# Trade Deficit, Foreign Direct Investment and Economic Growth "Evidences from Rwanda" (2000Q1-2015Q4)

**A Research Paper presented by:**

**Eric SIMBI**
simbieric@gmail.com

**(+250) 783548121**

**Abstract**

The theoretical and empirical connections between trade deficits and foreign direct investments' effects on economic growth have been discussed in economics for a long time; however this paper used an econometric investigation in order to assess the statistical effect of both variables on economic growth of Rwanda for the period of 2000Q1-2015Q4.This study used Co-integration technique and Vector error correction model(VECM) where we observed one co-integrating equation which normalized the coefficient of log real gross domestic product. By applying VECM, the speed of adjustment of the model was 56% with an error correction coefficient of 0.056109. In addition, the empirical findings also confirmed the long run negative effects of trade deficits and both short& long run positive effects of foreign direct investments on economic growth of Rwanda. However foreign direct investments did not generate economic growth in most efficient manner way despite its short run causality. The government of Rwanda may continue to review and address new policies towards net export and foreign direct investment improvement.

**Key words:** *Trade deficit, foreign direct investment, Economic growth.*

# 1. INTRODUCTION

The Rwandan economy grew more since 1995 compared to the previous years, this is perhaps because of different factors include good governance and the establishment of new developmental policies, but the country continues to record the imbalances between exports and imports undeterred by a slight change from thedeficit.

When a country persistently experiences a trade deficit there are predictable negative consequences that can affect economic growth and stability. If imports are more in demand than exports, domestic jobs may be lost to those abroad. While theoretically, this makes sense, that unemployment levels can actually persist at very low levels even with a trade deficit, and high unemployment may occur in countries with surpluses. As the demand for exports falls compared to imports, the value of a currency should decline. In fact, in a floating exchange rate system, trade deficits should theoretically be corrected automatically through exchange rate adjustments in the foreign exchange markets. Put another way, a trade deficit is an indication that a nation's currency is desired in the world market.

Similarly, a persistent trade deficit can often have adverse effects on the interest rates in that country. A downward pressure on a country's currency devalues it, making the prices of goods denominated in that currency more expensive; in other words it can lead to inflation. In order to combat inflation, the central bank may be motivated to enact restrictive monetary policy tools that include raising interest rates and reducing the money supply. Both inflation and high interest rates can put a damper on economic growth.

Despite an increase in goods exports, Rwanda struggles with a chronic trade deficit. Imports have risen sharply since 2004, largely as result of the increasing costs of imported fuel and energy. In 2016Q1, compared to the same period of 2015, trade deficit widened by 12.0% from a deficit of USD 410.8 million to a deficit of USD 460.1 million as a result of decline in formal exports by 11.4% in value compared to a decrease of formal imports value by 6.1%. Formal exportscovered21.0%offormalimportsin2016Q1against25.1%inthecorrespondingperiod

of 2015. Including informal cross border, exports covered 28.5% of imports in 2016Q1 from 29.8% in 2015Q1. (NBR 2016)

On the other side, classical and neo-classical economic theory suggest that economic growth depends on the supply of capital as well as the supply of labor and technology. Developing countries in general face capital shortages that put a limit on investment and therefore growth, which can be balanced with an inflow of funds from foreign private or public sector. Since the beginning of the 1990s foreign direct investment (FDI) has become the most important source of foreign capital for emerging market economies (EMEs) and research has shown that foreign direct investment (FDI) is an important catalyst for economic growth in accelerating the economic accomplishment and wealth of a country. (Mohammed Ershad Hussain &MahfuzulHaque 7January 2016)

Trade liberalization and foreign direct investments represent hope for the less developing countries, specifically Rwanda to overcome poverty, but if the expansion of trade volumes brings positive effects on the economy, the accompanying expansion of trade deficits brings dangers. This study attempts to assess the effects of trade deficits and foreign direct investment on the growth prospects by exploring the linearity and interaction effects associated with selected explanatory variables and economic growth of Rwanda during the concerned period of study.

## 2. LITERATUREREVIEW

Foreign direct investment and trade are the key catalysts for sustainable economic growth in developing countries. FDI stimulates domestic investment and facilitates the improvement in human capital but also trade is known to be an instrumental of economic growth. (D.Romer et al, .1996) Trade facilitates the more efficient production of goods and services by shifting production to countries that have comparative advantages in producing them. Some results suggest a strong positive interaction between FDI and trade in enhancing economic growth. Economic theory suggests that persistent trade deficits will be detrimental to a nation's economic outlook by negatively impacting employment, growth, and devaluing its currency. The United States, as the world's largest deficit nation, has consistently proven these theories wrong. This may be due to the special status of the United States as the world's largest economy and the dollar as the world reservecurrency.

Smaller countries certainly have experienced the negative effects that trade deficits can bring over time. Proponents of free markets, however, insist that any negative effects of trade deficits will correct themselves over time through exchange rate adjustments and through competition leading to a change in what a country produces. Large trade deficits may simply reflect consumer preferences and maynot.

Keynesian models in Kaldorian lines, such as Thirlwall's Balance-of-Payments constrained growth (BOP) model, find the channel between trade and growth by means of demand-pull characteristic of exports3. Trade represents an important constraint to economic growthby means of balance of payments problems. Static trade models suggest that movements toward openness can temporarily increase the rate of growth due to short-run gains from the reallocation of resources, which would imply a positive relationship between changes in openness and GDP growth. Structuralist and Post Keynesian tradition analyze trade and growth by means of export led growth, import substitution strategy, and balance of payments constraints. Post Keynesian tradition, stimulated by Harrod, Domar, and Kaldor, demonstrates the importance of investment and foreign multiplier as determinants of long-run economic growth. Structuralists, also based in demand-pull characteristics of economic growth, emphasize the importance of current account deficits and financial aspects in capital account, as pointed out by Findlay(1984)

Another important neoclassical model relating trade and growth is Bagwhati's (1958) immiserizing growth, in which national welfare declines as a result of economic growth pushed by technological progress. This result is a consequence of the deterioration of terms of trade after growth. The basic insight of this model is that after technological progress, national welfare can decline as a result of economic growth. This is caused by a sufficiently deterioration of the terms of trade that exceeds the favorable effect on welfare due to economic growth at constant relative product prices. Therefore, the change in terms of trade leads to an effect over consumption that contributes to a worse off in the global welfare. In other words it means that open up to trade in presence of distortions can be immiserizing and thereby decreasing the welfare of the economy.

Srinivasan and Bhagwati (1999), criticizing the critics of liberalized trade policies as contributing factors to foster economic growth, argued that the traditional theory of international trade still shows the best way to understand trade and growth. They sustain that openness to trade, factor and technology flows, potentially contribute to the sources of growth12. For them it is a mistake to criticize the effect of trade and growth in traditional international trade because the theory itself offers the theoretical possibilities that open up to trade can lead to worse welfare or even less growth under market failures. Therefore, being open to trade allows the economy to exploit its comparative advantage, thereby enhancing the efficiency of the allocation of domestic resources. (Jayme Jr., Frederico Gonzaga2001)

Alfaro et al. (2009) examined the relationship between foreign direct investment, the level of development of the financial sector, and economic growth. The authors found that an increase in the share of foreign direct investment led to higher additional economic growth rate in countries with a more advanced/developed financial sector, which highlights the necessity of a well-functioning financial system that can channel the surplus savings into the most productive investment. (Alfaro, L.; Chanda, A.; Kalemli-Ozcan, S.; Sayek, S. 2010)

AllenandAldred (2013) studied the regulatory and institutions' quality effect on both FDI inflows and economic growth in the Eastern European countries that had joined the EU recently. They found that some of these countries have been able to attract FDI and post strong economic growth. (Allen, M.M.C.; Aldred, M.L. 2013)

Causality analysis between FDI and growth show that there is a single-directional causality from FDI to economic growth (Tang et al., 2008; Ghazali, 2010; Katircioglu and Naraliyeva, 2006; Majagaiya and Qingliang, 2010), there is no causality between FDI and growth (Frimpong and Oteng-Abayie, 2006). Dhakal et al (n.d) revealed that FDI-to-growth causality is strengthened by the presence of greater trade openness, more limited rule of law, lower receipts of aid, and lower income level of the host country. There is a unidirectional causality relationship from exports to FDI (Jayachandran and Seilan, 2010). There is bi-directional causality between FDI and domestic investment (Ghazali, 2010) while others found that there is a single-directional causality from FDI to domestic investment (Tang et al., 2008). There is bi-directional causality between FDI and domestic savings (Katircioglu and Naraliyeva, 2006). Morever, The findings

onrelationshipbetweeneconomicgrowth,domesticinvestment,foreigndirectinvestment,

domestic savings and trade are controversial. In order to have policy recommendations, many scholars recommended specific country studies on basis of the appropriate approaches. (Charles Ruranga, Bruno Ocaya& William Kaberuka July,2014)

Despite a limited literature and research under the same area in case of Rwanda, Ruranga et al. (2014) used VAR in the analysis of economic growth, domestic investment, foreigndirect investment, domestic savings and trade in Rwanda. The researchers focused on the relationship among variables and causality but the current one emphasized on the short and long run effects of selected key catalysts of economic growth in developing economies like foreign direct investment and trade on basis of several economic tests rather than VARmodels.

## 3. METHODOLOGY

To analyze the empirical association between trade deficit's effects and foreign direct investment on real gross domestic product of Rwanda, this study used quarterly time-series data set covering the years 2000Q1 to 2015Q4. This study also identified the effects of selected variables on real gross domestic product with respect to their levels and nature of impacts. The model specification used lies on the Ordinary Least Square (OLS). To ascertain the stationarity of the data, Augmented Dickey Fuller (ADF) Unit root test was conducted, Johansen co-integration analysis were employed to determine the existence of long run relationship while the Error Correction test was used to evaluate the speed of adjustments.

Therefore, the empirical model was specified as:

**Figure1.1. Conceptual framework**

**Independentvariables**　　　　　　　　　　**Dependent variable**
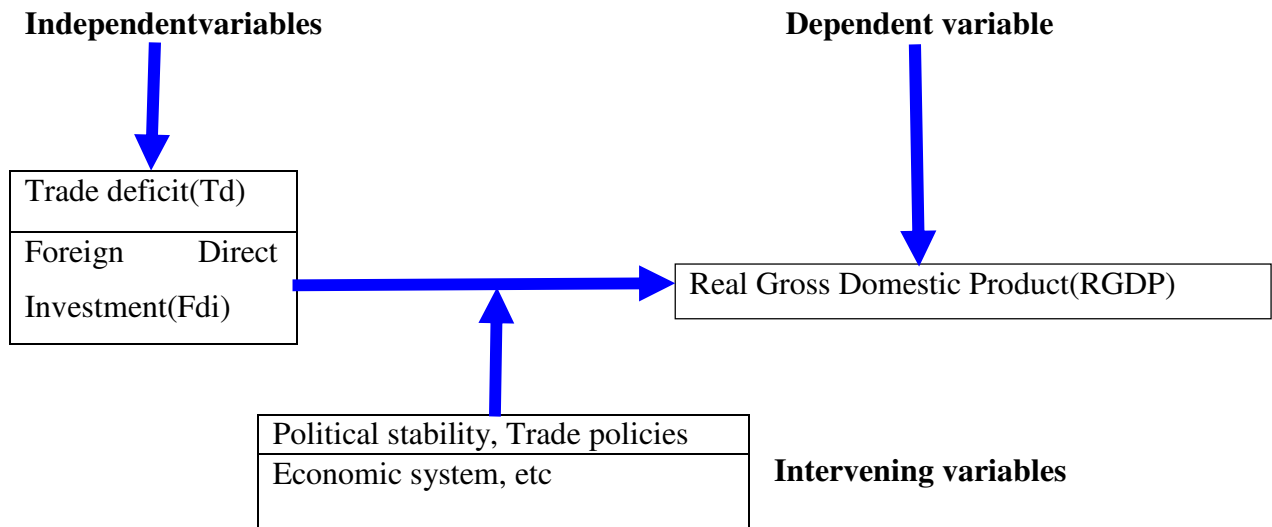


Source:Author's documentation

> **Rgdp=f(Td,Fdi,U)** ...............................................................................**(1)**

> **Rgdp$_t$=β0+β1Td$_t$+β2Fdi$_t$+U$_t$**...........................................................**(2)**

Econometrically, the above equation can be written as:

> **LnRgdp$_t$=β0+β1LnTd$_t$+β2LnFdi$_t$+U$_t$**........................................... **(3)**

Where:

**β0:** Is a constant term

**β1, β2:** Are the Parameters to be estimated

**LnRgdp$_t$:** refers to Log real gross domestic product at time t

**LnTd$_t$**: Is a Log trade deficit at time t

**LnFdi$_t$**: Has been also specified as Log foreign direct investment at time t,

**U$_t$**: is a disturbance term and assumed to be identically and independently distributed with a zero mean and constant variance, $\varepsilon_t \rightarrow N(0, \sigma^2)$

### 3.1. UNIT ROOTTEST

A unit root test is conducted to check if a time series variable is non stationary by applying an autoregressive model. The unit root test is then carried out under the null hypothesis **y= 0** against the alternative hypothesis of **y<0**. If the test statistic is greater (in absolute value) than the critical value let say at**5%** or **1%** level of significance, the null hypothesis of **y= 0** is rejected and no

unit root is present. In this study, we used Augmented Dickey–Fuller (Dickey and Fuller, 1979) unit-root test as follows:

$$\Delta Y_t = \beta_0 + \beta_t + y\Delta Y_{t-1} + \delta_1\Delta Y_{t-1} + \ldots\ldots + \delta_p\Delta Y_{t-p} + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$\text{Or}\Delta Rgdp_t = \beta_0 + \beta_t + y\Delta Rgdp_{t-1} + \delta_1\Delta Rgdp_{t-1} + \ldots\ldots + \delta_p\Delta Rgdp_{t-p} + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

$\beta_0$ is a constant, $\beta_t$ is the coefficient on a time trend and **p** is lag order of the autoregressive process and $\Delta$ is difference operator. Then our model in equation **(2)** becomes:

$$\Delta Rgdp_t = \beta_0 + \Delta Rgdp_{t-i} + \beta_1\Delta Td_{t-i} + \beta_2\Delta Fdi_{t-i} + Ut \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

### 3.2. COINTEGRATIONTEST

Let **Yt = (y1t. . . ynt)′** denote an **(n × 1)** vector of I(1) time series. Yt is cointegrated if there exists an **(n × 1)** vector **β = (β1. . . βn)′** such that :

$$\beta'Yt = \beta1y1t + \cdot\cdot\cdot + \beta nynt \sim I(0) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

The nonstationary time series in Yt are cointegrated if there is a linear combination of them that is stationary or I(0). If some elements of β are equal to zero then only the subset of the time series in Yt with non-zero coefficients is cointegrated. (GreeneJuly,2002)

In other words, if a dependent variable, assumes Rgdp and any of the explanatory variable(s) are both integrated of order d (i.e. I(d)), then, any linear combination of Rgdp and any of the explanatory variables will also be I(d); that is, the residuals obtained from regressing Rgdp on explanatory variable(s) are I(d).Therefore it implies that there is an evidence of long run relationship among the variables.

### 3.3. VARMODEL

Consider a univariate autoregressive model for example, an **AR(1)Rgdp$_t$=β$_0$+Rgdp$_{t-i}$+β$_1$Td$_{t-i}$+ β$_2$Fdi$_{t-i}$+Ut ................(8)** Our unrestricted vector autoregressive model in reduced form oforder **p**is presented in equation **(9)** as follows:

$$Rgdp_t = \beta + \Sigma^p_{i=1}A_iRgdp_{t-1} + \varepsilon t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Where **β = (β1,…,β2)′** is the **(3×1)** intercept vector of the VAR, **Ai** is the **i$th$(3×3)** matrix of autoregressive coefficients for **i = 1, 2,…, p**, and **εt=(ε1,t ,…, ε3,t)′** is the **(3×1)** generalization of a white noise process. Equation **(9)** explains the dynamics of one random variable **Rgdp$_t$**as a function of **Rgdp$_{t-1}$**, Basing on this model the forecast of dependent variable will depend on its past history, however the regressors interact with each other. However any change in FDI will

affect Td which in turn affects Rgdp´´ Ceteris Paribus

## 4. RESEARCH RESULTS ANDDISCUSSIONS

### 4.1. DATA ANDSTATIONARITY

This study used quarterly data ranging from 2000Q1 up to 2015Q4 of real gross domestic product, trade deficit and foreign direct investment. The data were transformed into Logarithms In order to test hypothesis and the stationarity. Study in the mentioned subject of econometrics indicates that various macroeconomics variables data are found non stationary. The finding was drawn from regression (integrated in different order) proceeds non sense or spurious regression. (Mohammad 2010)

Thus it is essential to analysis the stationary of the data before drawn the long run association among the variables.

**Table 4.1 Unit root tests results**

| Variables | ADF Test | | | | PP test | | | |
|---|---|---|---|---|---|---|---|---|
| | Level | $1^{st}$difference | Pvalue 5% | I(d) | Level | 1stdifference | P value5% | I(d) |
| **LRgdp** | -0.011100 | -3.186727* | 0.0000 | **I(d)** | -0.008239 | -1.284281* | 0.0000 | **I(d)** |
| **LTd** | -0.006554 | -1.108918* | 0.0061 | **I(d)** | -0.006554 | -1.108918* | 0.0000 | **I(d)** |
| **LFdi** | **-0.008426** | **-1.052587*** | **0.0000** | **I(d)** | **-0.008426** | **-1.052587*** | **0.0000** | **I(d)** |

Note: *(**) denote significant at 1%, 5% and 10% level of significance respectively.

The impacts of results show that all variables are stationary at level, Therefore null hypothesis of non stationary is rejected against alternative one at 0.05 level of significance. The value in parenthesis shows the lag length of different variables. All the given variables are integrated at order one. The unit root test also shows that all variables were stationery after the first differences and that they follow the I(1) series.

### 4.2. CO-INTEGRATIONANALYSIS

Co-integration is a statistical property of a collection $(X_1, X_2, ...,X_k)$ of time series variables. First, all of the series must be integrated of order 1. Next, if a linear combination of this collection is integrated of order zero, then the collection is said to be co-integrated. Formally, if $(X,Y,Z)$ are each integrated of order 1, and there exist coefficients a,b,c such that $aX + bY + cZ$ is integrated of order 0, then X, Y, and Z are co-integrated. Co-integration has become an important property in contemporary time series analysis. Time series often have trends—either deterministic or stochastic. In an influential paper, Charles Nelson and Charles Plosser(1982) provided statistical evidence that many US macroeconomic time series (like GNP, wages, employment, etc.) have stochastic trends. (Charles R. Nelson and Charles I. Plosser September, 1982)

**Table 4.2 Johansen Co-integration results**

Date: 01/06/18 Time: 21:09

Sample (adjusted): 2001Q1 2015Q4

Included observations: 60 after adjustments

Trend assumption: Linear deterministic trend

Series: RGDP TD FDI

Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.367361 | 38.49991 | 29.79707 | 0.0039 |
| At most 1 | 0.140014 | 11.02859 | 15.49471 | 0.2097 |
| At most 2 | 0.032433 | 1.978251 | 3.841466 | 0.1596 |

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.367361 | 27.47132 | 21.13162 | 0.0056 |
| At most 1 | 0.140014 | 9.050341 | 14.26460 | 0.2820 |
| At most 2 | 0.032433 | 1.978251 | 3.841466 | 0.1596 |

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Trace statistics indicates one co-integrating equation; hence trace statistics of 38.49991 became greater than its critical value of 29.79707 at 0.05 level of significance. Taking into account our lowest probability of 0.039 then we reject the null hypothesis in favor of alternative one. On the other hand the Maximum Eigen Statistics allow us also to reject the null hypothesis with its statistics and critical value of 27.47132 and 21.13162 respectively. Therefore real gross domestic product, trade deficit and foreign direct investment will have a long run association-ship.

**Table 4.3 Long-run Dynamics: Normalized Co-integration coefficients of Log Real GDP**

| LRgdp | LTd | LFdi |
|---|---|---|
| Coefficients | -1.467773 | **0.499812** |
| (SE) | (0.20235) | **(0.09742)** |
| [t-stat] | **[7.253634791]** | **[5.130486553]** |

Source: Author's estimation

**$LRgdp_t = -1.467773LTd_t + 0.499812LFdi_t$ .......................................................................(10)**

The above table shows the long run effects of all independent variables on real gross domestic

product for the period of 2000Q1 up to 2015Q4.The difference between imports and exportswill continue to affect real gross domestic product by -1.46773 from one unit percent increased(1%) in net exports. On the other hand there will be positive effect of foreign direct investment on real GDP.

### 4.3. Vector error correction model(VECM)

An error correction model belongs to a category of multiple time series models most commonly used for data where the underlying variables have a long-run stochastic trend, also known as co-integration. ECMs are a theoretically-driven approach useful for estimating both short-term and long-term effects of one time series on another. The term error-correction relates to the fact that last-periods deviation from a long-run equilibrium, the error, influences its short-run dynamics. Thus ECMs directly estimate the speed at which a dependent variable returns to equilibrium after a change in other variables. (Engle, Robert F.; Granger, Clive W. J. 1987)

The vector error correction models (VECM) specify the short-run dynamics of each variable in the system, and in a framework that anchors the dynamics to long-run equilibrium relationships suggested by economic theory.

**Table 4.4 Short-run dynamics: Vector error correction model coefficients**

Dependent Variable: D(RGDP)

Method: Least Squares

Date: 01/06/18 Time: 23:23

Sample (adjusted): 2001Q1 2015Q4

Included observations: 60 after adjustments

D(RGDP) = C(1)*( RGDP(-1) - 1.46777268294*TD(-1) +
0.499811665982

   *FDI(-1) - 0.903000872097 ) + C(2)*D(RGDP(-1)) +
C(3)*D(RGDP(-2))
   + C(4)*D(RGDP(-3)) + C(5)*D(TD(-1)) + C(6)*D(TD(-2)) +
C(7)*D(TD(
   -3)) + C(8)*D(FDI(-1)) + C(9)*D(FDI(-2)) + C(10)*D(FDI(-
3)) + C(11)

|  | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C(1) | 0.056109 | 0.016332 | 3.435521 | 0.0012 |
| C(2) | -0.785484 | 0.100553 | -7.811602 | 0.0000 |
| C(3) | -0.785484 | 0.100553 | -7.811602 | 0.0000 |
| C(4) | -0.785484 | 0.100553 | -7.811602 | 0.0000 |
| C(5) | 0.050473 | 0.036962 | 1.365565 | 0.1783 |
| C(6) | 0.050473 | 0.036962 | 1.365565 | 0.1783 |
| C(7) | 0.050473 | 0.036962 | 1.365565 | 0.1783 |
| C(8) | -0.036536 | 0.012381 | -2.950891 | 0.0048 |
| C(9) | -0.036536 | 0.012381 | -2.950891 | 0.0048 |
| C(10) | -0.036536 | 0.012381 | -2.950891 | 0.0048 |
| C(11) | 0.064872 | 0.004568 | 14.20021 | 0.0000 |

| R-squared | 0.747916 | Mean dependent var | 0.018798 |
|---|---|---|---|
| Adjusted R-squared | 0.696470 | S.D. dependent var | 0.034810 |
| S.E. of regression | 0.019178 | Akaike info criterion | -4.905951 |
| Sum squared resid | 0.018022 | Schwarz criterion | -4.521988 |
| Log likelihood | 158.1785 | Hannan-Quinn criter. | -4.755762 |
| F-statistic | 14.53797 | Durbin-Watson stat | 1.215827 |
| Prob(F-statistic) | 0.000000 |  |  |

Source: Author's estimation

The results of Vector Error Correction Model (VECM) confirm 56% as the speed of adjustment of the model with an error correction coefficient of 0.056109. This means that 56% of realized errors previously are corrected within the current quarter and 56% of disequilibrium errors will be corrected due to any change from the equilibrium. Adjusted R-squared of 69% in log real gross domestic product is attributed to the combined effects of the independentvariables.

**Table 4.5 The short run causality of TD**

Wald Test:

Equation: Untitled

| Test Statistic | Value | df | Probability |
|---|---|---|---|

| | | | |
|---|---|---|---|
| F-statistic | 1.708983 | (3, 49) | 0.1774 |
| Chi-square | 5.126949 | 3 | 0.1627 |

Null Hypothesis: C(5)=C(6)=C(7)=0

Null Hypothesis Summary:

| Normalized Restriction (= 0) | Value | Std. Err. |
|---|---|---|
| C(5) | 0.050473 | 0.036962 |
| C(6) | 0.050473 | 0.036962 |
| C(7) | 0.050473 | 0.036962 |

Restrictions are linear in coefficients.

Basing on the above results of Wald Test, our Probability of 0.1627 which is greater than 5 percent allows us to reject alternative in favor of null hypothesis. Then our null hypothesis stated that C(5)=C(6)=C(7)=0 is retained and we conclude that there is no short run causality running from net exports to real gross domestic product.

**Table 4. 6. The short run causality of FDI**

Wald Test:

Equation:Untitled

| Test Statistic | Value | df | Probability |
|---|---|---|---|
| F-statistic | 6.179606 | (3, 49) | 0.0012 |
| Chi-square | 18.53882 | 3 | 0.0003 |

Null Hypothesis: C(8)=C(9)=C(10)=0

Null Hypothesis Summary:

| Normalized Restriction (= 0) | Value | Std. Err. |
|---|---|---|

| | | |
|---|---|---|
| C(8) | -0.036536 | 0.012381 |
| C(9) | -0.036536 | 0.012381 |
| C(10) | -0.036536 | 0.012381 |

Restrictions are linear in coefficients.

On the hand , following the statement of our hypothesis as H0:C(8)=C(9)=C(10)=0 ,H1 : C(8)≠C(9)≠C(10)≠0 we reject our null hypothesis in favor of alternative because of the above lowest probability . So we can conclude that There is a short run causality running from FDI to RGDP. ceteris paribus

## 4.4. GRANGERCAUSALITY

The grange causality method indicates how the variables affect (drive) each other. The following are the granger causality results.

**Table 4.7 Grange causality test results**

Pairwise Granger Causality Tests

Date: 01/06/18 Time: 21:48

Sample: 2000Q1 2015Q4

Lags: 3

| Null Hypothesis: | Obs | F-Statistic | Prob. |
|---|---|---|---|
| TD does not Granger Cause RGDP | 61 | 0.09480 | 0.9626 |
| RGDP does not Granger Cause TD | | 1.92785 | 0.1360 |
| FDI does not Granger Cause RGDP | 61 | 0.48718 | 0.6926 |
| RGDP does not Granger Cause FDI | | 1.97459 | 0.1287 |
| FDI does not Granger Cause TD | 61 | 1.70730 | 0.1764 |

| TD does not Granger Cause FDI | 0.33251 | 0.8019 |
| --- | --- | --- |

Source: Author's estimation

From the above table of grange causality, probabilities of trade deficit and foreign direct investment are greater than 5% now we can't reject the null hypothesis; The highest probabilities confirm the significance and undirection causality. However, regressors are significant to explain real gross domestic product respectively.

**4.4 IMPULSE RESPONSEFUNCTION**

Impulse response functions are useful for studying the interactions between variables in a vector autoregressive model. They represent the reactions of the variables to shocks hitting the system. It is often not clear, however, which shocks are relevant for studying specific economic problems. Therefore structural information has to be used to specify meaningfulshocks.

### Figure 4.1 Impulse response function of LRgdp, LTd and LFdi



ResponsetoCholeskyOneS.D.Innovations±2S.E.
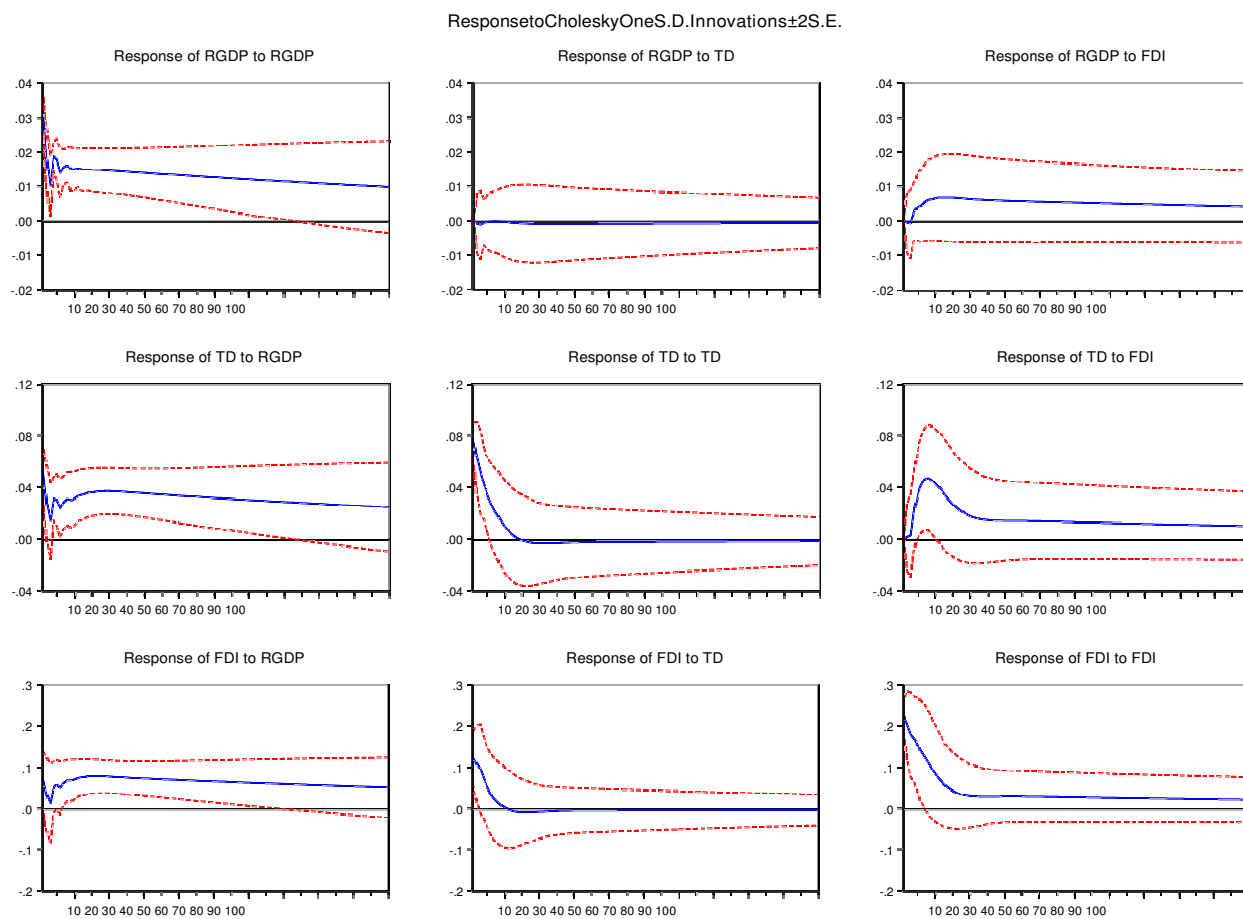
Source: Author's estimation

From the above table of impulse response function, The intermediate Blues lines indicate the short run relationship and the following red lines implicates long run relationship. However, there is slight increase response of both regressors on real gross domestic product. Briefly TD does not affect Rgdp in short run, the impulse response function also confirms that there is a relationship among variable but which is notdynamic.

### 4.5 VARIANCEDECOMPOSITION

In econometrics and other applications of multivariate time series analysis, a variance decomposition or forecast error variance decomposition (FEVD) is used to aid in the interpretation of a vector auto-regression (VAR) model once it has been fitted. The variance decomposition indicates the amount of information each variable contributes to the other variables in the auto-regression. It determines how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables. (Lütkepohl 2007)

**Table 4.8 Variance decomposition of LRGDP (Cholesky ordering Rgdp Td Fdi)**

| Period | S.E. | RGDP | TD | FDI |
|--------|------|------|-----|-----|
| 1 | 0.031964 | 100.0000 | 0.000000 | 0.000000 |
| 2 | 0.036696 | 99.93244 | 0.048437 | 0.019119 |
| 3 | 0.038102 | 99.80754 | 0.135478 | 0.056982 |
| 4 | 0.042575 | 99.38609 | 0.124165 | 0.489750 |
| 5 | 0.046332 | 98.67407 | 0.111835 | 1.214096 |
| 6 | 0.048599 | 97.98305 | 0.106913 | 1.910041 |
| 7 | 0.051338 | 97.08074 | 0.097825 | 2.821434 |
| 8 | 0.054188 | 96.11216 | 0.089595 | 3.798249 |
| 9 | 0.056579 | 95.21579 | 0.085326 | 4.698879 |
| 10 | 0.058918 | 94.36900 | 0.082780 | 5.548220 |
| 11 | 0.061274 | 93.58338 | 0.081764 | 6.334856 |
| 12 | 0.063473 | 92.88076 | 0.083199 | 7.036041 |
| 13 | 0.065570 | 92.25853 | 0.086535 | 7.654937 |
| 14 | 0.067620 | 91.71065 | 0.091213 | 8.198135 |
| 15 | 0.069587 | 91.23129 | 0.097207 | 8.671508 |

Source: Author's estimation

Basing on the above table of Log Real gross domestic product's variance decomposition, we analyzed the effects of Fdi and Td within different periods of time.At period 1, Rgdp is 100%

own shock and 0% from other variables, at period 4 Fdi is highly statistically significant to explain the incremental in output compared to Td. Within the following periods up to 10 the Fdi continues to present the better effects on Rgdp, and this means that foreign direct investment tends to be taken into account as one of the key drives of Rgdp for those countries experienced a larger trade deficit. As we approach the very long run for example starting from period 12 Fdi continues to affect Rgdp with a low contribution of trade deficit (Td).

## 5. CONCLUSION & POLICY RECOMMENDATIONS

  ➢ **Conclusion**

This paper examined the influences of trade deficit and foreign direct investment on economic growth of Rwanda for the period of 200Q1-2015Q4. On basis of several econometrics tests, we observed higher influence of log fdi rather than logTd on logRgdp. Johansen co-integration test results confirmed the existence of long run relationship among variables. On the other hand, via VECM an adjusted R-squared of 69% in log Rgdp was attributed to the combined effect of independent variables. However Td does not affect Rgdp in short run but Fdi presents a short run causality to Rgdp. The impulse response function also confirms a long run relationship among variables but not dynamic one.

  ➢ **Policy Recommendations**

Based on the results of this study, foreign direct investment trade deficit and economic growth of Rwanda for the period of 2000Q1-2015Q4, we suggested the following:

- Because the higher trade deficit reflects lack competitiveness or high levels of spending on imports, the government of Rwanda may review and address an issue of exchange rate & introduction ofquotas.

- As research findings confirmed the long run relationship between foreign direct investment and real gross domestic product, we suggested that government may create trade promotion and friendly foreign direct investment-policies.

- This paper also recommends an improvement in investment climate for foreign capital that can increase competitiveness and bargaining position of Rwanda in East African

Countries.

- We recommend also the future researchers to analyze the factors determine trade imbalance in case of Rwanda

## Bibliography

Alfaro, L.; Chanda, A.; Kalemli-Ozcan, S.; Sayek, S. "Does foreign direct investment promote growth?Exploring the role of financial markets on linkages." *J. Dev. Econ.*, 2010: 242–256.

Allen, M.M.C.; Aldred, M.L. "Business regulation, inward foreign direct investment, and economic growth in the new European Union member states." *Crit. Perspect. Int. Bus.*, 2013: 301-321.

Charles R. Nelson and Charles I. Plosser. "Trends and Random Walks in Macroeconmic Time Series: Some Evidence and Implications." *Journal of Monetary Economics*, September, 1982: P139-162.

Charles Ruranga, Bruno Ocaya& William Kaberuka. "VAR Analysis of Economic Growth, Domestic Investment, Foreign Direct Investment, Domestic Savings and Trade in Rwanda." *Greener Journal of Economics and Accountancy*, July,2014: P3.

Greene, William H. *econometric analysis.* New York: Pearson Education Ltd, July,2002.

Jayme Jr., Frederico Gonzaga. "Notes on trade and growth." *Universidade Federal de Minas Gerais and Cedeplar*, 2001: P16.

Lütkepohl, H. "New Introduction to Multiple Time Series Analysis." *Springer*, 2007: P.63.

Mohammad, Sulaiman D. "Determinant of Balance of Trade: Case Study of Pakistan." *European Journal of Scientific Research*, 2010: P5.

Mohammed Ershad Hussain &MahfuzulHaque. "Foreign Direct Investment, Trade, and Economic Growth: An Empirical Analysis of Bangladesh." *Journal of economies*, 7January 2016: P2.

NBR. *Quarterly Economic and Financial Report: Developments and Prospects.* Quartery Report, Kigali-Rwanda: NBR, 2016, Page 3.