



COLLEGE OF BUSINESS AND ECONOMICS

**THE IMPACT OF NATIONAL SAVINGS ON ECONOMIC GROWTH IN
RWANDA.**

(1995-2014)

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in Science of Economics

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DECLARATION

I, IHIMBAZWE Egide, declare that this research report hereby submitted for the Master's Degree in Science of Economics, to University of Rwanda, Postgraduate Program, Gikondo Campus, apart from the help recognized, is my own work through the professional guidance of my supervisor whose name appears on the title page and has not been submitted before for any other academic qualifications at any University or Institution of Higher Learning.

IHIMBAZWE Egide

Signature Date: / / 2018

APPROVAL

I, Dr. Fidèle Mutemberezi, hereby approve that, I have been the supervisor of IHIMBAZWE Egide for this work and the student had followed carefully my guidance, I allow him to submit and defend this Thesis in Partial Fulfillment of Academic Requirements for the Award of Master's Degree in Science of Economics at University of Rwanda, Postgraduate Program.

Date...../...../ 2018

Dr. Fidèle Mutemberezi

Signature of supervisor

DEDICATION

This thesis is dedicated
To my late Parents and Brother
To my family
To all my friends and classmates

ACKNOWLEDGEMENTS

First, I thank the almighty God for protecting, strengthening and inspiring me during my life in general and in this research in particular.

Special appreciations are expressed to all lecturers from the University of Rwanda, Gikondo Campus especially in Science of Economics, Postgraduate Program and to all the academic and administrative staff of the University of Rwanda, for sharing their knowledge and expertise; for their contribution in educating throughout courses and conferences.

Special thanks are extended to my family; my friends and colleagues of class since they become great motivators in this work. I am profoundly grateful to my supervisor Dr. Fidèle Mutemberezi, for his support, attention, time, encouragement and guidance made me successfully complete within time.

May God bless you abundantly.

LIST OF ABBREVIATIONS

ADF	: Augmented Dickey-Fuller
BNR	: Banque Nationale du Rwanda
COE	: Compensation of employees
CUSUM	: Cumulative Sum
Dr.	: Doctor
ECE	: Economic Commission for Europe
ECM	: Error Correction Model
EG	: Engle and Granger
Eviews7	: Economic Views
FDIC	: Federal Deposit Insurance Corporation
GDI	: Gross Domestic Income
GDP	: Gross Domestic Product
GNI	: Gross national income
GNP	: Gross National Product
GOS	: Gross operating surplus
GVA	: Gross Value Added
JB	: Jarque-Bera
LGDP	: Logarithm of Gross Domestic Product
LM	: Lagrange Multiplier
MINECOFIN	: Ministry of Finance and Economics Planning

NBR	: National Bank of Rwanda
NISR	: National Institute of Statistic of Rwanda
NNI	: Net National Income
MENA	: Middle East and North Africa
OECD	: Organization for Economic Co-operation and Development
OLS	: Ordinary Least Squares
Prof.	: Professor
U.S.	: United States
UR	: University of Rwanda
USA	: United States of America
VAR	: Vector Autoregressive
β	: Betta
μ_t	: error term

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ABSTRACT

The general objective of this research is to examine the impact of national savings on economic growth of Rwanda. The findings reveals that in long run, R-squared which is a statistical measure of how close the data are to the fitted regression line; it can also be defined as the percentage of the response variable variation that is explained by a linear model has a value of 0.962498 which shows that control variables; National Savings, Gross Capital Formation and Exports of goods and services explain GDP at 96.24% level of significant as $R^2=0.962498$. This also indicates that when National Savings, Gross Capital Formation and Exports of goods and services rise by one percent the Gross Domestic Product increases increase by 0.962498, while error terms are held constant.

In the short run of this research $R^2 = 0.857078$ which means that the GDP is explained by National Savings, Gross Capital Formation and Exports of goods and services at 85.70% level of significance. An increase of 1% in independent variables; National Savings, Gross Capital Formation and Exports of goods and services induce an increase of 0.857078 in Gross Domestic Product if other things remain constant(error terms). These results let the researcher conclude that National Savings, Gross Capital Formation, Exports of goods and services and the Gross Domestic Products have been moving in an increasing but with stable economic way during the period of twenty years from 1995 up to 2014. Therefore, the research results are broadly in line with earlier findings in the literature, more work was done to investigate the extent at which the estimates/findings are strong to alternative measures of the deep characteristics of Rwandan economy.

Key words: Gross Domestic Product, National Savings, Gross Capital Formation and Exports of Goods and Services.

CHAPTER 1: GENERAL INTRODUCTION

1.1. Background of the study

Saving is an income not spent, or deferred consumption. Methods of saving include putting money aside in, for example, a deposit account, a pension account, an investment fund, or as cash. Saving also involves reducing expenditures, such as recurring costs. In terms of personal finance, saving generally specifies low-risk preservation of money, as in a deposit account, versus investment, wherein risk is higher; in economics more broadly, it refers to any income not used for immediate consumption. (Dell'Amore Giordano, 2007).

There is some disagreement about what counts as saving. For example, the part of a person's income that is spent on mortgage loan repayments is not spent on present consumption and is therefore saving by the above definition, even though people do not always think of repaying a loan as saving. However, in the U.S. measurement of the numbers behind its gross national product (i.e., the National Income and Product Accounts), personal interest payments are not treated as "saving" unless the institutions and people who receive them save them. (Modigliani, Franco, 2009).

However, increased saving does not always correspond to increased investment. If savings are stashed in or under a mattress, or otherwise not deposited into a financial intermediary such as a bank, there is no chance for those savings to be recycled as investment by business. This means that saving may increase without increasing investment, possibly causing a short-fall of demand (a pile-up of inventories, a cut-back of production, employment, and income, and thus a recession) rather than to economic growth. In the short term, if saving falls below investment, it can lead to a growth of aggregate demand and an economic boom. In the long term if saving falls below investment it eventually reduces investment and detracts from future growth. Future growth is made possible by foregoing present consumption to increase investment. However savings kept in a mattress amount to an (interest-free) loan to the government or central bank, who can recycle this loan. (Kotlikoff, Laurence J., 2008).

In a primitive agricultural economy, savings might take the form of holding back the best of the corn harvest as seed corn for the next planting season. If the whole crop were consumed, the economy would deteriorate to hunting and gathering the next season. Within personal finance, the act of saving corresponds to nominal preservation of money for future use. A deposit account paying interest is typically used to hold money for future needs, i.e. an emergency fund, to make a capital purchase (car, house, vacation, etc.) or to give to someone else (children, tax bill etc.).

Within personal finance, money used to purchase shares, put in a collective investment scheme or used to buy any asset where there is an element of capital risk is deemed an investment. This distinction is important as the investment risk can cause a capital loss when an investment is realized, unlike cash saving(s). Cash savings accounts are considered to have minimal risk. In the United States, all banks are required to have deposit insurance, typically issued by the Federal Deposit Insurance Corporation or FDIC. In extreme cases, a bank failure can cause deposits to be lost as it happened at the start of the Great Depression. The FDIC has prevented that from happening ever since.

In many instances the terms saving and investment are used interchangeably. For example, many deposit accounts are labeled as investment accounts by banks for marketing purposes. As a rule of thumb, if money is "invested" in cash, then it is savings. If money is invested in a type of asset which can fluctuate in nominal value, then it is an investment. (David R. Henderson, 2013).

In Economics, Savings are defined as $\text{Income} - \text{Consumption}$.

The rate at which people can be expected to do this is called the Marginal propensity to save or Average propensity to save. The rate of savings is directly related to both the interest rate and investment, largely by way of the capital markets. It is worth noting that some investment is considered savings. If investment merely replaces depreciated capital stock, rather than increasing the capital stock and workforce, it is still considered part of savings.

Developing countries are always constrained by inadequate savings and investment, for instance economic development in Sub-Saharan Africa has been constrained by inadequate savings and investment, (Wollasa. L.Kumo, 2011), this is one of the reasons behind Africa is still known as "the world's poorest continent" (Gimbari, June 2, 2002).

Rwanda's has registered a steady growth of national savings as a proportion of GDP, this positive growth trend from a low level of about 5% of GDP in 2009 to 15.3% in 2013. Although national savings have grown steadily over time, they are still less than 20% which is the target by 2018 and also it is still very low when compared to other developing countries like Botswana where Savings as a percentage of GDP was 29% in 2008 and East Asia that saves more than 30% of gross national disposable income (GNDI).

When we look at the low level of saving rate in terms of sustained economic transformation, it implies that per capita incomes among Rwandan population is growing at a slow rate which may affect the impact of current economic growth into improved standards of living. It is also a constraint on resource mobilization which is a key factor to sustaining productivity driven economic transformation in the largely informal private sector. The low domestic saving rates in Rwanda can be attributed partly to a low saving culture, limited access to banking facilities especially in the rural areas and low incomes which translates into low savings for a significant portion of the population that cannot access banks. In a bid to increase domestic savings and access to finance for the rural population the government has established SACCOs through umurenge program which is a savings cooperative at grass root level. Where local people save in the cooperative with government supplementing the funds and the moment it reaches a certain threshold. Other members of the community can then borrow from the SACCOs and pay back in order to sustain the revolving funds under the SACCO umurenge program (Dickson Malunda, 2015).

1.3. Problem statement

Despite the fact that the government of Rwanda has put a lot of effort in improving the savings level of the country and that of the local population through several programs the national savings are still very low (Dickson Malunda,2015). This means that investments and fixed capital formation that all outcomes from adequate savings within an economy are both low. The low domestic saving rate in terms of sustained economic transformation implies that per capita incomes among Rwandan population is growing at a slow rate which may affect the impact of current economic growth into improved standards of living. It is also a constraint on resource mobilization which is a key factor to sustaining productivity driven economic transformation in the largely informal private sector. Due to inadequate saving, Rwanda is forced to borrow from other sources such as multinational companies, International Monetary fund and other countries thus the ever increasing debt burden which has in turn lead to low the gross domestic product (GDP) since funds that should be invested to increase gross production is used to repay the debt.

1.4. Research objectives

The objectives of the study are categorized as general and specific objectives as shown below:

1.4.1. General objective

The general objective of this research is to examine the impact of national savings on economic growth of Rwanda.

1.4.2. Specific objectives

- To determine at which extend other control variables (Gross Capital Formation, Exports of goods and services) influence the economic growth of Rwanda.

1.5. Hypotheses of the study

By assuming a 5% level of significance, and test the following hypothesis:

H₀: National savings have a positive impact on economic growth of the Rwandan economy.

1.6. Scope of the study

The researcher's work has periphery, as each scientific study requires delimitation, it's necessary to limit the study in the area for the definition of the researcher's extent of his study. This delimitation concerns the time, area and domain whereby this study refers to.

1.6.1. Scope In time

The researcher's study covers the period of twenty years, from 1995-2014.

1.6.2. Scope in domain

The research focused on national savings and economic growth, where it is related to the components of economic terms as scope in domain, such as macroeconomic and econometrics.

1.6.3. Geographical scope

The researcher's study is oriented in all area of Rwanda means that in space, this study is limited in Rwanda as a country.

1.7. Significance of the study

The interests of this study are the important policies and implications that bring out; therefore, this research is useful to the researcher, to the society of Rwanda and to scientific field.

1.7.1. Interest to the researcher

This research enabled the researcher to apply macroeconomic theories into the reality, especially the relationship between national savings and economic growth. This allowed the researcher to acquire the knowledge and skills in domain of macroeconomic fields. In addition, this study has to empower the student to fulfill the necessary requirements for the award of Masters' degree of Science in Economics, as a part of regulation of UR.

1.7.2. Academic interest

The study will be kept in the library and it will be served as reference by student of UR and other universities in carrying out their research. As scientific interest, the result of this research has to be used by other researchers who will carry out the related research topics.

1.7.3. Interest to policy makers

Based on the findings of this research, policy makers may use this research's findings and take adequate measures which may affect positively the economic growth in Rwanda (GDP).

1.8. Structure of the thesis

This study is structured into five chapters:

The first chapter covered the introductory part of the study which includes introduction, statement of the problem, purpose of the study, research objectives, research questions; research hypotheses, the significance of the study, the scope the study, the research methodology and organization of the study, this chapter generally gives an overview of what the study is aiming to. The second chapter encompassed a review of the relevant literature by other researchers in relation to the topic under the study; it also gives the definitions of key terms in the topic among other.

The third chapter presented the research methodology, it focused on the methodology that has been used while carrying out the research, and it was composed of research design, the sources of data collection methods, data analysis and the limitation of the study.

The fourth chapter presented the data collection, analysis and the interpretation of the results on econometric models of variables. The chapter five concerned with the summary of the study, conclusion and recommendations.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter provides different perception of various authors theoretically and empirically of the existing issues that have been explored and studied about the topic. It is basically related to the views extracted from the books, internet, reports etc.

2.2. Definition of key terms

This part named the definition of key terms is aiming to make deep understanding of variables:

Savings

Saving is income not spent, or deferred consumption. Methods of saving include putting money aside in, for example, a deposit account, a pension account, an investment fund, or as cash. Saving also involves reducing expenditures, such as recurring costs. In terms of personal finance, saving generally specifies low-risk preservation of money, as in a deposit account, versus investment, wherein risk is higher; in economics more broadly, it refers to any income not used for immediate consumption. (Dell'Amore Giordano, 2007).

Economic Growth

Economic growth is the increase in the market value of the goods and services produced by an economy over time. It is conventionally measured as the percent rate of increase in real gross domestic product, or real GDP, of more importance is the growth of the ratio of GDP to population. An increase in growth caused by more efficient use of inputs is referred to as intensive growth. GDP growth caused only by increases in inputs such as capital, population or territory is called extensive growth (Daniels J., Radebaugh L., Sullivan D., 2007).

Gross Capital Formation (GCF)

Average annual growth of gross capital formation based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant,

machinery and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.

□ **Exports of Goods and Services**

Exports are the goods and services produced in one country and purchased by citizens of another country. It doesn't matter what the good or service is. It doesn't matter how it is sent. It can be shipped, sent by email, or carried in personal luggage on a plane. If it is produced domestically and sold to someone from a foreign country, it is an export (Kimberly Amadeo, 2017).

2.3 Theoretical literature review

A number of researchers have studied about the relationship between savings and Economic growth in Sub-Saharan African countries and East Asian countries.

According to Nkash (1997), savings is seen as the amount of income per time that is not consumed by economic units. Accordingly, Samuelson (1998) defined savings as income minus consumption; following the above, savings can be made by individuals (personal or private saving) or by corporate organizations such as firms (corporate savings or retained savings). Personal savings is that part of disposable income that is not consumed, while corporate savings is that part of the firm's profit that is not distributed as dividends to shareholders. Therefore, for a country, the total supply of available savings is simply the sum of domestic savings and foreign savings. Igbatayo & Agbada (2012) noted that higher level of national savings leads to higher investment and consequently higher output. This is so because the level of savings determines the magnitude of capital accumulation. On the other hand, the magnitude of total earnings depends on the level of total output, thus output also determines the level of savings (capital accumulation) and investments by households and business.

Steven L and Nelson C.M (2011) Rick Harbaugh (2004) mentioned that China's high saving rate is the engine for its economic growth. Markin (2006) also reported that high level of saving and investment is always good for a country because it will accumulate the capital stock and hence increase the economic growth.

Hugues Kamewe-Tsafack (2010) reported that low saving rate is hindrance to the economic growth and in sub-Saharan Africa, saving rate is very low compared to other developing countries and main reason for this low savings is the low interest rate and high inflation. These negative interest rates encourage people to invest their money in tangible goods instead of investing it in the productive financial sector.

Even though most of the researchers agree and argue for capital formation and this capital formation is mobilized in the form of savings; so savings is an accelerating factor for economic growth, Keynes considered that to some extent savings are a constraint for economic growth (paradox of thrift) but Daniel L Thorton's study (2009) Provides the evidence that a higher savings rate does not mean less consumption, but it could result in more capital investment and ultimately, a higher rate of economic growth. However at the same time, he did not exclude the possibility that a higher savings rate can slow economic growth in the short run. But he believes that negative effect of higher saving rate on short run economic growth has been offset by the positive effect of other factors.

In the classical growth theory which has been developed by economists Adam Smith, David Ricardo, and Thomas Robert Malthus, they modeled it using an idea of "subsistence level". They believed that the GDP increase or decrease as an effect of an increase or a decrease of the population growth relative to the subsistence level, which means that if the real GDP rose above the subsistence level of income, the population would increase to match it, thus bringing the GDP to the subsistence level. Alternatively, if the real GDP fell below this subsistence level, parts of the population would die off and real income would rise back to the subsistence level. It was sort of like an equilibrium level that real GDP would always revert to in this theory. They also focused on the effects of technological progress, the concept of division of labor and the changes in production methods. To understand the real growth processes, they went up by analyzing the effects of population growth, capital and technical innovation within a scarce natural resources environment.

In his book *Wealth of Nations* Adam Smith emphasized on the impact of capital accumulation on labor productivity into the growth process. He stated two different circumstances determining the income per capita in every nation where he stated that; it is firstly determined by the skill, dexterity, and judgment with which its labour is generally applied; and, secondly, by the

proportion between the number of those who are employed in useful labour, and that of those who are not so employed.(Heinz D. Kurz and Neri Salvadori, *The Theory of Economic Growth: a 'Classical' Perspective*). Further to his analysis, he completed by emphasizing that the extent of the market may be a limiting factor of the division of labor; where he insisted that the larger is the market, the larger is the division of labor among people and among firms but that larger division of labor increases the productivity of labor for all firms. Despite the presence of increasing returns, Smith retained the concept of a general rate of profit. His argument appears to be implicitly based on the hypothesis that each single firm operates at constant returns, while total production is subject to increasing returns.

In the Neoclassical growth model, Harrod - Domar growth model was named after two well-known economists, Sir Roy Harrod of England and Professor Evesey Domar from the US. It is a conventional empirical that helps people to understand the economic growth rate derive from the productivity of capital and the savings level.(Pinchawee Rasmidatta), This model states that every economy must save a certain proportion of its national income, if only to replace worn-out or impaired capital goods (buildings, equipment, and materials). However, in order to grow, new investments representing net additions to the capital stock are necessary (Michael P. Todaro, Stephen C. Smith). The famous equation in the Harrod- Domar theory of economic growth, states simply that the growth rate is determined jointly by the national savings ratio and the national capital-output ratio.

In the year 1956, Robert Solow and Trevor Swan independently developed a model with mathematical characteristics, and proved to be a convenient starting point for various extension models such as the Ramsey-Cass-Koopmans Model (RCK) and Diamond Model. The model mainly focused on four variables available at any time in an economy with some amounts of capital, labor and knowledge or effectiveness of labor which are all combined to produce output (Y). Further to their research and they proved that, a change in the saving rate has a level effect but not a growth effect: it changes the economy's balanced growth path, and thus the level of output per worker at any point in time, but it does not affect the growth rate of output per worker on the balanced growth path. Indeed, in the Solow model only changes in the rate of technological progress have growth effects; all other changes have only level effects.

The relevant literature generated a mixed view regarding the relationship between savings and Economic growth. Some of the researches explain that savings cause the economy to grow; however some other certain works argue that economic growth granger causes savings.

2.4 Empirical Literature Review

Odhiambo (2008 and 2009) conducted a study in Kenya in 2008 and another one in South Africa in 2009 to study the relationship between savings and economic growth in these two countries. They used causality and co-integration test to analyze the relationship between the variables and the study proved that there is a positive relationship between savings and economic growth. Anorou.E & Ahmad.Y (2001) investigated the relationship between savings and economic growth in 7 African countries, Congo, Cote d'ivoire, Ghana, Kenya, Nigeria, South Africa and Zambia using vector error correction model. The result indicated that there is a long run relationship between economic growth and saving. Also they found that savings granger causes growth in Congo and there is bi-directional causality in South Africa and Cote d'ivoire.

Jagadeesh(2015) in a study *The Impact of Savings in Economic Growth: An Empirical Study.* investigated the role of savings in Economic growth in Botswana. In the study he applied the Harrod –Domar growth model to the Economy and performed his test is basing on the Auto Regressive Distributed Lagged (ARDL) model by Pesaran, Shin and Smith (1999) to check the existence of a long run relationship between Gross Domestic Product and Gross Domestic savings in Botswana. he further used DOLS approach in order to identify dynamic long run co integration between GDP and its independent variables. And he tested the stationarity and co integration of Botswana's time series data for the period of 1980 to 2013. The test results revealed that there is significant relationship between Savings and Economic growth and the study supported Harrod Domar growth Model. He concluded by suggesting Policies to accelerate Economic growth in the country.

Aghion et al (2009) in their paper *When Does Domestic Saving Matter for Economic Growth?*; aimed at answering their question of *Can a country grow faster by saving more?* they addressed this question both theoretically and empirically. In the theoretical model, growth results from innovations that allow local sectors in poor countries to catch up with frontier technology; requires the cooperation of a foreign investor who is familiar with the frontier technology and a domestic entrepreneur who is familiar with local conditions. In such a country, domestic saving matters for innovation, and therefore growth, because it enables the local entrepreneur to put

equity into this cooperative venture, which mitigates an agency problem that would otherwise deter the foreign investor from participating. In rich countries, domestic entrepreneurs are already familiar with frontier technology and therefore do not need to attract foreign investment to innovate, so domestic saving does not matter for growth. A cross-country regression shows that lagged savings is positively associated with productivity growth in poor countries but not in rich countries. The same result is found when the regression is run on data generated by a calibrated version of our theoretical model. They concluded that domestic saving is more critical for adopting new technologies in developing than in developed economies.

Turan and Gjergji (2014) in their paper *What is the Impact of Savings on Growth? The Case of a Small Open Economy (Albania)*; wanted to answer the following question *Does economic growth come as a result of increasing the saving rate of a country?* Their study aimed at indicating the causal relationship that exists between savings and economic growth in Albania between the years 1992 and 2012 they implemented the Johansen Co integration test. And the empirical results revealed that savings and economic growth are co integrated, therefore showing the existence of a stable long-run equilibrium relationship. Their results also showed that a positive relationship exists between savings and economic growth and the complementary role of FDI in growth. They recommended that the government must pay special attention toward FDI policies in order to positively affect Economic Growth of the country.

Sothan (2014) in this study *Causal Relationship between Domestic Saving and Economic Growth: Evidence from Cambodia* attempts to determine the direction of causality between domestic saving and economic growth in Cambodia, using data for the period 1989–2012. He based the empirical analysis on the Granger Causality Test. The study found that domestic saving does not Granger cause economic growth. His finding is contrary to the conventional wisdom that causality runs from saving to economic growth. He also found that Economic growth itself did not Granger cause saving. He therefore concluded that domestic saving and economic growth are independent of each other in Cambodia.

Al-Foul (2010) in his study *The Causal Relation between Savings and Economic Growth: Some Evidence from middle east and north Africa (MENA) Countries* examined empirically the long-run relationship between real gross domestic product (GDP) and real gross domestic saving (GDS) for Morocco (1965-2007) and Tunisia (1961-2007) using a newly developed approach to co integration by Pesaran et al. (2001) The empirical results reveal that in the case of Morocco a

long-run relationship exists between the variables, while no evidence of long-run relationship to exist in the case of Tunisia. The Granger causality test supports bidirectional causality between economic growth and saving growth in Morocco. However, in the case of Tunisia, the results suggest that there is a unidirectional Granger causality between real GDP and real GDS and runs from saving growth to economic growth.

Rasmidatta (2011) studied the relationship between domestic saving and economic growth and convergence hypothesis: case study of Thailand. The main objective of the study was to investigate the causality relationship between the domestic saving and economic growth of Thailand. He wanted to analyze the direction of causality between domestic saving and economic growth. Thus he conducted Granger causality test using time series annual data from 1960 to 2010, and the empirical result suggests that the direct of causality go from economic growth to domestic saving only.

This paper also examined whether the convergence hypothesis does hold in Thailand. And for this he checked whether or not Thailand is in the process of convergence, catching up, lagging behind, loose catching up, loose lagging behind or divergence over time compared with other developed countries. This test was conducted in pair wise between Thailand-Singapore, Thailand-United States, Thailand-United Kingdom, deployed data from 1970 to 2010 and the Augmented Dickey–Fuller (ADF) Test. The regression results demonstrate that convergence hypothesis does not hold in Thailand while the Granger Causality results showed that economic growth rate does lead to growth of domestic savings but only in Thailand. Thus, in order to learn the effect of gross domestic saving per capita growth rate can help narrow the different of GDP between two countries concerned, this paper further examined the correlation of two variables using OLS methods to investigate the correlation between gross domestic saving growth rate and the different of GDP per capita between Thailand and Singapore. The test also examined whether saving does help support convergence hypothesis for Thailand or not. But the test results shows that domestic saving growth rate does not help narrowing the range of different of income of Thailand and Singapore which mean that domestic saving growth rate does not support the convergence hypothesis in Thailand.

Opschoor (2015) studied The Effects of Saving on Economic Growth Does more saving lead to more growth? The study aimed at providing a thorough analysis of the relationship between saving and economic growth both theoretically and empirically. Empirically he performed a

Granger causality test and different panel data studies. The causality test showed that a majority of the countries in the data set show a causal relation between gross domestic saving and real per capita economic growth, but the direction is ambiguous. The results indicate that the direction of causality might depend on a country's income level. Findings from the panel data studies show that saving does have a positive significant effect on economic growth; it also shows that gross domestic saving rate positively affects the real per capita economic growth rate. Result after dividing the saving rate into private and public saving, indicated that public saving has a positive significant effect on economic growth. But there was no significant effect for private saving on real per capita economic growth.

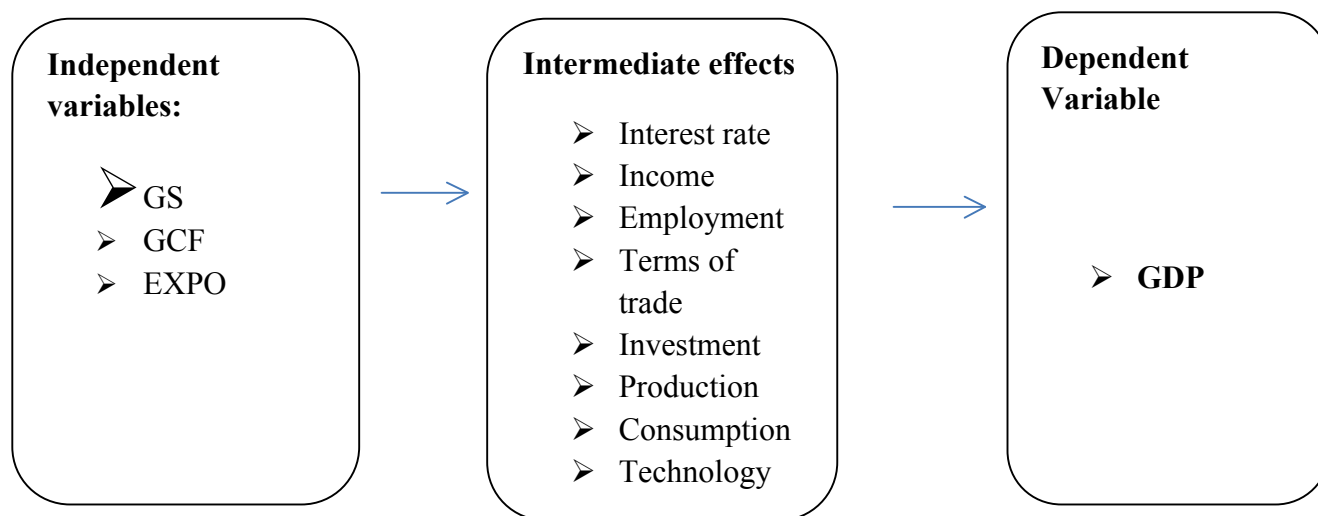
Mphuka (2010) investigated the causality between savings and economic growth in Zambia using bivariate vector auto-regression (VAR) estimation procedure. The test indicated that economic growth granger cause savings, even though the article argues that savings may influence the economic growth indirectly, because the savings will cause to accumulate capital and to inject the technologies from developed countries, in fact the technologies are the key to the economic growth. Romm A.T (2005) used Johansen VECM estimation technique to study the relationship between Growth and Savings in South Africa. The study confirmed that private saving rate has direct as well as indirect effect on economic growth.

Sajid and Sarfraz (2008) in their study savings and economic growth in Pakistan: an issue of causality investigated the causal relationship between savings and output in Pakistan by using quarterly data for the period of 1973:1 to 2003:4.using the co-integration and the vector error correction techniques they explored causal relationship between savings and economic growth. Their results suggested bi-directional or mutual long run relationship between savings and output level. However, there is unidirectional long run causality from public savings to output (GNP and GDP), and private savings to gross national product (GNP). The results also indicate that the speed of adjustment in case of savings is stronger than that of level of output. Their results of the overall long run results of the study favour the capital fundamentalist's point of view that savings precede the level of output in Pakistan. The short run mutual relationship exists between gross domestic product (GDP) and domestic savings. The results also indicate unidirectional short run causality from gross national product (GNP) to national and domestic savings; and from gross domestic product (GDP) to public savings. And finally they found that the short run causality runs only from national savings to gross domestic product (GDP). So overall short run results

favour Keynesian point of view that savings depend upon level of output. They recommended that an economic environment is stable, predictable that rewards savers be created among many others.

2.5. Conceptual framework

This part of conceptual framework shows and presents the aim and literature of variables, which can be two or more than two variables as follow:



2.6 Research gap

Many researchers have studied the impact of savings and came up with the various results depending on the case under consideration. Unfortunately, none of them has particularly studied at which extent national savings have impacted the economic growth of Rwanda. This study is set to investigate and bring new perspective which may contribute to policy makers' decision.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter three shows the technique of data collection and the methods of data analysis. It presents how the econometric model has been constructed.

3.1. Research design of the study

In this part of research design, the researcher has referred to outline, plan or strategy specifying the procedure to be used in investigating the research problem. In the due course the researcher collected relevant data needed to test the research hypotheses. In this study the researcher has adopted a case study approach, whereby Rwandan economy was particularly chosen.

3.2. Methodology of the study

The researcher has used quantitative as an approach that believes in quantifying responses in different levels, it uses statistical conclusions such as mean, percentages, standard deviation etc.

3.3 Source of data

Documentary sources (library and internet search) has been used in order to collect secondary data of Gross savings, Gross capital formation, Exports of goods and services and Gross Domestic Product from the period under study (1995-2014) through structured and unstructured of research guide of National Institute of Statistic of Rwanda (NISR), The ministry of finance and economic planning (MINECOFIN), The national bank of Rwanda(BNR) and World Development Indicators (on-line version- <http://www.worldbank.org/datastatistics>).

3.4 Models specification

To address this issue, this chapter is based on the study of the combined effect of such National savings, Gross Capital formation, Exports of goods and services on GDP in Rwanda, the researcher can't ignore that the GDP is explained by many variables, but here the researcher is going to analyze this effect in supply function by using real GDP as endogenous variable and

national savings, gross capital formation, and exports of goods and services as exogenous variables.

Mrs. Dhanya Jagadeesh in 2015 conducted a study in order to investigate the impact of savings on economic growth in Botswana, where she started by using the original version of Harrod Domar model, represented in the following form:

$$G = (\Delta Y/y) = (s / k)$$

This equation shows positive relationship between the Economic growth and Savings rate. It can be rewritten and extended with other variables that determine economic growth.

$$GDP = f(GDS, GCF, EXPO, INFL, LBR)$$

Where:

GDP =Economic Growth, GDS= Gross Domestic Savings, GCF = Gross Capital Formation, EXPO = Export, INFL = Inflation Rate. LBR = Labour Force.

The linear form of the above equation equation expressed as

$$GDP = \theta_0 + \theta_1 GDS + \theta_2 GCF + \theta_3 EXPO + \theta_4 INFL + \theta_5 LBR$$

Econometrically by including random term, then the model will be expressed as:

$$GDP = \theta_0 + \theta_1 GDS + \theta_2 GCF + \theta_3 EXPO + \theta_4 INFL + \theta_5 LBR + \mu_t$$

Where μ_t = Error Term.

The above model has been used as a reference model, which in turn enabled the research to make a model specification in the following form:

$$\mathbf{LRGDP_t = \beta_0 + \beta_1 LGS_t + \beta_2 LGCF_t + \beta_3 EXPO_t + \mu_t}$$

Where,

LRGDP: Logarithm of Real Gross Domestic Product

LGS: Logarithm of National savings

LGCF: Logarithm of Gross Capital formation

EXPO: Exports of goods and services

B₁, β₂ and β₃ are parameters of model

B₀ is constant or intercept

μ_t is standing for error term

3.5 Technique of Data Analysis

Method of data analysis simply means the statistical total or technique utilized in processing the data collected, with a view to arriving at valid conclusions. The statistical technique adopted for this study is simple regression econometric procedure. The study commenced its analysis with Dickey-Fuller test, to verify, the stationary variables so as to avoid spuriousness of empirical result. The t-test was employed to ascertain the significance of each of the constant parameters, while the diagnostic test based on the coefficient of determination (R^2) was used to check for the goodness of fit of the model. The Durbin-Watson statistic will be employed also to measures the serial correlation in the residuals.

3.6. Tools of data analysis

Secondary data collected and analyzed by the researcher by using the frequency distribution and percentage calculation where the Economic Views 7 (E-Views 7) software has been used during the data analysis and interpretations.

CHAPTER 4: DATA ANALYSIS AND RESEARCH FINDINGS

4.1 Introduction

In this chapter, the researcher analyzed the econometric relationship between National Savings, Gross Capital Formation, Exports of goods and services and Gross Domestic Product in Rwanda for the period under study.

From the model of Mrs Dhanya Jagadeesh, this in turn enabled the researcher to make a model specification in the form of:

$$\text{LRGDP}_t = \beta_0 + \beta_1 \text{LGS}_t + \beta_2 \text{LGCF}_t + \beta_3 \text{EXPO}_t + \mu_t$$

Where,

LRGDP: Logarithm of Real Gross Domestic Product

LGS: Logarithm of National savings

LGCF: Logarithm of Gross Capital formation

EXPO: Exports of goods and services

β_1 , β_2 and β_3 are parameters of model

β_0 is constant or intercept

μ_t is standing for error term

4.2 Expected Signs

$\beta_1 > 0$: this means that the explanatory variable LGS as endogenous variable is positively related to RGDP. This simply means that when there is an increase in GS we experience an increase in Real GDP as exogenous variable; (researcher, August 2017).

$\beta_2 > 0$: this means that the explanatory variable Gross Capital formation as endogenous variable is positively related to RGDP as exogenous variable. This simply means that when there is an

increase in Gross Capital formation we experience an increase in Real GDP as exogenous variable; (researcher, August 2017).

$\beta_3 > 0$: this means that the explanatory variable exports of goods and services as endogenous variable is positively related to real Gross Domestic Product as exogenous variable; (researcher, August 2017).

4.3 Stationary test

Time series data are assumed to be generated through stochastic or random process. This means that such a series has a mean, variance and covariance (between two time periods) that are all time invariant (Gujarati, 1995). Such a time series is said to be stationary and can be used to establish meaningful relationships between economic variables. However, if it is non-stationary, that is if the mean or variance or covariance or both are time variant, this will lead to spurious correlation amongst economic variables. Thus it is important to test for stationarity using the Augmented Dickey Fuller (ADF) unit root test. For a variable to be stationary at a particular order of integration, say I (0) or I (1), the ADF test statistic must be greater than the critical value in absolute terms. If it is not stationary then it must be differenced. If differenced once, then it is I(1), it twice then I (2), and so on. It's worth noting that most economics data is usually differenced once or twice only. In order to receive consistent, reliable results, the non-stationary data needs to be transformed into stationary data. In contrast to the non-stationary process, the stationary process reverts around a constant long-term mean and has a constant variance independent of time. Results for the unit root tests for the series LGS, LGCF, EXPO and LGDP at levels is presented in table below.

Table 1: Unit root test at level

Macro variable	ADF t-statistics	ADF P value	Comment
LGS	-3.9957	0.0093	Stationary
LGDP	-4.8201	0.0013	Stationary
LGCF	-0.1475	0.9302	Non stationary
EXPO	-1.1562	0.6704	Non stationary

Source: Author calculation (E-views). August, 2017

The above table shows that in absolute terms, the p- values of the ADF test statistics for the variables LGS and LGD are less than 0.05(5% significant level), thus they are stationary at 5% significant level. Therefore we fail to reject the null hypothesis for all the variables and conclude that variables LGS and LGDP are stationary at I(0) . For variables LGCF and EXPO, the first difference was taken. The results are presented in below table:

Table 2: Unit root test at first difference

Macro variable	ADF t-statistics	ADF P value	Comment
LGCF	-4.060	0.0066	Stationary
EXPO	-5.4959	0.0004	Stationary

Source: Author calculation (E-views). August, 2017

In absolute terms, most p- value of the ADF test statistics for the variables LGCF and EXPO are less than 0.05(5% significant level) which lead us to conclude that they stationary at 5% significant level.

4.4. Cointegration test

Cointegration is an econometric property of time series variables. If two or more series are themselves non-stationary, but a linear combination of them is stationary, then the series are said to be cointegrated. It is often said that cointegration is a mean used for correctly testing hypotheses concerning the relationship between two or more variables having unit roots. Testing cointegration, there are the first is an analysis of stationarity the residuals from the levels regression. The presence of cointegration between variables implies the existence of an error correction model.

Table 3. Johansen Co integration test results

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.787436	27.87318	27.58434	0.0459
At most 1	0.633568	18.07096	21.13162	0.1272
At most 2	0.238951	4.915035	14.26460	0.7525
At most 3	0.061190	1.136551	3.841466	0.2864

H₀: There is no Co integration among variables.

H₁: There exists Co integration among variables.

The results above reveals an existence of co integration among variables as the P value of 0.0459 is less than 5% level of significance, thus we reject the null hypothesis and accept the alternative hypothesis. Implying that there is a linear combination between the dependent variables GDP and the independent variable gross national saving (NS), gross saving (GDS), gross fixed capital formation (GCF) and Export of Goods and Services (EXPO).

4.5 Long- run relationship between variables

Table 4: Long run output

Dependent Variable: LGDP				
Method: Least Squares				
Date: 17/08/17 Time: 17:32				
Sample: 1995 2014				
Included observations: 20				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGS	0.03293	0.337972	-0.097457	0.9237
LGCF	0.872754	0.335559	2.600899	0.0201
EXPO	0.450312	0.447504	3.240889	0.0055
C	5.833573	2.475189	-2.356820	0.0324
R-squared	0.962498	Mean dependent var		6.914491
Adjusted R-squared	0.954998	S.D. dependent var		0.752061
Sum squared resid	0.381694	Schwarz criterion		-0.449817

Source: Author calculation (E-views). August, 2017

The results in the above table can be represented as follow

$$\text{LRGDP}_t = 5.833573 + 0.03293 \cdot \text{LGS}_t + 0.872754 \cdot \text{LGCF}_t + 0.450312 \cdot \text{EXPO}_t + \mu_t$$

With a value of $R^2 = 0.9624$ and Adjusted $R^2 0.954$, show us the goodness of fit of the estimated model. Up to 96.2% of long-run fluctuations in RGDP are influenced by changes in the national savings, gross capital formation and exports of goods and services. Parameters β_1 , β_2 , β_3 with values of 0.03293, 0.872754 and 0.450312 respectively can be explained by:

- **$\beta_1= 0.03293$** : This means that in the long run National savings is positively related to Rwandan growth indicator as per our expectation. When national savings increases by 1%, Real GDP increases by 3.29% other things being constant (Ceteris Paribus).
- **$\beta_2=0.872754$** : This means that in the long run LGCF is positively related to Rwandan growth indicator as expected. When LGCF changes in increasing by 1%, Real GDP increases by 87.27% other things being constant (Ceteris Paribus).
- **$\beta_3=0.450312$** : This means that in the long run EXPO is positively related to Rwandan growth indicator as expected. When EXPO changes by 1%, Real GDP increases by 45.03% other things being constant (Ceteris Paribus).

4.6 Short-run relationship between variables

4.6.1. Error correction model

Gujarati (2003:830) argued that the error correction mechanism developed by Engel and Granger (1987) is a means of reconciling the short-run behavior of an economic variable with its long-run behavior. The major reason why relationships are not always in equilibrium centers on the inability of economic agents to adjust to new information instantaneously.

Table 5: Short run output

Dependent Variable: DLGDP				
Method: Least Squares				
Date: 17/08/17 Time: 13:52				
Sample (adjusted): 1995 2014				
Included observations: 20 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESDLR(-1)	-0.155220	0.024551	-6.322326	0.0001
DLGS	0.175101	0.116759	1.499673	0.01679

DLGCF	0.213750	0.186604	-1.145474	0.02816
DEXPO	0.580952	0.256796	-2.262311	0.0500
C	309.1129	48.83747	6.329421	0.0001
R-squared	0.857078	Mean dependent var		0.129546
Adjusted R-squared	0.730036	S.D. dependent var		0.083791
Sum squared resid	0.017059	Schwarz criterion		-2.678407
F-statistic	6.746414	Durbin-Watson stat		3.048059

Source: Author calculation (E-views). August, 2017

The results above can be represented as follow:

$$D(LRGDP) = -0.155 * RESLR(1) + 0.175 * D(LGS) + 0.213 * DLGCF_t + 0.58 * D(EXPO)_t + U_t$$

In short run, $R^2 = 0.857078$ and Adjusted $R^2 = 0.730036$, show us the goodness of fit of the estimated model. Up to 85.7% of short-run fluctuations in RGDP are influenced by changes in the national savings, gross capital formation and exports of goods and services. Parameters β_1 , β_2 , β_3 with values of 0.175101, 0.213750 and 0.580952 respectively can be explained by:

- $\beta_1 = 0.175101$ which implies that a 1% increase of national savings induces an increase of 17.51% in Gross Domestic Product, all things being equal or other things remain constant, Ceteris Paribus.
- $\beta_2 = 0.213750$ which implies that an increase of 1% in Gross Capital formation induces an increase of 21.37% in Gross Domestic Product, all things being equal or other things remain constant, Ceteris Paribus.
- $\beta_3 = 0.580952$ which means that an increase of 1% in Exports of goods and services induces an increase of 58.09% in Gross Domestic Product, all things being equal or other things remain constant, Ceteris Paribus.

The adjusted coefficient is negative at -0.155 and this is the expected sign because it must always be negative means that to correct the errors is possible and they must be corrected at 15.5%. From these results, it is shown that both, EXPO, LGCF and GS explain Gross Domestic Product.

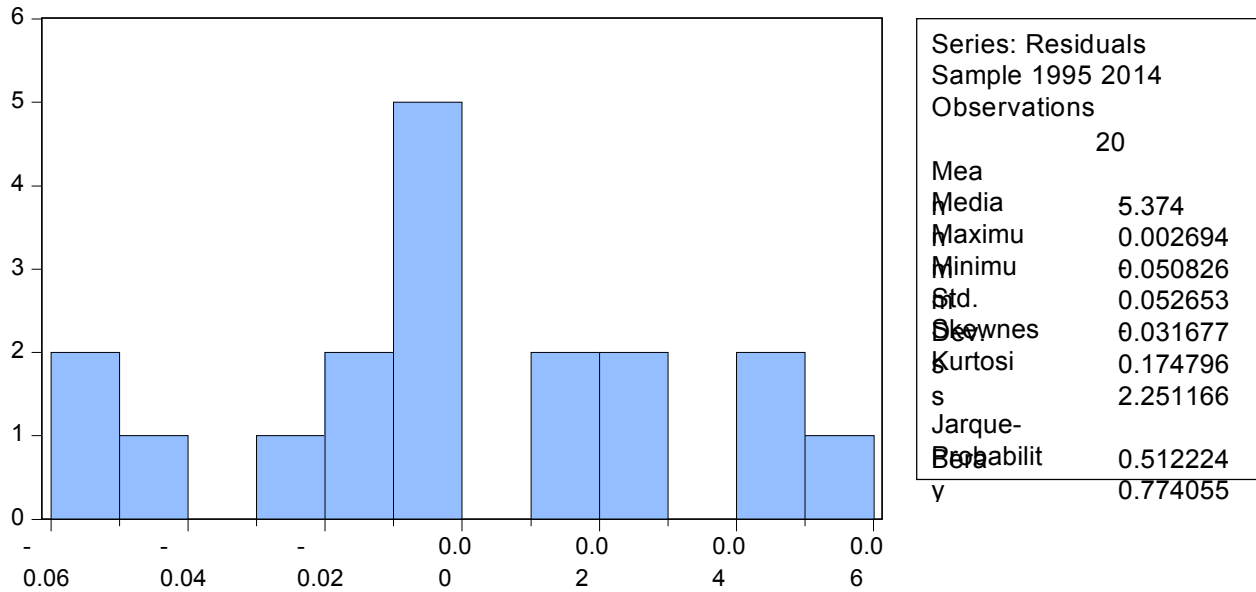
4.7 Diagnostic tests

After the error correction model the other tests are necessary to see whether the assumption of tradition regression is confirmed. These tests are related to residual series: Normal distribution test, Heteroscedasticity test, Autocorrelation test, Stability test.

4.7.1 Residual Histogram Normality test

With the assumption of normality, the test of Jarque- Bera will show us if the residual at a given period of time are not only correlated but also distributed normally. The test for normality of residuals plays a crucial role, because it precise the statistic distribution of estimators. It's due to this hypothesis that inference statistic could be realized. The results of this test are shown at the graph below:

Graph 1: Normality distribution test



Source: Author calculation (E-views). August, 2017

As probability of Jarque-Bera equals 0.774 greater than 10% reference of significance level, the researcher interprets it as residuals are normally distributed, and this reflects the good quality of the model.

4.7.2 Heteroscedasticity test

The Heteroscedasticity test shows specifically the correlation toward the variables of the model to the reference of significance at 10% where in the test modal, the test checks if there is the Heteroscedasticity or the Homoscedasticity according to the findings of the probability.

Table 6: Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	2.335725	Prob. F(8,9)	0.1141
Obs*R-squared	12.14863	Prob. Chi-Square(8)	0.1447
Scaled explained SS	1.899994	Prob. Chi-Square(8)	0.9839

Source: Author calculation (E-views). August, 2017

H₀: Homoscedastic model

H₁: Heteroscedastic model

The probability is greater than 5%; Thus we fail to reject the null hypothesis of homoscedasticity means the errors of homoscedasticity are accepted.

The observed estimations by OLS are optimal. The tests show the homoscedasticity because their probabilities are greater than 5% means that errors are constant.

4.7.3 Autocorrelation test

This test shows whether the model contains problems of autocorrelations of residuals. It means that errors of the period t affect the errors of the next period $t+1$. We use the view of probabilities.

Table 7: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	2.986953	Prob. F(2,7)	0.1154
Obs*R-squared	8.288208	Prob. Chi-Square(2)	0.2159

Source: Author calculation (E-views). August, 2017

The probability of obs*R-squared is 21.59% greater than 10% means that our model does not contain the problems of residuals autocorrelation.

CHAPTER 5: SUMMARY, CONCLUSION AND SUGGESTIONS

This chapter refers to the organized, presented and analyzed data in the preceding chapters. The Conclusion and Suggestion are drawn from the discussed findings, in line with the objectives of the study.

5.1. Summary of major findings

Basing on the specific objectives, this research aimed to verify the short and long run relationship between the national savings, gross capital formation, exports of goods and services and the gross domestic product in Rwanda. The study used the Ordinary least square (OLS) technique to model GDP. Before estimating the model, the researcher has first of all done different tests such as stationarity test of every variable, cointegration test of variables, normality test and stability test for the model. The empirical study found that the data were stationary and co-integrated. The OLS results showed that national savings (GS) has a positive significant impact on Economic growth (GDP) it further revealed that other variable like gross capital formation (GCF), Exports of goods and services (EXPO) positively affect GDP.

The findings show that in long run, National Savings, Gross capital formation and Exports of goods and services explain GDP at 96.24% level of significant because $R^2=0.962498$. In short run, $R^2 = 0.857078$ means that the GDP is explained by national savings, gross capital formation and exports of goods and services at 85.70% level of significance. Along with other tests used in this research, results show that the independent variables (GS, GCF and EXPO) positively affect the Real GDP of Rwanda. Further to this, the research showed that a 1% increase in national savings leads to an increase of 3.29% in the initial value of the GDP other factors remaining constant, while an increase of 1 % in gross capital formation leads to an increase of 87.24 % of the GDP other factors remaining constant and finally that a 1% increase in exports of goods and services will lead to an increase of 45.03 % increase of the GDP other factors remaining constant.

5.2 Conclusions

The empirical analysis presented in this paper offers some new insights into the relationships between national savings, gross capital formation, exports of goods and services and economic growth in Rwanda from the period of 1995 to 2014.

From the findings, the major objectives of this research have been achieved which were to investigate whether national savings affect positively or negatively the economic growth of Rwanda of the period under study. The findings revealed that at 5% level of significance the national savings have a positive impact on the economic growth in Rwanda whether in the long or short run. This simply means that we failed to reject the null hypothesis. It further shows that also other explanatory variables; Gross Capital Formation and Exports of Goods and Services positively affect the economic growth of Rwanda in the long run.

Findings also show us that; an increase of 1% of national savings leads to increase of 3.29 % increase in the economic growth in the long run. Taking into consideration the period of study; these values are broadly in line with the earlier findings shown in the introductory part where the level of savings in Rwanda was about 5% of the GDP in 2009 and rose to 15.3% in 2013 (Dickson Malunda, 2015). Although national savings have grown steadily over time, they are still less than 20% of the GDP which is the target by 2018. In order to maintain this steady growth, proper macroeconomic policies have to be implemented.

5.3. Recommendations

Following the empirical findings of this study, the following recommendations are made for the purpose of effective policy formulations in the area of National Savings and economic Growth:

- Policy makers should pursue sound macroeconomic policies that focus on increasing the level of savings, since the critical problem for most developing countries are the lack of investments which restricts economic growth. This can be done by developing several long term saving instruments to increase domestic, private and household savings.
- The government should make efforts to raise the savings in a sustainable manner as well should take appropriate strategies to redirect savings into productive investment which will enhance economic growth.

- Government should create a stable and predictable economic environment that makes savings rewarding to savers and reduces the fear of inflation or collapse of financial institutions which may lead to the loss of their savings.
- Strengthen their efforts to consolidate the rule of law and good governance, by stepping up efforts against corruption and enhancing policy and regulatory frameworks, financial reporting and intellectual property protection to foster a dynamic and well-functioning business sector. Such policies will benefit the climate of savings through their effect on transparency. By bringing among the elements of the enabling environment that can be influenced by policies, transparency is arguably important.

5.4 Areas of further research

Not all the determinants of the growth domestic product (GDP) have been encompassed in the current study, thus further research can be done including more variables such as government expenditure, Investments, etc...

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APPENDIX

This part presents the Data used during this research and it also shows various E-views test and results obtained.

➤ DATA PRESENTATION

Data of the Gross domestic products (GDP), Gross Capital Formation (GCF), National Savings (GS) and Export of Goods and Services (EXPO)

Year	GS (Annual % growth)	GDP(Annual % growth)	GCF(Annual % growth)	EXPO(Annual % growth)
1995	20.21	35.22	13.4	5.15
1996	14.21	12.74	14.37	6.03
1997	10.54	13.84	13.8	7.79
1998	8.01	8.85	14.8	5.58
1999	5.06	7.58	13.14	6.22
2000	6.35	8.31	13.37	6.31
2001	8.05	8.66	13.73	8.47
2002	7.28	13.51	13.48	7.035
2003	9.36	1.451	13.85	8.45
2004	14.8	6.94	15.02	11.12
2005	15.17	6.91	15.76	11.45
2006	13.21	9.23	16.66	12.29
2007	22.12	7.61	18.93	15.88
2008	19.15	11.16	24.17	12.73
2009	19.42	6.26	23.63	11.89
2010	18.13	7.31	23.2	12.09
2011	21.17	7.85	23.53	14.43
2012	16.77	8.78	25.88	14.13
2013	20.79	4.68	26.52	15.62
2014	21.12	6.96	26.29	14.93

Source: World Bank data report, 2015

➤ STATIONARITY TEST

To test for stationarity the Augmented Dickey Fuller (ADF) unit root test has been used. Results for the series LGS, LGCF, LGDP and EXPO at levels and first difference are presented below:

LGDP at Level

Null Hypothesis: LGDP has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.820167	0.0013
Test critical values: 1% level	-3.831511	
5% level	-3.029970	
10% level	-2.655194	

*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 19

Source: E-views 7, elaborated by the researcher, August 2017

LGS at Level

Null Hypothesis: LGS has a unit root

Exogenous: Constant

Lag Length: 4 (Automatic - based on SIC, maxlag=4)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.995785	0.0093
Test critical values: 1% level	-3.959148	
5% level	-3.081002	
10% level	-2.681330	

*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15

Source: E-views 7, elaborated by the researcher, August 2017

EXPO at levels

Null Hypothesis: EXPO has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.156297	0.6704
Test critical values: 1% level	-3.831511	
5% level	-3.029970	
10% level	-2.655194	

*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 19

Source: E-views 7, elaborated by the researcher, August 2017

EXPO at 1st Difference

Null Hypothesis: D(EXPO) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.495981	0.0004
Test critical values: 1% level	-3.857386	
5% level	-3.040391	
10% level	-2.660551	

*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 18

Source: E-views 7, elaborated by the researcher, August 2017

LGCF at Level

Null Hypothesis: LGCF has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.147579	0.9302
Test critical values: 1% level	-3.831511	
5% level	-3.029970	
10% level	-2.655194	

*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 19

Source: E-views 7, elaborated by the researcher, August 2017

LGCF at first Difference

Null Hypothesis: D(LGCF) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.060144	0.0066
Test critical values: 1% level	-3.857386	
5% level	-3.040391	
10% level	-2.660551	

*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 18

Source: E-views 7, elaborated by the researcher, August 2017

➤ **COINTEGRATION TEST**

MACKINNON Results

Significant level	MACKINNON	ADF STATISTIC	Conclusion
1%	4.3915	-4.169471	ADF STATISTIC is -4.17 less than 10% as significant critical level of MACKINNON value which is equal to -3.58. This means that there is cointegration between variables and there is long-run relationship between variables.
5%	-3.73953		
10%	-3.58342		

Source: E-views 7, elaborated by researcher, August 2017

$$C \text{ at } 1\% = C = -3.7429 - 8.352 * 20^{-1} - 13.41 * 20^{-2} = -3.73953$$

$$C \text{ at } 5\% = C = -3.7429 - 8.352 * 20^{-1} - 13.41 * 20^{-2} = -3.73953$$

$$C \text{ at } 10\% = C = -3.4518 - 6.241 * 20^{-1} - 2.79 * 20^{-2} = -3.58342$$

➤ **HETEROSKEDASTICITY TEST**

Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	2.335725	Prob. F(8,9)	0.1141
Obs*R-squared	12.14863	Prob. Chi-Square(8)	0.1447
Scaled explained SS	1.899994	Prob. Chi-Square(8)	0.9839

Source: E-views 7, elaborated by researcher, August 2017

➤ **AUTOCORRELATION TEST**

Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	2.986953	Prob. F(2,7)	0.1154
Obs*R-squared	8.288208	Prob. Chi-Square(2)	0.2159

Source: E-views 7, elaborated by researcher, August 2017

➤ **LONG RUN RELATIONSHIP BETWEEN DEPENDENT AND INDEPENDENT VARIABLES**

Dependent Variable: LGDP				
Method: Least Squares				
Date: 17/08/17 Time: 17:32				
Sample: 1995 2014				
Included observations: 20				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGS	0.03293	0.337972	-0.097457	0.9237
LGCF	0.872754	0.335559	2.600899	0.0201
EXPO	0.450312	0.447504	3.240889	0.0055
C	5.833573	2.475189	-2.356820	0.0324

R-squared	0.962498	Mean dependent var	6.914491
Adjusted R-squared	0.954998	S.D. dependent var	0.752061
S.E. of regression	0.159520	Akaike info criterion	-0.648646
Sum squared resid	0.381694	Schwarz criterion	-0.449817
Log likelihood	10.16214	Hannan-Quinn criter.	-0.614997
F-statistic	128.3271	Durbin-Watson stat	1.241413
Prob(F-statistic)	0.000000		

Source: E-views 7, elaborated by researcher, August 2017

➤ **SHORT RUN RELATIONSHIP BETWEEN DEPENDENT AND INDEPENDENT VARIABLES**

Dependent Variable: DLGDP				
Method: Least Squares				
Date: 17/08/17 Time: 13:52				
Sample (adjusted): 1995 2014				
Included observations: 20 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESDLR(-1)	-0.155220	0.024551	-6.322326	0.0001
DLGS	0.175101	0.116759	1.499673	0.01679
DLGCF	0.213750	0.186604	-1.145474	0.02816
DEXPO	0.580952	0.256796	-2.262311	0.0500
C	309.1129	48.83747	6.329421	0.0001
R-squared	0.857078	Mean dependent var		0.129546
Adjusted R-squared	0.730036	S.D. dependent var		0.083791
S.E. of regression	0.043536	Akaike info criterion		-3.123593
Sum squared resid	0.017059	Schwarz criterion		-2.678407
Log likelihood	37.11234	Hannan-Quinn criter.		-3.062208
F-statistic	6.746414	Durbin-Watson stat		3.048059
Prob(F-statistic)	0.004863			

Source: E-views 7, elaborated by researcher, August 2017