



International Journal of Management Research and Economics

Publisher's Home Page: <https://www.svedbergopen.com/>



Research Paper

Open Access

Econometrics Analysis of Impact of International Trade on Economic Growth in Rwanda (1990-2017)

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Article Info

Volume 2, Issue 2, July 2022

Received : 14 March 2022

Accepted : 18 June 2022

Published : 05 July 2022

doi: [10.51483/IJMRE.2.2.2022.30-46](https://doi.org/10.51483/IJMRE.2.2.2022.30-46)

Abstract

International trade is so much essential for economic growth not only in Rwanda but also worldwide because this world become as village due to globalization where one country's people can easily buy or sell products to another country. The objectives of this study is to examine impact of international trade on economic growth in Rwanda from 1990-2017. Descriptive data analysis was used and the variable considered here are: Gross Domestic Product (GDP) as proxy for economic growth, Trade Openness (TO), Foreign Direct Investment (FDI). This study was carried out using the Vector Error Correction Model (VECM) estimation method for data analysis using Econometric software (E-Views 8.0. Secondary data was used to conduct this study and the required data was collected from World Bank. Available literature has shown that international trade contributes to economic growth. Empirical investigation reveals that both TO and FDI are positively related to GDP by 0.048617% to 0.193749% respectively. The conclusion drawn from this work is that there is a correlation amongst GDP and its independent variable TO and FDI. This study recommends that the policymakers should improve and strengthen the trade openness and direct investment with the objective of striving for Rwanda sustainable development.

Keywords: Economic Growth, Trade Openness, Export, Import, International Trade, VECM

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1. Introduction

1.1 Background of the Study

International trade is one of the leading discussions taking place not only in Rwanda but all over the world. The major concern is always about the level of economic growth. According to Qaiser *et al.* (2009) a trade theory indicates that there is generally a positive association among openness, export to Growth Domestic Product (GDP) ratio, investment to GDP ratio and inflation. Kehinde *et al.* (2012) asserts that trade can promote growth from the supply side, but if the balances of payment cost reduce the availability of imported inputs which enter the product of exports, thus forcing exporters to use expensive imports of double quality. Rwanda's economic growth performance has strengthened sustainability since the end of Genocide against Tutsi in 1994. Estimations of potential output growth based on

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alternative methodologies were conducted, including a standard production function approach. It suggests that during 1995–2003 the rate of potential output growth increased to 3%. The measure of potential output is based on historical rates of factory utilization and Total Factor Productivity (TFP), rather than on full employment. It includes the effects of structural and institutional rigidities that may have impeded growth in the past but not necessarily in the future. The actual rate of real GDP growth also rose to nearly 3.5 from 0.25% during 1980–94, largely reflecting a turnaround in TFP growth as the combined growth contribution of labor and capital accumulation stayed roughly unchanged (Arora, 2003).

However, over the past decade Rwanda's exports have underperformed. Export growth in real terms has stagnated and the exporters have made only limited inroads into global markets. Be it in minerals, non-minerals or services, Rwanda's exports have lagged behind those of peers and not lived up to their potential. That been the case, the National Development Plan I is targeting export volume growth of 6% a year to achieve an annual increase in real GDP of about 5.5% and to help generate 11 million new jobs by 2030. Despite successes in some subsectors, Rwanda will need to greatly improve its export performance to meet these targets (Purfield *et al.*, 2014). The purpose of this study is to investigate the impact of foreign trade on economic growth in Rwanda. The significance of trade is vital to any modern economy because it is very crucial to the competitiveness of the economy. Although several studies like Kehinde *et al.* (2012), Eravwoke and Imide (2013), etc. have paid attention to trade and economic growth, to our knowledge very few have done an econometric analysis of the impact of international trade on economic growth in Rwanda.

Economic growth refers to increase in production. It is the steady process by which the productivity capacity of an economy is increased overtime to bring about rising levels of national output and income while, foreign trade is trade between different countries of the world. According to Patel (2013), foreign trade is the process of focusing on the resources of the globe and objectives of the organizations or global business opportunities and threats in order to produce, buy, sell or exchange of goods and services world-wide. Put differently, foreign trade is all commercial transactions (private and governmental, sales, investments, logistics, and transport) that take place between two or more regions, countries and nations beyond their political boundary. It is also called international trade or external trade or inter-regional trade. It consists of imports, exports and entrepot. Import trade refers to purchase of goods by one country from another country or inflow of goods and services from foreign country to home country. Export trade refers to the sale of goods by one country to another country or outflow of goods from home country to foreign country. Entrepot trade is also called re-export. It refers to purchase of goods from one country and then selling them to another country after some processing operations (Wikipedia, the free encyclopedia). Foreign trade can be influenced by differences in natural factor endowments, preferences, technologies, exchange rate, distance and Gross Domestic Product (GDP) (Andrew, 2004).

1.2 Problem Statement

Rwanda is a rural, agrarian country with about 35% of the population engaged in subsistence agriculture, and with some mineral and agro-processing. Population density is high but not concentrated in large Metropolis, its people about 13 million are spread out on a small amount of land. International trade expansion can be a catalyst for output growth directly as a component of aggregate output. An increase in foreign demand for domestic exportable products can cause an overall growth in output via an increase in employment and income in the exportable sector (Verdoorn, 1949). Tourism, minerals, coffee and tea are Rwanda's main sources of foreign exchange. Despite Rwanda's fertile ecosystem, food production often does not keep pace with demand, requiring food imports. Energy shortages, instability in neighboring states, and lack of adequate transportation linkages to other countries continue to handicap private sector growth.

Problems with international trade are caused by the imposition of import duties or quotas on imports. This may make goods exported abroad less competitive on the overseas market, where the government of the foreign country may wish to protect its domestic industries.

Other problems include dealing in a different currency and facing risks from fluctuations in exchange rates. Further problems with international trade are caused by the imposition of import duties or quotas on imports. This may make goods exported abroad less competitive on the overseas market, where the government of the foreign country may wish to protect its domestic industries

It is in this way this work seeks to analyze the impact of international trade on the economic growth of Rwanda.

1.3. General Objective of the Study

The general objective of this study will be to analyze the Impact of International Trade on Economic Growth in Rwanda for the period (1990-2017) .

The broad objective of this study is to examine the impact of Impact of International Trade on economic growth in Rwanda from 1990 to 2017. The specific objectives of the study are to:

- i. To examine the relationship between trade openness and economic growth in Rwanda;
- ii. To examine the relationship between Foreign Direct Investment (FDI) and economic growth in Rwanda.

1.4. Hypotheses

The research work is guided by the following null and alternative hypotheses:

- i. H_0 : There is no significant relationship between trade openness and economic growth in Rwanda .
 H_1 : There is significant relationship between trade openness and economic growth in Rwanda.
- ii. H_0 : There is no significant relationship between FDI and economic growth in Rwanda.
 H_1 : There is a significant relationship between FDI and economic growth in Rwanda.

1.5. Scope of the Study

The scope of this study covers critical examinations on the impact of Impact of International Trade on economic growth in Rwanda. In order to analyze the relationship between International Trade and Gross Domestic Product, annually data for the period of 1990 to 2017 were used for these two variables from World Bank.

1.6. Scope of the Study

This study will cover the period of (1990-2018). This research will present a study on matters of concern with the effectiveness of international trade and economic growth in Rwanda, based on the limited in time, space and domain of research.

1.7. Significance of the Study

This study will contribute in understanding international trade process that Rwanda is engaging in and by identifying factors and are responsible for changes in economic growth and revising appropriate policies that fever international trade. For the economic policymakers, it will be vital to identify the main variables of international trade that will give life to economic growth in Rwanda so that they can be able to take appropriate actions to be undertaken and assess their effects with accuracy. Moreover, it is important for Rwanda to assess how international trade agents and trade policies of Rwanda, respond to its actions and the impact of their behavior on economic growth in Rwanda. This study will try to address those issues.

This study will indicate to what extent certain variables affect economic growth so that any policy actions would be undertaken with predictable effects. Furthermore, this research is significant because it will add up to the limited available literature on the Rwandan economy and hence will provide information for those students or researchers who may want to further explore this relationship of international trade and economic growth in Rwanda.

2. Literature Review

This study begins with literature review from the perspective of international trade theories, Conceptual framework and Related studies.

2.1. Mercantilist Trade Theory

Some of the finders are Jean Baptise Colbert and Thomas Hobbes. According to the mercantilist trade theory the key way for a nation to become rich and powerful is to export more than it import. That is the most key way in which a country could be prosperous was to acquire more precious metals such as gold. The country should ensure that the volume of exports was better than the volume of imports. Exports may be enhanced through domestic production. Controls should exist over working hours, wage rates, and prices. The mercantilist believe that trade has to be controlled, regulated and restricted. The control, regulation and restriction can be in the form of increase tariffs, quotas and other commercial policies (example import licensing, embargo, foreign exchange control, devaluation and import monopoly) that will minimize imports in order to protect a nation 's trade position. The country can aggregate wealth from gold and silver. This will lead to surplus exports that will add to the economic strength and riches of the country. However, mercantilism

did not favor free trade and the need for regulation to maintain order in human affairs and economic affairs were taking for granted. In addition, the key mistake in mercantilist thinking was the belief that trade was a zero sum activity. That is, one nation's gain is another nation's loss (Ray, 2011; Kalra, 1997; Shim *et al.*, 1995; Akeem, 2011; Gerber, 2007).

2.2. Absolute Advantage Trade Theory

Absolute advantage trade theory was propounded by Adam Smith in his famous book -*Wealth of Nation?* 1776. Smith advocated free trade as the best policy for nations of the world. According to Adam Smith with free trade each nation could specialise in the production of those commodities in which it could produce more efficiently than the other nations, and then import those commodities in which it could produce less efficiently. That is according to the absolute advantage trade theory, a nation should specialize in the production of export of commodities in which it has lower cost or absolute cost advantages over others. This international specialization of factors in production would result in increase in world output, which would be shared by trading nations. Thus, a nation need not gain at the expense of other nations, all nations could gain simultaneously. On the other hand, the same country should import a commodity in which it has higher or absolute cost disadvantage granted (Ray, 2011; Kalra, 1997; Shim *et al.*, 1995; Akeem, 2011).

2.3. Comparative Advantage Theory (Comparative Cost Principle)

The theory of comparative advantage was demonstrated by David Ricardo (1772 – 1823). According to Ricardo a country should specialise in producing and exporting only those goods and services which it can produce more efficiently, that is, at lower opportunity cost than other goods and services which it should import.

Comparative advantage results from different endowments of the factors of production, that is, capital, land, labor, entrepreneurial skill, power, resources, technology and so on. It therefore follows that free trade is beneficial to all countries, because each can gain if it specializes according to its comparative advantage. Alternatively, the principle states that trade is beneficial even if a country does not have an absolute advantage in the production of a good, but does have a cost benefit of producing the good relative to its trading partner. This principle explains why countries specialize in producing and exporting products based on their endowment of resources. The concept is especially important in international trade, suggesting that countries should specialize in areas in which they have a comparative advantage. Differently argued, in the domain of international trade, each nation takes to the production of only those products in the manufacturer of which, she is at an advantage in terms of skill, equipment, machinery or tradition, as compared to the other nations. Thus, with international specialization that has become order of the day, each nation concentrates on the making of only such products in which it has the maximum comparative advantage and the least comparative cost (Akeem 2011; Ray, 2011; Shim *et al.*, 1995; Kalra, 1997).

2.4. Heckscher – Ohlin Trade Theory (Factor Endowment Theory)

This is an explanation of trade patterns, offered by the Swedish economist Bertil Heckscher and subsequently developed by his pupil, Eli Ohlin, that contend that international trade is based on differences in comparative costs and attempts to explain the factors that make for differences in comparative costs. Different goods require different factor proportions, and different countries have different relative factor endowments; countries will tend to have comparative advantages in producing the goods that use their abundant factors more intensively; for this reason each country will end up exporting its abundant factor goods in exchange for imported goods that use its scarce factors more intensively. That is, the model takes up the case of two trading countries with different endowment facilities. A nation that has a factor available in plenty would have it at a lower cost as well. The other country likewise would have relatively cheaper, the other factor that it has in abundance. The model works on the presumption of two goods and two factors. Such a proposition is known as factor—abundance hypothesis. Thus, according to the theory, a nation should produce and export a product for which the large amount of the relative abundance resources is used. Such countries should import the commodity in which a great deal of its relative scarce and expensive factors is used (Shim *et al.*, 1995; Kalra, 1997; Akkem, 2011; Ray, 2011). The Heckscher-Ohlin model and Ricardian trade theory both predict that trade promotes the specialization of a country so that it can realize trading gains (Osterfeld, 2007).

From the above discussions, it could be seen that trade is an engine of economic growth. This is because; (1) there is efficient allocation of resources; (2) it encourages investment; (3) it leads to division of labor and specialization; (4) it increases resource productivity; (5) total world output of commodities seems to increase; (6) increase in the world output will increase the variety of goods available to consumers; (7) there is an increase in competition which bring prices down; (8) there is technological transfer; (9) there is also job creation; (10) generation of income and relaxation of foreign exchange restraints; (11) maintains balance of payment position and promotes world peace. However, sometimes, foreign trade may come with some challenges like language barriers and currency differentials (Akeem, 2011; Nnadozie, 2003).

2.5. Conceptual Framework

Figure 1 presents the independent and dependent variables. Since there are many variables, the researcher shall concentrate on three most important variables such as Independent variable, Dependent variable, and Intervening variables. This conceptual framework interlinks those three types of variables following their interdependence. It is clear that the economic growth as a dependent variable is influenced by exports, imports, foreign direct investment indicators of international trade in Rwanda as independent variables.

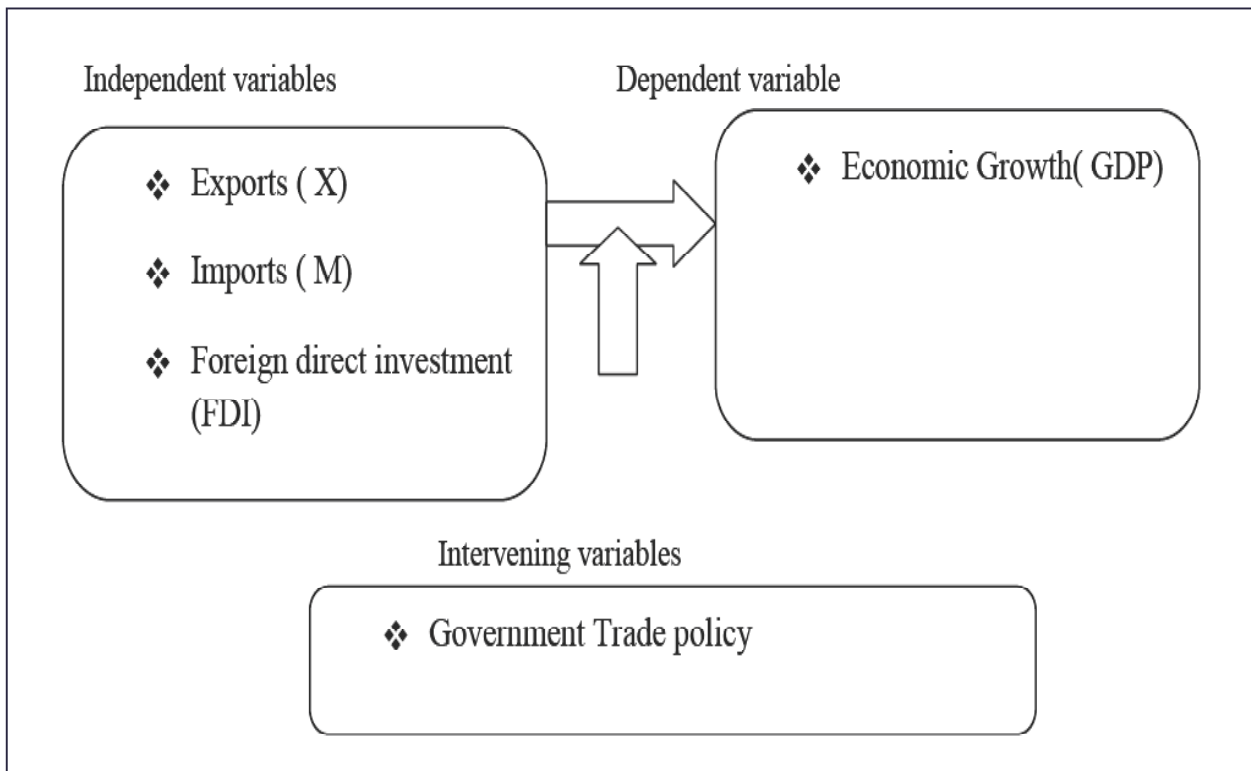


Figure 1: Conceptual Framework

Source: Computed by Researcher, December, 2020

3. Related Case Studies

Tong (1995) explored the relationship between economic growth and import. He recognized that import at different times contributed to economy differently, but on the whole, there was a positive correlation between import and economic growth. The reasons might be due to the fact that imports encourage domestic enterprises to improve product quality and production efficiency and also promote the upgrading of traditional industrial structure.

Summers (1997) analyzed the relationship between external trade and growth in Australia and Canada, concluding that imports and exports play different roles in economic growth of Canada and Australia. Import plays a significant role in Canada but no evidence was found to support the export-led growth in Australia.

Lin (2000) explored the relationship between trade and economic growth based on China’s national data for the period of 1952 to 1997. He found that the growth rate of exports, the growth rate of imports, and the growth rate of the volume of trade are positively related to growth rate of per capita GDP. He also found that the labor force growth was positively related to economic growth. He suggested that to keep the economy at a high level of growth, China should actively engage in the world economy and continue its trade promotion policy.

Aurangzeb (2006) examined the link between exports, productivity and economic growth in Pakistan: a time series analysis from the period 1973 to 2005. The main focus of the study was to analyze the direct and indirect impacts of exports on Pakistan’s economic growth during 1973 to 2005 using the analytical framework developed by Feder (1983). The estimation results indicated that marginal factor productivities are significantly higher in the export sector and thus the results of his study are supportive of the export oriented outward-looking approach to trade relations adopted by policy makers over the past decade.

Narayan *et al.* (2007), researched on the topic -export-led growth hypothesis: evidence from Papua New Guinea and Fiji. The main purpose of the study was to examine the export-led growth hypothesis for Fiji and Papua Guinea. They employed the bound test for cointegration. They found that for Fiji there is evidence of export-led growth in the long run, while for Papua New Guinea there was evidence of export-led growth in the short run.

Akeem (2011) did a study on the topic -Performance evaluation of foreign trade and economic growth in Nigeria (1970 -2005?. He found out that a 1% increase in export will cause economic growth to decrease by 19%. He suggested that conscious efforts should be made by the government to fine-tune the various macroeconomic variables in order to provide an enabling environment to stimulate foreign trade.

Ezike *et al.* (2012) studied on the topic 'Macroeconomic impact of trade on Nigerian growth: An empirical evaluation'. They found out that exports and foreign direct investment inflows were positive and are significant determinants of economic growth in Nigeria. They suggested that Nigeria needs to diversify its export base away from oil and add value to its exports by emphasizing on non-oil production and exportation. Again, primary products should be processed into semi-finished and finished industrial products before they are exported.

Atoyebi *et al.* (2012) empirically examined the impact of international trade on economic growth in Nigeria from 1970 – 2010. Their empirical investigations revealed that three of the variables were statistically significant at 5% and those variables were export, foreign direct investment and exchange rate. They were positively related to real GDP while the other variables such as import, inflation rate and openness had a negative impact on real GDP. They recommended that the government should design appropriate strategy by diversifying the economy through export promotion, stimulating foreign direct investment and ensuring exchange rate stability in order to boost productivity of Nigeria economy by raising the standard of living of the citizens.

Usman *et al.* (2012) investigated the relationship of export and economic growth: an empirical study of Pakistan from 1980 to 2009. The main aim of their study was to study the impact of export on the economy of Pakistan. They employed the log linear growth model and determined the values of the parameters of the model specified by using the least squares estimation technique. Their dependent variable was economic growth and the independent variables were export, inflation, and real exchange rate. Their results showed that there is a significant positive relationship between export and economic growth of Pakistan.

Faridi (2012) studied the contribution of agricultural exports to economic growth in Pakistan from the period 1972 to 2008. The main goal of the study was to explore and quantify the contribution of agricultural export to economic growth in Pakistan. He specified his model in the form of the Cobb – Douglas form of neoclassical production function and also used the Johansen Co-integration technique. His dependent variable was economic growth proxy by GDP in million rupees at market price and the independent variables were labor force measured as total labor force in million people, capital measured as fixed capital formation in million rupees, inflation measured as consumer price index, agricultural export in million rupees at market price and non agricultural export in million rupees at market price. He found that agricultural export had a negative significance effect on economic growth. He suggested that nonagricultural exports should be promoted.

Edoumiekumo *et al.* (2013) researched on the topic, Economic Growth in Nigeria: The Role of Global Trade?. They found out that there is a positive relationship between real gross domestic product and export and import, but the export coefficient was insignificant. Their result showed that international trade had contributed to economic growth in Nigeria. They suggested that Nigeria has to increase or diversify her export goods to enjoy more of the benefits of trade.

Azam (n.d.) did a study on exports and economic growth in Pakistan: an empirical analysis for the period 1971 to 2009. The main purpose of the paper was to understand the importance of exports in the process of economic growth and also to examine empirically the impact of exports and FDI on economic growth in Pakistan. Azam (n.d.) employed a simple log linear regression model.

In Azam's model specification his dependent variable was economic growth measured as GNP at factor cost in Pak rupees million in log form. The explanatory variables were exports measured as exports of Pakistan in Pak rupees million in log form and Foreign Direct Investment (FDI) Pak. Rupees million in log form. Azam found that exports impacted positively on growth. Also, FDI impacted positively on economic growth. Azam concluded that the positive impact of exports on economic growth demonstrates that expansion of exports is highly important for accelerating economic growth of the economy of Pakistan.

From the above empirical literature review, it could be concluded that, mostly, foreign trade impact positively on economic growth. But, despite all these strong empirical foundations, there is still not much convincing empirical evidence on the impact of foreign trade on economic growth in Ghana. Therefore, the need for this study.

4. Methodology of the Study

4.1. Research Design

This research problem was studied through the use of causal research design. Causal research deals with cause-effect relationship (Ahamad and Das, 2018). In causal research design, the emphasis is on specific objectives about the effects of changes of one variable on another variable and it involves an experiment where an independent variable is used to see how it affects a dependent variable. Causal research design was useful in this study since it enabled the researcher to examine the impact on the dependent variable from variations in the independent variables. Dependent variable is GDP (economic Growth) and Independent variables are tradeopenness and foreign direct investment.

4.2. Sources of Data

To conduct this study, necessary secondary data was collected from the econometric analysis is performed by using a quarterly time series data from 1990 to 2017. The data is sourced from the World Bank (WB)

4.3. Techniques of Data Analysis

In analyzing the data gathered regressions model was employed to establish the relationship between dependent and independent variables. The study made use of economic approach in estimating the relationship between international trade and economic growth. The Vector Error Correction Model (VECM) technique was employed in obtaining the numerical estimates of the co-efficient in different equation. VECM method was chosen because it possesses some optimal properties. Its computational procedure is fairly simple.

4.4. Limitation

Like any other research, this research will be encountered by the difficulties such as; Inadequate money to carry out the project, Personal enormously effort to meet deadline.

4.5. Ethical Consideration

Rwanda should develop strategies to promote exports (Made in Rwanda) but also improve trade structure so that Rwandan can adore continental free trade area market.

4.6. Model Specification

The data analysis method used was based on Pearson correlation analysis and a multiple regression model. A multiple regression model was used since it enables the prediction one variable on the basis of several other variables. The multiple regression model took the form of:

$$Y = \beta_0 + \beta_{1X} + \beta_{2Z} + \varepsilon$$

$$GDP = f(TO, FDI)$$

The estimable econometric model is shown in equation as:

$$GDP = a + \beta_1 TO + \beta_2 FDI + \varepsilon t$$

where

$LGDP$ = Natural logarithm of Gross Domestic Product

LTO = Natural logarithm of trade openness

$LFDI$ = Natural logarithm of Foreign direct investment

β_1, β_2 = Regression parameters

εt = Stochastic error

4.7. Coefficients Signs Expected

Table 1: Showing Definition of Variables Used, Their Estimation Coefficients and Expected Signs			
Variable	Definition	Estimation Coefficient	Expected Sign
GDPI	Gross domestic product can be defined as the total monetary value of all finished goods and services produced within a country's borders in a specified time period	This is the dependent variable	
TOI	Trade openness is a measure of economic policies that either restrict or invite trade between countries. For example, if a country sets a policy of high trade tariffs, thus restricting the desirability of international trade, this restrictive policy will inhibit other countries from sending exports and accepting imports from that country.	β_1	Positive
.FDI	Foreign Direct Investment (FDI) is a controlling ownership in a business enterprise in one country by an entity based in another country	β_2	Positive

Source: Author's Computations

5. Results and Interpretation

The main objective of this study was to examine the impact of International Trade on economic growth in Rwanda from 1990-2017. In order to achieve this objective, the study utilized data on Gross Domestic Product (GDP) as the dependent variable while Trade Openness (TO) and Foreign Direct Investment (FDI) are the independent variables. The data used for the study is basically time series annual data from 1990-2017 which relates to both the dependent and explanatory variables. Thus, the data was sourced from world Bank as presented in Appendix.

Table 2: Data Descriptive Statistic			
	LGDP	LTO	FDI
Mean	1.924290	3.291101	1.327739
Median	2.072498	3.666199	0.373700
Maximum	3.561730	4.295435	4.331630
Minimum	-1.394056	-0.820121	0.000133
Std. Dev.	0.829348	1.294078	1.429774
Skewness	-2.224853	-2.325808	0.755028
Kurtosis	10.70468	7.752485	2.014972
Jarque-Bera	92.35571	51.59424	3.792312
Probability	0.000000	0.000000	0.150145
Sum	53.88012	92.15082	37.17668
Sum Sq. Dev.	18.57109	45.21521	55.19486
Observations	28	28	28

Source: Author's Estimates

5.1. Data Descriptive Statistics

From Table 2, Gross Domestic Product (GDP) had a mean of 1.924290 from the year 1990 to 2017. With a maximum and minimum of 3.5617 and 1.394056 respectively; the standard deviation from the mean for GDP between 1990 and 2017 was 13.01. Moreover, Trade Openness (TO) from the year 1990 to 2017 had a mean of 1.327739 with a maximum and minimum of 4.295435 and -0.820121 and a standard deviation of 1.294078. In addition, Foreign Direct Investment (FDI) had a mean of 1.327739 from the year 1990 to 2017; and with a maximum and minimum of 4.331630 to 0.000133 respectively; the standard deviation from the mean for FDI between 1990 and 2017 was 1.429774.

5.2. Correlation Matrix

The correlation matrix presented in Table 3 indicates perfect correlation of 100% between GDP and TO. A strong positive relationship of 56% exists between GDP and TO.

Also, a strong positive relationship of -24% exists between GDP and FDI.

5.3. Unit Root Test (Test for Stationarity)

Unit Root Test is done to ascertain whether the variables used in the model are normally distributed (stationary) or non-stationary (i.e., have a unit root). This is done using the Augmented Dicker-Fuller (ADF) Test as shown in Table 4.

	LGDP	LTO	LFDI
LGDP	1	0.566000956868463	-0.2438755899143188
LTO	0.566000956868463	1	0.08733804624461585
LFDI	-0.2438755899143188	0.08733804624461585	1

Source: Author's Estimates

Variable	Augmented Dickey-Fuller Test Statistic	MacKinnon (1996) one Sided p values	1% Level Critical Value	5% Level Critical Value	10% Level Critical Value	Order of Integration	Stationarity
LGDP	-4.09375	0.000***	-3.78803	-3.01236	-2.64612	1(1)	Stationary
LTO	-3.054420	0.0051***	-3.699871	-2.976263	-2.62742	1(1)	Stationary
LFDI	-9.315301	0.0000***	-3.71146	-2.98104	-2.62991	1(1)	Stationary

Note: *** $p < 0.01$.

Source: Author's Computation

The stationarity test result presented in Table 3 shows that at various levels of significance (1%, 5% and 10%), the variables were stationary. Although the variables were not stationary at level 1, the variables were thus differentiated. Thus, all the variables became stationary at first difference (integrated of order one). Hence, the entire variables in this study are stationary.

Therefore, there is need to determine the long run relationship with the aid of the Johansen Cointegration test.

5.4. Test for Co-integration

Table 5 shows the results of the Johansen Cointegration test used to investigate whether there exists long-run relationship among the cointegrating variables.

The Unrestricted Cointegration Rank Test (Trace) results as shown in Table 6 indicate that there are two cointegrating equations at the 5% level since the trace statistic is greater than the critical value at 5% level. This shows that the

variables used in the analysis are cointegrating and this necessitated the study to run the Vector Error Correction Model (VECM). The presence of cointegration also rules out the possibility of spurious correlation.

Table 5: Unrestricted Cointegration Rank Test (Trace)				
Series: LGDP LTO LFDI				
Lags interval (in first differences): 1 to 2				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized	Trace		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.839704	62.61904	29.79707	0.0000
At most 1 *	0.456596	16.85078	15.49471	0.0311
At most 2	0.062116	1.603235	3.841466	0.2054
Note: Trace test indicates 2 cointegrating eqn(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	Trace		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.839704	45.76826	21.13162	0.0000
At most 1 *	0.456596	15.24755	14.26460	0.0349
At most 2	0.062116	1.603235	3.841466	0.2054
Source: Author's Computation				

5.5. Empirical Model VECM Estimation Results

Cointegrating Eq:	CointEq1		
LGDP(-1)	1.000000		
LTO(-1)	-0.155988 (0.02630) [-5.93153]		
LFDI(-1)	-0.005482 (0.01423) [-0.38519]		
C	-1.437860		
Error Correction:	D(LGDP)	D(LTO)	D(LFDI)
CointEq1	-2.584291 (0.59096) [-4.37300]	-1.319769 (1.20740) [-1.09307]	3.192889 (1.11600) [2.86100]

Cointegrating Eq:	CointEq1		
D(LGDP(-1))	0.768489 (0.44236) [1.73727]	0.092241 (0.90378) [0.10206]	-1.227935 (0.83536) [-1.46994]
D(LGDP(-2))	0.282394 (0.27093) [1.04232]	0.322613 (0.55353) [0.58282]	-0.650146 (0.51163) [-1.27073]
D(LTO(-1))	0.306595 (0.11664) [2.62860]	-0.295849 (0.23830) [-1.24148]	0.467199 (0.22026) [2.12109]
D(LTO(-2))	0.048617 (0.15235) [0.31912]	0.098667 (0.31126) [0.31699]	0.396127 (0.28770) [1.37689]
D(LFDI(-1))	0.248068 (0.10851) [2.28614]	-0.402935 (0.22170) [-1.81751]	-0.598093 (0.20491) [-2.91874]
D(LFDI(-2))	0.193749 (0.10244) [1.89127]	-0.037641 (0.20930) [-0.17984]	-0.373158 (0.19346) [-1.92887]
C	-0.078558 (0.10355) [-0.75868]	0.219266 (0.21155) [1.03645]	0.185358 (0.19554) [0.94793]
R-squared	0.904782	0.485569	0.872703
Adj. R-squared	0.865575	0.273745	0.820287
Sum sq. resids	4.320138	18.03340	15.40659
S.E. equation	0.504109	1.029946	0.951982
F-statistic	23.07681	2.292317	16.64943
Log likelihood	-13.52861	-31.39034	-29.42245
Akaike AIC	1.722289	3.151227	2.993796
Schwarz SC	2.112329	3.541267	3.383837
Mean dependent	0.002685	0.170897	0.135767
S.D. dependent	1.374940	1.208564	2.245632
Determinant resid covariance (dof adj.)		0.040021	
Determinant resid covariance		0.012584	
Log likelihood		-51.72858	
Akaike information criterion		6.298286	
Schwarz criterion		7.614672	
Source: Author's Computation			

5.5.1. Coefficient of Multiple Determination (R²)

The coefficient of multiple determinations (R²) is 0.904782. This means that 90% of variations in the dependent variable LGDP are explained by the independent variables used in the model.

5.5.2. Cointegration Equation for Variables

From this table we can estimate cointegration equation of three variables by applying below econometric formula

$$\text{Cointegrating equation: } LGDP_{T-1} = \beta_0 + \beta_1 LDT_{T-1} + \beta_2 LTGS_{T-1} + \beta_3 LTITT_{T-1}$$

$$\text{Cointegrating equation} = 1,000LGDP(-1) + 0.155988LTO(-1) - 0.005482LFDI(-1) - 1.437860$$

Time series namely gross domestic product, trade openness and foreign direct investment, they have long run equilibrium. Since all variables above are stationary at I(1) and above coefficient shows the adjustment speed in both shortrun and longrun.

5.5.3. Vector Error Correction Model (VECM)

By estimating VECM with LGDP as variable target:

$$VECM : \Delta Y = \alpha + \beta_0 + \sum_{i=1}^n \Delta X_i - 1 + \phi Z_i - 1 + \mu_t$$

$$\Delta LGDP = -0.078558 + 0.768489D(LGDP(-1)) + 0.282394(LGDP(-2)) + 0.306595D(LTO(-1)) +$$

$$0.048617D(LTO(-2)) + 0.248068D(LFDI(-1)) + 0.193749D(LFDI(-2)) - 2.584291ECM$$

5.5.4. Interpretation for VECM

5.5.4.1. Gross Domestic Product: The estimation results showed that the Rwanda’s Gross Domestic Product (GDP) for the last two years was statistically significant in determining the current year’s GDP. A 1% increase in previous two year’s GDP, holding all other factors constant, leads to 0.282394% increase in the current year’s GDP.

5.5.4.2. Trade Openness: The estimation results indicate that trade openness and economic growth has significant positive relations. The results indicate that, a 1% increase in the amount of income tax collected two years back leads to a 0.048617% increase in current year’s GDP.

5.5.4.3. Foreign Direct Investment (FDI): The estimation results indicate that FDI and economic growth have significant positive relations. A 1% increase in previous 2-year’s total imports ceteris paribus leads to a 0.193749% decrease in gross domestic product.

5.5.4.4. Error Correcting Term (ECT)

The error correcting term is statistically significant and negative and has a coefficient of 2.584291. This means that -2.584291 of a shock in equilibrium position in the previous year will be corrected in the present year.

5.6. Test for Serial Correlation / Autocorrelation

Table 6 provides the results of the Breusch-Godfrey Serial Correlation LM Test.

Table 6: Breusch-Godfrey Serial Correlation LM Test			
Test F-statistic	1.526992	Prob. F(2,18)	0.2455
Obs*R ²	3.959492	Prob. Chi- Square(2)	0.1381
H ₀ : No serial Correlation H _A : serial correlation			
Source: Author Computation			

Since the p-value of the F-statistic is greater than 5% level of significance, we fail to reject the null hypothesis that there is no serial correlation in the model and conclude that the model has no serial correlation.

5.7. Normality Test

Figure 2 provides the results for normality test done using the Jargue-Bera test.

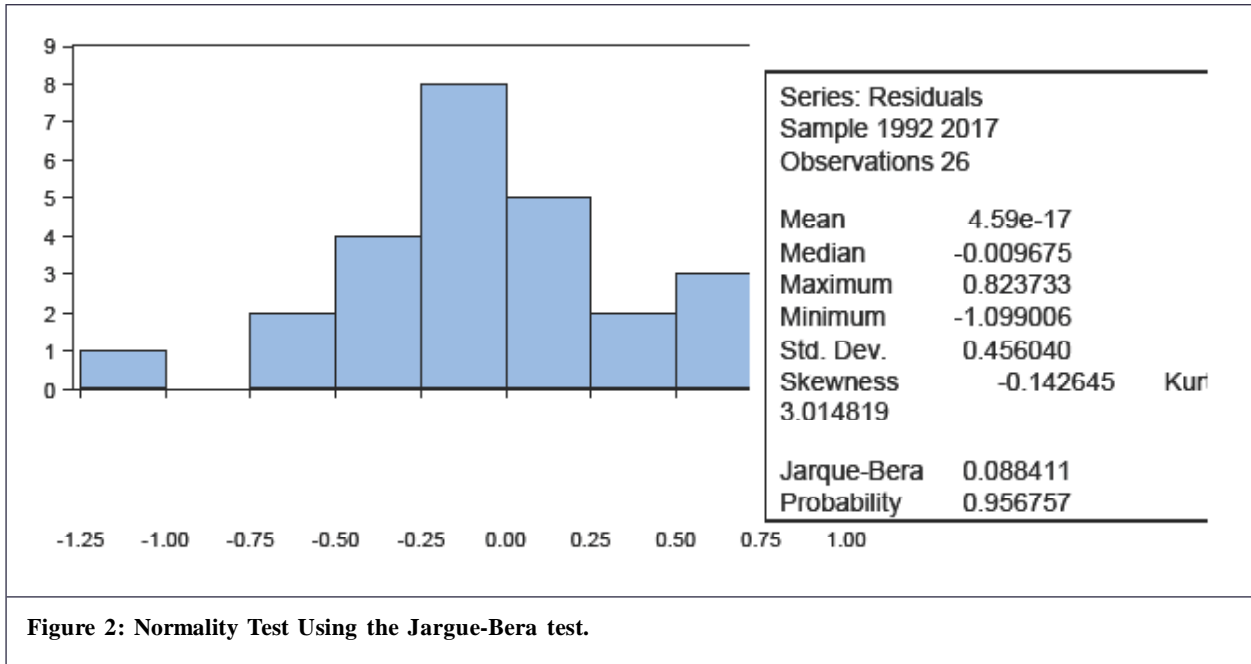


Figure 2: Normality Test Using the Jargue-Bera test.

Since the *p*-value is greater than 5% level, we fail to reject the null hypothesis that the error term is normally distributed at 90% confidence interval and conclusion made that the error term in normally distributed.

5.8. Heteroskedasticity Test

Table 7 provides the Breusch-Pagan-Godfrey Test results for the presence of heteroskedasticity in the model.

Table 7: Breusch-Pagan-Godfrey Test			
<i>F</i> -statistic	5.761187	Prob. <i>F</i> (8,33)	0.0015
Obs* <i>R</i> ²	16.77793	Prob. Chi-Square(8)	0.0101
Scaled explained SS	9.026197	Prob. Chi-Square(8)	0.1721
<i>H</i> ₀ : Constant Variance			
<i>H</i> _A : No constant variance			
Source: Author's Computation			

Since the *F*-statistic has a *p*-value (0.898227) greater than the appropriate threshold of 0.05 (95% confidence interval), we fail to reject the null hypothesis of constant variance and conclude that the error term of the model is homoscedastic (has constant variance).

6. Summary, Conclusion and Recommendations

6.1. Summary

From this study, the objectives of this study is to examine impact of international trade on economic growth in Rwanda from 1990-2017. Descriptive data analysis was used and the variable considered here are: Gross Domestic Product (GDP) as proxy for economic growth, Trade Openness (TO), Foreign Direct Investment (FDI). This study was carried out using the Vector Error Correction Model (VECM) estimation method for data analysis using Econometric software (E-Views 8.0. Secondary data was used to conduct this study and the required data was collected from World Bank. Available literature has shown that international trade contributes to economic growth. It can also be inferred that Rwanda engages in international trade with other countries to stimulate the economy.

6.2. Conclusion

This study examined the impact of foreign trade on Economic growth in Rwanda, the coefficients of the variables used show that both TO and FDI are positively related to the real GDP.

The positive coefficient of trade openness ratio implies higher productivity. The positive coefficient ratio of the foreign direct investment also helped to stimulate the economy thereby increasing capital inflow into the economy.

6.3. Recommendations

Rwanda must develop strategies to promote exports as components of trade openness like Made in Rwanda Government policy and increasing capital inflow into economy of Rwanda. Secondly, Rwanda government should strengthened the competitiveness of exports by combing the imports of high technology and domestic independent research. The technological know how could be imported by direct buying or indirectly through foreign direct investment. However, the domestic absorptive ability in Rwanda is very weak. Therefore, Rwanda's government should try to import appropriate technology which can easily be absorbed and acquired by domestic firms with their corresponding capability. It is equally important to develop strong domestic sector of competitive firms that can assimilate and disseminate imported technologies and to improve their own innovative capacities.

Finally, Rwanda is government should focus on the catch up strategy by establishing a national innovation system which includes proper education, finance and industrial policy, which could promote openness and enhancing domestic absorptive capability, thereby increasing productivity of the economy.

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Appendix					
Data of GDP Import, Export, Trade Openess and FDI					
Year	GDP	Import	Export	Trade Openess	FDI
1990	-2.514379654	14.06955	-7.56084	6.508708537	0.296541
1991	5.872725234	18.05537	-8.5	9.555371729	0.239484
1992	-8.108691874	18.26304	-17.7953	0.4677096	0.107814
1993	-50.2480671	20.50376	-61.0634	-40.55962181	0.2968
1994	35.22407831	64.79304	8.571075	73.36411777	0.000133
1995	12.74569576	25.82138	42.07122	67.89259744	0.17102
1996	13.84975249	26.1987	30.4106	56.60929611	0.160471
1997	8.858669496	25.67012	1.90026	27.57038087	0.140344
1998	4.262760871	23.2094	40.85836	64.06775617	0.356358
1999	8.370910445	23.47967	0.199253	23.67892632	0.090894
2000	8.484539669	23.79482	39.86848	63.6633016	0.458618
2001	13.19206519	23.24337	5.096721	28.34009577	0.26492
2002	2.202376415	22.73117	20.3959	43.12706663	0.149201
2003	7.447699419	22.59802	31.74353	54.34154518	0.244401
2004	9.377875686	23.78617	11.16212	34.94828712	0.354084
2005	9.227091484	24.23763	2.986727	27.22435669	0.391042
2006	7.681564984	25.24354	44.63859	69.8821375	0.983399
2007	11.1672534	25.30401	-12.0812	13.22284903	2.158828
2008	6.255647061	29.78426	-2.51205	27.2722067	2.123159
2009	7.338194817	29.70791	7.870105	37.57801323	2.208599
2010	7.783920275	29.93911	22.69426	52.63336469	4.33163
2011	8.820321117	30.24751	8.793036	39.04054379	1.814712
2012	4.713550714	31.7846	18.62854	50.41314238	3.476021
2013	7.62457575	31.93012	7.24054	39.17065843	3.380281
2014	8.867977374	32.91057	6.254986	39.16555839	3.926137
2015	5.981314913	38.30989	12.9316	51.24148221	2.698056
2016	6.057831319	33.10424	33.61201	66.7162515	3.14193
2017	8.671683394	32.77235	0.760275	33.53262839	3.211806
<i>Source: World bank and NISR, https://data.worldbank.org</i>					

Appendix (Cont.)

Data Description

Import of goods and services: (annual % growth) at market prices based on constant local currency.

Exports of goods and services: (annual % growth) at market prices based on constant local currency.

Trade openness: is total of import and export of goods and services (annual % growth) at market prices based on constant local currency.

GDP growth: (annual %) Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars.

GDP: is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

Cite this article as: Nzabirinda Etienne (2022). [Econometrics Analysis of Impact of International Trade on Economic Growth in Rwanda \(1990-2017\)](#). *International Journal of Management Research and Economics*. 2(2), 30-46. doi: 10.51483/IJMRE.2.2.2022.30-46.