsymbol{X}_{t-j} + \ldots + \boldsymbol{\lambda ECT}_{t-1} + \boldsymbol{e}_t \quad (5)$$

ECT_{t-1} is the lagged OLS residual got from long-run co-integrating equation:

$$Y_t = \sigma + \beta_j X_t + \ldots + e_t$$

Therefore: $ECT_{t-1} = [Y_{t-1} - \beta_1 X_{t-1} - \ldots]$, the co-integration equation,

The ECT means that the previous period's deviation from Long-run equilibrium (error) influences short-run movement in the dependent variable

Where λ the coefficient of ECT, is the speed of adjustment, and it is a measurement of the speed at which Y returns to the equilibrium after a change in independent variables. as it is recommended by Granger representation theorem which states that if two variables are co-integrated, there must be a long-run relationship, and then there exists a short term relationship. From (5) we write the following models:

$$\Delta\ \text{FDI}_t = \sigma + \sum_{i=1}^{n-1} \beta_i \Delta \text{FDI}_{t-i} + \sum_{j=1}^{n-1} \delta_j \Delta \text{GDP}_{t-j} + \sum_{k=1}^{n-1} \rho_k \Delta \text{Hum Cap}_{t-k} + \sum_{m=1}^{n-1} \tau_m \Delta \text{Openness}_{t-m} + \lambda_1 \text{ECT}_{t-1} + e_{1t} \quad (6)$$

$$\Delta \text{GDP}_t = \alpha + \sum_{i=1}^{n-1} \beta_i \Delta \text{FDI}_{t-i} + \sum_{j=1}^{n-1} \delta_j \Delta \text{GDP}_{t-j} + \sum_{k=1}^{n-1} \rho_k \Delta \text{Hum Cap}_{t-k} + \sum_{m=1}^{n-1} \tau_m \Delta \text{Openness}_{t-m} + \lambda_2 \text{ECT}_{t-1} + e_{2t} \quad (7)$$

$$\Delta \text{Hum Cap}_t = \theta + \sum_{i=1}^{n-1} \beta_i \Delta \text{FDI}_{t-i} + \sum_{j=1}^{n-1} \delta_j \Delta \text{GDP}_{t-j} + \sum_{k=1}^{n-1} \rho_k \Delta \text{Hum Cap}_{t-k} + \sum_{m=1}^{n-1} \tau_m \Delta \text{Openness}_{t-m} + \lambda_3 \text{ECT}_{t-i} + e_{3t} \quad (8)$$

$$\Delta \text{Openness}_t = \vartheta + \sum_{i=1}^{n-1} \beta_i \Delta \text{FDI}_{t-i} + \sum_{j=1}^{n-1} \delta_j \Delta \text{GDP}_{t-j} + \sum_{k=1}^{n-1} \rho_k \Delta \text{Empl}_{t-i} + \sum_{m=1}^{n-1} \tau_m \Delta \text{Openness}_{t-m} + \lambda_4 \text{ECT}_{t-i} + e_{4t} \quad (9)$$

Where *k*-1: is the length of the lag

Δ is the first difference operator.

β,δ,ρ,τ: are the short-term dynamic coefficients

λ_i: is a parameter with a negative sign (it is velocity adjustment parameters always with a negative sign when it is significant).

$\text{ECT}_{(t-1)}$: the error correction term (Contains long-run information derived from the long-run co-integrating rela-

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tionship).

e_{it}: residuals or stochastic error terms (in other words is innovations or shocks).

4. Empirical Results

Table 1. Summary statistics of variables

Variables Name	Mean	Standard Deviation	Min	Max
FDI	1.113157	0.296615	0.18332	1.37528
GDP	2.78965	0.0654896	2.604819	2.856475
Hum Cap	1.752692	0.1213394	1.555699	1.947385
Openness	1.78932	4.31565	-8	11.78318

Table 2. Correlation Matrix

Variable Name	FDI	GDP	Hum Cap	Openness
FDI	1			
GDP	0.8105	1		
Hum Cap	-0.3983	-0.3323	1	
Openness	0.1568	0.1996	0.2593	1

4.1 Autocorrelation and Partial Autocorrelation of the Variables

The study used Autocorrelation and partial autocorrelation to exhibit stationarity of the variables.

H_0 = Null hypothesis, we accept the null hypothesis once the variable is stationary at the level and we reject the null hypothesis once the variable is nonstationary at the level.

H_1= Alternative hypothesis, we accept hypothesis once the variable is stationary at the first differenced level and we reject it once it is nonstationary at first differenced level.

Table 3. Autocorrelation and Partial Autocorrelation of FDI (Corrgram FDI, Prob>Q is less than 5%)

LAG	AC	PAC	Q	Prob>Q
1	0.7856	0.8065	22.276	0.0000
2	0.5184	-0.3341	32.291	0.0000
3	0.3683	0.5105	37.514	0.0000
4	0.2774	0.0010	40.578	0.0000
5	0.1508	-0.5528	41.516	0.0000
6	0.0386	-0.1457	41.58	0.0000
7	-0.0485	-0.3990	41.684	0.0000
8	-0.1126	-0.8479	42.27	0.0000
9	-0.1162	-0.0556	42.919	0.0000
10	-0.1280	-0.4515	43.742	0.0000
11	-0.1561	-0.4769	45.021	0.0000
12	-0.1711	-0.2100	46.632	0.0000
13	-0.1452	-0.2426	47.849	0.0000
14	-0.1381	-1.0576	49.009	0.0000

Corrgram D.FDI (First differenced level) Prob>Q is greater than 5%

LAG	AC	PAC	Q	Prob>Q
1	0.0036	0.0119	0.00046	0.9828
2	-0.3368	-0.5989	4.1151	0.1278
3	0.0029	0.0052	4.1155	0.2493
4	0.1456	0.4293	4.9391	0.2936
5	-0.1399	-0.1576	5.7276	0.3336
6	-0.0179	0.0190	5.741	0.4528
7	-0.0257	0.4331	5.7699	0.5669
8	-0.1253	-0.4233	6.4818	0.5934
9	0.0412	-0.0194	6.5622	0.6826
10	0.0217	-0.1308	6.5856	0.7639
11	-0.0365	-0.4263	6.6546	0.8263
12	-0.0830	-0.3278	7.0296	0.8556
13	0.0444	0.3623	7.1426	0.8947
14	-0.0523	-1.3774	7.3079	0.9222

Table 4. Autocorrelation and Partial Autocorrelation of GDP (Corrgram GDP)

LAG	AC	PAC	Q	Prob>Q
1	0.7760	1.0470	21.737	0.0000
2	0.5101	-0.4630	31.432	0.0000
3	0.2663	0.0391	34.163	0.0000
4	0.0614	-0.1065	34.313	0.0000
5	-0.0887	0.2071	34.638	0.0000
6	-0.1559	-0.5192	35.677	0.0000
7	-0.1715	0.1010	36.984	0.0000
8	-0.1748	-0.2779	38.395	0.0000
9	-0.1612	-0.5012	39.646	0.0000
10	-0.1135	-0.1427	40.293	0.0000
11	-0.0889	-0.6657	40.707	0.0000
12	-0.0700	-0.3090	40.976	0.0000
13	-0.0579	0.2190	41.17	0.0001
14	-0.0316	0.8732	41.231	0.0002

Corrgram D.GDP

LAG	AC	PAC	Q	Prob>Q
1	0.3876	0.3911	5.2719	0.0217
2	0.0823	-0.0768	5.5176	0.0634
3	0.0303	0.0332	5.5521	0.1356

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4	-0.1192	-0.1678	6.1045	0.1915
5	0.0647	0.3577	6.2731	0.2805
6	-0.0528	-0.2330	6.3897	0.3810
7	-0.0992	0.0506	6.8176	0.4481
8	0.0578	0.1415	6.9691	0.5400
9	-0.0778	-0.2326	7.2553	0.6106
10	0.0490	0.3007	7.3739	0.6897
11	-0.0001	-0.2736	7.3739	0.7680
12	-0.2457	-0.6385	10.659	0.5585
13	-0.0946	-1.2809	11.17	0.5966
14	-0.0393	-2.5258	11.264	0.6652

Table 5. Autocorrelation and Partial Autocorrelation of Human Capital (Corrgram Hum Cap)

LAG	AC	PAC	Q	Prob>Q
1	0.9041	0.9678	29.502	0.0000
2	0.7925	-0.0706	52.901	0.0000
3	0.7018	0.0789	71.863	0.0000
4	0.5994	-0.1257	86.171	0.0000
5	0.5414	0.3134	98.26	0.0000
6	0.4923	-0.1375	108.63	0.0000
7	0.3986	-0.2691	115.69	0.0000
8	0.2925	0.0754	119.64	0.0000
9	0.1906	0.0981	121.39	0.0000
10	0.0744	0.4870	121.67	0.0000
11	-0.0092	0.0345	121.67	0.0000
12	-0.0777	0.1557	122	0.0000
13	-0.1776	-0.5023	123.83	0.0000
14	-0.2702	-0.1990	128.26	0.0000

Corrgram D. Hum Cap

LAG	AC	PAC	Q	Prob>Q
1	0.0340	0.0340	0.04068	0.8402
2	-0.1079	-0.1095	0.46323	0.7933
3	0.0747	0.0859	0.6724	0.8797
4	-0.2918	-0.3315	3.9802	0.4087
5	0.0434	0.1199	4.0562	0.5414
6	0.2872	0.2324	7.5073	0.2765
7	-0.1547	-0.1432	8.5487	0.2867
8	-0.0869	-0.1711	8.891	0.3516
9	-0.1551	-0.4650	10.03	0.3481
10	-0.1973	-0.0101	11.955	0.2881
11	0.0330	-0.1210	12.011	0.3628
12	0.0917	0.1823	12.469	0.4088
13	0.0255	-0.1490	12.506	0.4867
14	0.0558	-0.1339	12.694	0.5508

Table 6. Autocorrelation and Partial Autocorrelation of Openness (Corregram Openness)

LAG	AC	PAC	Q	Prob>Q
1	0.4853	0.4874	8.5003	0.0036
2	0.3476	0.1191	13.001	0.0015
3	0.2288	0.0543	15.016	0.0018
4	0.1277	-0.0193	15.666	0.0035
5	-0.1013	-0.3325	16.089	0.0066
6	-0.0188	0.2484	16.104	0.0132
7	-0.1279	-0.1701	16.831	0.0185
8	-0.2951	-0.3407	20.854	0.0075
9	-0.3308	-0.1723	26.345	0.0018
10	-0.2511	-0.1590	29.511	0.0010
11	-0.3308	-0.3718	35.255	0.0002
12	-0.1802	0.0769	37.041	0.0002
13	-0.1661	-0.3394	38.633	0.0002
14	-0.2068	-0.1448	41.233	0.0002

Corrgram D. Openness

LAG	AC	PAC	Q	Prob>Q
1	-0.2801	-0.2806	2.7539	0.0970
2	-0.0819	-0.1844	2.9975	0.2234
3	0.0079	-0.0808	2.9998	0.3917
4	0.2257	0.2319	4.9792	0.2894
5	-0.4095	-0.3848	11.735	0.0386
6	0.1921	0.0906	13.279	0.0388
7	0.1505	0.2267	14.264	0.0467
8	-0.0016	0.0026	14.264	0.0751
9	-0.1928	-0.0399	16.022	0.0664
10	0.2776	0.1359	19.833	0.0309
11	-0.2571	-0.3444	23.257	0.0163
12	0.0213	0.0753	23.282	0.0254
13	-0.0535	-0.1292	23.445	0.0366
14	0.0095	-0.5211	23.451	0.0533

As all the variables become stationary at the first differenced level this allows us to perform Johansen tests for co-integration. In the table below the row with rank 0 means that there is no co-integration among the variables such as FDI, GDP, Hum Cap, and Openness. Once the trace statistics are higher than the critical value, this alludes the rejection of the null hypothesis. When the trace statistics are smaller than critical value means that we cannot reject the null hypothesis rather, we accept the null hypothesis. In other words, there is a co-integration model in this system (the * in trace statistic column indicated that there is co-integration equation any lag you can put it brings to rank where * is) this reveal that our four vari-

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ables such FDI, GDP, Hum Cap, and Openness are co-integrated, the four variables have a long-run relationship or long-term, they move together. The condition is that when variables are co-integrated, we can run the VECM model but when they are not co-integrated we may run a VAR model.

4.2 The Results of Johansen Tests for Co-integration

Table 7. Johansen tests for Co-integration

Trend: Constant Number of Observation =29
Sample: 1989-2017 Lags =4

Upper Panel

Maximum rank	Parms	LL	eigenvalue	Trace statistic	5%critical value
0	52	80.618224		75.8613	45.21
1	59	100.8475	0.75220	35.4028	29.68
2	64	111.0813	0.50628	14.9353*	15.41
3	67	117.55335	0.36004	1.9911	3.76
4	68	118.5489	0.06635		

Lower Panel

Maximum rank	Parms	LL	eigenvalue	Max statistic	5%critical value
0	52	80.618224		40.4585	27.07
1	59	100.8475	0.75220	20.4675	20.97
2	64	111.0813	0.50628	12.9442	14.07
3	67	117.55335	0.36004	1.9911	3.76
4	68	118.5489	0.06635		

Since the variables are co-integrated we run the VECM model. Firstly, we verify the sign and significance of the error correction term and we discover that there is long-run causality running from GDP, Hum Cap, and openness to FDI.

4.3 The Results of VECM

Table 8. The VECM model

Equation	Parms	RMSE	R-square	chi2	p>chi2
D_FDI	14	0.101676	0.8450	81.75148	0.0000
D_GDP	14	0.025198	0.5623	19.27035	0.1549
D_Hum cap	14	0.045285	0.4042	10.17645	0.7492
D_Openness	14	4.23517	0.3799	9.18947	0.8187

	Coefficient	Standard Deviation	z	p>|z|
D_FDI				
_cel				
L1.	***-0.0195373***	0.003981	-4.91	***0.000***
GDP				
LD.	0.8185652	1.064243	0.77	0.442
L2D.	3.449989	1.056048	3.27	0.001
L3D.	2.593446	1.056778	2.45	0.014
Hum Cap				
LD.	1.997876	0.6344983	3.15	0.002
L2D.	2.393092	0.6362846	3.76	0.000
L3D.	3.153222	0.6466822	4.88	0.000
Openness				
LD.	-0.0160466	0.0063409	-2.53	0.011
L2D.	-0.0102386	0.0062588	-1.64	0.102
L3D.	-0.0049194	0.006103	-0.81	0.420
_cons	0.0781149	0.038175	2.05	0.041
D_GDP				
_cel				
L1.	***-0.0010343***	0.0009866	-1.05	***0.294***
FDI				
LD.	0.0289839	0.0667213	0.43	0.664
L2D.	-0.0715233	0.0646167	-1.11	0.268
L3D.	0.0453252	0.0715899	0.63	0.527
Hum Cap				
LD.	0.253123	0.1572481	1.61	0.107
L2D.	0.0905745	0.1576908	0.57	0.566
L3D.	0.1247486	0.1602677	0.78	0.436
Openness				
LD.	-0.0016493	0.0015715	-1.05	0.294
L2D.	0.0018828	0.0015511	1.21	0.225
L3D.	-0.0000627	0.0015125	-0.04	0.967
_cons	0.0049268	0.0094609	0.52	0.603
D_Hum cap				
_cel				
L1.	***-0.0032644***	0.0017731	-1.84	***0.066***
FDI				
LD.	-0.1704707	0.1199084	-1.42	0.155
L2D.	-0.1982914	0.116126	-1.71	0.088
_L3D.	-0.093297	0.128658	-0.73	0.468
GDP				
LD.	0.1257098	0.4740026	0.27	0.791
L2D.	-0.495532	0.4703527	-1.05	0.292
L3D.	0.2636564	0.4706777	0.56	0.575
Openness				
LD.	-0.0026121	0.0028242	-0.92	0.355

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L2D.	-0.0011983	0.0027876	-0.43	0.667
L3D.	-0.0006495	0.0027182	-0.24	0.811
__cons	0.0299773	0.0170027	1.76	0.078
D_Openness				
__cel				
L1.	***-0.1252951***	0.1658217	-0.76	***0.450***
FDI				
LD.	-8.606463	11.21409	-0.77	0.443
L2D.	-18.60748	10.86035	-1.71	0.087
L3D.	-5.110784	12.03236	-0.42	0.671
GDP				
LD.	21.05301	44.32971	0.47	0.635
L2D.	28.85988	43.98837	0.66	0.512
L3D.	24.27435	44.01877	0.55	0.581
Openness				
LD.	13.9544	26.42924	0.53	0.598
L2D.	42.06984	26.50364	1.59	0.112
L3D.	26.62417	26.93674	0.99	0.323
_cons	-0.0130022	1.590131	-0.01	0.993

4.3.1 Long-run Causality

The cel. L1 (-0.0195373) which is Error correction term or speed of adjustment toward equilibrium has a negative sign and significant for D_FDI, we agreed that there is a long-run causality running from GDP, Hum Cap, and Openness to FDI as it is described in [21].

4.3.2 Short-run Causality

We check whether, GDP, Hum Cap, Openness can cause FDI or not. In other words, we can check whether, GDP, Hum Cap, and Openness their respective lags (LD., L2D., and L3D.) jointly can cause FDI or not. Firstly, we test if there is a short-run causality running from ([D_FDI]: LD.GDP, L2D.GDP, L3D.GDP). We find a significant result that indicates that in short-run GDP and FDI in Burundi can move together (Prob>chi2 is smaller than 5%) as indicated by [36].

Coefficients	chi(3)	Prob>chi2
[D_FDI]LD.GDP=0		
[D_FDI]L2D.GDP=0	26.11	0.0000
[D_FDI]L3D.GDP=0		

Secondly, we test whether there is a short-run causality running from ([D_FDI]: LD. Hum Cap, L2D. Hum Cap, L3D. Hum Cap). We get also a significant result that means that there is a short-run causality running from Human capital to FDI in Burundi. (Prob>chi2 is less than 5%).

Coefficients	chi(3)	Prob>chi2
[D_FDI]LD. Hum Cap=0		
[D_FDI]L2D. Hum Cap=0	34.56	0.0000
[D_FDI]L3D. Hum Cap=0		

Lastly, we verify a short-run causality running from ([D_FDI]: LD. Openness, L2D. Openness, L3D. Openness). We find that there is not short-run causality running from Openness to FDI in Burundi as it is documented by [15]. (Prob>chi2 is greater than 5%)

Coefficients	chi(3)	Prob>chi2
[D_FDI]LD. Openness=0		
[D_FDI]L2D. Openness=0	7.42	0.0595
[D_FDI]L3D. Openness=0		

We also applied the Lagrange Multiplier Test to assess whether there are serial auto-correlations or not. We found no auto-correlation at lag 2 as it also found by [11].

Table 9. Lagrange Multiplier Test

Lag	chi2	df	Prob>chi2
1	20.2791	16	0.20791
2	14.0117	16	0.59784
H0:	no autocorrelation at lag order		

For lag 1 and lag2 Prob>chi2 is higher than 5% what indicates that no autocorrelation found at lag 2. We proceed for testing residual normality (We check if the residuals of the model are normally distributed or not using the Jarque-Bera test. We discovered that the residuals were normally distributed. We concluded that the model was desirable [11,21].

Table 10. Jarque-Bera Test

Equation	chi2	df	Prob>chi2
D_FDI	1.84	2	0.39859
D_GDP	0.676	2	0.71316
D_Hum Cap	0.702	2	0.70399
D_Openness	0.430	2	0.80655
ALL	3.648	8	0.88743

Overall, we found Prob>chi2 (0.88743) is greater than 5% we conclude that we use a desirable model.

5. Conclusion

The study scrutinized the impact of foreign direct in-

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vestment on Burundian economic growth in one of the members of the East Africa Community country Burundi during the period of 1989 to 2017. By applying Vector Error Correction Model (VECM), we found that there is a long-term relationship between variables, this indicates that foreign direct investment has a positive and statistically significant impact on economic growth in Burundi these results are in accordance with [11,21]. However, we found that GDP and human capital have a short-term relationship to FDI but no short-term causality found from openness to FDI, this implies that no market seeking of FDI in the country and Burundi's economic activities are more domestically and less regionally. Moreover, Burundi still is caring more about political stability than opening up with the rest of the world to interact economically. After doing post estimation diagnostic tests and discovered that the residuals of regressions are normally distributed and no auto-correlation between the variables. We accepted the VECM model and the results from it suggest that Burundi should now implement policies which exhibit openness environment by lowering trade restriction, tariffs and applying tightly foreign exchange control laws which actually brake business activities in order to capture as much as possible amount of FDI inflow, this is in contrast with the study by [15]. The free primary and secondary education adopted by the Burundi government since 2005 improves human capital state [26] as it is a factor determinant of the labor force, and is predicted to be a vehicle of economic growth and attract more FDI in the country in short and long- terms [4]. Burundi since its integration in the East Africa Community (EAC) in 2009, adding to its natural resources, has been pointed out to be in the category of countries that can attract more FDI as well as all EAC countries members namely Burundi, Tanzania, Rwanda, Uganda, Kenya, and South Sudan. Burundi should also use all generated opportunities to create a conducive good investment atmosphere to attract and promote foreign investment and export more as it is constructing a special economic zone and extracting minerals. The policymakers should take the measurement which helps to attract more FDI by focusing on economic growth, openness, and human capital as it is shown that in the long-term can move together with FDI. For research, we suggest that further study should examine the contribution of FDI associated with natural resources in Burundi's economic growth.

Appendix

The Results Gotten from STATA MP-64:

```
        time variable:  Date, 1985 to 2017
                delta:  1 year

. varsoc GDP FDI HumCap Openess

  Selection-order criteria
  Sample:  1989 - 2017                              Number of obs      =        29
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-5.84367				.000023	.678873	.737938	.867466
1	65.9088	143.5	16	0.000	5.0e-07*	-3.16612	-2.8708*	-2.22316*
2	75.4604	19.103	16	0.263	8.4e-07	-2.72141	-2.18982	-1.02408
3	95.0313	39.142	16	0.001	7.9e-07	-2.96768	-2.19984	-.515975
4	118.549	47.035*	16	0.000	7.1e-07	-3.48613*	-2.48203	-.280058

```
  Endogenous:  GDP FDI HumCap Openess
   Exogenous:  _cons

. varsoc GDP FDI HumCap Openess

  Selection-order criteria
  Sample:  1989 - 2017                              Number of obs      =        29
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-5.84367				.000023	.678873	.737938	.867466
1	65.9088	143.5	16	0.000	5.0e-07*	-3.16612	-2.8708*	-2.22316*
2	75.4604	19.103	16	0.263	8.4e-07	-2.72141	-2.18982	-1.02408
3	95.0313	39.142	16	0.001	7.9e-07	-2.96768	-2.19984	-.515975
4	118.549	47.035*	16	0.000	7.1e-07	-3.48613*	-2.48203	-.280058

```
  Endogenous:  GDP FDI HumCap Openess
   Exogenous:  _cons
```

Stationarity Test:

```
. corrgram Openess
```

LAG	AC	PAC	Q	Prob>Q	[Autocorrelation]	[Partial Autocor]
1	0.4853	0.4874	8.5003	0.0036		
2	0.3476	0.1191	13.001	0.0015		
3	0.2288	0.0543	15.016	0.0018		
4	0.1277	-0.0193	15.666	0.0035		
5	-0.1013	-0.3325	16.089	0.0066		
6	-0.0188	0.2484	16.104	0.0132		
7	-0.1279	-0.1701	16.831	0.0185		
8	-0.2951	-0.3407	20.854	0.0075		
9	-0.3378	-0.1723	26.345	0.0018		
10	-0.2511	-0.1590	29.511	0.0010		
11	-0.3308	-0.3718	35.255	0.0002		
12	-0.1802	0.0769	37.041	0.0002		
13	-0.1661	-0.3394	38.633	0.0002		
14	-0.2068	-0.1448	41.233	0.0002		

```
. corrgram D.Openess
```

LAG	AC	PAC	Q	Prob>Q	[Autocorrelation]	[Partial Autocor]
1	-0.2801	-0.2806	2.7539	0.0970		
2	-0.0819	-0.1844	2.9975	0.2234		
3	0.0079	-0.0808	2.9998	0.3917		
4	0.2257	0.2319	4.9792	0.2894		
5	-0.4095	-0.3848	11.735	0.0386		
6	0.1921	0.0906	13.279	0.0388		
7	0.1505	0.2267	14.264	0.0467		
8	-0.0016	0.0026	14.264	0.0751		
9	-0.1928	-0.0399	16.022	0.0664		
10	0.2776	0.1359	19.833	0.0309		
11	-0.2571	-0.3444	23.257	0.0163		
12	0.0213	0.0753	23.282	0.0254		
13	-0.0535	-0.1292	23.445	0.0366		
14	0.0095	-0.5211	23.451	0.0533		

```
. corrgram HumCap
```

LAG	AC	PAC	Q	Prob>Q	[Autocorrelation]	[Partial Autocor]
1	0.9041	0.9678	29.502	0.0000		
2	0.7925	-0.0706	52.901	0.0000		
3	0.7018	0.0789	71.863	0.0000		
4	0.5994	-0.1257	86.171	0.0000		
5	0.5414	0.3134	98.26	0.0000		
6	0.4923	-0.1375	108.63	0.0000		
7	0.3986	-0.2691	115.69	0.0000		
8	0.2925	0.0754	119.64	0.0000		
9	0.1906	0.0981	121.39	0.0000		
10	0.0744	0.4870	121.67	0.0000		
11	-0.0092	0.0345	121.67	0.0000		
12	-0.0777	0.1557	122	0.0000		
13	-0.1776	-0.5023	123.82	0.0000		
14	-0.2702	-0.1990	128.26	0.0000		

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. corrgram D.HumCap

LAG	AC	PAC	Q	Prob>Q
1	0.0340	0.0340	.04068	0.8402
2	-0.1079	-0.1095	.46323	0.7933
3	0.0747	0.0859	.6724	0.8797
4	-0.2918	-0.3315	3.9802	0.4087
5	0.0434	0.1199	4.0562	0.5414
6	0.2872	0.2324	7.5073	0.2765
7	-0.1547	-0.1432	8.5487	0.2867
8	-0.0869	-0.1711	8.891	0.3516
9	-0.1551	-0.4650	10.03	0.3481
10	-0.1973	-0.0101	11.955	0.2881
11	0.0330	-0.1210	12.011	0.3628
12	0.0917	0.1823	12.469	0.4088
13	0.0255	-0.1490	12.506	0.4867
14	0.0558	-0.1339	12.694	0.5508

. corrgram FDI

LAG	AC	PAC	Q	Prob>Q
1	0.7856	0.8065	22.276	0.0000
2	0.5184	-0.3341	32.291	0.0000
3	0.3683	0.5105	37.514	0.0000
4	0.2774	0.0010	40.578	0.0000
5	0.1508	-0.5528	41.516	0.0000
6	0.0386	-0.1457	41.58	0.0000
7	-0.0485	-0.3990	41.684	0.0000
8	-0.1126	-0.8479	42.27	0.0000
9	-0.1162	-0.0556	42.919	0.0000
10	-0.1280	-0.4515	43.742	0.0000
11	-0.1561	-0.4769	45.021	0.0000
12	-0.1711	-0.2100	46.632	0.0000
13	-0.1452	-0.2426	47.849	0.0000
14	-0.1381	-1.0576	49.009	0.0000

. corrgram D.FDI

LAG	AC	PAC	Q	Prob>Q
1	0.0036	0.0119	.00046	0.9828
2	-0.3368	-0.5989	4.1151	0.1278
3	0.0029	0.0052	4.1155	0.2493
4	0.1456	0.4293	4.9391	0.2936
5	-0.1399	-0.1576	5.7276	0.3336
6	-0.0179	0.0190	5.741	0.4528
7	-0.0257	0.4331	5.7699	0.5669
8	-0.1253	-0.4233	6.4818	0.5934
9	0.0412	-0.0194	6.5622	0.6826
10	0.0217	-0.1308	6.5856	0.7639
11	-0.0365	-0.4263	6.6546	0.8263
12	-0.0830	-0.3278	7.0296	0.8556
13	0.0444	0.3623	7.1426	0.8947
14	-0.0523	-1.3774	7.3079	0.9222

. corrgram GDP

LAG	AC	PAC	Q	Prob>Q
1	0.7760	1.0470	21.737	0.0000
2	0.5101	-0.4630	31.432	0.0000
3	0.2663	0.0391	34.163	0.0000
4	0.0614	-0.1065	34.313	0.0000
5	-0.0887	0.2071	34.638	0.0000
6	-0.1559	-0.5192	35.677	0.0000
7	-0.1715	0.1010	36.984	0.0000
8	-0.1748	-0.2779	38.395	0.0000
9	-0.1612	-0.5012	39.646	0.0000
10	-0.1135	-0.1427	40.293	0.0000
11	-0.0889	-0.6657	40.707	0.0000
12	-0.0700	-0.3090	40.976	0.0000
13	-0.0579	0.2190	41.17	0.0001
14	-0.0316	0.8732	41.231	0.0002

. corrgram D.GDP

LAG	AC	PAC	Q	Prob>Q
1	0.3876	0.3911	5.2719	0.0217
2	0.0823	-0.0768	5.5176	0.0634
3	0.0303	0.0332	5.5521	0.1356
4	-0.1192	-0.1678	6.1045	0.1915
5	0.0647	0.3577	6.2731	0.2805
6	-0.0528	-0.2330	6.3897	0.3810
7	-0.0992	0.0506	6.8176	0.4481
8	0.0578	0.1415	6.9691	0.5400
9	-0.0778	-0.2326	7.2553	0.6106
10	0.0490	0.3007	7.3739	0.6897
11	-0.0001	-0.2736	7.3739	0.7680
12	-0.2457	-0.6385	10.658	0.5585
13	-0.0946	-1.2809	11.17	0.5966
14	-0.0393	-2.5258	11.264	0.6652

Performance of VECRANK (Johasen Test of Cointegration):

. vecrank GDP FDI HumCap Openess, trend(constant) lags(4) max

Johansen tests for cointegration

Trend: constant Number of obs = 29
Sample: 1989 - 2017 Lags = 4

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	52	80.618224	.	75.8613	47.21
1	59	100.84749	0.75220	35.4028	29.68
2	64	111.08126	0.50628	14.9353*	15.41
3	67	117.55335	0.36004	1.9911	3.76
4	68	118.54889	0.06635		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	52	80.618224	.	40.4585	27.07
1	59	100.84749	0.75220	20.4675	20.97
2	64	111.08126	0.50628	12.9442	14.07
3	67	117.55335	0.36004	1.9911	3.76
4	68	118.54889	0.06635		

Testing Long Run and Short Run Causality of the Variables

Long-run Causality:

. vec GDP FDI HumCap Openess, trend(constant) lags(4)

Vector error-correction model

Sample: 1989 - 2017 No. of obs = 29
AIC = -2.886034
Log likelihood = 100.8475 HQIC = -2.014828
Det(Sigma_ml) = 1.12e-08 SBIC = -.104294

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_GDP	14	.025198	0.5623	19.27035	0.1549
D_FDI	14	.101676	0.8450	81.75148	0.0000
D_HumCap	14	.045285	0.4042	10.17645	0.7492
D_Openess	14	4.23517	0.3799	9.18947	0.8187

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
D_GDP						
_ce1						
L1.	-.0010343	.0009866	-1.05	0.294	-.002968	.0008994
GDP						
LD.	.4696517	.263752	1.78	0.075	-.0472927	.9865962
L2D.	-.3198873	.2617211	-1.22	0.222	-.8328512	.1930766
L3D.	.0546542	.261902	0.21	0.835	-.4586643	.5679726
FDI						
LD.	.0289839	.0667213	0.43	0.664	-.1017875	.1597554
L2D.	-.0715233	.0646167	-1.11	0.268	-.1981696	.0551231
L3D.	.0453252	.0715899	0.63	0.527	-.0949885	.1856388
HumCap						
LD.	.253123	.1572481	1.61	0.107	-.0550777	.5613237
L2D.	.0905745	.1576908	0.57	0.566	-.2184939	.3996429
L3D.	.1247486	.1602677	0.78	0.436	-.1893703	.4388675
Openess						
LD.	-.0016493	.0015715	-1.05	0.294	-.0047294	.0014307
L2D.	.0018828	.0015511	1.21	0.225	-.0011573	.004923
L3D.	-.0000627	.0015125	-0.04	0.967	-.0030272	.0029017
_cons	.0049268	.0094609	0.52	0.603	-.0136163	.0234698

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D_FDI						
_ce1						
L1.	-.0195373	.003981	-4.91	0.000	-.0273398	-.0117347
GDP						
LD.	.8185652	1.064243	0.77	0.442	-1.267312	2.904443
L2D.	3.449989	1.056048	3.27	0.001	1.380173	5.519805
L3D.	2.593446	1.056778	2.45	0.014	.522199	4.664692
FDI						
LD.	-1.293076	.2692215	-4.80	0.000	-1.82074	-.7654114
L2D.	-1.953872	.2607291	-7.49	0.000	-2.464891	-1.442852
L3D.	-1.360676	.2888662	-4.71	0.000	-1.926843	-.7945085
HumCap						
LD.	1.997876	.6344983	3.15	0.002	.7542828	3.24147
L2D.	2.393092	.6362846	3.76	0.000	1.145997	3.640186
L3D.	3.153222	.6466822	4.88	0.000	1.885749	4.420696
Openess						
LD.	-.0160466	.0063409	-2.53	0.011	-.0284746	-.0036186
L2D.	-.0102386	.0062588	-1.64	0.102	-.0225056	.0020284
L3D.	-.0049194	.006103	-0.81	0.420	-.016881	.0070422
_cons	.0781149	.038175	2.05	0.041	.0032934	.1529365
D_HumCap						
_ce1						
L1.	-.0032644	.0017731	-1.84	0.066	-.0067396	.0002107
GDP						
LD.	.1257098	.4740026	0.27	0.791	-.8033181	1.054738
L2D.	-.495532	.4703527	-1.05	0.292	-1.417406	.4263423
L3D.	.2636564	.4706777	0.56	0.575	-.658855	1.186168
FDI						
LD.	-.1704707	.1199084	-1.42	0.155	-.4054869	.0645454
L2D.	-.1982914	.116126	-1.71	0.088	-.4258942	.0293114
L3D.	-.093297	.128658	-0.73	0.468	-.345462	.1588679
HumCap						
LD.	.2719398	.2825988	0.96	0.336	-.2819438	.8258233
L2D.	.1095076	.2833945	0.39	0.699	-.4459353	.6649506
L3D.	.4696802	.2880255	1.63	0.103	-.0948393	1.0342
Openess						
LD.	-.0026121	.0028242	-0.92	0.355	-.0081474	.0029232
L2D.	-.0011983	.0027876	-0.43	0.667	-.0066619	.0042653
L3D.	-.0006495	.0027182	-0.24	0.811	-.0059771	.004678
_cons	.0299773	.0170027	1.76	0.078	-.0033475	.063302
D_Openess						
_ce1						
L1.	-.1252951	.1658217	-0.76	0.450	-.4502997	.1997094
GDP						
LD.	21.05301	44.32971	0.47	0.635	-65.83162	107.9377
L2D.	28.85988	43.98837	0.66	0.512	-57.35574	115.0755
L3D.	24.27435	44.01877	0.55	0.581	-62.00085	110.5495
FDI						
LD.	-8.606463	11.21409	-0.77	0.443	-30.58567	13.37274
L2D.	-18.60748	10.86035	-1.71	0.087	-39.89337	2.678406
L3D.	-5.110784	12.03236	-0.42	0.671	-28.69378	18.47221
HumCap						
LD.	13.9544	26.42924	0.53	0.598	-37.84595	65.75475
L2D.	42.06984	26.50364	1.59	0.112	-9.876342	94.01603
L3D.	26.62417	26.93674	0.99	0.323	-26.17087	79.41922
Openess						
LD.	-.4584344	.2641238	-1.74	0.083	-.9761075	.0592387
L2D.	-.1777171	.2607018	-0.68	0.495	-.6886833	.3332492
L3D.	-.1596221	.2542113	-0.63	0.530	-.6578671	.3386229
_cons	-.0130022	1.590131	-0.01	0.993	-3.129601	3.103597

Cointegrating equations

Equation	Parms	chi2	P>chi2
_ce1	3	45.48774	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ce1						
GDP	1	.	.	.	.	.
FDI	-18.93634	7.069623	-2.68	0.007	-32.79255	-5.080132
HumCap	64.61977	10.69969	6.04	0.000	43.64877	85.59077
Openess	-.4101897	.2977042	-1.38	0.168	-.9936792	.1732998
_cons	-81.45272	.	.	.	.	.

Short-run Causality:

```
. test ([D_FDI]: LD.GDP L2D.GDP L3D.GDP)

 ( 1)  [D_FDI]LD.GDP = 0
 ( 2)  [D_FDI]L2D.GDP = 0
 ( 3)  [D_FDI]L3D.GDP = 0

           chi2(  3) =   26.11
         Prob > chi2 =    0.0000

. test ([D_FDI]: LD.HumCap L2D.HumCap L3D.HumCap)

 ( 1)  [D_FDI]LD.HumCap = 0
 ( 2)  [D_FDI]L2D.HumCap = 0
 ( 3)  [D_FDI]L3D.HumCap = 0

           chi2(  3) =   34.56
         Prob > chi2 =    0.0000

. test ([D_FDI]: LD.Openess L2D.Openess L3D.Openess)

 ( 1)  [D_FDI]LD.Openess = 0
 ( 2)  [D_FDI]L2D.Openess = 0
 ( 3)  [D_FDI]L3D.Openess = 0

           chi2(  3) =    7.42
         Prob > chi2 =    0.0595
```

Descriptive Statistics and Correlation Matrix:

```
. summarize FDI GDP HumCap Openess
```

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI	33	1.113157	.296615	.18332	1.37528
GDP	33	2.78965	.0654896	2.604819	2.856475
HumCap	33	1.752692	.1213394	1.555699	1.947385
Openess	33	1.78932	4.31565	-8	11.78318

```
. pwcorr
```

	Date	GDP	FDI	HumCap	Openess
Date	1.0000				
GDP	-0.4692	1.0000			
FDI	-0.5802	0.8105	1.0000		
HumCap	0.8747	-0.3323	-0.3983	1.0000	
Openess	-0.0059	0.1996	0.1568	0.2593	1.0000

Testing the Model:

```
. veclmar
```

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	20.2791	16	0.20791
2	14.0117	16	0.59784

H0: no autocorrelation at lag order

```
. vecnorm, jbera
```

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_GDP	0.676	2	0.71316
D_FDI	1.840	2	0.39859
D_HumCap	0.702	2	0.70399
D_Openess	0.430	2	0.80655
ALL	3.648	8	0.88743

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