



**ST. MARY'S UNIVERSITY  
SCHOOL OF GRADUATE STUDIES**

**INSTITUTE OF AGRICULTURE AND DEVELOPMENT STUDIES**

**THE IMPACT OF TRADE OPENNESS AND REAL EFFECTIVE  
EXCHANGE RATE ON ECONOMIC GROWTH: THE CASE OF EAST  
AFRICAN COUNTRIES**

**BY**

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**ID Number: SGS/0689/2010A**

**JULY, 2019**

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**THE IMPACT OF TRADE OPENNESS AND REAL EFFECTIVE  
EXCHANGE RATE ON ECONOMIC GROWTH: THE CASE OF EAST  
AFRICAN COUNTRIES: A PANEL DATA ANALYSIS**

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**MAY, 2019**

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## Declaration

I, undersigned, declare that this study entitled “the impact of trade openness & real effective exchange rate on economic growth in East Africa countries” is my own work. I have undertaken the research work independently with the guidance & support of Sisay Debebe(Phd). This study has not been submitted for any degree or diploma program in any institutions and that all sources of materials used for the study have been duly acknowledged.

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## TABLE OF CONTENTS

TABLE OF CONTENTS.....	i
ACKNOWLEDGMENT.....	iii
ACRONYMS AND LIST OF ABBREVIATIONS .....	iv
LIST OF TABLES .....	v
LIST OF FIGURES .....	vi
<i>ABSTRACT</i> .....	vii
CHAPTER ONE.....	1
1. INTRODUCTION .....	1
1.1 Background of the study .....	1
1.2 Statement of the Problems.....	3
1.3. Objective of the study .....	5
1.3.1 The Specific Objectives.....	5
1.4. Hypothesis of the study .....	5
1.5. Significance of the study .....	6
1.6. Delimitation and limitations of the study.....	7
1.7. Organization of the study .....	7
CHAPTER TWO .....	8
2. LITERATURE REVIEW .....	8
<u>1.1.</u> Definitions of basic terms .....	8
2.1.1Trade openness .....	8
2.1.2Real effective Exchange rate (REER) .....	8
<u>1.2.</u> Theoretical literature review .....	9
2.2.1Trade openness .....	13
2.2.2Real Effective Exchange Rate .....	14
2.3. Empirical literature review.....	16
2.4.Conceptual frame work of the study .....	20
CHAPTER THREE .....	24
3.RESEARCH METHODOLOGY.....	24
3.1 Description of the Study Area.....	24
3.2 Research Design.....	24
3.2 Data type, Source and Method of Data Collections .....	24
3.3. Method of Data Analysis.....	24

3.4 Econometrics Model Specification .....	25
3.5 Tests of Econometrics model .....	28
3.6 Definitions of variables, measurement and hypothesis .....	30
CHAPTER FOUR.....	33
4. RESULT AND DISCUSSIONS.....	33
Introduction .....	33
4.1 Descriptive analysis of the study .....	33
4.1.1 Trade and Economic situations of East African Countries .....	35
4.2 Econometric s Model .....	39
4.2.1 Post estimation tests.....	39
4.3 Model estimation and interpretations of results.....	41
4.4.1. Growth equations .....	42
4.4.2. Openness equation .....	44
4.4.3. Exchange rate equation.....	46
CHAPTER FIVE .....	49
5. Conclusion and Recommendations .....	49
5.1 Conclusion .....	49
5.2 Recommendation .....	50
REFERENCES .....	51
Appendixes .....	56
Appendix 1 list of countries in the sample.....	56
Appendix 2 panel unit root tests.....	56
Appendix 3 normality test.....	60
Appendix 4 normality test on box plot.....	60
Appendix 5 the specification tests.....	63
Appendix 6 Multicollinearity test result.....	64
Appendix 7 The heteroskedesticity test results .....	65
Appendix 8 the regression results .....	66

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## ACRONYMS AND LIST OF ABBREVIATIONS

ADI	African development indicator
ARDL	Auto Regressive Distributed Lag Model
CPI	Consumer Price Index
EEC	European Economic Commission
FDI	Foreign Direct Investment
FGLS	Feasible generalized least square
GDP	Gross Domestic Product
GLS	generalized least square
IMF	International Monetary Fund
ISS	Import substitution strategies
NIID	Normally identically and independently distributed
OLS	ordinary least square
PMG	Pooled mean group
PPP	Purchasing Power Parity
REER	Real Effective Exchange Rate
RER	Real Exchange Rate
SADC	Southern Africa development community
SITC	Standard international trade classification
TFP	Total Factor Productivity
UNCTAD	United Nation Conference on Trade and Development
WB	World Bank
WDI	World development indicator

## LIST OF TABLES

Table 4.1 East African countries general economic out look .....	35
Table 4.1 Growth model results .....	42
Table 4.2 Openness equation result .....	45
Table 4.3 Exchange rate equation result .....	47

## LIST OF FIGURES

Figure 2.1 the conceptual framework of the study .....	23
Figure 4.1 Mean value of export in million USD from 2004-2018.....	36
Figure 4.2 Mean value of import in million USD from 2004-2018.....	37
Figure 4.3 Mean values trade balance from 2004-2018 in million USD.....	38

## **ABSTRACT**

*Different researchers and scholars define trade between countries is based on the absolute advantage, comparative advantages, based on the economic growth and distance between trading countries. This researchers categorized based on their major findings as trade promotes economic growth and the other is trade may not promote economic growth specially for developing countries as a result the impact of trade on economic growth is still continuing in debate. The study measures trade openness as a ratio of trade from GDP and real effective exchange rate is the competitiveness of countries domestic currency against a basket of trading partners of foreign currency the data is obtained from WB, WDI, UNCTAD & Federal Reserve Bank. This study analyzes the impact of real effective exchange rate and trade openness on economic growth in 13 selected East Africa countries economy using longitudinal panel data for the period 2004-2018. The analysis is with the help of both fixed and random effect model of longitudinal panel data analysis techniques. The study found that the impact of trade openness on economic growth in East Africa is insignificant and the impact of real effective exchange rate on economic growth positive and significant but the impact of real effective exchange rate on trade openness is negative and significant. In addition foreign direct investment and external debt have positive and significant impact on economic growth. Implies that devaluation of domestic currency leads to reduce the export and import volume and value in east Africa country where as this devaluation promotes foreign investors to invest in domestic countries because of access to cheap labor, land and other inputs to invest in it. Policy like devaluation of currency promotes investment and economic growth but negatively affects trade openness. For those countries developing domestic investments and shifting the demand for domestically produced goods and services is recommended.*

**Key Word: openness, real effective exchange rate, East Africa**

# CHAPTER ONE

## 1. INTRODUCTION

### 1.1 Background of the Study

The important questions that most researchers' on trade asked and have different explanations are how and when countries need trade. What is the basis of trade? How the amount of export and imported goods decided? The famous economists Adam Smith's (1776) Wealth of Nations of Laissez faire and trade based on different strengths of nations to produce different goods. His view is that trade benefits both the trading parities in the assumption of absolute advantages. Which is based on the labor theories of value trade is takes place between two countries in accordance with the amount of labor employed on the production of goods and services.

Later trade is not only the assumption of absolute advantage but with the comparative cost advantage which is explained by David Ricardo in 1817 in his book the principle of political economy and taxation. Ricardo assumption is that each country would specialize in the comparative costs of production but did not address the ratio at which terms of trade is held. Ricardian theories of comparative cost did not also answers the reason why difference in comparative cost exist, this theories was carried by the Heckscherohlin theory in 1919 that trade results in factor endowment and factor intensity difference between two countries.

Since 20<sup>th</sup> century the Ricardian and heckscherohlin theory does not fully explain the world trade systems. This leads to the emergence of modern trade theories and considered the former comparative theories as traditional trade theory because of their assumption of perfect competition, constant return to scale, and the same technology among the nations are not valid in today's trade world. By relaxing their limitation in 1970s the new trade theory emerged through the assumptions of imperfect competition, increasing return to scale and there is technological gap among the nations.

In 1970sand 1980s new trade theories develops their own idea that leads to trade internationally. Trade considered the country's economic growth and distance between the trading partners which was developed by Jan Tinbergen in 1962 which is known as the gravity model. This

dynamic model tries to evaluate the effectiveness of treaties and trade agreements in the economy.

Trade also take place in the same industries (intra industries) due to the demand gap like some requires imputes and the other the final products. Many researchers tries to evaluate this two way trade between industries .the first man is Verdoorn, P. J. (1960) studies the trade increment in the European Economic Community (EEC). Robinson (ed.) (1980) also analysis the product composition & its quality in trading parties in EEC with in similar products.

In 2008, Krugman and Lanchaster explained the trade theories and economic geography, the patterns of international trade and geographical concentration of wealth by analyzing the consumer preference for diversified commodities and economics of scales. Michael V. Posner's (1961) international trade is takes place due to the technological advancement deference and product life cycle(new product ,matured product and standardize product) between countries. This theory is developed by Raymond Vernon in 1960s.

Various researchers in different countries carried out research the impact of trade openness and REER on economic growth by using different methodologies. According to study conducted by VasilikiPIgika-Balanika (2008) on the impact of trade liberalization in developing countries covering aperiod between 1990-2005 by incorporating augmented Solow growth model in a panel data analysis ,both fixed and two way fixed effects used and found aresult in developing countries trade openness has positive and significant impact but the result is deferent in sub-Saharan Africa due to natural trade barriers, export depends on primary commodities and inadequate infrastructure and concludes his result in sub-Saharan Africa trade openness doesn't contribute to economic growth.

Henok Arega(2011) study trade policy and economic growth in sub-Saharan Africa from 2000-2008 and claims his result that trade openness stimulates both economic growth and investment and REER has both direct and indirect impact on economic growth. Another study by Akua Auffo(2012) on the relationship between trade openness and economic growth on African countries from 1980-2008 by using Cobb-Douglas production function on both one or two way fixed or random effect model founded that trade openness have appositive relationship with GDP.A study by Mori Kogid ,RozileeAsid(2012) on the impact of Real exchange rate and

economic growth over a period 1971-2009 in Malaysia found a positive long run relationship between variables and suggests systematic monetary policy to develop, promote stability and sustainability of economic growth of the country.

According to Clement Moyo and Halefang Khobai (2018) study on trade openness and economic growth in SADC countries from 1990-2016 by employing ARDL –bounds test approach and the pooled mean group (PMG) to estimate the long run relation. And found a result in the long run at 1% level of confidence interval trade openness has a negative and significant impact on economic growth with exception Malawi, Mauritius, Swaziland and Tanzania. On the other hand Clement Moyo, Nwabisa Kolisi And Ahalefang Khobai (2017) studied the relationship between trade openness and economic growth in Ghana and Nigeria over a period 1980-2016. Their study employed ARDL model to determine the long run relationship between the variables and found controversial results. At 1% confidence interval trade openness has positive and significant impact on economic growth in Ghana while negative and insignificant in Nigeria.

## **1.2 Statement of the Problems**

The inquiry is that does open economy promote economic growth or not? The traditional economist's states that if the country is open to international trade or have open economic policies they register faster economic growth than that of the closed economies. From empirical investigations of the impact of trade liberalization or outward oriented trade strategies most economists argued that outward oriented trade strategies accelerate economic growth and trade have multi dimension impact on economic growth. As a result based on their empirical investigations we divide the researchers view on pessimists and optimistic view of trade liberalization policies. The former argued that open economic strategies affects economic growth positively since trade helps in transmission of knowledge's and technologies and the later argued that in most developing countries rather than open economic strategies trade barriers affect economic growth positively because of the reason that developing countries export primary commodities, lacks adequate infrastructure, and natural trade barriers Vasiliki Pigika-Balanika (2008).

Rodrik and Rodriguez (2000), Kruger (1998), Stieglitz (1998) Oskam et al (2004) summarizes that countries which have more open and outward oriented trade strategies register high

economic growth than that of having inward-oriented or more closed trade strategies. Government of Developing countries have open economic strategies since it helps in efficient allocation of resources, transfers Knowledge's, technologies and capital.

Studies on the World Bank (2002) empirically explain that more globalized developing countries register positive economic growth. Thus developing countries register 1% increase in per capita growth rate in 1960, 3% increase in 1970, 4% increase in 1980 and 5% increase in 1990s. Another study by Henok Arega in 2011 on trade policy and economic growth on Sub-Saharan Africa confirms that openness to international trade stimulates economic growth and investment. And real effective exchange rates have both direct and indirect impact on economic growth.

Studies made on the impact of trade openness and real effective exchange rate in different countries. Akua Akuffo made in African countries by employing Cobb-Douglas production function and found that trade openness has a positive impact on economic growth over 1980-2008 and Clement Moyo and Halefang Khobai in SADC countries by employing ARDL and PGM model and found a result that the long run impact of trade openness on economic growth in SADC countries is negative in some exception countries from 1990-2016. Henok Arega studies on trade policy and economic growth in sub-Saharan Africa over 2000-2008 found that trade openness stimulates both economic growth and investment and REER has direct and indirect impact on economic growth.

Even if research was made on the impact of trade openness and REER on economic growth their relationship is continued in debated way. Both trade openness and REER has positive and negative impact on economic growth. Therefore the motive to conduct this study can be seen in three ways. The first motive is to know the relationship between REER and trade openness in East African countries in contrasting with former study's findings. Secondly even though the studies was made on trade openness and economic growth in SADC, African countries, Sub-Saharan Africa and developing countries their result is in debated way and this study evaluates in which sign fails their relationship by incorporating the current updated data in East Africa.

Lastly as far as the research knowledge there is no similar studies that analysis the relationship between REER and economic growth in East Africa and these studies helps to understand their relationship for other researchers and policy makers. This research tries to capture the impact of

real effective exchange rate and openness to international trade on economic growth in Eastern African countries covering a period from 2004-2018. The purpose of this study is to empirically analyze the impact of trade openness and real effective exchange rate on economic growth on the case of Eastern African countries in the specified time period.

### **1.3. Objective of the study**

The general objective of the study is to analyze the impact of openness to international trade and real effective exchange rate change on economic growth in East African countries'.

#### **1.3.1 The Specific Objectives**

The study has the following specific objective:-

- To analyze the relationship between trade openness and Economic growth.
- To analyze the relationship between real effective exchange rate and Economic growth

### **1.4. Hypothesis of the study**

The general working hypothesis of this study is that trade openness has direct impact on economic growth and indirect impact operates through investment and REER has direct and indirect impact on economic growth. The direct impact of real effective exchange rate is it balances trade deficit through promoting exports and increases the competitiveness of domestic commodities in global market. The indirect impact is depreciation of real effective exchange rate increases the cost of production and contracts the economic growth.

Capital formation and efficient utilization of resource through trade increases the growth of countries economy. In the endogenous growth model exploitation of technology and human capital increases the growth of the GDP of the country. In this model open economic policies increases technological progress through learning by doing and exchange of ideas, research, and development and hence increase the productivity of capital either through expansion of input or output market. Based on the above discussions the study projected the following hypothesis to be tested under the null.

- I. H<sub>0</sub>: Trade openness does not have significant impact on economic growth
- II. H<sub>a</sub>: REER does not have significant impact on economic growth

## 1.5. Significance of the Study

Different researches were conducted on the impact trade openness and REER on economic growth by using different techniques. This study tries to address their relationship in the East African countries over 2004-2018. Even though different research is carried on the impact of trade openness and real effective exchange rate on economic growth in different areas over different time period, their findings is continue as in debate. The study has the following significance

- Helps to know the relationship and their magnitude between real effective exchange rate, trade openness, and economic growth particularly on east Africa.
- This study provides the current and outstanding data to show the relationship between trade openness and REER with economic growth particularly on the east African countries. As a result this study helps for further research and comparison with the former related studies regarding to know the time trend relationship with trade openness, real effective exchange rate and economic growth.
- It will help for policy makers regarding on how countries trade policy seems to be to accelerate economic growth and helps to understand the former empirical finds with the findings of this study and also helps as an input for other researchers for similar issues,

## **1.6. Delimitation and limitations of the study**

Generally the studies analyze the relationship between trade openness and REER on economic growth in East African. The study focuses on the east African countries since our countries is also one of the member of east Africa countries the researcher motivated to know the impact of trade on east African countries and wants to answer the question is east African countries benefited from trade or not. The study makes use of the two prominent trade restriction indices, simple trade-weighted average tariff, and real effective exchange rate. Hence, inferences about the relationship between growth and other forms of trade policies are not to be implied from the conclusions of this study. Moreover, the empirical parts of this study focuses particularly on East African countries over the period 2004-2018. Hence, any definitive conclusion about other variables or time periods may not be made based on the results of this study.

This study has limitations because of difficulties of available data; the study forced to use short time period data from 2004-2018 over 13 east African countries as a result the study may not fully address all east African countries.

## **1.7. Organization of the study**

This study has structured in to five chapters. The first chapter is about introduction which includes background, statement of the problem, hypothesis, objective, significance, & delimitations of the study. The rest part of the study was organized as follows. Chapter two discusses about the theoretical review, empirical review and conceptual frameworks regarding on the relationship of real effective exchange rate and trade openness on economic growth. The third chapter was about the methodology of the study which contains the research design the data type and source method of data analysis, model specifications, and definitions of variables. The fourth chapter is about the result and discussions of the study and finally the fifth chapter is about conclusion and recommendations of the study.

## CHAPTER TWO

### 2. LITERATURE REVIEW

#### 1.1. Definitions of basic terms

##### 2.1.1 Trade openness

It is widely accepted that open economic policy accelerates economic growth than the closed economy. The term openness is related to globalization which is explained by different researchers and institutions. According to Fischer(2003) globalization is defined as ongoing process of economic interdependence among countries that reflected the increase amount of flows of goods and services, financial flows and increase the flow of labor force.

In most researches trade liberalization and openness are viewed interchangeably but they are not identical. Trade liberalization includes policy measures to increase trade openness while increased trade openness is usually considered as an increase in the size of a country's traded sectors in relation to total output. Increased openness can, but need not, be the result of trade liberalization. Recently, the meaning of "openness" has become identical to the idea of "free trade" that is a system where all trade distortions are eradicated. Pritchett et.al (1996) simply defines "openness" as an economy's trade intensity. However, according to KyrreStenses (2006), it would be more precise to define openness in relation to barriers to international trade imposed by governments.

According to studies on new economic geography (NEG),2002 defined international trade openness relates to as low international trade costs which are transportation costs, tariffs and non-tariff barriers and tax subsidies. And trade liberalization is attained by lowering the biases against export sector for instance export subsidizing and encouraging exports.

##### 2.1.2 Real effective Exchange rate (REER)

International monetary (IMF), 2000 defined REER is the real effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs. An increase in REER implies that exports become more expensive and imports become cheaper; therefore, an increase indicates a loss in trade

competitiveness. It measures the value of a currency against a basket of other currencies; it takes into account changes in relative prices and shows what can actually be bought.

In most cases Researchers find that the purchasing power of one country when the trading is takes place with more countries and goods and services. To know it usually uses real exchange rate against basket of goods and services Consumer price index (CPI) is the dominant measure.

According to Luis A.V Vacatao (20017) Real exchange rate between two countries may wrongly contention of to the country's political and economic interest. But economists and policymakers are more interested in the real effective exchange rate (REER) to measure the country's currency competitiveness.

The REER is an average of the bilateral RERs between the country and each of its trading partners, weighted by the respective trade shares of each partner. Being an average, a country's REER may be in "equilibrium" when its currency is overvalued relative to that of one or more trading partners so long as it is undervalued relative to others.

To establish when a currency is miss valued, and, if so, by how much, a rough assessment can be obtained by the REER series over time. Under either absolute or relative PPP, there should be no change in REERs over time if currencies are in equilibrium. But because consumption patterns can change faster than the market baskets statistician's constructs can trade policies, tariffs, and transportation costs. Deviations in REERs don't necessarily indicate fundamental misalignment.

## **1.2. Theoretical literature review**

Deferent researchers have debate on the reason behind why growth of the countries may different as a result of trade open ness and real effective exchange rate. Based on these ideologies the theoretical literature review of the paper can see on the side of the two parameters trade openness and REER against economic growth.

In the late 1980s and early 1990s, a new wave of trade theory emerged focusing on the study of the dynamic linkages between international trade and economic growth. Rather than looking at the gains from trade at a certain point in time (the static view), economists then wanted to understand the mechanisms through which trade affects growth and how these mechanisms evolve over time (the dynamic view). A key channel through which trade can lead to economic expansion is productivity growth. As a country opens up to trade and invests in research and

development (R&D), its comparative advantage can evolve over time towards the production of products with larger profit margins due to the higher level of differentiation generated. Using an endogenous growth model, Grossman and Helpman (1989) study the evolution of comparative advantage through the allocation of resources to R&D and find that the human capital rich country is a net exporter of differentiated products and a net importer of labor intensive traditional products at every moment in time. In addition, they establish that if product development is human-capital intensive relative to the production of current differentiated products, the volume of trade as a fraction of world GNP or world expenditure grows over time. Building upon this model, Romer (1990) finds that an economy with a larger total stock of human capital, the main resource for R&D, will experience faster growth. Thus trade liberalization can act to speed up growth in underdeveloped countries with low levels of human capital through access to a larger pool of global human capital. Grossman and Helpman (1991) advance this notion by showing that the lowering of trade barriers would generate spillovers to the local economy through contacts with foreign businessmen and markets while also raising incentives for local R&D. Coe and Helpman (1995) and Keller (1998) further develop the productivity growth effect of trade openness through the “international R&D spillovers” phenomenon, which states that a country benefits from R&D done elsewhere through the importing of intermediate and capital goods from other parts of the world. In addition to productivity growth, other sources of gains from international trade have been examined.

Trade may lead to economic growth depending on the market imperfection, economics of scale and technology. According to Sabina Silajdzic and Eldin Mehic (2017) the benefits of trade openness depends on market imperfection and economics of scale of trading partners.

According to theoretical propositions and endogenous growth theory, asymmetric context of trading partners implies considerable differences in production functions, technology, and endowments which may result in adverse effect of trade openness on countries with inferior technological prowess (Grossmann and Helpman, 1991).

Studies on location distribution and spatial organization of economics across the world states that during the 20<sup>th</sup> century import substitution strategies (ISS) played dominant role in most developing countries but due to ISS Latin American countries register lower economic growth and East Asian countries promote export and achieve high economic growth. This

result evokes most researchers to investigate the relationship between trade liberalization and economic growth.

Despite the extensive literature on the mechanisms through which countries would gain from international trade, whether a country should adopt a free trade regime in the first place is still a hotly debated topic. The most notable counter argument to trade liberalization is that of infant industry protection. For a newly created industry to survive, the government needs to protect it from foreign competition until its production process becomes more efficient and cost effective.

In other words, through strategic industrial policy, one could turn a latent comparative advantage into an effective one (Harrison and Rodriguez-Claire, 2009). However, to judge the merits of such a policy one has to consider both the costs incurred and potential benefits reaped from that protected industry. For example, the Mill test requires that the protected sector needs to eventually survive international competition while the Abatable test takes this notion further in demanding that discounted future benefits from the protected industry have to exceed the present costs of protection other conditions under which benefits from protection justify losses in consumer welfare.

In recent time trade has been seen as a center of discussion of development policy. From such policy maker institutions the Breton wood institutions are on the main streaming viewers of trade for the economic development. According to the 1990 consensus on trade policy strategies IMF and WB regarded as trade openness as essential to achieve economic growth. According to the consensus trade policy focuses on lowering tariffs on imports, especially on intermediate inputs that gives competitive edges for industrial export products. Although the consensus focuses on such growth policy they also acknowledge the negative impact domestic computing industries. Protection would create costly distortion that ends up penalizing exports and impoverishing the domestic economy while generating massive potentials of corruption (Williamson, 1990).

Pro trade liberalization view evidenced through a host of cross country economic studies by Sachs and Warner (1995), Harrison (1996), Edwards (1998) among others suggests that trade liberalization has a positive impact on economic growth.

According to the World Bank average tariff trend report of 2011 the countries ended in lowering their global average tariff rate trend is starting 1990. Furthermore in 2001 the world trade

organization (WTO) advanced trade liberalization by introducing Doha development agenda aiming at creating global commitment in lowering tariffs and adhere anew rules across the border in agricultural, industrial and service products in developing countries.

On the other hand the challenges is coming against the view of trade liberalization and its positive impact on economic growth by Rodrik (2006) argue that on the institutional views rather than the policy .the central argument of Rodrik is that policy reform would not be able to produce last result unless without strong institutional has not developed.

According Rodrik&Rodriguez(2000) trade liberalization will fail due to the weak institutional strength. Those weak institutions includes faller of fiscal institutions on compensate on loses of trade revenues, faller of capital market in supplying appropriate funds for the development of the sector ,corrupt custom institutions and incompetent labor market to handle transitional unemployment. Real effective exchange rate (REER) is a useful summary indicator of essentialEconomic information. It has occupied a major place in theoretical discussionbetween economists. REER is commonly used as a measure of competitiveness of the traded goods sector and a measure of the standards of living in one country relative to another and that, changes in the real exchange rate are seen as an important part of the adjustment process to real shocks. Movementsin the real effective exchange rate may significantly affect inflation and output in transition economies. In addition, there is a strong relationship between the real effective exchange rateindices and the current account. Empirically it appears that current accountimmediately worsens after real depreciation, and then gradually improves withinseveral months period (Krugman, 2000).Therefore, the REER can be a good indicator for monetary andexchange rate policies, as policy makers may use it to forecast current accountand trade balance in the country.

Considering the importance of the real effective exchange rate, there is a littleagreement about forms of the real exchange rate, ways of its measuring andinterpretation of its movements. The concept of the REER derives originallyfrom the purchasing power parity (PPP) (Hinkle, 1998). The real exchangerate is evolved from the theoretical model of dependent economy and is based onthe ratio of domestic prices of non-tradable to tradable.

Hinkle (1998) states that the real exchange rate for home country can be defined either in the relation to one trading partner or to an average for its maintrading partners. In the first case, it is

called real bilateral exchange rate (RBER), and in the second multicountry case, it is called real effective exchange rate (REER), and is calculated as a weighted average.

REER index measures how nominal exchange rate adjusted for price differences between a country and its trading partners, moves over a period of time (Lafrance, 1998).

As some empirical researches indicate, a number of transition countries have experienced real exchange rate appreciations as the initial transformational recession has given way to a recovery (De Broeck, 2001).

According to many empirical studies, the growth rate of GDP is positively related to the growth rate of trade openness (Edwards, 1992). However, not everyone agrees that openness to trade is of outstanding importance. Rodriguez and Rodrik (1999) showed that the positive correlation between openness and growth is not robust as a result of problems in openness measures or lack of the appropriate control variables. For instance, Rodrik (2002) demonstrated that the strong effect of trade on growth, in both Dollar and Kraay (2003), comes from their choice of measuring openness by using “real openness” instead of the conventional measures of openness, which always results in positive biased estimations of openness on growth..

### **2.2.1 Trade openness**

It is the ratio of trade (export and import) to GDP. Trade is one important factor to interconnect countries through exchanging goods and services. In most of the literature of trade liberalization they relate to globalization social political and economic interdependence of the countries

Another group of literature supports that trade openness effectively fosters economic growth, only by the improvement of particular policies and sectors or by the existence of specific preconditions. For international trade openness contribution to be strong in developing countries, Rodrik (1997) proposed the accumulation of human capital, physical infrastructures, macroeconomic stability, private sector development, and the rule of law. In addition to this, Abramovitz (1986) and Howitt (2000) support that host economies should have a sufficiently high level of “social capability” in order to successfully implement technology developed in more advanced economies. Finally, the adoption of technology also depends on the “absorptive capacity” of a country which is determined by human capital and R&D investment. The lack of investment in human capital and R&D prevent less developed countries from fully exploiting technology transfers, and hence confines productivity growth.

## 2.2.2 Real Effective Exchange Rate

Trade in less developed country may cause external price instability and shocks and trade initiation development for them leads to increase the income difference, rural urban migration and may leads to poverty. According to Nara Bahadur Thapa (2001) the real effective exchange rate has both positive and negative effect on the economic growth through demand side and supply side of the countries transaction. The demand side depreciation of domestic currency increases the competitiveness of domestic products, increase export, and leads to growth in economy. On the other hand the supply side of depreciation of real effective exchange rate increase the cost of production, leads to redistribution of income in the favor of rich leads to the contraction of the economic growth.

The real effective exchange rate (REER) is the weighted average of a country's currency in relation to an index or basket of other major currencies. The weights are determined by comparing the relative trade balance of a country's currency against each country within the index. This exchange rate is used to determine an individual country's currency value relative to the other major currencies in the index Well Kenton, 2019.

The real effective exchange rate (REER) is used to measure the value of a specific currency in relation to an average group of major currencies. A country's REER is an important measure when assessing its trade capabilities.

The REER can be used to measure the equilibrium value of a country's currency, identify the underlying factors of a country's trade flow, and analyze the impact that other factors, such as competition and technological changes, have on a country and ultimately the trade-weighted index. There are factors besides trade that can impact the REER. The real effective exchange rate doesn't take into account price changes, tariffs or other factors affecting trade. If prices are higher in one country versus another, trade might decrease in the country with higher prices and impact the REER.

In other words, the amount of trade being done with a country can be impacted by many factors. The weighting used in the REER calculation has to be adjusted to reflect any changes in trade.

Also, central banks adjust monetary policy, which can lower or raise interest rates in their home country. As a result, money flows could increase to the countries with higher rates as investors chase yield, thus strengthening the currency exchange rate. The REER would be impacted, but it would have little to do with trade and more to do with the interest rate markets.

The concept of the real exchange rate is a useful summary indicator of essential economic information. It has occupied a major place in theoretical discussion between economists of different countries. However, among all those works there is no clear agreement on how real exchange rate should be measured. This fact has led to the existence of many alternative models, theories, and indices that could be used for the construction of real effective exchange rate.

The concept of the real exchange rate initially comes from purchasing power (PPP) theory. According to Rogoff (1996, p.647), real exchange rate tends towards PPP in the long run, however, the speed of the convergence is extremely slow.

Krugman (2000.) argues that deviations from the relative PPP can be reviewed in a country's real exchange rate, the price of a typical foreign expenditure basket in terms of the typical domestic expenditure basket. However, the history of the real exchange rate and its analysis during last year's confirm that real exchange rates are non-stationary and assessment from the PPP point of view is not highly acceptable.

Mark De Broeck and Torsten Slok, (2001) construct the real exchange rate from the relative prices of tradable and non-tradable. They used the following real exchange rate decomposition (MacDonald, 1997):

$$qt \equiv st - pt^* + pt \quad (1),$$

Where  $qt$  denotes real exchange rate,  $s_t$  is the nominal exchange rate (the foreign currency price per unit of national currency), and  $pt^*$  and  $pt$  are the foreign and domestic price levels, respectively (with all variables in the logs). As this equation shows, the rise (fall) in the  $qt$  indicates appreciation (depreciation) of the real exchange rate.

According to Hinkel (2000) exchange rate can be considered in two forms which scale the real bilateral exchange rate index (RBER) and real effective exchange rate index (REER).

The real bilateral exchange rate (RBER) is defined in the relation to one trading partner or currency area (Hinkle, 2000). It is the easiest way of calculating the real exchange rate index. It compares the value of consumption or production basket of the domestic country with the representative basket of a foreign country measured in the same currency, either domestic or

foreign. Therefore, RBER indicates the relative value of the domestic and foreign consumption or relative baskets.

The RBER in foreign-currency term can be calculated as:

$$RBER = EP^*/p$$

Where  $E$  is the nominal exchange rate which defined as the unit of domestic currency per one unit of foreign currency.  $P$  and  $P^*$  are domestic and foreign price indices, respectively. A decline in the RBER corresponds to a real exchange rate appreciation and reflects an increase in the prices of domestic goods and services relative to the foreign goods and services.

On the other hand Real Effective Exchange Rate (REER) is defined in the relation to the average of the country's main trading partners (Hinkle, 2000). It is weighted real exchange rate index:

$$REER = \prod_{i=1}^m [E_i P_i^*]^{w_i} \frac{1}{P}, \quad 0 < w_i < 1, \quad i = \overline{1..m}$$

Where  $m$  is number of trading partners or countries  $w_i$  is the appropriate weight of each foreign country  $i$  stands from 1,, $m$  and the summation of their appropriate weight of foreign country is one.

Based on the above two equations we can see the link between real bilateral exchange rate and real effective exchange rate as follows

$$REER = \prod_{i=1}^m RBER^{w_i}$$

### 2.3. Empirical literature review

The debate is that the extent in which international economic policy affects the level of economic growth. This situation still continues today. To come up with a consensus different researchers can made in different multi-country case studies utilizing comparable analytical frameworks, numerous econometric studies using large cross-country data sets, and important theoretical advances concerning how a country's international economic policies and its rate of economic growth interact were used, there is still disagreement among economists concerning the nature of the relationship. All things considered, and especially no simple and clear theoretical explanations on the effect of trade restrictions and economic growth, it comes as no surprise that the empirical evidence on the benefits of trade openness measured using various trade policy indices reveals mixed results and inconclusive evidence.

Frankel and Romer (1999) attempted to identify whether trade cause growth or not by using a cross-sectional analysis. One of the difficulties to link the issue of trade with growth is the problem of endogeneity. They seem to solve the problem by taking geographic factors as an instrument variable for trade and income. This is because some countries trade because they are near well-populated countries and others trade less because they are isolated. Geographic factors are not a consequence of income or government policy, and there is no likely channel through which they affect income. In their finding, trade raises income. The relation between the geographic component of trade and income suggest that a rise in one percent point in the ratio of trade to GDP increases income per person by at least one half-percent.

However according to Rodrik and Rodriguez (2000) the work of Frankel and Romer(1999) is concerned with the relationship between incomes and the volumes of trade, and does not have immediate implication for trade policy. The reason is that the implications of geography-induced differences in trade, on the one hand, and policy-induced variations in trade, on the other, can be in principle quite different. Selective trade policies work as much by altering the structure of trade as they do by reducing the volume of trade. To the extent that policy is targeted on market failures, trade restrictions can augment incomes (or growth rates) even when indiscriminate barriers in the form of geographical constraints would be harmful. Of course, to the extent that selective trade policies are subject to rent-seeking, it is also possible that geography induced Variations in trade underestimate the real costs of trade restrictions. Ultimately, whether on balance trade policies are used towards benign ends or malign ends is an empirical question, on which the Frankel-Romer paper is silent.

Yanikkaya (2003) study gives rise to the hypothesis that trade restrictions can promote growth. In his study he finds evidence that trade restrictions in the form of tariffs, as well as trade-related taxes are positively associated with economic growth relying on a large sample of both developing and developed countries, and concludes that the relationship between trade openness and growth is complex and depends on the level of development and the size of the economy of an individual country as consistent with theoretical propositions. Similarly, contrary to the conventional view that trade barriers are distortive and detrimental to growth, Rodriguez and Rodrik (2001) have found that average tariff growth rates positively affect total factor productivity growth (TFP) for the sample of 46 countries over the 1980-1990 period, while

Edwards (1998) and Clemens and Williamson (2001) suggest rather weak relationship between trade restrictions and economic growth. Contrary to these findings, a studies by Harission (1996) and Edwards (1998), for example, found significant and negative effect of tariff rates on economic growth. Notwithstanding the inconsistency in the results obtained from empirical investigation of the effect of trade restrictions on economic growth, other studies, that rely on trade intensity measures (e.g. export and import to GDP ratio, export to GDP ratio by and large reveal evidence on positive impact of trade on economic growth ( Krueger and Berg, 2003; Dollar and Kraay, 2004; Lee, 2004; Chang, 2009). However, in this study we argue at length that papers which attempt to use conventional measures of trade openness i.e. trade intensity ratios as proxy for trade openness suffer from serious inconsistencies between theoretical propositions and empirical framework designed to test these hypothesis. However in contradicting the above arguments on the impact of openness to international trade on economic growth openness to international trade deteriorate the growth of developing countries because of the exported items of most developing countries are simply primary agricultural inputs and in most case developing countries kecked the leader of the developing countries through trade.

Among the view of the above arguments even if trade openness and economic growth have positive and significant impact different researcher's estimates that trade barriers have positive and significant impact on the growth of the country's economy Yanikayaa,(2003).

Oskamet et,al(2004) identified the arguments on trade barriers leads to economic growth. These arguments on trade barriers are if the countries have week government institutions and inadequate infrastructure outward oriented trade strategy deteriorate economic growth, in less developed countries most industries are in the initial stages of production and services at thus movement if the countries have outwards oriented strategies the country loss their own industries development(infant industry argument). Most of African countries are in stages of production of new and emerging infant industries, at the early stages of production this infant industry have no potential to compute over the developed industries.

According to VasilikiPigka-Balanika(2008)the impact of trade openness on economic growth in developing countries over aperiod1990-2005.Founded that trade openness has a positive and significant impact on economic growth in East Asian, Latin America and but not any significant

impact on Sub-Saharan Africa due to natural barriers and export on primary commodities and poor infrastructural development.

According to AnhTungo (2014) studies on 71 worldwide countries covering a period 1980-2010 by using both fixed effect with time dummy and random effect panel data founded a positive and significant relationship between trade openness and economic growth. The magnitude is 0.004 which implies that a 10% point increase in trade shares would result in 0.04% point increase in economic growth rate.

According to Akuffo (2012) studies on 38 African countries over 1980-2008 on the relationship between trade openness and economic growth found a result that capital labor ratio depreciation of currency and trade openness have a positive relationship at 1% significance level with the exception of capital labor ratio which is significant at 10% significance level.

Akufo analysis his study based on one or two way fixed and random effect panel data analysis. Based on his results the elasticity of exchange rate is 0.05% which implies that a 1% depreciation of local currency in relation to USD causes 0.05% increase in GDP/capita. The elasticity of trade openness is 0.69 implies that a 1% increase in trade openness results in 0.69% increase in GDP/capita.

Georgioskarras (2006) studies the effect of openness on macro-economic volatility by two different data i). 1951-1998 period for 56 economies and ii). 1960-1997 for a sample of 106 economies. Both data sets include countries at various stages of development. Macroeconomic volatility is measured here by the variances of cyclical (detrended) output, consumption, investment, and the exchange rate.

The results show that the bivariate openness-volatility relationship is weak, fragile, and generally statistically insignificant, regardless of the data set, detrending method, or volatility measure used. This confirms the empirical literature's difficulty to find conclusive evidence of a strong relationship. However, when economic size is included in the estimated models, the effects of both openness and economic size on macroeconomic volatility are found to be negative, sizable, and statistically significant. The reason for the resolution of the empirical ambiguity is that economic size is negatively correlated with openness, and so failure to include it in the regression biases the results. In addition, the average depreciation rate is shown to be inversely

related to both economic size and trade openness. The policy implications of the paper's results are straightforward. While there is not much economic policy can do to change an economy's relative size (at least in the short run), for most countries no such limitations exist regarding openness. Policies, national or global, which facilitate trade among countries, should also promote macroeconomic stability. From successful trade rounds that reduce various forms of protection, to bilateral or multilateral agreements (such as NAFTA) that dismantle trade barriers, to the trade liberalization that is one of the characteristics of globalization, the effects on macroeconomic stability (as well as on growth) are positive and sizable.

In terms of the theoretical importance of the results, the main implications are two. First, knowing that trade openness is in fact inversely related to macroeconomic volatility can help narrow down the set of useful theoretical models simply by ruling out the mechanisms that are inconsistent with these negative correlations.

Second, the fact that economic size and trade openness have empirical effects on volatility that are identifiably distinct means that we need theoretical approaches that distinguish between the two concepts and their economic effects, which hasn't been usually the case in most of the theoretical literature.

## **2.4. Conceptual frame work of the study**

The study tries to analyze the relationship between trade openness and REER on economic growth. The conceptual frame work of this study trade openness has controversial impact's the level of growth of economy.

In the endogenous growth theories the main reason for trade is due to technological gap between countries. Due to the demand lag in each countries trade can lead to exchange skills, knowledge, and adoption of technologies. In this model due to the gap in technology and advancement in human capital there is no convergence in the economic activity of the nations. Their after trade is never ending.

Trade policy affects economic growth in relation to the technological advancement, economics of scale and production capacity of the nation. On the one hand trade liberalization can leads to rise in economic growth through lowering the costs of trade, transaction costs, diffusion of knowledge and technologies, leads to specialization in trade, scales the economy of the country,

and increases the competitive pressure of the country. In this point of view trade liberalization can accelerate the efficiency of economic growth and leads to increase in economic growth (Williamson, 2000)

On the other hand trade liberalization may not necessarily leads to increase in economic growth.it depended on the levels of technology if thecountry have less technological advancement the ability to produce computing product is limited hence the amount of benefits from trade liberalization is low. Thiskind of countries have limited absorptive capacity of technology as a result of either knowledge or other economic factors, pervasive market and coordination failure, inhibit development of strategies, infant or new industries, crowding out effect of trade liberalization on domestic firms /industries which relates to trade protection can leads to economic growth through infant industry argument (Rodrik and Rodirigeze, 2004).

The view point of against trade liberalization on economic growth first we should evaluate the degree of industrial development, sophistication of technologies, economics of scale between the trading countries.

The study measures the impact of openness on economic growth. Openness can measured in the shares of trade from the GDP. As a result the magnitude of openness depends on the values and volumes of exported and imported commodities.

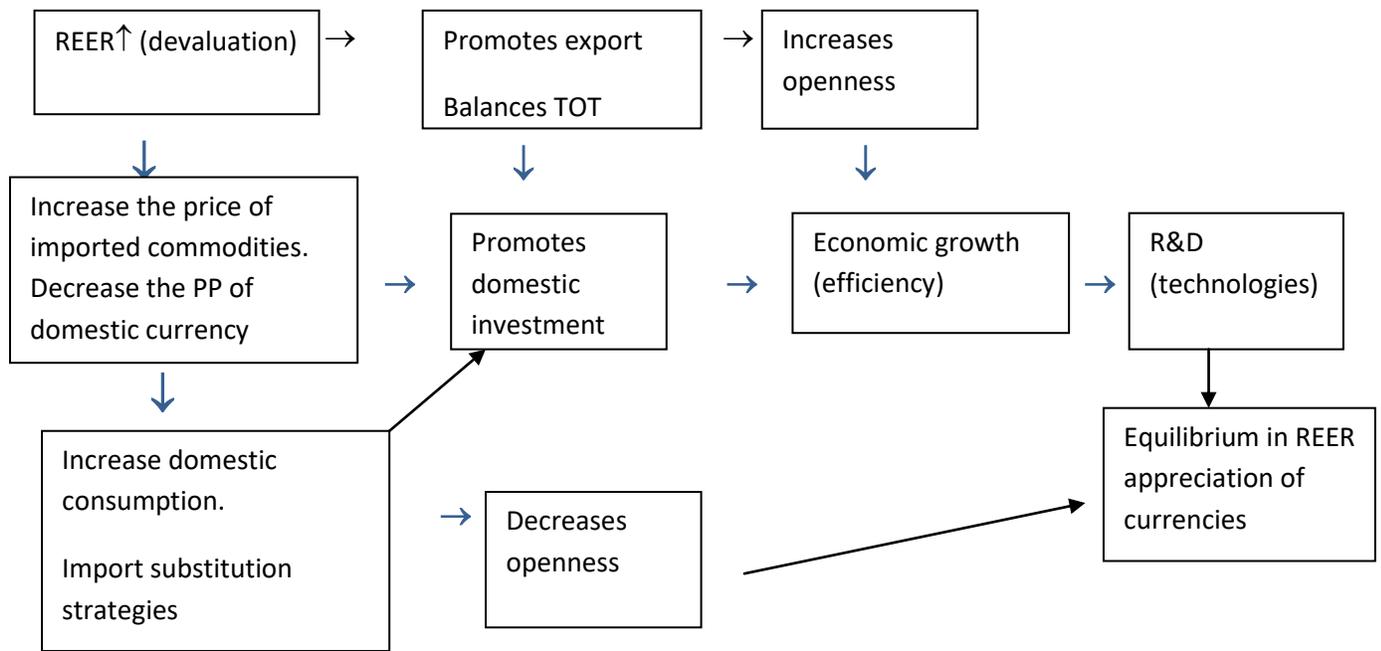
The countries export amount increases either by devaluation of the currencies or have has produce high quality products and demanded products that increases the openness of the countries in other wardsdevaluation increases the price of importing commodities these leads to decrease the purchasing power of local currencies hence reduces the amount of import implies that decrease the openness of the countries.Devaluation can leads to increase the demand of locally produced goods and services because the price of this commodities is cheap than the rest of the world commodities. Hence devaluation promotes the local industries to export their products and accelerates economic growth.

This study also tries to analysis the relationship between REER and economic growth the traditional views of economics states that the impact of REER on economic growth can be seen in the point of Aggregate demand and aggregate supply causes.

On the one hand depreciation of domestic currency can leads to increase the competitiveness of domestically produced products and hence increases the export volume and leads to positive terms of trade and later leads to accelerate economic growth. In the natural meaning increase in

REER implies that devaluation of the local currency. Devaluation of domestic currency can promote domestic investments for producing exported products and also leads to import substitution of domestic consumers for domestically produced goods and services but the main thing is that the production capacity, quality and even little production outlines of technological products like pharmaceutical products, electronics, and other luxury products. According to world trade organization 2017 reports most of African countries export primary products. This is the aggregate demand side view of the traditional economists.

On the other hand depreciation of domestic currency increases the cost of production, redistribution of income which favors for the rich which reduces the aggregate demand and contracts the growth of the economy. Devaluation without the capacity of producing competent modern technological product is kicking back the economy. Devaluation of domestic currency increases the price of imported products since the purchasing power of domestic currency is low. This leads to the consumption of imported item decreases and leads to the fail in economic activities. This is aggregate supply side view.



Source: own compilation based on various authors view

Figure 2.1 the conceptual framework of the study

## CHAPTER THREE

### 3. RESEARCH METHODOLOGY

#### 3.1 Description of the study area

Lists of East Africa countries have different members by different organizations like African facts listed east Africa has 19 members whereas that of world atlas says that east Africa have 22 members. Lists of east Africa countries are still open to debate. For the time being the study uses 13 members from the world atlas lists of east African countries.

According to world atlas members of east Africa countries are Burundi, Comoros, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mayotte, Mozambique, reunion, Rwanda, Seychelles, Somalia, south Sudan, Sudan, Tanzania, Uganda, Zambia, & Zimbabwe. Out of 22 countries the study uses 13 of east Africa countries which are Burundi, Comoros, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Sudan, Tanzania, Uganda, & Zambia.

#### 3.2 Research Design

The research design for the study is longitudinal research design because of the nature of the data is quantitative data. Due to the convenience of secondary and quantitative data to test the relationship between economic variables longitudinal panel data analysis technique's has employed.

#### 3.2 Data type, source and method of data collections

The type of data used by the researcher is quantitative secondary data and the sources of secondary data obtained from famous World international organizations which are World Bank, United Nation Conference on Trade and Development, Federal Reserve Bank of USA, African fact books, Africa Development Indicator and World Development Indicators.

#### 3.3. Method of Data Analysis

The study analysis data by evaluating the theoretical and empirical literature reviews regarding the relationship between trade openness and REER on economic growth in East African countries.

The theoretical part is mentioned in chapter two through developing conceptual frame work, theoretical literature, and empirical reviews in accordance with the stated objective of the study.

The study uses descriptive analysis and econometric model to empirically asses the existing relationship between trade openness and REER on economic growth in the study area. The descriptive statistics used in this study is using the mean, percentage, maximum, and minimum values which are explained in simple figures and tables.

The econometric model is based on longitudinal balanced panel data cover from 2004-2018. The longitudinal balanced panel data model uses whether there is fixed or random effect that can causes significant difference on the growth level of the entire country.

Before the econometric analysis the researcher testes the distributional analysis of the variable by skewness and kurtosis, normality test , checked multicollinearity problem by variance influencing factor, heteroskedesticity problem by Brucsch pagan test, and problem of serial correlations by Derbin Watson tests for accuracy of the results and interpretations. Finial the study employs the Hausman tests to choose whether affixed effect or random effect is appropriate for the regressions.

### 3.4 Econometrics Model Specification

The objective of this study is to analysis the relationship between REER and trade openness on economic growth. To achieve the entire objective the model has the following macro-economic variables. The variable includes real GDP per capita, openness as a measure of trade (export and import) to GDP, REER, FDI, capital formation, labor force, average weighted tariff rate, institutional quality and external debt, which ware collected from WDI, ADI, federal reserve bank, UNCTAD which have potential access to such kind of data.

The standard panel data model according to Wooldridge, (2002) which satisfies the classical model assumptions was developed as

$$Y_{it} = \alpha + \beta X_{it} + v_{it}, \text{ where } i = 1 \dots N \text{ and } t = 1 \dots T \dots \dots \dots (3.1)$$

$X_{it}$  is K-dimensional vector of explanatory variable without a constant term and  $\alpha$ , is the intercept and independent of i and t,  $\beta$  a (K+1) vector, the slopes independent of i and t and  $v_{it}$  the error term which varies over i and t.

The panel data model also classified as a fixed effect model and random effect model. The fixed effects model is specified as follows:

$$Y_{it} = \alpha_i + \beta X_{it} + v_{it}, \text{ where } i = 1 \dots N \text{ and } t = 1 \dots T \dots \dots \dots (3.2)$$

$$\varepsilon_{it} = \alpha_i + v_{it} \dots \dots \dots (3.3)$$

Where  $v_{it} \sim \text{NIID}(0, \delta_v^2)$ ;  $\alpha_i$  denotes a cross-section-specific effect, and  $v_{it}$  is the idiosyncratic error term (Hsiao, 2002). In the fixed effects analysis,  $\alpha_i$  is arbitrarily correlated with  $X_{it}$ .  $E(X_{it}'\alpha_i) \neq 0$  (Wooldridge, 2002).

Accordingly the random effect model which implies that both the intercept and the slope were varies and the intercept is included in the error term. According to Wooldridge, 2002 the model specifies as follows.

$$Y_{it} = \beta X_{it} + u_{it}, \text{ where } i = 1 \dots N \text{ and } t = 1 \dots T \dots \dots \dots (3.4)$$

$$u_{it} = \alpha_i + v_{it} \dots \dots \dots (3.5)$$

Where  $\alpha_i \sim \text{NIID}(0, \delta_\alpha^2)$ ;  $v_{it} \sim \text{NIID}(0, \delta_v^2)$ . In the random effects approach,  $\alpha_i$  is in the composite error term that is orthogonal to the explanatory variables,  $(X_{it})$ ,  $E(X_{it}'\alpha_i) = 0$ . Furthermore, the method accounts for the implied serial correlation in the composite error,  $u_{it} = \alpha_i + v_{it}$ , the same way as the generalized least squares (GLS) estimation technique (Wooldridge, 2002).

Based on the above macroeconomic variable to capture the stated objectives the study has three dependent variables. It includes GDP per capita, trade openness equation, and REER

**GDP per capita growth equation:** - is a better measure of economic wellbeing because it incorporates population's values of the country. It is an annual percentage growth of GDP per capita per individual. The study uses GDP per capita one dependent variable and this variable is estimated to be affected by external debt, foreign direct investment, openness, investment to GDP ratio, REER and access to sea port.

Based on the above variables the model to check the stated objectives the growth equation: developed as follows

$$\ln \text{rgdppca}_{it} = \beta_0 + \beta_1 \ln \text{edst}_{it} + \beta_2 \ln \text{opp}_{it} + \beta_3 \ln \text{fdi}_{it} + \beta_4 \ln \text{reer}_{it} + \beta_6 \ln \text{GEO}_i + u_{it} \dots \text{eq (3.6)}$$

$$u_{it} = \alpha_i + v_{it}$$

Where  $\text{rgdppca}$  is real GDP per capita,

$\text{edst}$  is external debt,

$\text{fdi}$  is foreign direct investment,

*reer* is real effective exchange rate,

*OPP* is trade openness,

''U'' is the Error term and the subscript ''it'' indicates the country and the time period respectively and

''Ln'' is the natural logarithm form.

**Openness equation:** -is the share of trade (export and import) from the total GDP. The study considers the following variable affects the openness of the country. The study develops the following openness equations.

$$\ln opp_{it} = \beta_0 + \beta_2 \ln reer_{it} + \beta_3 \ln gdp_{it} + \beta_4 \ln tar_{it} + \beta_5 \ln labr_{it} + \beta_6 GEO_{it} + u_{it} \dots \dots \dots eq(3.7)$$

Where GEO is geographic factor and

Gdp is gross domestic product in current USD

Tar is average weighted tariff rate

Labr is labor force ratio

Reer is real effective exchange rate

**Exchange rate equation:** it is the weighted average countries currency in relation to the basket of other major currency .it includes any Tariffs and transaction costs associated with imported goods and services. The paper tries to evaluate the relationship of REER based on the model as follows

$$\ln reer_{it} = \beta_0 + \beta_1 capi_{it} + \beta_2 \ln edst_{it} + \beta_3 \ln opp_{it} + \beta_4 \ln gdp_{it} + u_{it} \dots \dots \dots eq(3.8)$$

Where *capi* is capita formation

*Edst* is external debt stock

*opp* is openness

*gdp* is gross domestic product

*Bo* is constant term

*ln* is natural logarithm

### 3.5 Tests of Econometrics model

Before estimating econometric model, it is essential to explore the data. This is because, according to Alemayehu and et al (2009), data exploration is a pre-requisite for a good model formulation. Data exploration helps us to identify the pattern of the data in order to give it a good mathematical form. As a result the data requires the following tests before the regression and making the study's results.

#### 1. Unit root test of panel data

Unit root test of a panel data before running the regression of the variable and discussing about the inferences the study checks the unit root of the all variables by Levin linchu, Harris- Tzavalis & Hadri Im test of unit root tests of panel unit root tests.

#### 2. Normality test

One of the assumptions of econometric model before the regression is that normality tests. So under this topic the study tries to test the distribution of the variable are normally distributed out of the population.

From the ways to test the normality of the variable the study uses skewness and kurtosis. This test helps to know whether the variable is right skewed or left skewed and leptokurtic, platykurtic or mesokurtic checked under the normality test.

kurtosis measures the data is whether peak or flat for normal distribution kurtosis is three, if the result is greater than three kurtosis indicates a "peaked" distribution (leptokurtic) and if the result is less than three kurtosis indicates a "flat" distribution (platykurtic)(Gidisa, 2018).

Regardless of the problems of normality the study uses from the remedies of normality which are dropping of outliers substituting by medians and transformations of the variable. From the solution of the problem i.e. deletion, robust statistics and transformation of the variable the study uses one of the remedies.

#### 3. Multi co linearity test

Multicollinearity is phenomenon that may occurred in the multiple regressions that results in greater confidence interval and high estimation of standard errors (small t- value) and high  $R^2$ . It may occur as a result of little variation in the explanatory variable or high

correlation between one or more explanatory variables (Gujarati, 2008). As a result the study measures the problem by the variance inflation factor (VIF) as a rule of thumb if the VIF is greater than 10 there is a multicollinearity problem.

#### 4. Hausman specification test

Under this section we carry out some diagnostic tests to examine which estimation technique fits the model and the data well. Panel data models examine fixed and/ or random effects of group of time. Hence, our data should have individual effects or time effects. In order to examine the presence of individual effects and/or time effects, it is required to perform either fixed effects or random effects test.

For choosing whether fixed effect or random effect used in the mode Hausman specification testes is used. Therefore the study test the specified models under which model they fail whether fixed effect or random effect is appropriate.

The null and alternative hypothesis for this test is:

$H_0$ : random effect is appropriateand

$H_a$ : fixed effect is appropriate.

If we fail to reject the null hypothesis, the random effect regression model is favored and vice versa.

#### 5. Test for Heteroskedesticity

The homoscedasticity assumption states that the variance of the unobservable error,  $u$ , conditional on the explanatory variables, is constant. Homoscedasticity fails whenever the variance of the unobservable changes across different segments of the population, which are determined by the different values of the explanatory variables (Wooldridge, 2002).In short, if we persist in using the usual estimation procedures despite heteroskedesticity, whatever conclusions we draw or inferences we make may be very misleading. (Gujarati, 2008),

In this study we have applied the Breusch – Pagan and white tests test for heteroskedesticity discussed in Verbeek (2000). This study estimates the square of residual of the random effects model. The test statistics multiplies the R2 of auxiliary regression of this residual with explanatory variables used in the model by  $N(T-1)$ . The

test statistics has a Chi-square distribution with J degrees of freedom, where J is the number of explanatory variables used in the auxiliary regression.

#### 6. Testing for Serial Correlation AR (1)

In a model where the regressors are not strictly exogenous, at least one of the regressors is correlated with one period lagged error term. Since the presence of this serial correlation biases the standard errors and causes the results to be less efficient, we should be concerned about testing for it. To test for autocorrelation, in this study we used the modified Durbin-watson test for adjusting serial correlations.

### 3.6 Definitions of variables, measurement and hypothesis

**Real GDP per capita:** It is a measure of economic wellbeing it adjusts the variation in price it is the annual growth rate of GDP per capita. It includes the population's adjusted income it measured in the percentage value since it is the growth rate. The study uses this variable as a dependent variable.

**Openness:** it measured as the ratio of trade (export and import) as percentage of GDP it measured at the current price. This variable affects economic growth positively since in the new growth theories trade leads to technological progress and this progress leads to economic growth. Viselike Pigka-Balanika2006 on the impact of trade openness on economic growth in developing country on panel data method from 1990-2005 and found a result that trade openness leads to economic growth but the result is not true for sub-Sahara African country. The reason behind is that most of African country exports primary agricultural products as a result openness does little or not contribute to economic growth. On the other hand study by Anh Tung Dao, 2014 on trade openness and economic growth over 1980-2010 on 71 worldwide countries found a result trade openness can have a positive and significant impact on economic growth and another study by Henok Arega on 2012 on 47 sub-Sahara Africa on the relationship between openness and economic growth over 2000-2010 and found that openness stimulates both economic growth and investment. Therefore the study expects to have a positive sign for this variable.

**Real effective exchange rate:** it is the measure of competitiveness of local currency against a basket of trading partner's foreign currency. By nature increase in REER index indicates that real

depreciation of local currencies and promotes export and distorts import and leads to trade balances for exporter countries and decrease in REER index implies that appreciation of domestic currencies and increases import since the import price of foreign products is cheap than the locally produced goods and services. Therefore the expected sign of this variable is indeterminate. Because depreciation of domestic currency has two side effects on the one hand it promotes export since the export price of domestically produced goods and services is cheap in the international market. On the other hand devaluation of currency leads to import more expensive in the domestic market than before. The first effect promotes openness while the second effect reduces the degree of openness. The main thing that must take in to account is that the export products of most of the Africa countries are primary products. Therefore the magnitude of this variable is depends on the first and second impact and that of exporting commodities.

**Foreign direct investment:**it refers to direct investment equity flows in the reporting economy. It is the sum of equity capital, reinvestment of earnings, and other capital. Direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy. Ownership of 10 percent or more of the ordinary shares of voting stock is the criterion for determining the existence of a direct investment relationship. It is measured in current U.S dollars. An investment made by a firm or individual in one country into business interests located in another country. It differs from the portfolio investment through purchasing equities. It includes ownership and controlling of foreign companies. It measured in current price USD for all countries.

**Capital output ratio:** It measures the level of investment and its impact on the GDP. It is the amount of capital needed to produce one more unit in GDP. It measured in a percentage form and the expected sign for this variable is positive since investment promotes economic growth.

**Labor force:**it is measured in the ratio of total population and working age group. In the endogenous growth model human capital is on important factor for disproving the convergence in countries economy. It the expected sign for this variable is positive.

**Geographic factor:** the study uses this variable by expecting countries which have sea outlets expected to trade more than the land locked country. It is a dummy variable for land locked assigned to 0 and for those who have sea outlet1. The expected sign for the variable for those who have access to sea have positive and negative for the land locked countries.

**Tariff rate:** obviously tariff rate decreases the volume of imports significantly as it increases the price of imported goods in the domestic market. Therefore, this variable is expected to have a negative sign. Simple mean applied tariff is the weighted average of effectively applied rates for all products subject to tariffs calculated for all traded goods. Data are classified using the Harmonized System of trade at the six- or eight-digit level. Tariff line data were matched to Standard International Trade Classification (SITC) revision 3 codes to define commodity groups. Effectively applied tariff rates at the six- and eight-digit product level are averaged for products in each commodity group. When the effectively applied rate is unavailable, the most favored nation rate is used instead. To the extent possible, specific rates have been converted to their ad valorem equivalent rates and have been included in the calculation of simple mean tariffs.

## CHAPTER FOUR

### 4. RESULT AND DISCUSSIONS

#### Introduction

Under this chapter the study provides a detailed discussion regarding to the objectives of the study based on both descriptive statistics, and econometric models. The study also discusses about the post estimation tests for all equations developed to analysis the impact of trade openness, real effective exchange rate on economic growth.

For the descriptive statistics the study try to see the area coverage, their percentage share of economic sectors from GDP, total population and the labor force ,the trade balance and the major importing and exported commodities under each countries, and the natural resources endowmentof the countries. Accordingly the descriptive statistics also shows the trade flows of each countries and the balance of trade over the past 15 years.

The econometric analysis includes the post estimation tests including the unit root test, Hausman specification test and diagnostics tests of the model finally after the post estimation tests the researcher interprets the estimation results of all econometric models.

#### 4.1 Descriptive analysis of the study

As shown in the table 4.1 below from the selected east African countries Sudan has the highest area coverage followed by Ethiopia and Mozambique. In the economic activities based on PPP of GDP Ethiopia has the highest GDP followed by Sudan and Kenya, their GDP amount on 2017 was 200, 177and 163 billion USD respectively. The composition of their GDP in the economic sector, except Comoros (agriculture is the leading economic activity) in all stated countries service sector is the leading economic activity.

In population and labor force number Ethiopia has the highest number followed by Tanzania and Kenya. In 2018 from the total population of Ethiopia reaches 107.6 million and from the total population 52.8 million are in the working age group. In the endogenous growth theories human capital is one important component that leads to economic growth. This population has direct

relationship with consumptions as a result higher population may increase the import of consumption goods. On 2017 the population of Tanzania reaches to 59 million, their labor force is 24 million, population of Kenya is 50 million, and their labor force is 19.6 million.

From the 13 east African countries except Zambia all the rest countries has trade deficit in 2017 physical year. Kenya is the highest importer countries followed by Ethiopia and Tanzania. The major commodities imported to those countries are Machineries and equipment including aircrafts, metal products, electrical materials, petroleum, motor vehicles, chemical and fertilizers Consumer goods, industrial raw material, motor vehicles, iron and steel. On the exported amount Zambia ,Kenya and Tanzania are the major exporter countries the major exported commodities of Zambia is natural resources mainly Copper/cobalt, electricity, tobacco, flowers, cotton the major exported commodities of Kenya is horticultural products ,tea and apparels and Tanzania exports Gold, coffee, chasewe nuts, manufactures . Our country Ethiopia exports mainly agricultural primary commodities, mainly the exported commodities of Ethiopia are Coffee, oilseed, vegetable, gold animal products.

**Table 4.1 East African countries general economic out look**

No	Countries	Total area / sq km	GDP(PPP) in billions US 2017	2017 GDP %			2018 Population in million	2018 Labor force in million	Trade	
				Agriculture	industry	Service			export 2017 US	import 2017 US
1.	Burundi	27,830	8.007	39.5	16.4	44.2	11.216	5.012	119 m	603.8 m
2.	Comoros	2,235	1.319	47.7	11.8	40.50	0.852	0.279	18.9 m	207.8m
3.	Ethiopia	1,104,300	200.6	34.8	21.6	43.6	107.621	52.82	3.23b	15.59b
4.	Kenya	580,369	163.7	34.5	17.8	47.5	50.121	19.6	5.792 b	15.99b
5.	Madagascar	587,041	39.85	24	19.5	56.4	25.948	13.4	2.29 b	2.74b
6.	Malawi	118,484	22.42	28.6	15.4	56	18.955	7	1.42b	2.314b
7.	Mauritius	2,040	28.27	4	21.8	74.1	1.266	0.634	2.36	4.986 b
8.	Mozambique	799,380	37.09	23.9	19.3	56.8	30.128	12.9	4.725 b	5.223 b
9.	Rwanda	26,338	24.68	30.9	17.6	51.6	12.486	6.227	1.05b	1.922 b
10.	Sudan	1,861,484	177.46	39.6	2.6	57.8	41.274	11.92	4.1 b	8.22 b
11.	Tanzania	947,300	162.5	23.4	28.6	47.6	59.312	24.89	4.971 b	7.869 b
12.	Uganda	241,038	89.19	28.21	21.1	50.7	43.242	15.84	3.339 b	5.036 b
13.	Zambia	752,618	68.93	7.5	35.3	57	17.540	6.898	8.216 b	7.852 b

Source, UNCTAD report 2018 and World fact books

M\* indicates million & b\* for billions

#### **4.1.1 Trade and Economic situations of East African Countries**

Most of east African countries exports primary products from the major exported commodities coffee, cotton, oil seeds, vegetables, animal products, and sugar and horticulture products. But out the selected countries Sudan, Tanzania, and Zambia exports natural resources which includes gold, oil & petroleum products, copper and cobalt.

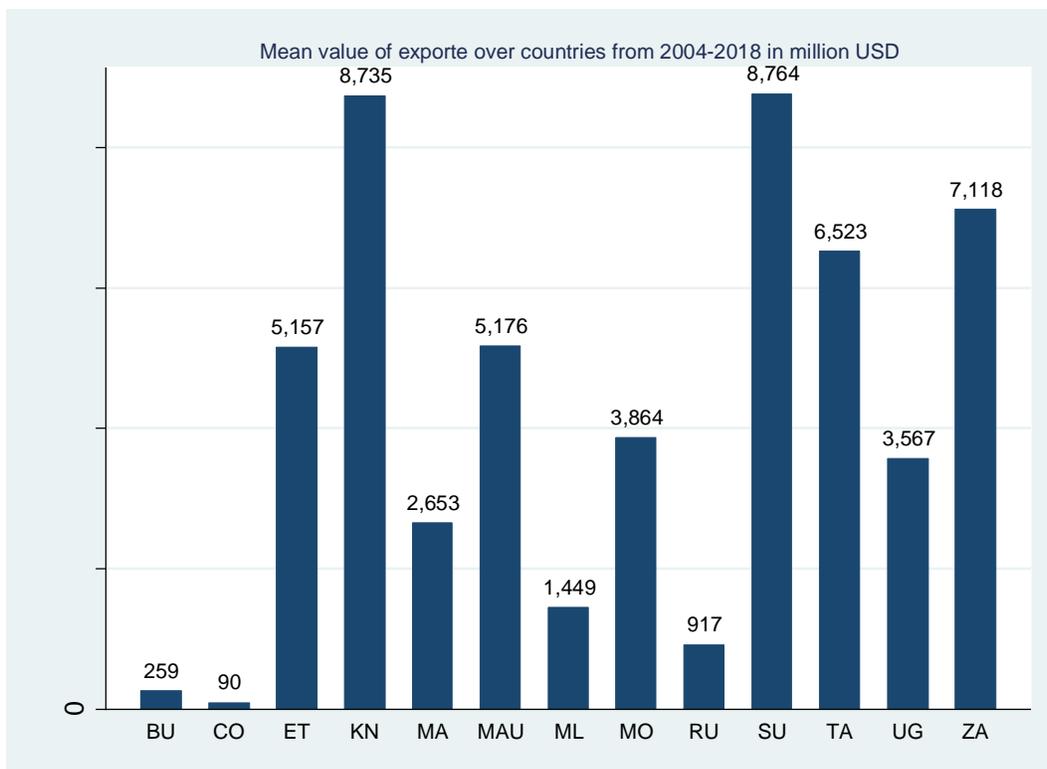
On the other hand they imports industrial equipment's, vehicles, oil & petroleum products, capital equipment's, metal & construction materials, and consumer goods.

In the most of the country under this study in their GDP composition the service sector have the majority share from the total GDP but in the employment & exported commodities agriculture is the dominant sector of the economy. Due to this East African countries exported commodities is primary products mainly agricultural commodities. As a result the price of the exported products

is low and in revers to this they imported heavy industrial products that lead to deficit in trade balances.

As it is mentioned in the theoretical parts of the study the high values of imported commodities leads to increase the demands for foreign currency to full fill the imported amounts. Hence increase the demand for foreign currency leads to devalue the local currency as a result this devaluation promotes the local producers to export their commodities.

For the mean values of the export & import of the study across countries can show graphically as follows.



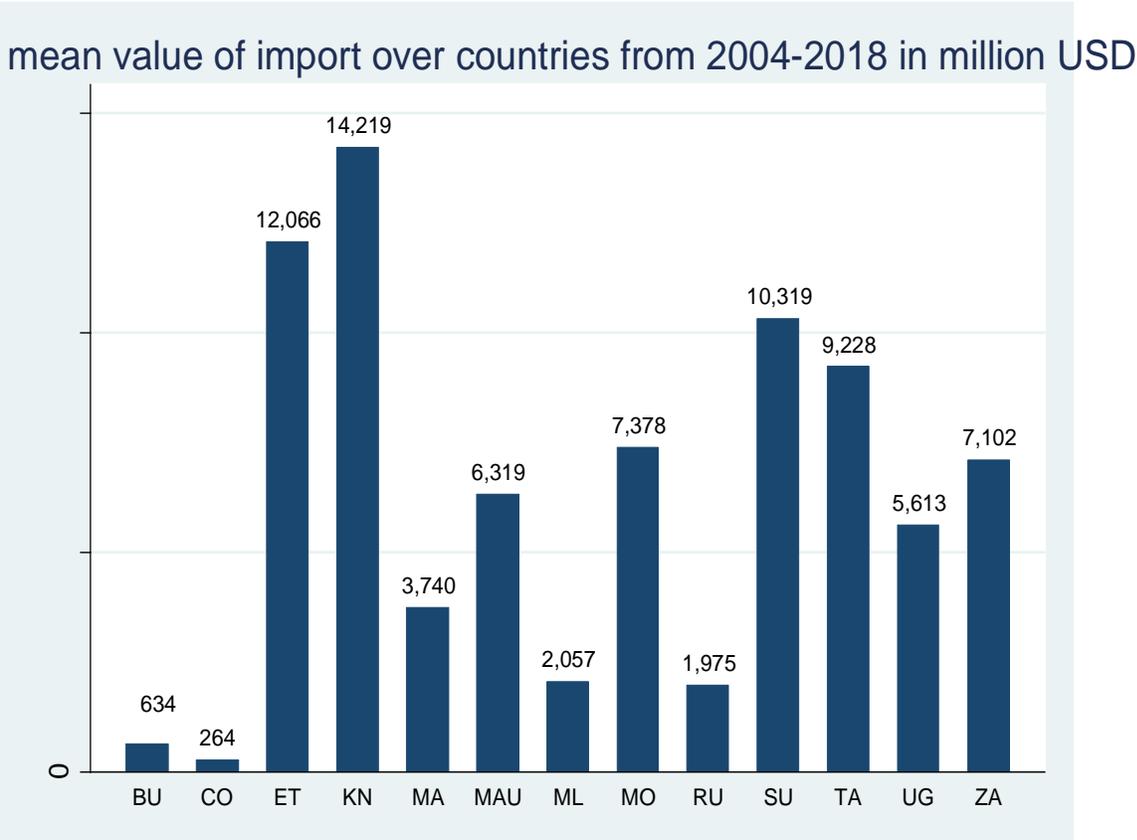
Source: from the main source of the data

**Figure 4.1 Mean value of export in million USD from 2004-2018**

Where, BU- Burundi , TA- Tanzania, KN – Kenya, UG- Uganda, RU- Ruanda, ET- Ethiopia, MO- Mozambique, MA- Madagascar, ML- Malawi, ZA- Zambia, CO- Comoros, Mau- Mauritius, and SU- Sudan.

The above graph shows that Sudan Kenya and Zambia is the major exporter countries over the past 15 years. Sudan and Zambia exports natural resources.Sudan exports Gold, oil & petroleum, cotton, sesame & gum Arabica whereas Zambia exports Copper, Cobalt, electricity, tobacco, flowers & cotton. But the major commodity exported by Kenya which is the second exporter countries under the studied countries is tea, horticultural products, coffee, and apparels.

Tanzania is the 4<sup>th</sup> exporter countries which also have natural resources Gold is the major product exported by Tanzania. The rest countries export primary products mainly agricultural commodities. To sum up east African countries export is concentrated mainly on agricultural commodities and natural resources.

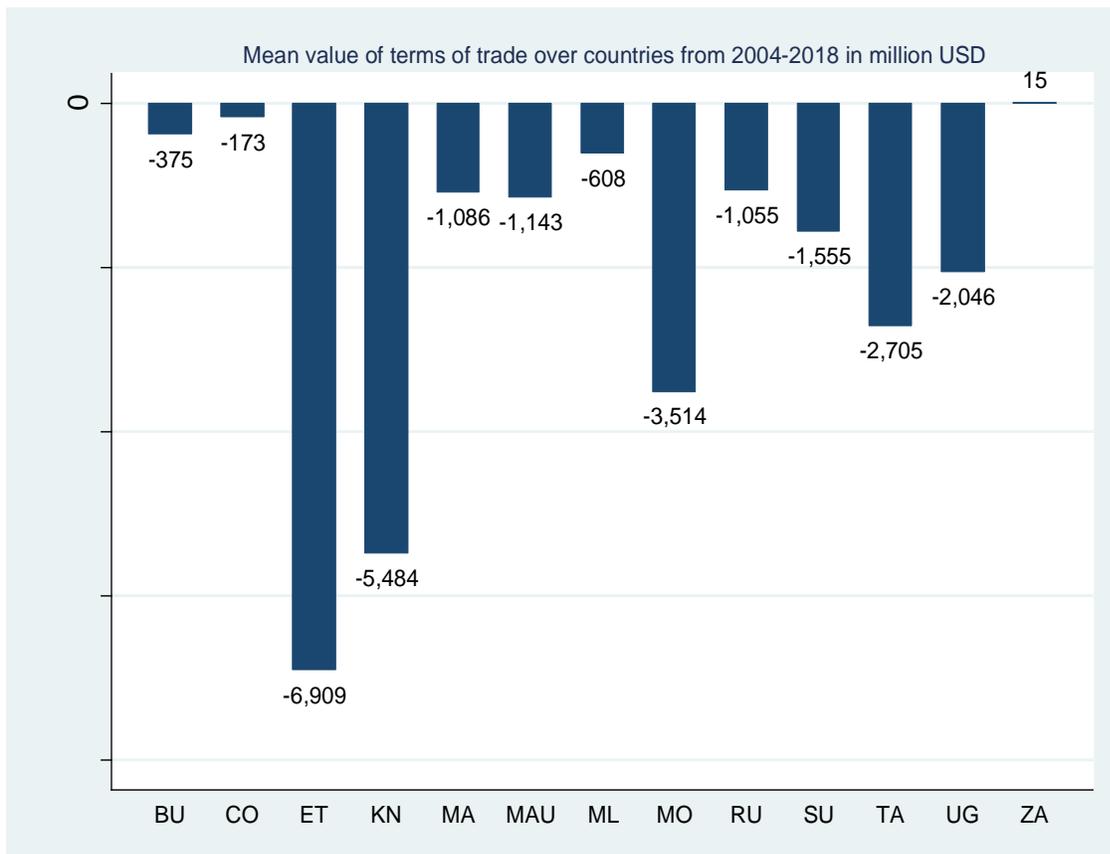


Source: from the main source of the data

Figure 4.2 Mean value of import in million USD from 2004-2018

The above graph shows that Kenya, Ethiopia, Sudan, Tanzania, & Zambia have the high importer countries over the specified countries while Comoros, Burundi, Ruanda, & Malawi are the least importer countries.

The major imported commodities imported to these countries is categorized in industrial and manufacturing products in all 13 east African countries which includes machineries and equipment's, transport materials and vehicles like aircrafts , steel & metal products, petroleum products, food staffs, chemicals & pharmaceutical products, fertilizers & clothing.



\*is the surplus of trade,

Source: from the main sources of the data

**Figure 4.3 Mean values of trade balance from 2004-2018 in million USD**

Our country Ethiopia has high amounts of trade deficit followed by Kenya over the last 15 years. Due to the fact that the major exported commodities of Ethiopia are primary products mainly agricultural commodities and they import commodities are huge industrial & manufacturing

commodities including transport vehicles, equipment's, and manufacturing materials, chemicals and pharmaceutical products.as a result because of the price variation and high population number the trade imbalance of Ethiopia is high.

Zambia is the only countries under this study that have trade surplus over the last 15 years. The main reason is that the major commodities that exported by Zambia is Copper/cobalt, cobalt, electricity, tobacco, flowers, and cotton.

## **4.2 Econometric s Model**

Econometric model of the study consists of post estimation tests and results of the post estimations, the diagnostics test of the study and finally the model estimation and interpretation of the results. In the post estimation test of the study the unit root test and distributional test has evaluated and the researcher also uses their remedies. The diagnostic test consists of the Hausman specification test, theheteroskedesticity,multicollinearity, and serial correlations of the entire econometric model havealso tested.

The econometric model result of growth equation openness equation and exchange rate equation.

Growth equation results

### **4.2.1 Post estimation tests**

#### **Unit root tests**

The unit root tests of the variable is checked from methods of panel data unit root testing methods by Harris-Tzavalis unit-root test , Levin- Lin- Chu &Hadri Lm stationary tests such that the null and alternative hypothesis for the variable states that

Ho: Panels contain unit roots and

Ha: Panels are stationary

The method to know whether the variable is stationary or not is based on the p value if the p value is greater than 0.05(5%) reject the null hypothesis implies that there is stationeries

otherwise the variable have stationary problem. After the transformation of variables in to the logarithm form all the rest variables are stationary except FDI. FDI is stationary at its first difference. The results of unit root tests are attached on the appendix1.

### **Normality Tests**

As shown on the skewness and kurtosis table on appendix 1 all variables are not normal distributed from the population. Dueto this problem to overcome a normal data the study transforms all variables into logarithm form. Transformation of variables is among the solution to normalize the variable. After making the logarithmform the normality of the variable on the box plot then the variable is normal see appendix two and three.

### **Hausman specification test**

The specification test hypothesis  $H_0$ : random effect is appropriate and

$H_a$ : fixed effect is appropriate

The decision to choose weather fixed effect or random effect is based on the  $\text{Prob}>\chi^2$ . If the  $\text{pro}>\chi^2$  is greater than 5% we accept the null Hypothesis that means random effect is appropriate model and if the  $\text{Prob}>\chi^2$  is less than 5% fixed effect model is appropriate.

Based on the Hausman specification results for the growth and openness equation the random effect model is appropriate, and for the exchange rate equation fixed effect model is appropriate model. The results of Hausman specification tests are attached in the appendix 4 in the back mater of the study.

### **Multicollinearity test**

In the presence of a problem of multi co linearity the regression results may lead to high  $R^2$  and large confidence interval which means the coefficient cannot be estimated with greater precision and accuracy.

The study checks the presence of multicollinearity problem by variance inflation factor (VIF) attached in the annex5. That means there is no a problem of multicollinearity problem in the all models.

### **Heteroskedasticity tests**

One of the assumptions of OLS estimators is homoscedastic assumption or constant variance in the panel data the presence of heteroskedasticity is due to large population and small sample size as a result in most cases it is not the problem of a panel data analysis. But the study tests by Breusch-Pagan /Cook-Weisberg tests & a White test of heteroskedasticity the result suggests that there is no problem of heteroskedasticity. The results are attached in the annex 6 of the back matter of the study.

### **Tests for serial correlations**

From the assumptions of OLS estimators is that the residuals are normally distributed over time period. Implies that the residuals of the time period is normally distributed to its previous lag period residuals. In a model where the regressors are not strictly exogenous, at least one of the regressors is correlated with one period lagged error term. Since the presence of this serial correlation biases the standard errors and causes the results to be less efficient, we should be concerned about testing for it. To test for autocorrelation, in this study we used the modified Durbin-Watson test of adjusted serial correlations.

The study adjusts the problem of serial correlation at first order serial correlation to handle the problem the study uses the generalized least square regressions and first order serial correlation techniques.

## **4.3 Model estimation and interpretations of results**

Since the data for this study is collected over a time period and across 13 East Africa countries the estimation and interpretation of the inferences is based on panel data analyzing technique. After checking the normality & stationery tests of the variable the study tests the Hausman specification tests to choose whether the fixed effect model is appropriate or random effect is appropriate to interpret the regression results. Finally the multicollinearity, heteroskedasticity, and serial correlation problem also checked & solve the existing problems. This test was done for the three equations.

### 4.4.1. Growth equations

The growth equation of the study formulated as.

$$\text{LnGDPPCA}_{it} = \beta_0 + \beta_1 \text{Lnreer}_{it} + \beta_2 \text{Lnfdi}_{it} + \beta_3 \text{lnedst} + \beta_4 \text{lnopp}_{it} + \beta_5 \text{lnGEO}_{it} + u_{it} \dots \text{eq (4.1)}$$

$$u_{it} = \alpha_i + v_{it}$$

In the growth equation of the regression result based on the random effect model

**Table 4.1 Growth model results**

Dependent variable log of GDP per capita			
Independent variable	Coefficient	Sd. error	P>z
Lnreer	1.43	.109	0.000***
Lnopp	-0.02	.033	0.595
Lnedst	.08	.028	0.005***
Lnfdi	.03	.008	0.000***
GEO	.76	.428	0.076*

\*Significant @ 10%, \*\* significant@5% & \*\*\* is significant @1%

R2 within= 0.63

No observation=195

Between=0.21No group =13

Overall=0.25Waldchi2 =218.08

prob>chi2=0.000

roh-fov=0.98

Source model result of growth equation see appendix 7

R<sup>2</sup> within the country which is 0.6313 implies that from the total variation in GDP per capital with in the country 63.13 % of variation is explained by the independent variable listed in the model. That means real effective exchange rate, external debt stock, openness and foreign direct investment explain 63.13% of the GDP per capital of each country. R<sup>2</sup> between countries 0.2081 indicates that on average from the total variation in GDP per capital between countries the listed variable explains 20.81% and overall R<sup>2</sup> which is 0.2484 indicates that from the total variation in

GDP per capital over the selected east African countries real effective exchange rate, external debt, openness to international trade, foreign direct investment & access to sea port explains only 24.84% of GDP per capital.

The  $\text{prob} > F$  is 0.0000 implies that the coefficients of the independent variable is deferent from zero which is good and it also measures the overall goodness the model which is good.

*lnopp* is not statistically significant. Hence openness does not contribute to economic growth even the magnitude is negative implies that as openness of the country increases their economy decreases because of the stated facts the country's exports natural resources & primary products mainly agricultural commodities and they import heavy industrial commodities due to this trade openness deactivates their economic growth in east Africa. The result for this variable is different from the hypothesis of the study and the result of Henok Arega 2012 on sub-Saharan Africa and Anh Tung 2014 on 71 worldwide countries open ness has positive and significant impact on economic growth with the exception of developing countries. But the result is similar with the study by Vasilika, pigika- balanika on 2006 on the impact of trade openness on economic growth is insignificant.

From the stated variable *lnreer*, *lnfdi* & *lnedst* are statically significant at 1% confidence interval and GEO (access to sea) is statically significant at 10% confidence interval, their interpretation has discussed as follows.

REER indicates that on average a 1% increase in REER causes on average 143% increase in GDP per capita income. The result is related to Henok Arega(2011) findings on sub-Saharan Africa countries indicates that real effective exchange rate has direct impact on economic growth. Hence devaluation of domestic currency in east Africa has statically significant change on the economic growth of the country. Because devaluation promotes domestic investment to export their products & the demand for domestically produced goods and services increase in the foreign market because of the price of domestically produced goods and services decreases in foreign currency. But the main thing that East African country produces and exports primary agricultural commodities as a result devaluation may not create the stated significant impact on the economy.

EDST indicates that one percent increase in external debt causes on average 7.9% increase in the GDP per capita. Hence that external debt has significant impact in the economic growth of the country. As the country's external debt increases the domestic investment of the country also increases but the fact is that debated countries debt management and the way in which they propose to debt have problems like in many cases developing country requires debt for non-profitable investments mainly in infrastructure projects due to this debt repayment has difficulties it leads to debt hangover.

The foreign direct investment also affects the GDP per capita of the country positively. The coefficient of the FDI indicates that a one percent increase in the inflow of foreign direct investment on average increases the GDP per capita by 3.05%. This is the fact that foreign direct investment increases the investment of the country, transfers knowledge, and technologies to resident employees and creates job opportunities.

Geo is statically significant at 10% the magnitude of access to sea is positive indicates that the country have access to sea port increases the GDPPCA by 7.6% than those who have no access to sea port sea port is positively affects GDP per capital of East African countries. This result matched with Henok Arega (2011) studies on trade policy and economic growth on sub-Saharan Africa in Addis Abeba University.

Rho which equals to 9.8% variation GDP per capita of each country is due to the random effects of each country individual random effect.

#### 4.4.2. Openness equation

To see the existing relationship between openness and the independent variables the study develops following openness equation.

$$\ln \text{opp}_{it} = \beta_0 + \beta_1 \ln \text{reer}_{it} + \beta_2 \ln \text{capi}_{it} + \beta_3 \ln \text{gdp}_{it} + \beta_4 \ln \text{tar}_{it} + \beta_5 \ln \text{labr}_{it} + \beta_6 \text{GEO}_i + u_{it} \dots \text{eq (4.2)}$$

$$u_{it} = \alpha_i + v_{it}$$

In the openness equation the study tests first which model is appropriate based on the probability value of Hausman specification tests. The  $\text{prob} > \chi^2$  indicates that random effect is appropriate for the openness equation. The random model result of openness equation:

Table 4.2 Openness equation result

Dependent variable log openness			
Independent variable	Coefficient	Sd. error	P>z
Lnreer	-.75	.188	0.000***
Lncapi	.38	.070	0.000***
Lngdp	.08	.061	0.167
Lnlabr	1.66	.391	0.000***
Lntar	-.05	.032	0.133
GEO	.33	.134	0.014**

\*Significant @ 10%, \*\* significant@5% & \*\*\* is significant @ 1%

R2 within =0.24      No observation=195

Between=0.59No group =13

Overall=0.50Waldchi2=65.53

prob>chi2=0.000

rho-fov=0.48

Source model result of growth equation of appendix 7

Based on the generalized least square results of the openness equation, GEO are statically significant at 5% confidence interval. Whereas *lnreer*, *lncapi* & *lnlabr* are statically significant at 1% confidence interval. But tariff rate and *lngdp* are not statically significant.

R2 within the country is 0.2386 implies that from the total variation in openness within the country the independent variable of the model explained on average 23.86% of openness in each country. R2 between the country is 0.5982 indicates that from the total variation in the openness between countries the independent variable of the model explained on average 59.82% of openness between countries. R2 overall is 0.5006 indicates that from the total variation in openness over all studied countries the independent variable of the model on average explained 50.06% the openness.

REER coefficient is -.7468 indicates that on average a one percent increase in REER (devaluation of domestic currency) causes on average 74.68% decrease in trade openness in east Africa. Hence devaluation of domestic currency in this kind of country has a negative impact on trade (export & import) of the country the result is machined with study by Henok Arega 2011 on trade policy in sub-Saharan Africa countries devaluation distorts openness.

Capital formation (capi) which is the gain from investing in the country the coefficient is .3810 indicates that on average the amount of investment increases by one percent increases the openness of the country on average by 38.10percent. Hence investment has appositve impact on openness of the country due to the fact that investment increases the amount import and export of the country.

As the coefficient of labor force rate is statically significant at 1% confidence interval indicates that as the labor force ratio on average increase by one the openness also increase on average by 165%. Implies that labor force increases the demand for investment in thus countries and increases consumptions i,e consumption is the main component of GDP and it accounts on average two third of countries GDP,labor force is one factor for investment and it also increases the trade flows.

Rho which is equals to 0.48 indicates that on average 48% of variation in openness of each country is due to the random effect of each country.

#### 4.4.3. Exchange rate equation

To see the relationship between Real exchange rate and independent variables the study develops the following equation. The fixed effect model by itself works through first differencing of the data, time invariant factors like the access to port is o work because of their difference is zero.

$$\lnreer_{it} = \beta_0 + \beta_1 \ln capi_{it} + \beta_2 \ln edst_{it} + \beta_3 \ln oppit + \beta_4 \ln gdp_{it} + u_{it} \dots \text{eq (4.3)}$$

$$u_{it} = \alpha_i + v_{it}$$

The fixed effect result for real effective exchange rate equations:

Table 4.3 Exchange rate equation result

Dependent variable log real effective exchange rate			
Independent variable	Coefficient	Sd. error	P>z
Lncapi	.04	.031	0.241
Lnedst	-.05	.017	0.007***
Lngdp	.26	.021	0.000***
Lnopp	-.02	.018	0.187
-cons	-.41	.151	0.008

\*Significant @ 10%, \*\* significant@5% & \*\*\* is significant @1%

R2 within =0.54 No observation=162

Between=0.10 No group =12

Overall=0.12 F(4,146)=43.15

prob>F=0.000

rho-fov=0.95

Source model result of growth equation see appendix 7

Based on the adjusted regression result of the exchange rate equation gross lnedst & lngdp are statically significant at 1% confidence interval and lnopp & lncapi are not statically significant.

R2 within the country is 0.5418 indicates that from the total variation in real exchange rate within the country on average the explanatory variable explains 54.18% only. The R2 between countries 0.1069 indicates that from the total variation in real exchange rate between countries the explanatory variable explains only 10.69% which is weakly explained by the explanatory variable between countries. The R2 overall is 0.1227 indicates that from the total variation in REER over all countries the explanatory variable explains only 12.27% only.

The coefficient of gross GDP is 0.2589 indicates that on average a one percent increase in GDP causes an average increase in REER implies that as the income level of the country increases the consumption of the country also increases so the country imports commodities to satisfy their wants.

The coefficient of external debt is -0.0472 indicates that a one unit increase in debt stock over a country causes on average 4.72 decrease in real exchange rate, implies that accumulations of external debt lead a country to devalue its currency because of the demand for hard currency increase in debt countries to repay its debt and its service charges.

Rho-fov which is equal to 0.95 indicates that on average 95% of the variation in exchange rate of each countries is due to the countries fixed effect in this cause the countries fixed effect can also asociated with the occurrence of natural resources in some east african countries.

## CHAPTER FIVE

### 5. Conclusion and Recommendations

#### 5.1 Conclusion

The impact trade openness and REER on economic growth has controversies in the theoretical and empirical literatures of the study. Different researcher's tries to see their relationship in different time; different country and different methodology have been found different results. Based on the objectives and methodology of this study the researcher finds the following conclusions.

Based on the generalized least square regression result of the growth equation founded that real effective exchange rate has appositive and significant impact on economic growth and openness has no any significant impact on economic growth even the magnitude is negative implies that trade openness has no any impact the economic growth of East African countries. The reason behind is due to different natural barriers to trade, export dependence on primary commodities poor overland infrastructures the result supports the study conducted by Vasilika, pigika- balanika on 2006 on the impact of trade openness to economic growth. The bidirectional relationship between openness and economic growth is insignificant. In addition foreign direct investment external debt and the access to sea port has a positive and significant impact on economic growth.

On the openness equation the study uses the generalized least square with auto correlation order one results and finds that the access to sea port, capital formation, and labor force rate has appositive impact on openness and real effective exchange rate and tariff rate has negative impact on trade openness. Even if openness has no any significant impact on economic growth real effective exchange rate has a negative and significant impact on trade openness that implies that policies like devaluation and tariff have negative impact on trade openness on East Africa countries supports the study of Henok Arega 2012 on trade policy on Sub-Saharan Africa.

On the other hand GDP and real effective exchange rate has bidirectional appositive relationships. GDP has positive significant impact on the real effective exchange of the countries and vice versa, external debt stock has a negative impact on real effective exchange rate.

## 5.2 Recommendation

Based on the above conclusions and major findings the study has the following recommendations.

- The impact of trade openness on economic growth is insignificant as a result East African countries can promote and upgrading domestic investment to produce industrial products and shifting the domestic consumption to domestically produced goods and services this helps the country to reduce imports of goods and services and later increases export.
- Developing trade protection strategies in import of goods and services on luxury products, and those which domestically produced goods through imposing high tariffs and quotas on to shift the demands of the society to domestically produced goods and services, reducing tariffs and Quotas for investment materials for domestic investors those who are willing to invest mainly on adding values on primary exported commodities, adoption of technological products that leads to reduce the natural barriers, strengthen the government institutions (custom and tax) that leads to increase the efficiency of the economy.
- Real effective exchange rate has positive and significant impact implies that devaluation of domestic currency increases the demand to invest in these countries. Because of the fact that devaluation promotes the foreign investors to invest domestically, i.e. the cost of investment is low for foreign investors, like access to cheap labor & raw material. In doing this the role of government is in selecting appropriate investment sectors i.e. labor intensive investments and leads to reduce unemployment rate, controlling and facilitating activities of investors like infrastructure and institutional developments that reduce the bureaucracy system of government, revising rule and regulations that restrict the exporters of primary commodities and creating market channels for investors.

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## Appendixes

### Appendix 1 list of countries in the sample

	Madagascar	Ruanda	Zambia
Burundi			
Comoros	Mauritius	Sudan	
Ethiopia	Malawi	Tanzania	
Kenya	Mozambique	Uganda	

### Appendix 2 panel unit root tests

```
. xtunitroot ht lnreer
```

Harris-Tzavalis unit-root test for lnreer

Ho: Panels contain unit roots	Number of panels = 13
Ha: Panels are stationary	Number of periods = 15
AR parameter: Common	Asymptotics: N -> Infinity
Panel means: Included	T Fixed
Time trend: Not included	

	Statistic	z	p-value
rho	0.7555	-1.0678	0.1428

```
. xtunitroot ht lngdp
```

Harris-Tzavalis unit-root test for lngdp

Ho: Panels contain unit roots	Number of panels = 13
Ha: Panels are stationary	Number of periods = 15
AR parameter: Common	Asymptotics: N -> Infinity
Panel means: Included	T Fixed
Time trend: Not included	

	Statistic	z	p-value
rho	0.8798	1.2596	0.8961

. xtunitroot ht lngdppca

Harris-Tzavalis unit-root test for lngdppca

---

Ho: Panels contain unit roots                      Number of panels =     13  
Ha: Panels are stationary                         Number of periods =    15

AR parameter: Common                             Asymptotics: N -> Infinity  
Panel means: Included                             T Fixed  
Time trend: Not included

---

	Statistic	z	p-value
rho	0.8353	0.4275	0.6655

---

. xtunitroot ht lncapi

Harris-Tzavalis unit-root test for lncapi

---

Ho: Panels contain unit roots                      Number of panels =     13  
Ha: Panels are stationary                         Number of periods =    15

AR parameter: Common                             Asymptotics: N -> Infinity  
Panel means: Included                             T Fixed  
Time trend: Not included

---

	Statistic	z	p-value
rho	0.7565	-1.0494	0.1470

---

. xtunitroot ht lnedst

Harris-Tzavalis unit-root test for lnedst

Ho: Panels contain unit roots                    Number of panels =     13  
Ha: Panels are stationary                        Number of periods =    15

AR parameter: Common                            Asymptotics: N -> Infinity  
Panel means: Included                            T Fixed  
Time trend: Not included

---

	Statistic	z	p-value
rho	0.9104	1.8338	0.9667

---

. xtunitroot llc lnopp, lags(1)

Levin-Lin-Chu unit-root test for lnopp

Ho: Panels contain unit roots                    Number of panels =     13  
Ha: Panels are stationary                        Number of periods =    15

AR parameter: Common                            Asymptotics: N/T -> 0  
Panel means: Included  
Time trend: Not included

ADF regressions: 1 lag

LR variance:        Bartlett kernel, 7.00 lags average (chosen by LLC)

---

	Statistic	p-value
Unadjusted t	-3.9231	
Adjusted t*	-0.9229	0.1780

---

. xtunitroot llc lnimp, lags(1)

Levin-Lin-Chu unit-root test for lnimp

Ho: Panels contain unit roots                      Number of panels =        13  
Ha: Panels are stationary                            Number of periods =      15

AR parameter: Common                                Asymptotics: N/T -> 0  
Panel means: Included  
Time trend: Not included

ADF regressions: 1 lag  
LR variance:        Bartlett kernel, 7.00 lags average (chosen by LLC)

---

	Statistic	p-value
Unadjusted t	-4.8182	
Adjusted t*	-1.1859	0.1178

---

. xtunitroot llc lnexp, lags(1)

Levin-Lin-Chu unit-root test for lnexp

Ho: Panels contain unit roots                      Number of panels =        13  
Ha: Panels are stationary                            Number of periods =      15

AR parameter: Common                                Asymptotics: N/T -> 0  
Panel means: Included  
Time trend: Not included

ADF regressions: 1 lag  
LR variance:        Bartlett kernel, 7.00 lags average (chosen by LLC)

---

	Statistic	p-value
Unadjusted t	-2.0452	
Adjusted t*	0.5817	0.7196

---

. xtunitroot llc lntar, lags(1)

Levin-Lin-Chu unit-root test for lntar

Ho: Panels contain unit roots                      Number of panels =        13  
Ha: Panels are stationary                            Number of periods =      15

AR parameter: Common                                Asymptotics: N/T -> 0  
Panel means: Included  
Time trend: Not included

ADF regressions: 1 lag  
LR variance:        Bartlett kernel, 7.00 lags average (chosen by LLC)

---

	Statistic	p-value
Unadjusted t	-6.1637	
Adjusted t*	1.3271	0.9078

---

## Appendix 3 normality test

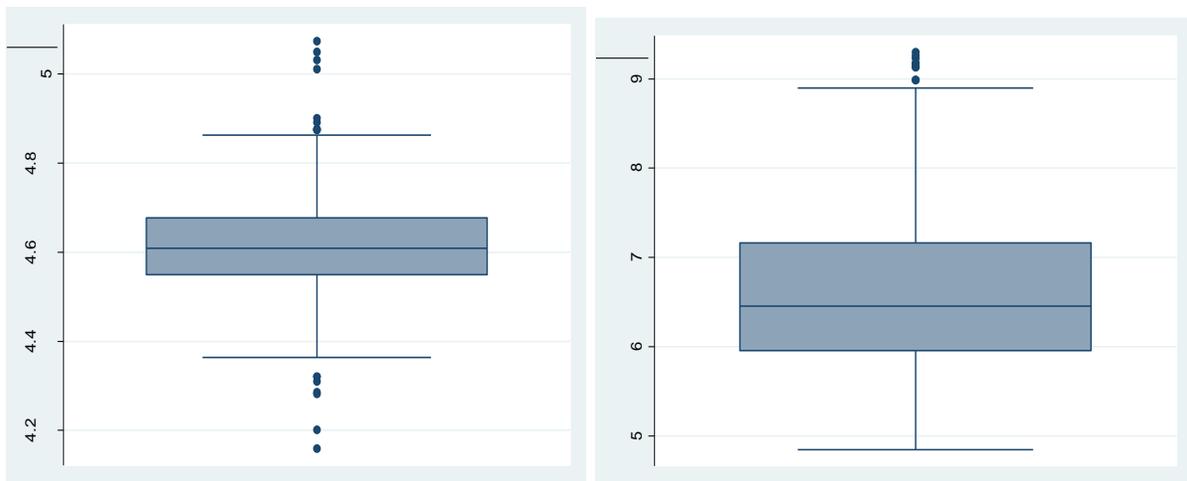
```
. xtset ID year
      panel variable:  ID (unbalanced)
      time variable:  year, 2004 to 2018
      delta: 1 unit

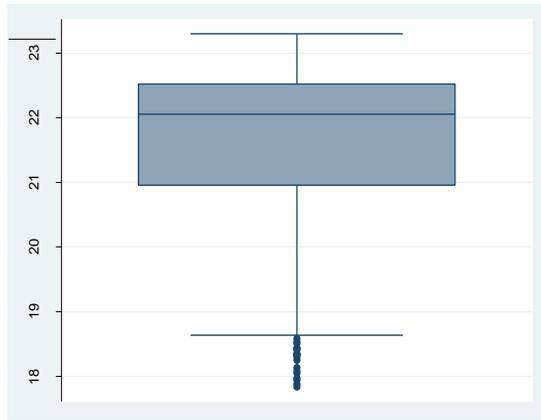
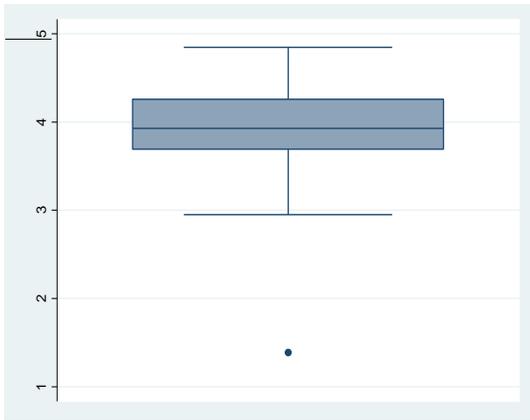
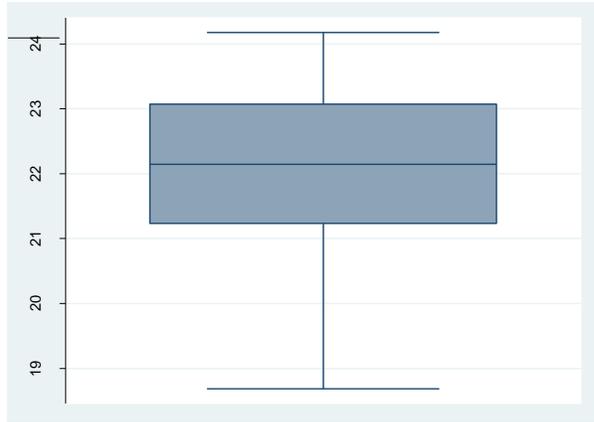
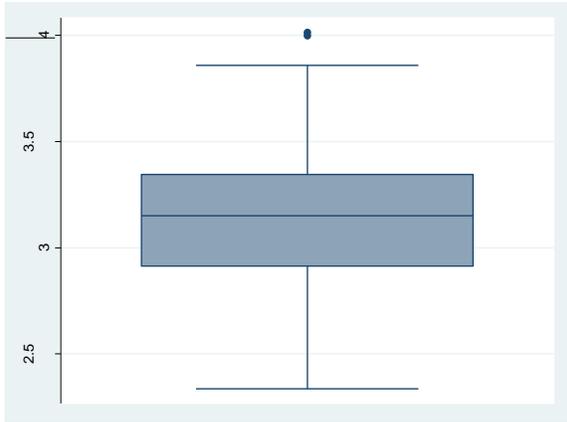
. sktest GDPPCA REER CAPI EDST opp GDP EXP IMP IMPU FDI GDPGR LABR LABT POP TAR INS
```

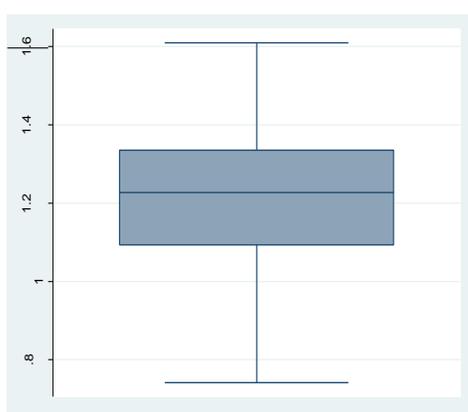
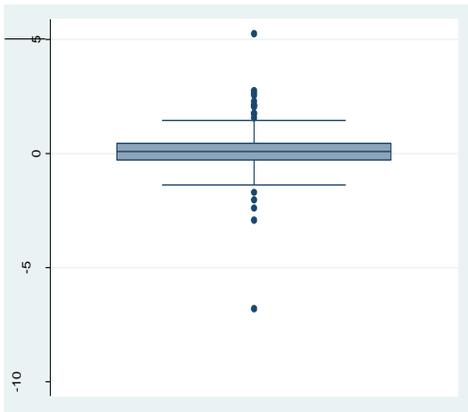
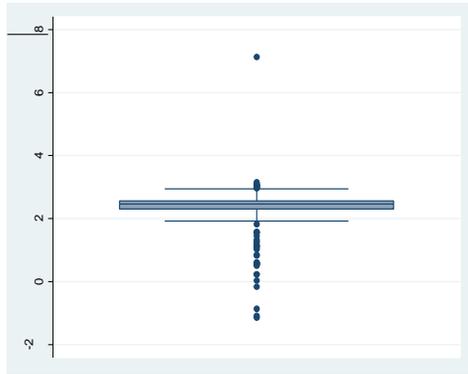
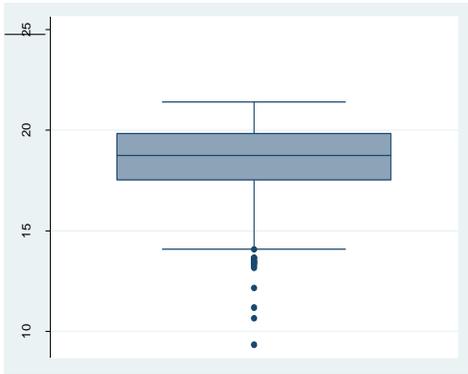
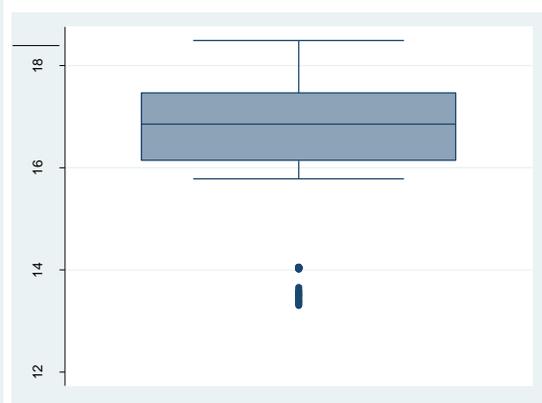
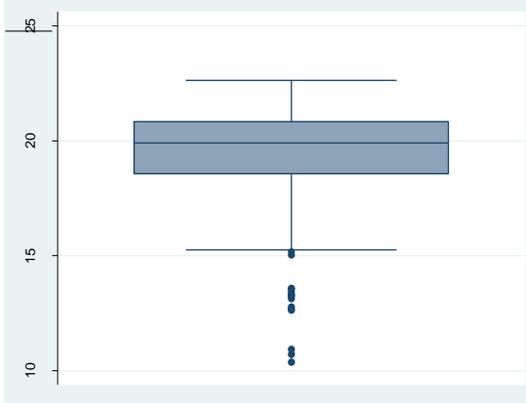
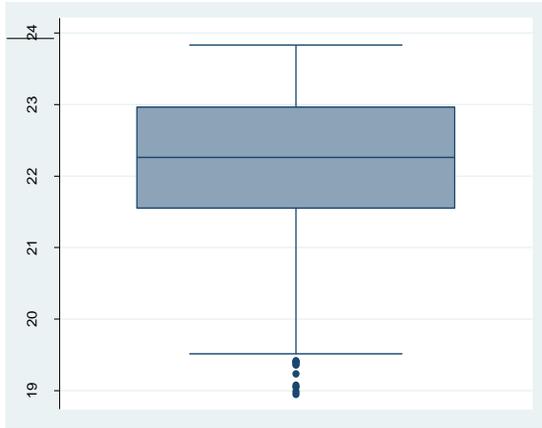
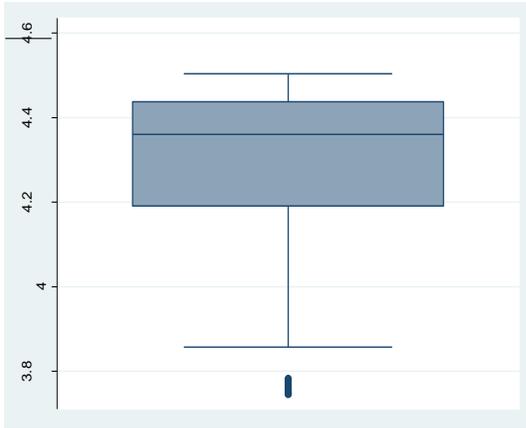
Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
GDPPCA	195	0.0000	0.0000	.	0.0000
REER	195	0.0000	0.0001	28.86	0.0000
CAPI	195	0.0000	0.0039	23.72	0.0000
EDST	195	0.0000	0.0947	28.15	0.0000
opp	195	0.0000	0.1130	22.47	0.0000
GDP	195	0.0000	0.0000	57.65	0.0000
EXP	195	0.0000	0.2316	19.12	0.0001
IMP	195	0.0000	0.0006	37.27	0.0000
IMPU	195	0.0000	0.3053	19.36	0.0001
FDI	195	0.0000	0.0000	.	0.0000
GDPGR	195	0.8082	0.0151	5.82	0.0544
LABR	195	0.0000	0.8111	20.23	0.0000
LABT	195	0.0000	0.0000	60.44	0.0000
POP	195	0.0000	0.0006	40.03	0.0000
TAR	195	0.0000	0.0000	.	0.0000
INS	195	0.3214	0.4439	1.59	0.4523

## Appendix 4 normality test on box plot







## Appendix 5 the specification tests

### Specification test for growth equation

```
. hausman fixed
```

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
lnreer	1.522117	1.524011	-.001894	.0150168
lnfdi	.0756754	.0750073	.0006681	.0016515
lnedst	.1527984	.1521849	.0006135	.0041158
lnopp	-.1418621	-.13766	-.0042021	.0080488

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

```
chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
          = 0.52
Prob>chi2 = 0.9711
```

### The specification test of openness equation

```
. hausman fixed .
```

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
lnreer	-.4883275	-.746086	.2577586	.1044828
lncapi	.3891355	.3796915	.009444	.0123123
lngdp	-.0983365	.0734868	-.1718233	.0826547
lnlabr	.6678983	1.30671	-.6388112	1.048745
lnlabt	.1698126	-.1729216	.3427341	.2513313
lntar	-.0595456	-.0660153	.0064697	.

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

```
chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
          = 3.09
Prob>chi2 = 0.7979
(V_b-V_B is not positive definite)
```

## Specification test of exchange rate equation

. hausman fixed .

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
lncapi	.0435877	.0498648	-.0062771	.
lnedst	-.0288361	-.038908	.0100719	.
lnopp	-.0885304	-.0931702	.0046399	.0059158
lngdp	.1777694	.1450968	.0326726	.0027465

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V\_b-V\_B)^(-1)](b-B)  
 = 54.19  
 Prob>chi2 = 0.0000  
 (V\_b-V\_B is not positive definite)

## Appendix 6 Multicollinearity test result

### Multicollinearity test of growth equation

. vif

Variable	VIF	1/VIF
lnfdi	2.22	0.449565
lnedst	2.14	0.468292
lnopp	1.14	0.878021
lnreer	1.12	0.895124
Mean VIF	1.65	

### Openness test for multicollinearity

. vif

Variable	VIF	1/VIF
lnlabt	6.09	0.164166
lngdp	3.44	0.291112
lnrar	2.44	0.409398
lnlabr	2.44	0.410141
lncapi	1.30	0.767972
lnreer	1.27	0.789666
Mean VIF	2.83	

## Multicollinearity test of exchange rate equation

```
. vif
```

Variable	VIF	1/VIF
lngdp	8.10	0.123447
lnedst	8.08	0.123689
ln capi	1.27	0.788289
lnopp	1.17	0.852949
Mean VIF	4.66	

## Appendix 7 The heteroskedasticity test results

### Heteroskedasticity test of growth equation

```
. hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of lngdppca

chi2(1) = 1.64

Prob > chi2 = 0.2005

### Openness heteroskedasticity test result

```
. imtest,white
```

White's test for Ho: homoskedasticity

against Ha: unrestricted heteroskedasticity

chi2(34) = 34.19

Prob > chi2 = 0.4586

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	34.19	34	0.4586
Skewness	11.37	7	0.1232
Kurtosis	1.00	1	0.3179
Total	46.56	42	0.2902

## Heteroskedasticity result of exchange rate equation

```
. hettest
```

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
```

```
Ho: Constant variance
```

```
Variables: fitted values of lnreer
```

```
chi2(1) = 3.44
```

```
Prob > chi2 = 0.0637
```

## Appendix 8 the regression results

### The result for growth equation

```
. xtregar lngdppca lnreer lnedst GEO lnopp lnfdi, re rhotype(theil)
```

```
RE GLS regression with AR(1) disturbances      Number of obs      =      195
Group variable: ID                            Number of groups   =      13

R-sq:                                         Obs per group:
  within = 0.6313                             min =              15
  between = 0.2081                            avg =             15.0
  overall = 0.2484                             max =              15

Wald chi2(6) = 218.08
corr(u_i, Xb) = 0 (assumed)                   Prob > chi2 = 0.0000
```

lngdppca	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
lnreer	1.430373	.1096219	13.05	0.000	1.215518 1.645228	
lnedst	.0790621	.0281868	2.80	0.005	.0238169 .1343073	
GEO	.7606844	.4281045	1.78	0.076	-.0783849 1.599754	
lnopp	-.0178011	.0335023	-0.53	0.595	-.0834645 .0478622	
lnfdi	.0305311	.0085053	3.59	0.000	.013861 .0472013	
_cons	-2.693339	.8672964	-3.11	0.002	-4.393209 -.9934698	
rho_ar	.7651742	(estimated autocorrelation coefficient)				
sigma_u	.77528644					
sigma_e	.11017404					
rho_fov	.9802052	(fraction of variance due to u_i)				
theta	.87063519					

## Result for openness equation

```
. xtregar lnopp GEO lnreer lncapi lngdp lnlabr lnlabt lntar, re rhtype(theil)

RE GLS regression with AR(1) disturbances      Number of obs      =      195
Group variable: ID                            Number of groups   =      13

R-sq:                                         Obs per group:
  within  = 0.2386                               min =      15
  between = 0.5982                               avg  =     15.0
  overall = 0.5006                               max  =      15

corr(u_i, Xb) = 0 (assumed)                    Wald chi2(8)       =     65.53
                                                    Prob > chi2        =     0.0000
```

lnopp	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
GEO	.3292275	.133839	2.46	0.014	.066908	.591547
lnreer	-.7468392	.1886487	-3.96	0.000	-1.116584	-.3770946
lncapi	.3810203	.0703501	5.42	0.000	.2431365	.518904
lngdp	.0842935	.0610254	1.38	0.167	-.0353141	.2039012
lnlabr	1.657657	.391219	4.24	0.000	.8908823	2.424432
lnlabt	-.1929545	.0787949	-2.45	0.014	-.3473897	-.0385192
lntar	-.047712	.0317561	-1.50	0.133	-.1099528	.0145289
_cons	.1179909	1.608451	0.07	0.942	-3.034516	3.270498
rho_ar	.15409904	(estimated autocorrelation coefficient)				
sigma_u	.20518145					
sigma_e	.21251841					
rho_fov	.48244027	(fraction of variance due to u_i)				
theta	.70183016					

## Result of exchange rate equation

```
. xtregar lnreer lncapi lnedst lnopp lngdp, fe rhtype(theil)

FE (within) regression with AR(1) disturbances  Number of obs      =     162
Group variable: ID                            Number of groups   =     12

R-sq:                                         Obs per group:
  within  = 0.5418                               min =      9
  between = 0.1069                               avg  =    13.5
  overall = 0.1227                               max  =    14

corr(u_i, Xb) = -0.8879                       F(4,146)          =     43.15
                                                    Prob > F          =     0.0000
```

lnreer	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lncapi	.0369598	.031403	1.18	0.241	-.0251034	.0990231
lnedst	-.0471964	.0174002	-2.71	0.007	-.0815853	-.0128075
lnopp	-.0246663	.0186226	-1.32	0.187	-.0614709	.0121383
lngdp	.258941	.0214127	12.09	0.000	.2166221	.3012599
_cons	-.4051361	.1512532	-2.68	0.008	-.7040647	-.1062074
rho_ar	.66053875					
sigma_u	.25378039					
sigma_e	.05636963					
rho_fov	.95298253	(fraction of variance because of u_i)				

F test that all u\_i=0: F(11,146) = 7.91 Prob > F = 0.0000