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EFFECT OF GOVERNMENT EXPENDITURE ON ECONOMIC GROWTH IN RWANDA (2005-2015)

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Abstract

Rwanda has gone through various structural transformations since independence. Over the years there has been increased government expenditure with minimal impact on GDP growth. The main objective of this study was to analyze the effect of government expenditure on economic growth in Rwanda specifically expenditure on physical infrastructure, agriculture and social sectors using quarterly time series data from 2005 to 2015. The sources of data included government reports of expenditure and GDP from Minecofin and National Institute of Statistics of Rwanda. ADF stationarity, Cointegration and Granger Causality tests were carried out before applying the VAR model to study the effects of government expenditure components on economic growth. Cointegration tests revealed a long run relationship between government expenditure components and GDP. Granger causality tests revealed bidirectional causality among the variables except for education expenditure and GDP which showed a unidirectional

causality. The impulse response and VDA results revealed that expenditure on agriculture, education and health had positive effects on GDP, sports and culture expenditure had mixed reactions and Physical infrastructure expenditure had negative effects. The study recommended that agriculture and social sector expenditures to be increased while infrastructure expenditure be streamlined.

Keywords: Minecofin, Government Expenditure, Expenditure Growth, Economic Growth, Stationarity, Granger causality, Vector Auto Regression (VAR)

INTRODUCTION

After the genocide of 1994 which brought the Rwandan economy to grassroots, the government embarked on reviving the economy through adopting measures that stimulates economic growth in various sectors of the economy. This called for expansion of government expenditure in various sectors of the economy in order to achieve a steady economic growth. Over the years government expenditure has grew more rapidly than the growth rate of GDP. This raises concern among policy makers and requires an investigation as to why GDP is growing at a slower rate despite the government effort to expand its expenditure in order to stimulate rapid economic growth. Given this fiscal scenario, there is need to study the impact of government expenditure on economic growth in order to explain the wide range difference between government expenditure growth rate and GDP growth rate.

The relationship between Government expenditure and economic growth is a key area of study. The question is whether government expenditure increases the long run steady growth rate. Generally, government expenditure on physical infrastructure and human capital speeds up growth though the sources of such finances can slow down growth (Landau, 1983; Devarajan, 1993; Cashin, 1995; Kneller, 1999).This is due to the negative impact of taxes for example on investment. High taxes discourage investments and this slows down economic growth (Musgrave and Musgrave, 1989).Government expenditure can increase output directly or indirectly through different ways as examined by Lin (1994).These ways include provision of public goods, social services like health and education and through promotion of exports by offering subsidies.

Government expenditure can impact positively or negatively depending on its form. According to Barro (1990), expenditure on investment and productive activities including state-owned production e.g. infrastructure, education should contribute positively to growth, whereas

government consumption expenditure e.g. wages and salaries and public debt servicing is expected to be growth-retarding.

Government expenditure can contribute to economic growth directly or indirectly (Barro & Sala-i-Martin, 1992).According to Barro, direct effect is where government expenditure results to increase in physical and human capital stock reflecting higher flows of government funds, for example expenditure on education, health and physical infrastructure. An indirect effect can be seen on its impact on marginal productivity of production factors. For example expenditure on research and development improves the productivity of capital, labor. Similarly expenditure on security lowers production cost of firms inform of security expenses for the employees and assets.

There is growing evidence that suggest that in developing countries, externalities associated with infrastructure expenditure may be important in enhancing growth (Landau, 1985). Indeed, it has been found that infrastructure may have an impact on human capital as well. According to(Meltzer, 1992) (2007), government expenditure on infrastructure affects growth not only through its direct impact on investment and the productivity of factors in the private sector, but also through health and education outcomes. Government expenditure that facilitates access to clean water and sanitation helps to improve health and thereby labor productivity. These expenditures can be in the form of provision of electricity, which is essential for the functioning of hospitals and the delivery of health services, and better transportation networks, which contribute to easier access to health care, particularly in rural areas. In addition, there is evidence of direct linkages between infrastructure and education. Education allows for more training and greater access to learning technologies. Enrollment rates and the quality of education tend to improve with better transportation networks, particularly in rural areas. Greater access to sanitation and clean water in schools tend to raise attendance rates.

According to Kosimbei (2013) and Maingi (2010), there are two major traditional approaches that analyses the effect of government expenditure on economic growth. They include the Keynesian approach and the monetarist approach. Keynesians believe that the key to both a healthy economy and correcting recessions and depressions is doing whatever it takes to entice consumers to continue spending. According to Keynes, during recession, households save more than they consume. This is due to the fear of loss of job in the near future. This trend worsens the economy more since reduced consumption makes businesses to close down and hence investment falls. To break the cycle, Keynesian economists think that the government should increase its spending to compensate for the slowdown in aggregate demand. Government spending would help to boost productivity and therefore protect jobs, which in turn will help to drive more consumption, or spending, by consumers.

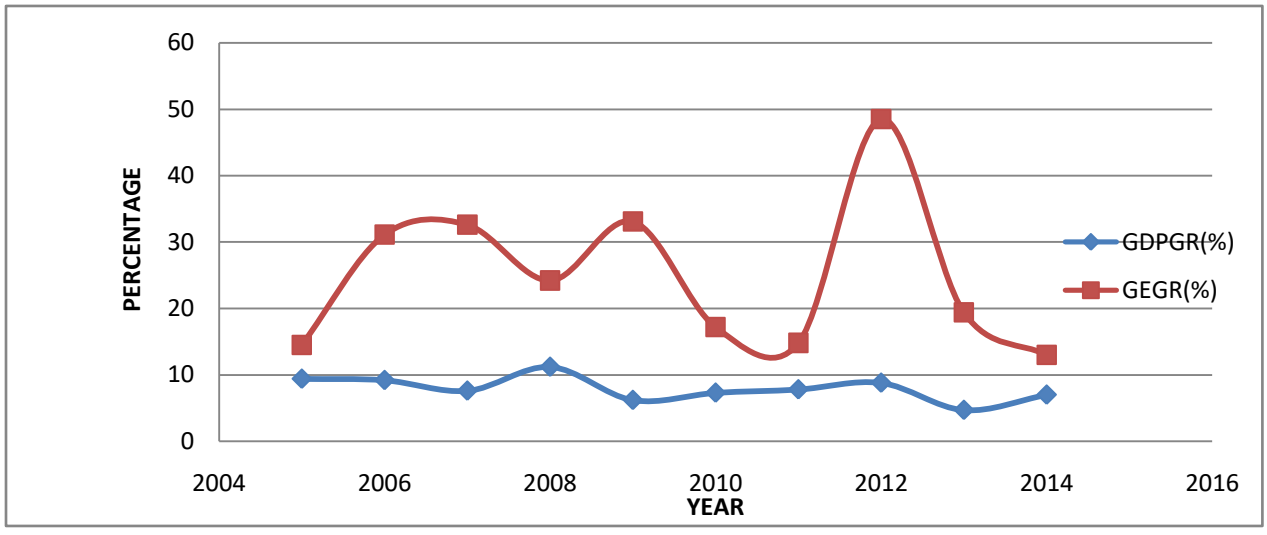
According to Monetarist approach led by Friedman, sustained money growth in excess of the growth of output produces inflation (Branson, 1989).To reduce inflation, the growth in the money supply needs to be controlled and thus the need to control or reduce government expenditure (Brunner and Meltzer, 1992). This theory further argues that tax financed government expenditure crowds out private investment (Ahmed, 1999). This is because when government expenditure is tax-financed, any extra expenditure calls for more taxation. A higher tax burden reduces the disposable income for individuals, which results to a reduction in consumption, lower savings and hence lower investment. On the other hand, higher tax burden on corporations and businesses result to decreased profits and thus reduces expansion and development aspects. If the government decides to borrow from money or capital market to finance its expenditure, it has a future obligation to repay the loan and its interest, which places a burden on the future generation. These factors result to crowding out of private investment in the course of funding government expenditure (Ahmed, 1999).

The modern approach states that labor force must be provided with more resources i.e. physical capital, human capital and technology for increased productivity to be achieved. This implies that the only way a government can affect economic growth, at least in the long-run, is via its impact on investment in capital, education and research and development. The approach makes improved education the key to achieving economic growth.

Trend in government expenditure and economic growth in Rwanda

The trend in government expenditure and economic growth in Rwanda is shown in the figure 1.

Figure 1: Trends in government expenditure and GDP growth



Source: GDP and Public expenditure reports, NISR, 2016 and Minecofin

From figure 1 above initially there was a sharp increase in government expenditure from 2005 to 2007.This was accompanied by a fall in the GDP growth rate. In 2007/2008 financial year government expenditure growth rate declined and then rose up in the following financial year, 2008/2009.This period saw a rise and a fall in GDP growth rate within the two years.

Followed was a downward trend in expenditure growth rate for the next 3years which was accompanied by an increasing trend in GDP growth rate. There was a rapid increase and a fall in government expenditure growth rate from 2011 to 2013 accompanied by a slight increase and a fall in GDP growth rate. The last financial year was accompanied by a fall in government expenditure growth rate and a rise in GDP.

Generally the expenditure growth rate is greater than the GDP growth rate evidenced by the gap in the figure 1 above. There was a fluctuation in government expenditure growth rate during the period of study though there was an increasing expansion of government expenditure every year. The GDP growth rate is generally accompanied by a steady decline, a minimal rise and fall, steady increase overtime and then a minimal rise and fall. Expenditure growth rate was highest in 2011/2012 which was accompanied by a rise in GDP growth in line with the Keynesian theory that there a positive relationship between government expenditure and economic growth. The GDP growth rate was highest in 2008 though there was a decline in expenditure growth in the same year.

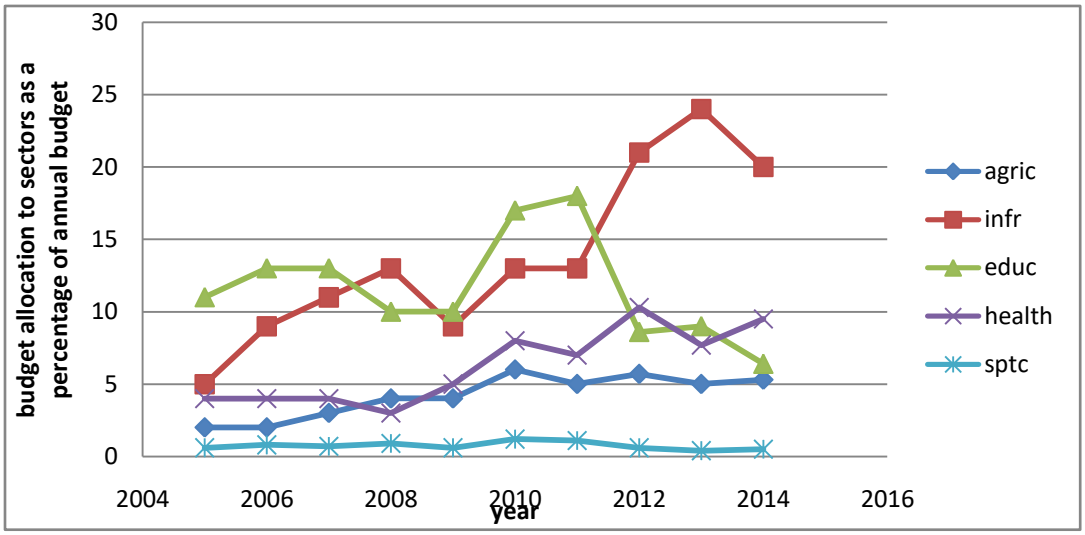
Trend in composition of government expenditure in selected sectors in Rwanda

In order to explain the growth in the overall government expenditure, we consider its breakdown into different categories. Government expenditure can be broadly classified in terms of purpose as development expenditure and recurrent expenditure. Capital expenditure refers to the amount spent in the acquisition of fixed (productive) assets (whose useful life extends beyond the accounting or fiscal year), as well as expenditure incurred in the upgrade/improvement of existing fixed assets such as lands , building, roads, machines and equipment, etc., including intangible assets. Expenditure in research also falls within this component of government expenditure. Capital expenditure is usually seen as expenditure creating future benefits, as there could be some lags between when it is incurred and when it takes effect on the economy. They are more discretionary and are made of new programs that are yet to reach their stage of completion (Ag'enor, 2007).

Recurrent expenditure refers to expenditure of recurrent expenses that are less discretionary and are made on ongoing programs or activities. It constitutes of wages and salaries, administration, transfers payment, debt repayment and welfare services. Recurrent expenditure may affect economic growth through its effects on people's ability and willingness to

work, save and invest (Ag'enor, 2007). Various ministries in Rwanda incur expenditures from government budget allocations which vary from one ministry to another every financial year (figure 2). This study will concentrate on 5 sectors namely, agriculture, sports and culture, health, education and infrastructure.

Figure 2: Distribution of public spending in selected sectors in Rwanda



Source: public expenditure data reports from Minecofin

From the figure 2 above, the Rwandan government invested greater percentage of the budget on education and infrastructure sectors. Expenditure on education rose initially, decreased from 2007 and then started to rise again from 2009 reaching maximum in 2011 before exhibiting a downward trend for the remaining period. Infrastructure expenditure increased upto 2008 and started to fall before rising again after 2009 reaching a maximum in 2013 before dropping. Health expenditure remained fairly constant up to 2007, dropped and then started to rise again after 2008 until 2010 beyond which it exhibited a rise and fall every year for the rest of the period. Agriculture expenditure had an increasing trend up to 2010 after which showed a steady trend for the rest of the period. Sports and culture had a fairly constant trend with expenditure taking less than 2%of the total budget execution within the study period.

Statement of the problem

The causes of much of the variations in economic growth rate and expenditure growth rate in Rwanda are not well understood. Particularly, the effect of government expenditure on economic growth has not been explored well. Several studies have been carried out on government expenditure and economic growth in several countries and they give different

findings. (Landau, 1983; Diamond, 1984; Barro, 1990; Davarajanet al. 1993; Kweka, 1995; Colombier, 2000; Maingi, (2008),Njuguna, (2009).From these studies, the effect of government expenditure on economic growth appear unconvincing. Despite this uncertainty, theory tells us that government expenditure has a positive effect on economic growth (Keynes, 1936; Solow-Swan, 1956; Musgrave and Musgrave, 1989; Barro, 1990; Barro and Salai-i-Martin, 1992, and 1995).

In Rwanda, government expenditure has been rising rapidly for the last ten years as a move by the government to stimulate economic growth. The impact of these increases in government expenditure on economic growth appears to be minimal as shown by a steady but slow economic growth rate. The government of Rwanda spends substantial amounts of money annually on physical infrastructure, agriculture and social sectors such as education, health care, sports and culture, public order and national security, defense and general administration as evidenced by budget execution. From theory, when there is an increase in government expenditure in these sectors, it is expected that the economy will exhibit a rapid positive economic growth rate, but this does not seem to happen in Rwanda. This could be due to non-growth-enhancing expenditures that crowd-out outlays that are meant to boost economic growth (Colomber, 2000). Therefore, the issue of which government expenditure can foster permanent movements in economic growth in Rwanda becomes important and needs to be investigated.

General objective of the study

The general objective of this study was to analyze the effect of government expenditure on economic growth in Rwanda for the period between 2005 and 2015.

Specific objectives of the study

i. To examine the effect of physical infrastructure expenditure on economic growth
ii. To determine the effect of agriculture expenditure on economic growth
iii. To establish the effect of social sector expenditure on economic growth

Research hypotheses

A hypothesis is an explanation for certain behavior, patterns, phenomenon or events that have occurred or will occur (Gay, 1996).The research was guided by the following working hypotheses:

i. Physical infrastructure has a significant effect on economic growth.
ii. Agriculture has a significant effect on economic growth.
iii. Social sector has a significant effect on economic growth.

Justification of the study

The study from the onset was important since it enabled completion of my Master's degree program in economics of JKUAT. Since 2005, Rwanda has gone through substantial structural changes in various sectors of the economy. The study attempted to provide an empirical analysis of the impact of government expenditure components on economic growth. This was important to policy makers since they were able to identify the main drivers of expenditure growth and be able to identify which component of government expenditure to be targeted for any fiscal action in line with both short run and long run growth objectives of the country. Furthermore the study analyzed both theoretical and empirical literature on government expenditure and economic growth. This opened the way for further studies.

Scope of the study

The study was limited to the period between 2005 and 2015 since this period there was mass increase in government spending and the data was readily available. Economic growth can be affected by both fiscal and monetary policies. This study concentrated on fiscal policy effects particularly government expenditure leaving out government revenue as another form of fiscal policy. Government expenditure was categorized in terms of actual budget execution to various ministries. The study was limited to the following sectors, physical infrastructure, agriculture and social sectors specifically education, health and sports and culture.

LITERATURE REVIEW

Theoretical review

Wagner's theory

This theory was put forward by German political economist, AdolphWagner (1835-1917). He argued that government growth is a function of increased industrialization and economic development. Wagner stated that during the industrialization process, as the real income per capita of a nation increases, the share of public expenditures in total expenditures increases. The law cited that "The advent of modern industrial society will result in increasing political pressure for social progress and increased allowance for social consideration by industry."

Wagner (1893) designed three focal bases for the increased in state expenditure. Firstly, during industrialization process, public sector activity will replace private sector activity. State functions like administrative and protective functions will increase. Secondly, governments needed to provide cultural and welfare services like education, public health, old age pension or retirement insurance, food subsidy, natural disaster aid, environmental protection programs and other welfare functions. Thirdly, increased industrialization will bring out technological change

and large firms that tend to monopolize. Governments will have to offset these effects by providing social and merit goods through budgetary means.

In his Finanzwissenschaft (1883) and Grundlegung der politischen Wissenschaft (1893), Adolf Wagner pointed out that public spending is an endogenous factor, which is determined by the growth of national income. Hence, it is national income that causes public expenditure. This theory is relevant in Rwanda since the increased GDP of Rwanda overtime accelerated by industrialization has attracted more government expenditure in order to expand provision of public goods and other essential state services. Some of the flaws of this theory is that it concentrated on the demand side of the government expenditure while overlooking the supply side and it also dwelt on industrialization as the only driving force for increased public spending.

Peacock and Wiseman's political constraint model

Peacock and Wiseman (1890-1935) in their analysis of time path pattern of government expenditure established the displacement effect.it is based on political theory of government expenditure determination that government likes to spend more money and citizens do not like to pay taxes. The model assumes that there is some tolerable level of taxation that act as a constraint on government behavior. As the economy grows, tax revenue would rise and hence a rise in government spending in line with GNP (Peacock & Wiseman 1961).

During period of social upheaval such as war, famine or some large-scale social disaster, the gradual upward trend in government expenditure would be distorted (displaced upward). In order to finance the increase in government expenditure, the government may be forced to raise taxation level, a policy which would be regarded as acceptable to the electorate during period of crises. This is called the displacement effect (Peacock & Wiseman, 1961). There will be a new level of "tax tolerance". Individuals will now accept new taxation levels, previously thought to be intolerable. Furthermore, the public expect the state to heal up the economy and adjust to the new social ideas, or otherwise, there will be the inspection effect. The net result of these two effects is occasional short- term jumps in government expenditure within a rising long-term trend (Peacock and Wiseman, 1961).

This theory is relevant in Rwanda since after the genocide of 1994, there was a rapid rise in government expenditure to heal the country from the effects of war. The theory has some weaknesses such as; it explains the economic upheaval as the cause of increased government expenditure yet in Rwanda public expenditure has been rising overtime yet there is peace, its long since war of 1994 and yet the public spending keeps on rising; the theory also considers tax as the only source of revenue for the government overlooking other sources of revenue such

as domestic and foreign borrowing, foreign aid and income from sale of goods and services (Brown et al, 1996).

Keynesian theory

This theory was put forward by economist; John Maynard Keynes (1883-1946).He argued that government intervention was necessary in the short run to save the economy from depression. He argued that in the long run we are all dead. Increasing saving during depression will not help but instead spending saves the economy. Increased spending raises the purchasing power of people and hence consumption increases. Producers expand their production and hence employment is created. He further said that expansion of government expenditure should be done with a lot of care since too much of it could lead to inflation.

The flaws of Keynes theory are: The theory tended to give rise to the phenomenon known as stop-go. That is, in periods of high unemployment, the government would expand aggregate demand. This would reduce the unemployment but at the same time tend to create inflationary pressure so that eventually the government would have to reduce aggregate demand again. Thus, all go period tended to be followed by stop period and it became difficult to achieve long term economic growth. A second limitation of the Keynesian model is that it fails to take adequately into account the problem of inflation. Third, it tends to understate the influence of money on the real variables in the economy. A change in the money supply, only affects national income through its effects on the rate of interest.

Monetarist theory

This theory stresses the primary importance of money supply in determining nominal GDP and the price level (Ahmed, 1999). Friedman (1956) argued convincingly that the high rates of inflation were due to rapid increases in the money supply. The key to good policy was therefore to control the supply of money. The foundations of the model were: There is a close relationship between the changes in the money supply and changes in national income in the long-run, without government interference the economy will tend towards its „natural" rate of unemployment, velocity of circulation of money is predictable, money changes will only affect real national income indirectly and the economy is in equilibrium at full employment Monetarists disliked big government and tended to trust free markets. They did not like government expenditure and believed that fiscal policy was not helpful in bringing about economic growth. Where it could be beneficial, monetary policy could do better. Excessive government expenditure only interferes in the workings of free markets and could lead to bloated bureaucracies, unnecessary social programs and large deficits (Cullison, 1993). The short

comings of the model include the following. First, the monetary theory does not offer a complete explanation of the complex phenomenon of changes in the making of which the non-monetary factors also significantly matter.

Rostow's Theory

This theory takes government expenditure as a prerequisite of economic development, its level being directly related to the stage of development that a country has reached. In the early stage of economic growth and development, public investment as a proportion of the total investment of the economy is found to be high. The public sector provides social infrastructure overheads such as roads, transport infrastructure, sanitation services, law and order, health, education and other investments in human capital, which are all necessary to gear up the economy for takeoff into the middle stages of economic and social development (Musgrave and Musgrave, 1989). In the middle stages of growth, the government continues to supply investment goods, but this time public investment is complementary to the growth in private investment. During the two stages of development, markets failures exist, which can frustrate the push towards maturity, hence increase in government involvement in order to deal with these market failures. In the mass consumption stage, income maintenance programs and policies designed to redistribute welfare grows significantly relative to other items of government expenditure, and also relative to GNP (Musgrave and Musgrave, 1989).

Empirical review

Harerimana (2016) conducted a study on the analysis of government spending on agriculture sector and its effect on economic growth in Rwanda using General Method of Moments and OLS. The results indicated that there is a long run relationship between agriculture expenditure and economic growth and that there is a positive significant effect of agriculture sector on economic growth in Rwanda.

Edward (2012) examined the interrelationships between public spending composition and Uganda's development goals including economic growth and poverty reduction using dynamic computable general equilibrium model. The results demonstrated that public spending composition on productive sectors such as agriculture, energy, water, health and complementary infrastructure such as roads has positive impact on economic growth and poverty reduction while unproductive sectors such as public administration and security had a negative impact on economic growth and poverty reduction.

Albala and Mamatzakis (2001) using time series data covering 1960-1995 to estimate a Cobb-Douglas production function that includes public infrastructure for Chile, found a positive

and significant correlation between public infrastructure and economic growth. The study reported that public investment crowds out private investment. One major weakness of the study was that it omitted impact of important variables such as education, health care and public order and security.

Fasoranti (2012) while conducting a study on the effect of government expenditure on infrastructure on the growth of Nigerian economy found out that expenditure on healthservices, transport and communication imparted negatively on growth. Moreover, expenditure on agriculture and security had no impact on the growth of the economy while expenditure on education, environment and housing and on water resources had a positive impact on economic growth.

Olopade and Olapade (2010) assess how fiscal and monetary policies influence economic growth and development. The essence of their study was to determine the components of government expenditure that enhance growth and development, identify those that do not and recommend those that should be cut or reduced to the barest minimum. The study employs an analytic framework based on economic models, statistical methods encompassing trends analysis and simple regression. They found no significant relationship between most of the components of expenditure and economic growth.

Maingi (2010), while studying the impact of government expenditure on economic growth in Kenya found out that in the long run expenditure on economic affairs, defense, education, government investment, general administration and services and physical infrastructure have positive impacts on economic growth. In the short run health care, public order and national security have positive impact on economic growth, whereas, public debt servicing had negative impact on economic growth.

Kosimbei (2013) while conducting research on the impact of government expenditure components on economic growth in Kenya found out that public expenditure component like education, transport and communication and public order and security are the major drivers of economic growth. The study found out that Public expenditure on health impacted negatively on economic growth.

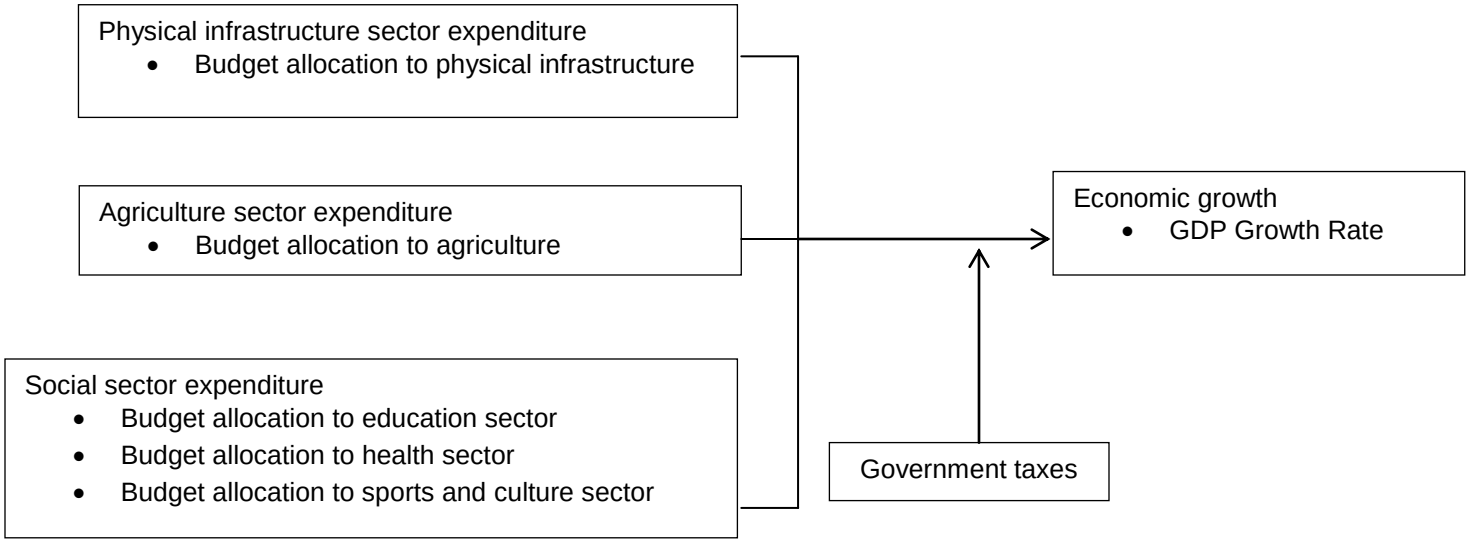
Naftally (2014)while conducting research on the effect of government expenditure on economic growth in East Africa using the disaggregated model found out that expenditure on health, defense, agriculture and openness were positively related to economic growth while expenditure on education, terms of trade and population growth had a negative impact on economic growth. However the study concentrated majorly on 3 countries namely Kenya, Uganda and Tanzania.

Abbas and Abdul (2016) conducted a research on the impact of government expenditure on agricultural sector and economic growth in Pakistan over the period 1983 to 2011using time series data. They used null hypothesis that agriculture expenditure does not have impact on economic growth which they finally rejected. Study found a positive relationship between agricultural output and economic growth. An increase in agricultural output leads to a positive economic growth. They recommended that the government should increase expenditure on agriculture sector.

Mustapha (2015), while analyzing empirically the impact of education expenditure on economic growth in Nigeria using granger causality analysis found out that there is no causality between Real Growth Rate of gross domestic product and Total government expenditure on education but there is bi-directional causality between Recurrent Expenditure on Education and Total government expenditure on education. He further found out that while Primary School Enrolment does not Granger cause Total government expenditure on education, the latter does Granger cause the former. No causality between Recurrent Expenditure on Education and Real Growth Rate of gross domestic product and also no causality between Primary school enrolment and Real Growth Rate of gross domestic product.

Mekdad et.al (2014) examined the effect of public spending on economic growth in Algeria for the period 1974-2012. Their study used Ordinary Least Square and Johansen Co-integration test and causality tests, their results showed that public spending on education affects economic growth positively.

Figure 3: Conceptual framework



Critical review of literature

The question of whether or not public expenditure stimulates economic growth has dominated theoretical and empirical debate for a long time. One viewpoint believes that government involvement in economic activity is growth enhancing, but an opposing view holds that government operations are inherently inefficient, bureaucratic and therefore stifles rather than promotes growth, while some studies still are of the view that public expenditure is indeterminate of economic growth (Najkamp & Poot, 2002). In the empirical literature, results are equally mixed. It is evident that most of the empirical literatures focuses on developed countries, even so all of them have not come up with similar relationship between public expenditure and economic growth, and some sharply contradict others (Jerono, 2002).

The methodologies used in those literatures reviewed might not be very applicable in Rwanda due to divergence in geographical region, political difference and level of economic growth between the studied countries and Rwanda. In Rwanda studies on public expenditure impact on economic growth have not been carried out. Studies that have been carried out in the neighboring developing countries like Kenya and Nigeria and the East Africa as a disaggregated model have reported divergent results as to the impact of public expenditure on economic growth (Jerono, 2002). Finally with a lot of contention, the underlying argument is that public expenditure is capable of enhancing economic growth in short and in the long run in both developing and developed countries.

Summary of the literature

From the review of the studies, the effect of public spending on economic growth is fundamental in any economy. There are divergent results on these studies depending on the variables of public spending used, the methodology and the location. Public spending is fundamental for a countries growth and therefore there is need to inquire more about the effect of such public expenditures on economic growth. Moreover with the increasing and ever changing world i.e. from less developed to developing nations and increasing need for industrialization ,there is need for changes in the allocation of public funds to various sectors to achieve economic growth. In summary public spending is one of the fiscal policy tools of achieving economic growth and requires deeper investigation.

Research gap

Most of the literature on government expenditure and economic growth gives different results on the relationship and effects of government expenditure and economic growth depending on the variables used to measure public expenditure and the country where the studies are done. Most

of the studies were carried out on developed countries and less on developing countries as evidenced from the theoretical literature. The few studies done in developing countries did not look at Rwanda in isolation. This study therefore sought to add knowledge about government expenditure and economic growth on developing countries by looking at Rwanda. This is a gap that existed and needed to be filled. The relationship between government expenditure and economic growth has been giving different results from the previous literature depending on how the government expenditure is categorized. Studies by Devaragan (1993) grouped government expenditure into productive and non-productive categories while Stephen Gitahi (2014) categorized government expenditure in terms of development and recurrent expenditure. Only Maingi (2010) looked at government expenditure in terms of annual budget allocation to various Ministries as a percentage of GDP. He found out that expenditure on education, health, defense, economic affairs and infrastructure had a positive impact on economic growth while public debt servicing had a negative impact on economic growth.

METHODOLOGY

Research Design

A research design is the overall strategy of integrating the various components of the study in coherent and logical manner in order to effectively address the research problem. (Labaree, 2009). The study utilized quantitative research design because it involves systematic empirical investigation of observable phenomena via statistical or numerical data. This study aims at establishing the impact of public expenditure components on economic growth in Rwanda. Measurement of various variables of public expenditure and economic growth is crucial in this research since it shows connection between empirical observation and mathematical expression of quantitative relationships.

There are basically three dimensions of quantitative research design, descriptive research which seeks to describe the current status of a variable or a phenomenon, correlational design which explores the relationship between variables using statistical analysis and experimental design which involve use of scientific method to establish a cause-effect relationship. Since the study seeks to investigate the impact of government expenditure on economic growth, descriptive and correlational quantitative research design is justified. Descriptive studies are aimed at finding out “what is,” so observational and survey methods are frequently used to collect descriptive data (Borg & Gall, 1989). Descriptive research is unique in the number of variables employed. Like other types of research, descriptive research can include multiple variables for analysis, yet unlike other methods, it requires only one variable (Borg & Gall, 1989). For example, a descriptive study might employ methods of analyzing

correlations between multiple variables by using tests such as Pearson's Product Moment correlation, regression, or multiple regression analysis which suited this research because the study used multi-variate time series data. The study employed an econometric model to study the relationship between the variables under study. VAR model was employed to assess the effects of government expenditure components on economic growth. Similar method was used by other researchers like Albala (2001) in Chile, Fasoranti (2012) in Nigeria, Maingi (2010) in Kenya, (Sharabati et al*.,* 2010) in Jordan.

Data collection and procedure

The study used time series secondary data. This was enhanced by easy accessibility of secondary data from government's data base and also to be consistent with the previous researchers who also used secondary data such as Fasoranti (2012) and Kosimbei (2013) Government expenditure was classified in terms of budget execution in selected sectors in Rwanda. These are agriculture, health, sports and culture, education and physical infrastructure. Quarterly data on these variables was obtained from Ministry of Finance and Economic Planning (Minecofin) for the period 2005 to 2015. Economic growth was in terms of GDP output within the study period. The data was obtained from National Institute of Statistics of Rwanda annual report data base.

Several previous researches on government expenditure and economic growth utilized time series secondary data though the time frame and geographical location was different from one research to another as shown in the empirical review. This study is therefore consistent with the previous researches.

Data Analysis Approach

The study addresses three objectives. The analysis of effects requires testing for the relationships first between the variables under study. This was achieved by carrying out multivariate cointegration test and granger causality test. To analyze the effects of government expenditure components on economic growth, the researcher utilized vector autoregresion model and subsequently the impulse response analysis and variance decomposition analysis.

Definition and measurement of variables

Economic Growth (GDP)

This is the percentage rate of increase in gross domestic product. It captures the change in value of goods and services produced in a given economy for a specified period of time. It was measured as annual value of total output in the economy from all the sectors. (Kosimbei, 2013)

Education expenditure

This is the share of expenditure in education to total government expenditure. It includes the expenditure the government incurs to fund basic up to higher education, by paying teachers and lecturers, construction of learning infrastructure such as classrooms, lecture halls, offices and purchase of learning equipment. It also includes expenses on scholarships whether local or abroad. (Fasoranti, 2012)

Health expenditure

This is the share of public expenditure on health to total government expenditure. It includes the amount the government spends in construction of hospitals building structures, equipping the hospital institution with equipment and drugs, training of doctors and nurses and paying their salaries. (Maingi & Kosimbei, 2013)

Infrastructure expenditure

This is the share of public funds over the total government expenditure directed to activities such as, construction of air and seaports, construction of highways, fiber optic cable connection lay outs. (Buhari, 2000)

Agriculture expenditure

This is the share of public funds over the total government expenditure that is spent on activities such as providing fertilizer for farmers, research and extension services, veterinary services, educational workshops, paying salaries for employees etc. (Gideon and Njenga, 2013)

Sports and culture expenditure

This is the share of public expenditure over the total expenditure that is spent on activities such as maintaining tourism sites, cultural functions such as genocide memorial, sports matches, salaries for employees in the sports and culture ministry etc. (Kosimbei, 2013)

Model Specification

The study was based on Keynesian theory. Keynesian theory states that public expenditure determines economic growth. During recession a policy of budgetary expansion should be undertaken to increase the aggregate demand in the economy thus boosting the Gross Domestic Product (GDP), the employment rises, income and profits of the firms increase, and this would result in the firm's hiring more workers to produce the goods and services needed by the government.

Y = *f (GE)*.....(3.1)

The Keynesian modeled economic growth as a function of public expenditure.

Y = *f (GE)*……..(3.2)

Jerono (2009) defined total public expenditure as a function of summation of all individual government expenditure in all components.

GE = *f* (government expenditure in all components) …… (3.3)

In this study combining the two models will yield a richer econometric model that will facilitate estimation. The government expenditure (GE) *is* defined as the five components; this modification will help us investigate the impact of government expenditure on economic growth in Rwanda.

GE= *f* [(ei, eg,ed,eh, es), Ut]……..... (3.4)

And because,

Y= *f (*GE*)* according to the Keynesian,

Hence

Y = *f* [(ei, eg, ed, eh, es), Ut]…….. ……..... (3.5)

$Y = \beta 0 + \beta 1ei + \beta 2eg + \beta 3ed + \beta 4eh + \beta 5es + ut$ …….. ……..... (3.6)

Where;

Y = gross domestic product

ei= infrastructure expenditure

eg = agriculture expenditure

ed= education expenditure

eh= health expenditure

es = sports and culture expenditure

Ut =Error term (causes of economic growth not explained by variables in the model)

Time Series property of the data

In view of the fact that this study will use time series data and inherently it might exhibit some strong trends, the non-random disposition of the series might undermine the use of some of econometrics tests such as F and t tests. This is because they can cause rejection of a hypothesis which would have otherwise not been rejected. This study intends to conduct stationarity and cointegration tests to mitigate such situations.

In empirical analysis, non-stationarity of time series data is a perennial problem. To avoid estimating and getting spurious results, the study conducted test for stationarity. To apply standard estimation or testing procedures in a dynamic time series model, the stationarity of

variables is required ((Verbeek, 2004), 2004). According to (Brooks, 2008) Brooks (2008), a stationary series can be defined as one with a constant mean, constant variance and constant auto-covariance for each given lag. The study used Augmented Dickey Fuller method to test for stationarity and establish the order of integration. The (ADF) test for stationarity in a series of say GDP, involves estimating the equations.

$\Delta GDP = \alpha 0 + \beta t + \theta yt - 1 + mi = 1 \rho \Delta GE - i + et$ (This is for levels)

$\Delta\Delta GDP = \alpha 0 + \beta t + \theta \Delta yt - 1 + mi = 1 \rho \Delta\Delta GE - i + et$ (This is for first differences).There are cases where ADF does not have a drift and a trend but the example has both a drift (intercept) and a trend. Where $\alpha 0$ is a drift, m is the number of lags and e is the error term and t is trend. The null hypothesis will be

HO: ($\alpha 0$,) = ($\alpha 0$, 0, 1) (Not stationary)

The alternative hypothesis

H1: ($\alpha 0$,) ≠ ($\alpha 0$, 0, 1) (Stationary). If the test reveals that null hypothesis should be rejected then the variable will be said to be stationary.

Testing for Cointegration

The researcher used Johansen Cointegration test method. Cointegration is a technique used to test for existence of long-term relationship (co-movement) between variables in a non-stationary series. Before testing for cointegration, it is important to determine the order of integration of the individual time series. A variable Xt is integrated of order d (1d) if it becomes stationary for the first time after being differenced d times (Hjalmarsson and Österholm, 2007). Cointegration also asserts that 1(1) can be estimated using OLS method and produce non spurious results.

Granger Causality Test

Granger (1969) proposed a time-series data based approach in order to determine causality. Granger causality shows whether the past values of say X can be able to predict current or future values of Y. Granger causality test is used to test the causal direction. It is also used to test for exogeneity and enables the researcher to decide whether to estimate the model using simultaneous or single equation. Granger causality test has been chosen in this paper for its favorable response to both large and small samples as evidenced by (Gall, 1989, Salemi, 1982, Geweke et al., 1983). In this study, it was predicted that the components of government expenditure affected economic growth. On the same breath the economic growth (GDP levels) could as well influence the government expenditure and this can lead to our model suffering from simultaneous bias. Just in case the study estimates the model and gets a statistically significant association between economic growth and government expenditure, the study need

to conduct the causality test to know the direction of causation. To establish whether it is government expenditure causing GDP growth or whether it is the GDP leading to growth in government expenditure or if there is a case of bi-directional causation (a feedback system). The researcher carried out a pairwise granger causality test of GDP and GE components with different lags by running the data on E-views software which attracted rejection or acceptance of null hypothesis. If it is significant then the study conclude that either GDP granger causes GE (unidirectional), that is a long term relationship between GE and GDP exist whereby the past values of GDP can be used to predict current or future values of GE. If both granger causes each other that is GE granger causes GDP and GDP intern granger causes GE then a conclusion that there is bi-directional relationship is made.

FINDINGS AND DISCUSSION

Unit root test

Quarterly values of all the variables under consideration were used in this study. The period was from 2005Q1 to 2014Q4.This period was selected because of reliability and availability of data. In availability of quarterly data that leads to use of disaggregated annual data cause some estimation and forecasting biases(Gichondo & Kimenyi, 2012).

When time series data is non stationary and used for analysis it may give spurious results because estimates obtained from such data will possess non constant mean and variance. Because this study used time series data, it was important to establish the stationarity of the data or what order they are integrated to make sure that the results obtained are not spurious. In this regard Augmented Dickey Fuller (ADF) was used to test for unit roots. The unit roots results of the variable in the model are reported in table 1 and table 2.

Table 1: Stationarity test (at level) results

Variable	At level	ADF	Critical values at	probability
Agriculture expenditure	Intercept and trend	-4.117322	1% -4.211868 5% -3.529758 10% -3.196411	0.0127
Infrastructure expenditure	,,	-2.068879	1% -4.211868 5% -3.529758 10% -3.196411	0.5464
Education expenditure	,,	-3.120828	1% -4.211868 5% -3.529758 10% -3.196411	0.1158

Table 1...

Health expenditure	,,	-2.337312	1% -4.211868 5% -3.529758 10% -3.196411	0.4050
Sports and culture expenditure	,,	-3.679703	1% -4.211868 5% -3.529758 10% -3.196411	0.0358

Source: constructed from the study data collected; Computed as per attached appendix 1

From the table above, agriculture and sports and culture are stationary at 5% and 10%.This is because the test critical value is less than the ADF value and the probability is less than 0.05.the null hypothesis of presence of unit root is rejected. Infrastructure, health and education are not stationery at all significance levels. The test critical value is greater than the ADF value and the probability is greater than 0.05 hence we cannot reject null hypothesis.

Therefore most of the variables are not stationary at level and this necessitated testing for stationarity at 1st difference and the results were as shown in the next page.

Table 2: Stationarity test (at 1st difference) results

Variable	1st difference	ADF	Test critical values at	probability
Agriculture expenditure	Intercept and trend	-9.109051	1% -4.219126 5% -3.533083 10% -3.198312	0.0000
Infrastructure expenditure	,,	-6.761223	1% -4.219126 5% -3.533083 10% -3.198312	0.0000
Education expenditure	,,	-6.724756	1% -4.226815 5% -3.536601 10% -3.200320	0.0000
Health expenditure	,,	-6.348406	1% -4.219126 5% -3.533083 10% -3.198312	0.0000
Sports and culture expenditure	,,	-7.243673	1% -4.219126 5% -3.533083 10% -3.198312	0.0000

Source: constructed from the study data collected; Computed as per attached appendix 1

From the above table, all the variables are stationary since the ADF values are greater than the corresponding critical values and the probability is less than 0.05 for all variables. Therefore the data becomes stationary at first difference integrated of order 1 that is I(1).

Cointegration test

Because the variables are not stationary at level as evident from the unit root test results but are integrated of order one, thus the linear combination of one or more of these variables might exhibit a long run relationship. In order to capture the extent of cointegration among the variables, the multivariate cointegration methodology proposed by (Johansen 1990) was utilized. The results are shown in table 3 below.

Table 3: Johansen cointegration results

Hypothesized No of CEs	**Trace statistics**	**Critical value 0.05**	**p-value**	**Maximum Eigen statistics**	**Critical value0.05**	**p-value**
None*	99.44733	95.75366	0.0272	42.49552	40.07757	0.0262
At most 1	56.95181	69.81889	0.3407	24.59660	33.87687	0.4128
At most 2	32.35521	47.85613	0.5925	14.00401	27.58434	0.8223
At most 3	18.35120	29.79707	0.5402	10.69113	21.13162	0.6780
At most 4	7.660073	15.49471	0.5024	7.483600	14.26460	0.4336
At most 5	0.176473	3.841466	0.6744	0.176473	3.841466	0.6744

*****denotes rejection of the hypothesis at the 0.05 significance level

Source: constructed from the data collected; Computed as per attached appendix 2

From the above table, both trace statistics and maximum Eigen value test revealed one cointegrating equation at 5% level of significance. The null hypothesis of no cointegration among the variables was rejected at none since the p value was less than 0.05 in both tests. This result therefore confirmed that there is a long run relationship between government expenditure variables that is expenditure on education, infrastructure, agriculture, health and sports and culture and economic growth.

Nevertheless, the cointegration result did not point the direction of the long-run relationship between variables. Since there was evidence of cointegration, this confirmed the existence of causality from GDP growth rate to government expenditure, or vice versa, or both. Therefore, the next step was to carry out Granger-causality tests to determine the direction of causation

VAR diagnostic tests

Prior to carrying out causality test, diagnostic tests were carried out in order to determine the appropriate VAR model free from spurious VAR estimation results. The diagnostic tests carried out included normality (Jarque-Bera test), autoregressive conditional heteroscedasticity(ARCH LM test), and serial correlation (Breusch-Godfrey serial correlation LM test).The results are presented in table 4 below.

Table 4: Diagnostic tests

Test	F-statistics	p-value
Normality: Jarque-Bera statistic	2.234339	0.327205
Serial correlation: Breusch-Godfrey serial correlation LM test	0.004138	0.9491
Autoregressive conditional heteroscedasticity: ARCH LM test	0.176053	0.6773

Source: constructed from the study data; Computed as per attached appendix 4

In normality test, null hypothesis of presence of normality was not rejected since the p-value is greater than 5%.This confirmed that the data is normally distributed. For serial correlation test, the null hypothesis of no serial correlation between the variables was not rejected since the p-value is greater than 5% as shown in the table. Lastly the null hypothesis of no heteroscedasticity was not rejected too because the p-value is greater than 5% as shown in the table.

Therefore the diagnostic tests indicate that the residuals are normally distributed, homoscedastic and serially uncorrelated.

Granger causality test

Granger causality is a technique for searching the direction of causation between variables after the existence of cointegration (Kalyoncu & Yucel 2006). Cointegration results indicated a long run relationship between the variables but did not indicate the direction of causation. Granger causality test with various lags was carried out using pairwise granger causality criterion (table 5).

Table 5: Granger causality test

Null hypothesis	F- statistic	lag	probability	conclusion
GDP does not granger cause agriculture expenditure	4.77784	2	0.0151	Bi-directional
Agriculture expenditure does not granger cause DGP	3.71253	2	0.0351	

Table 5...

GDP does not granger cause infrastructure expenditure	2.83024	4	0.0442	Bi-directional
infrastructure expenditure does not granger cause GDP	5.34148	4	0.0027	
GDP does not granger cause education expenditure	3.55049	2	0.0401	Uni-directional running from GDP to education expenditure
Education expenditure does not granger cause GDP	0.34145	2	0.7132	
GDP does not granger cause health expenditure	8.14080	5	0.0001	Bi-directional
Health expenditure does not granger cause GDP	2.67051	5	0.0468	
GDP does not granger cause sports and culture expenditure	2.89993	8	0.0360	Bi-directional
Sports and culture expenditure does not granger cause GDP	2.82478	8	0.0396	

The granger causality test results revealed that there was bi-directional causality between government expenditure on agriculture, infrastructure, health and sports and culture and economic growth. The p- values for these variables are less than 5% hence the null hypothesis was rejected. This means that these set of variables predicted each other and hence could be on either side of the equation, (either as dependent or as an independent variable). These results are consistent with the results of Maingi (2010).Education expenditure had a unidirectional causality on economic growth.GDP granger causes education expenditure. These findings confirm the use of VAR model given that there was directional causality between economic growth and government expenditure components under the study.

From these results, there was a feedback effect between government expenditure components and GDP growth rate, which supported the Wagner's hypothesis that states that increase in GDP causes growth in the government expenditure, and the Keynesian hypothesis that states that increase in government expenditure causes GDP to increase. This suggests that allocation of government resources should be designed carefully in order to spur economic growth of the country.

Impulse response function

The impulse response function traced the effects of one standard deviation shock on a variable on its own and on the other variables. The vertical axis shows the deviation from the baseline

level of the target variable in response to a one standard deviation shock of the independent variable (Kigabo, et al.2015).

The specific objectives of this study were to analyze the effects of government expenditure on various sectors on economic growth. The results were depicted by the following response functions of GDP and the various government sectors

The effect of agriculture expenditure on GDP

The effect of a one standard deviation shock to agriculture expenditure on GDP is shown in the figure 4 below.

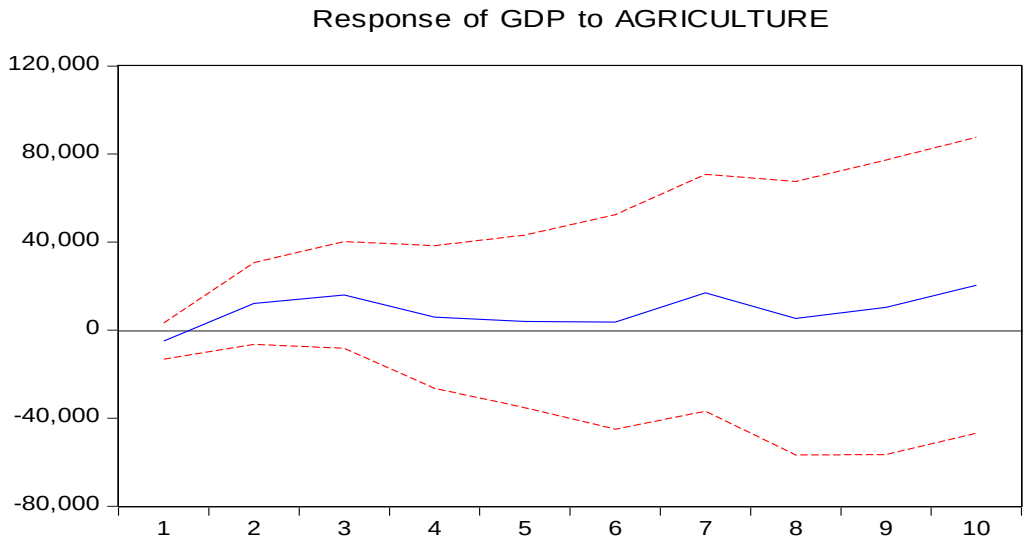


Figure 4: effect of agriculture expenditure on GDP

There were fluctuations on the effects of agriculture expenditure on GDP throughout the study period though the variations were positive (blue line trend) showing that agriculture expenditure was significant in stimulating economic growth. There was a positive effect on GDP incase of a one standard deviation shock in agriculture expenditure. This could be due to the fact that increased agriculture expenditure improves the total agricultural output which increases aggregate domestic consumption and export earnings which adds to the GDP.Improved methods of farming through provision of quality seeds to farmers, fertilizer provision and bringing more land under agriculture could have necessitated this outcome. The results are similar to those of Abbas & Abdul (2016). They also found a positive relationship between agriculture expenditure and economic growth in Pakistan.

The effect of infrastructure expenditure on GDP

The effect of a one standard deviation shock to infrastructure expenditure on GDP is shown in the figure 5 below.

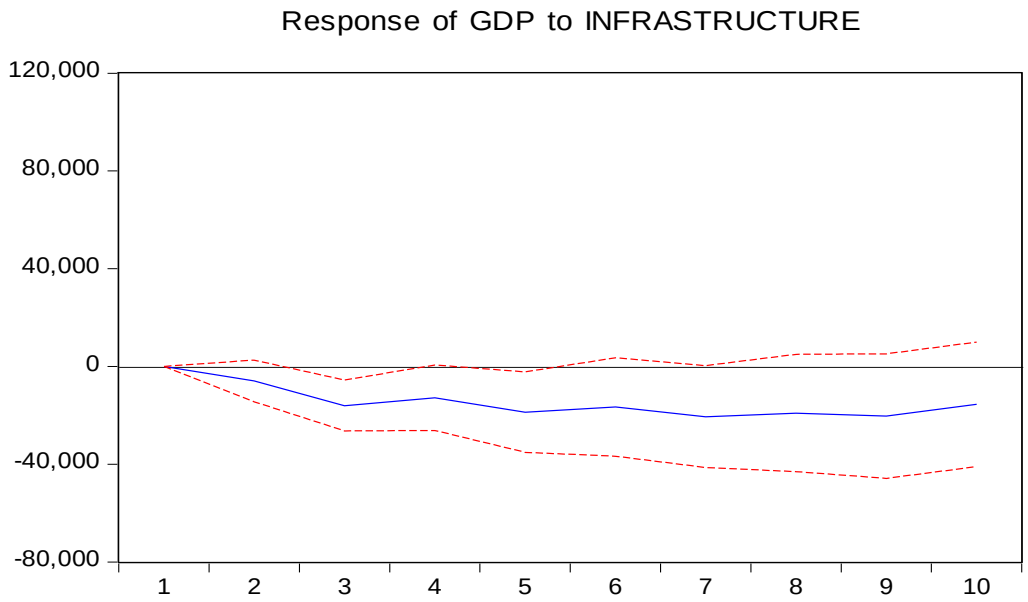


Figure 5: effect of infrastructure expenditure on GDP

The effects of infrastructure on economic growth remained fairly stable on the negative side throughout the study period exhibiting a decreasing trend initially and increasing trend from the 5th financial year as shown by the blue line below the base line in the above figure. This shows that infrastructure expenditure had a negative effect on GDP within the study period. A one standard deviation shock of infrastructure expenditure impacted negatively on economic growth. This could be due to high expenditure on salaries and wages incurred on foreign firms given the tenders initially since Rwanda had shortage of skilled manpower on construction of roads and communication networking initially. This led to high capital outflow which could have impacted negatively on economic growth. The steady rise in the effects can be explained by the fact that Rwanda has improved her manpower and this has reduced the capital outflow though still not enough to foster positive effects.

Effect of education expenditure on GDP

The effect of a one standard deviation shock to education expenditure on GDP is shown in the figure 6 below.

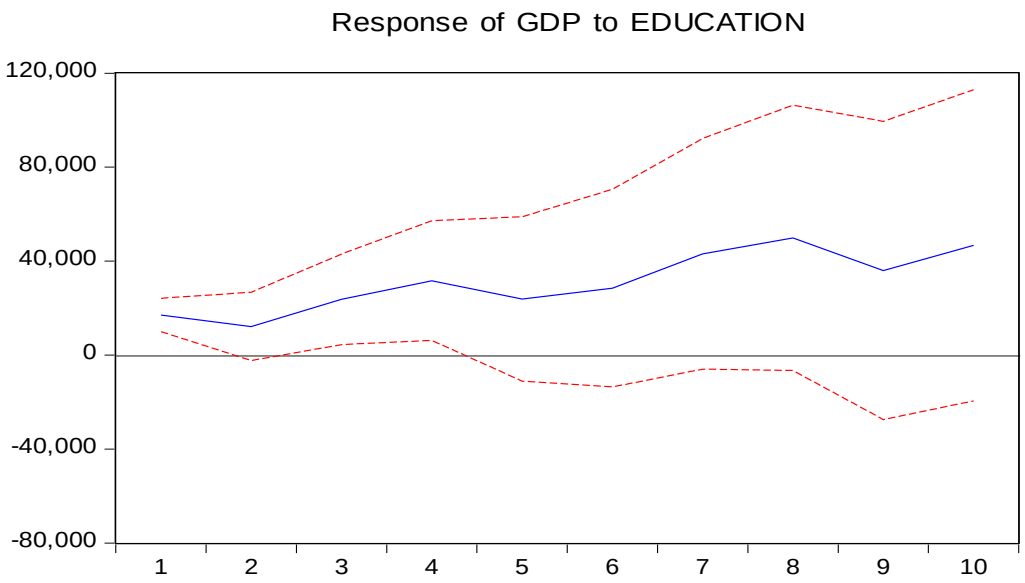


Figure 6: effect of education expenditure on GDP

The effects of education expenditure on GDP remained positive for the entire period as shown by the blue line in the above figure. A one standard deviation shock of education expenditure had a positive effect on GDP. Education expenditure contributed greatly to economic growth within the study period.

There were fluctuations on the effects but they generally exhibited an increasing trend with time depicted by increased gap between the baseline and the blue line.

This trend could be attributed to the increased skilled labour force (human capital) with time needed in the industries leading to increased efficiency in production hence increased total output. This could have been achieved by carrying out awareness programmes on education, expansion of learning institutions right from primary to university, provision of appropriate physical infrastructure in schools, provision of high skilled manpower which ultimately increases the marginal productivity of labour, introducing fee guidelines in the learning institutions and finally increased number of government sponsored students to higher learning institutions. All these factors led to increased enrolment rate in the learning institutions creating a pool of skilled manpower required in both public and private sectors leading to increased GDP. The results are consistent with those of Mekdad (2014) who also found a positive relationship between education expenditure and economic growth in Algeria.

Effect of health expenditure on GDP

The effect of a one standard deviation shock to health expenditure on GDP is shown in the figure 7 in the next page.

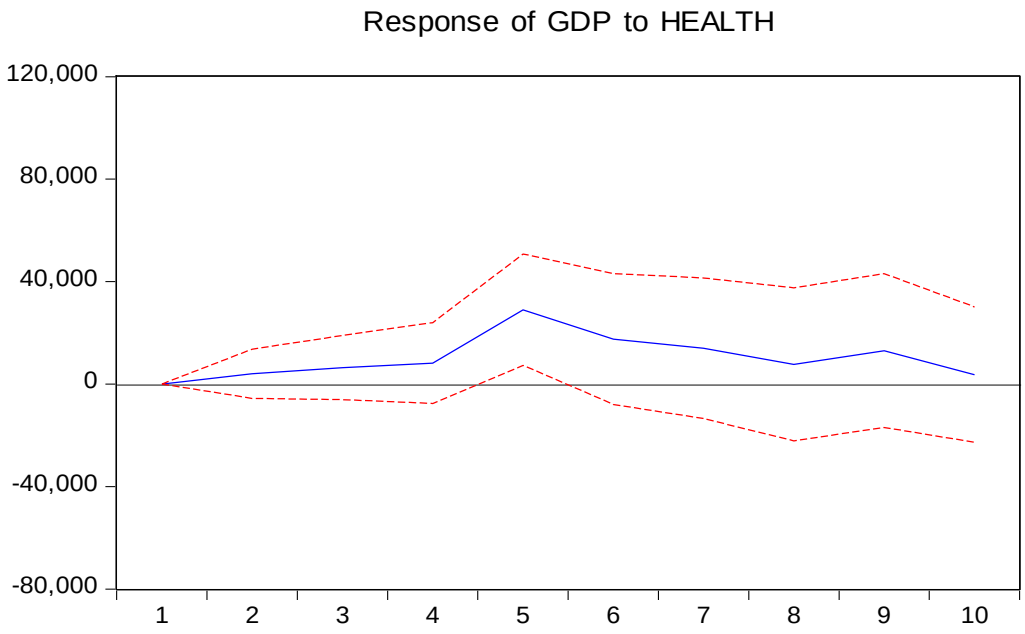


Figure 7: effect of health expenditure on GDP

The effects of a one standard deviation shock of health expenditure on GDP had an increasing trend up to the fifth financial year, a decreasing trend after up to eighth financial year then a rise and fall in the last two years. The effects were otherwise positive for the entire study period depicted by the blue line being on the positive side of the base line.

This phenomenon could be due to the fact that health expenditure by the government raises the health status and productivity of the people, thereby promoting economic growth. The increased expectation of a longer life could affect the intertemporal discount rate and therefore savings. Increased health expenditure could increase the participation of women in the labour market, and affect fertility, which has effect on demographic transition and therefore on the economy. Further, government investments on buildings of hospitals represent expenditure on the core functions and therefore are expected to have a positive effect on the economy.

Effect of sports and culture expenditure on GDP

The effect of a one standard deviation shock to sports and culture expenditure on GDP is shown in the figure below.

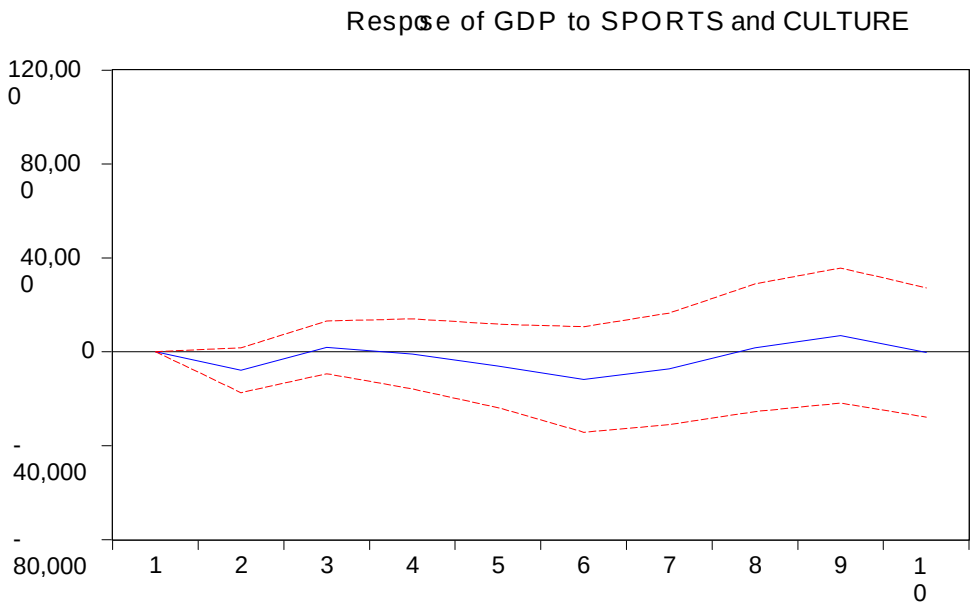


Figure 8: effect of sports and culture expenditure on GDP

The effect of a one standard deviation shock of sports and culture on economic growth was negative initially, became positive shortly then dropped again for some time till the 6th financial year before rising again. Generally there was fluctuation in the effects on both sides of the baseline for the entire period. This shows that sports and culture expenditure had mixed effects on economic growth.

The positive effects could be attributed to expansion of tourist sites and increased expenditure on promotion of sports activities which saw more Rwandese playing in foreign clubs which brings in foreign earnings for the country. Expansion of tourist sites and culture attracted more tourists hence increased foreign earnings. The negative effects could be attributed to low foreign earnings from tourism sector.

Variance decomposition analysis

This is an alternative method to analyzing the effects of shocks of government expenditure to GDP. This technique determined how much of the forecast error variance for any variable in the system was explained by innovations to each explanatory variable over a series of time horizon (Enders, 1995). The own series shocks explained most of the error variance, although the shock also affected other variables in the system.

Table 6: Variance Decomposition of GDP

Period	S.E.	Agriculture	Education	GDP	Infrastructure	Health	Sports
1	24901.20	3.968332	46.72514	49.30653	0.000000	0.000000	0.000000
2	33653.91	15.06025	38.56126	36.28718	4.469364	0.099278	5.522663
3	48022.86	18.45604	43.32326	20.19318	13.47984	1.684615	2.863073
4	60012.15	12.79648	55.55743	13.65086	14.86549	1.269825	1.859908
5	77696.92	7.890091	42.54327	18.47325	27.35257	2.019334	1.721482
6	88653.19	6.229233	43.01876	17.68598	28.38375	1.588301	3.093974
7	104622.8	7.095155	47.83236	15.19716	25.90313	1.259926	2.712270
8	117958.4	5.787590	55.51899	12.11537	23.05790	1.365970	2.154174
9	127624.8	5.600654	55.38244	12.43816	23.17407	1.272767	2.131907
10	138516.2	6.919037	58.39322	10.79958	20.67820	1.399489	1.810470
11	159044.8	8.260947	62.84100	8.363508	17.88110	1.257448	1.395994
12	177701.6	6.767621	68.31625	6.707170	15.63880	1.363437	1.206724
13	189030.4	6.822639	67.25645	7.589458	16.04426	1.220247	1.066949
14	201744.4	7.669578	66.50102	7.267382	16.36545	1.141441	1.055130
15	220855.1	7.732854	66.23548	6.529335	17.55513	1.066366	0.880839
16	237908.4	6.725740	68.76594	5.664421	16.96847	1.098232	0.777199
17	248883.0	6.512409	68.23409	5.945763	17.56899	1.008045	0.730704
18	260314.8	6.547030	69.02914	5.607940	17.14029	0.991892	0.683705
19	278963.8	6.765398	70.31845	5.057450	16.21401	1.041449	0.603236
20	296467.4	6.335191	72.46252	4.479365	14.85690	1.260293	0.605734
21	307364.0	6.569625	72.18440	4.507010	14.80422	1.253058	0.681684
22	318505.4	6.882963	72.48866	4.248400	14.48346	1.260933	0.635585
23	336090.3	7.151752	72.70326	3.922676	14.44103	1.204320	0.576966
24	351920.0	6.642467	74.05450	3.577832	13.96342	1.224414	0.537361
25	361359.8	6.563721	73.57116	3.815292	14.35751	1.171478	0.520841
26	369607.2	6.656279	73.55654	3.727837	14.38566	1.170271	0.503419
27	382837.5	6.862447	73.47889	3.547683	14.44939	1.175946	0.485642
28	396256.1	6.491941	74.52175	3.346039	13.84126	1.280769	0.518239
29	403846.6	6.473792	74.52402	3.346163	13.81175	1.260935	0.583339
30	410904.1	6.550582	74.83158	3.236979	13.53954	1.276606	0.564711
31	422535.7	6.833924	74.91175	3.099671	13.33001	1.278800	0.545850
32	434245.3	6.585195	75.69118	2.963983	12.84530	1.367724	0.546625
33	440393.2	6.611783	75.41055	3.033625	13.01529	1.347073	0.581679
34	445257.6	6.660639	75.43544	2.976594	13.01408	1.343974	0.569283
35	453832.7	6.802171	75.27253	2.903800	13.15422	1.315768	0.551508
36	462831.8	6.555947	75.88242	2.841523	12.82151	1.354215	0.544384

Table 6...

37	466846.8	6.525288	75.78565	2.895420	12.87946	1.339293	0.574890
38	469693.2	6.571074	75.86677	2.860464	12.77475	1.358686	0.568257
39	475515.1	6.825033	75.72995	2.798101	12.70237	1.368334	0.576213
40	482679.6	6.649089	76.07719	2.863049	12.35369	1.450289	0.606692

From the results in the above table, GDP was affected by its own shocks which also affected other variables, these are agriculture, health, infrastructure, education and sports and culture. Most of the error variations in GDP were explained by its own, agriculture and infrastructure expenditures. Education expenditure explained most of the GDP variations both in the short run and long run periods. Agriculture expenditure had average explanations for the GDP variations. Health and sports and culture had minimal explanations for GDP variations. The variations in GDP was greatly explained by education, its own, infrastructure, agriculture, health then finally sports and culture. Education expenditure explained averagely 60% of variations in the short run and over 70% in the long run.

SUMMARY

The rapid growth in government expenditure in Rwanda has caused concern among policy makers on the implication of such growth, especially to the whole economy in general, and the private sector in particular. For the last one decade, government expenditure in the country grew at a faster rate than the growth rate of GDP. This rapid growth in government expenditure seems not to bring adequate economic growth. Given this fiscal scenario, an explanation of this requires studying the impact of government expenditure on economic growth. Therefore the study sought to analyze the effects of government expenditure components on economic growth by looking at expenditure on five sectors that is agriculture, infrastructure, education, health and sports and culture.

The study applied Vector Auto Regression (VAR) estimation technique together with time series data for the period 2005 to 2015 to evaluate the effects of government expenditure on economic growth. Unit root tests were conducted to test the stationarity level of the data which was found to be integrated of order one. The data was also tested for Cointegration and revealed long run relationship between economic growth and its determinants. Granger causality tests were carried out which generally revealed bidirectional causality between government expenditure components and economic growth.

Using the time series secondary data, the VAR model yielded impulse response functions and variance decomposition analysis. From the impulse response functions the study found out that expenditure on agriculture sector, health sector and education sector had positive

effects on GDP. Expenditure on infrastructure sector had negative effect on GDP but approaching the positive side towards the end of the study period. Expenditure on sports and culture had mixed effects on GDP within the study period. The variance decomposition analysis revealed that GDP variations were majorly explained by its own shocks, infrastructure expenditure and education expenditure. Health and sports and culture expenditures explained the least variations in GDP.

CONCLUSION

Overall, the analysis shows that on average public expenditure and potential economic growth are linked by a long-run relationship. The results suggest that, increased economic growth would differ quite considerably across sectors. In order to realize the expected economic growth in the country the performance will largely depends on the efficiency of scaled-up expenditure. From the study, it is evident that the composition of government expenditure affects economic growth. It is however worth noting the key public expenditure components like education, agriculture and health were the major drivers of economic growth. This is based on the simple fact that Rwanda is a developing country and any investment in education leads to creation of required skilled human capital in industries which increases the GDP. Agriculture expenditure increases the total output of goods and services for domestic consumption and export. Health raises the productivity of people within the economy and even the savings increases too for a healthy economy thereby increasing the GDP. The possible explanation as to why public expenditure in infrastructure contributed negatively to economic growth in Rwanda is that Rwanda imported much labor in infrastructural development leading to high capital outflow.

RECOMMENDATIONS

The government should increase its expenditure allocation to the education sector. This is because the study found out that education expenditure affect economic growth positively. This positive effect can be maintained through continued provision of education facilities, training and employing more teachers, ensuring access to education to all citizens, reduction of the cost burden to the parents/guardian through offering fee guidelines to education institutions and expanding education to the marginalized groups through offering free and subsidized education. This is because quality education creates positive externalities and increases the productive capacity that helps to raise the steady state rate of economic growth.

The government should increase health expenditure as it increases the productivity of the citizens hence improving GDP. From the results health expenditure has a positive significant effect on economic growth that is an increase in health expenditure leads to an increase in total

output. This can be done through expansion of health facilities through building of more hospitals and dispensaries, training and employing more doctors and nurses, expansion of medical research centers and buying modern hospital equipment which helps in improving the efficiency of health services among others. These measures will improve the health standards of the workforce in the entire economy enabling them to actively participate in employment activities hence improved economic growth.

Agriculture expenditure should also be increased as it leads to increased total output as evidenced by the positive effects from the research findings. An increase in agriculture expenditure leads to an increase in total output. The government should increase resource allocation in providing farm inputs to farmers such as subsidized quality fertilizers, tractors for digging the farms, offering better prices for farmers produce, building of green houses and expansion of agricultural research institutions to ensure farming is done in line with the modern technology for good harvest. Dams should be constructed to provide water for irrigation to farmers during dry seasons and also enable farming to be done in dry parts of the country.

Expenditure on infrastructure should be streamlined. From the results infrastructure has a negative effect on GDP though the negativity keeps on diminishing towards the end of the study period. Physical infrastructures being a capital expenditure the returns are not immediate. The government should embark on training more citizens on infrastructural development work to create more skilled manpower in this sector hence reducing the capital outflow resulting into a positive effect on GDP. Roads and railway networks should be improved and fibre optics expanded to enhance efficient transportation and communication respectively hence resulting into positive effects on GDP.

Expenditure on sports and culture should be regulated. The government should increase allocation to those areas which increases the total output such as tourism attraction sites and sporting activities and regulate expenditure on areas deemed to have negative effect such as social conventions. This would ultimately lead to permanent positive effects on GDP.

SUGGESTIONS FOR FURTHER RESEARCH

The current research concentrated majorly on the effect of government expenditure component of fiscal policy on economic growth. Further research can be done on the effect of other components of fiscal policy such as taxation on economic growth. This research also opens the way for research on other sectors of the economy since this study looked at only 5 sectors leaving out others such as defense, tourism etc.

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APPENDICES

Appendix 1: Stationarity test

1.1. Agriculture expenditure at level

Null Hypothesis: AGRICULTURE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.117322	0.0127
Test critical values:	1% level	-4.211868	
	5% level	-3.529758	
	10% level	-3.196411	

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

1.2. Agriculture expenditure at first difference

Null Hypothesis: D(AGRICULTURE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.109051	0.0000
Test critical values:	1% level	-4.219126	
	5% level	-3.533083	
	10% level	-3.198312	

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

1.3. Infrastructure expenditure at level

Null Hypothesis: INFRASTRUCTURE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.068879	0.5464
Test critical values:	1% level	-4.211868	
	5% level	-3.529758	
	10% level	-3.196411	

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

1.4. Infrastructure expenditure at first difference

Null Hypothesis: D(INFRASTRUCTURE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.761223	0.0000
Test critical values:	1% level	-4.219126	
	5% level	-3.533083	
	10% level	-3.198312	

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

1.5. Education expenditure at level

Null Hypothesis: EDUCATION has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.120828	0.1158
Test critical values:	1% level	-4.211868	
	5% level	-3.529758	
	10% level	-3.196411	

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

1.6. Education expenditure at first difference

Null Hypothesis: D(EDUCATION) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.724756	0.0000
Test critical values:	1% level	-4.226815	
	5% level	-3.536601	
	10% level	-3.200320	

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

1.7. Health expenditure at level

Null Hypothesis: HEALTH has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.337312	0.4050
Test critical values:	1% level	-4.211868	
	5% level	-3.529758	
	10% level	-3.196411	

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

1.8. Health expenditure at first difference

Null Hypothesis: D(HEALTH) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.348406	0.0000
Test critical values:	1% level	-4.219126	
	5% level	-3.533083	
	10% level	-3.198312	

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

1.9. Sports and culture expenditure at level

Null Hypothesis: SPORTSCULTURE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.679703	0.0358
Test critical values:	1% level	-4.211868	
	5% level	-3.529758	
	10% level	-3.196411	

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

1.10. Sports and culture expenditure at first difference

Null Hypothesis: D(SPORTSCULTURE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.243673	0.0000
Test critical values:	1% level	-4.219126	
	5% level	-3.533083	
	10% level	-3.198312	

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

Appendix 2: Cointegration results

Date: 03/26/17 Time: 05:01
Sample (adjusted): 2005Q3 2014Q4
Included observations: 38 after adjustments
Trend assumption: Linear deterministic trend
Series: AGRICULTURE EDUCATION GDP HEALTH INFRASTRUCTURE SPORTS
Lags interval (in first differences): 1 to 1

2.1. Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.673166	99.44733	95.75366	0.0272
At most 1	0.476532	56.95181	69.81889	0.3407
At most 2	0.308247	32.35521	47.85613	0.5925
At most 3	0.245232	18.35120	29.79707	0.5402
At most 4	0.178757	7.660073	15.49471	0.5024
At most 5	0.004633	0.176473	3.841466	0.6744

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values

2.2. Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.673166	42.49552	40.07757	0.0262

At most 1	0.476532	24.59660	33.87687	0.4128
At most 2	0.308247	14.00401	27.58434	0.8223
At most 3	0.245232	10.69113	21.13162	0.6780
At most 4	0.178757	7.483600	14.26460	0.4336
At most 5	0.004633	0.176473	3.841466	0.6744

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

AGRICULTURE	EDUCATION	GDP	HEALTH	INFRASTRUCTURE	SPORTS
0.000580	-0.000243	-4.31E-06	-0.000195	7.70E-05	1.52E-05
-0.000434	-0.000247	7.85E-06	-0.000113	5.41E-05	0.002370
0.000156	7.04E-06	-7.57E-06	4.37E-05	2.32E-05	0.002177
1.82E-06	0.000195	2.11E-06	-0.000234	8.15E-07	0.001037
0.000127	5.95E-05	4.69E-06	6.03E-05	-0.000135	-0.000151
3.78E-05	7.20E-05	-4.80E-07	-9.63E-05	-2.54E-05	0.000832

Unrestricted Adjustment Coefficients (alpha):

D(AGRICULTURE)	-146.3580	972.1990	14.19502	425.2384	319.5922	21.11193
D(EDUCATION)	1600.472	916.6202	401.0318	-1018.631	237.8306	125.5627
D(GDP)	18654.38	-22308.99	5926.312	6690.980	9714.408	3773.855
D(HEALTH)	2086.559	-25.51758	-215.2141	998.3350	97.43973	42.02400
D(INFRASTRUCTURE)	1553.292	-380.3694	415.5696	-666.5262	2787.585	75.71495
D(SPORTS)	82.16836	-90.27643	-152.4233	-6.394585	-25.43160	9.958738

1 Cointegrating Equation(s): Log likelihood -2167.064

Normalized cointegrating coefficients (standard error in parentheses)

AGRICULTURE	EDUCATION	GDP	HEALTH	INFRASTRUCTURE	SPORTS
1.000000	-0.419600	-0.007435	-0.335936	0.132763	0.026206
	(0.08938)	(0.00207)	(0.07448)	(0.03683)	(0.73937)

Appendix 3: Variance decomposition analysis of GDP

Period	S.E.	AGRICULTURE	EDUCATION	GDP	INFRASTRUCTURE	HEALTH	SPORTS
1	24901.20	3.968332	46.72514	49.30653	0.000000	0.000000	0.000000
2	33653.91	15.06025	38.56126	36.28718	4.469364	0.099278	5.522663
3	48022.86	18.45604	43.32326	20.19318	13.47984	1.684615	2.863073
4	60012.15	12.79648	55.55743	13.65086	14.86549	1.269825	1.859908
5	77696.92	7.890091	42.54327	18.47325	27.35257	2.019334	1.721482
6	88653.19	6.229233	43.01876	17.68598	28.38375	1.588301	3.093974
7	104622.8	7.095155	47.83236	15.19716	25.90313	1.259926	2.712270
8	117958.4	5.787590	55.51899	12.11537	23.05790	1.365970	2.154174
9	127624.8	5.600654	55.38244	12.43816	23.17407	1.272767	2.131907
10	138516.2	6.919037	58.39322	10.79958	20.67820	1.399489	1.810470

11	159044.8	8.260947	62.84100	8.363508	17.88110	1.257448	1.395994
12	177701.6	6.767621	68.31625	6.707170	15.63880	1.363437	1.206724
13	189030.4	6.822639	67.25645	7.589458	16.04426	1.220247	1.066949
14	201744.4	7.669578	66.50102	7.267382	16.36545	1.141441	1.055130
15	220855.1	7.732854	66.23548	6.529335	17.55513	1.066366	0.880839
16	237908.4	6.725740	68.76594	5.664421	16.96847	1.098232	0.777199
17	248883.0	6.512409	68.23409	5.945763	17.56899	1.008045	0.730704
18	260314.8	6.547030	69.02914	5.607940	17.14029	0.991892	0.683705
19	278963.8	6.765398	70.31845	5.057450	16.21401	1.041449	0.603236
20	296467.4	6.335191	72.46252	4.479365	14.85690	1.260293	0.605734
21	307364.0	6.569625	72.18440	4.507010	14.80422	1.253058	0.681684
22	318505.4	6.882963	72.48866	4.248400	14.48346	1.260933	0.635585
23	336090.3	7.151752	72.70326	3.922676	14.44103	1.204320	0.576966
24	351920.0	6.642467	74.05450	3.577832	13.96342	1.224414	0.537361
25	361359.8	6.563721	73.57116	3.815292	14.35751	1.171478	0.520841
26	369607.2	6.656279	73.55654	3.727837	14.38566	1.170271	0.503419
27	382837.5	6.862447	73.47889	3.547683	14.44939	1.175946	0.485642
28	396256.1	6.491941	74.52175	3.346039	13.84126	1.280769	0.518239
29	403846.6	6.473792	74.52402	3.346163	13.81175	1.260935	0.583339
30	410904.1	6.550582	74.83158	3.236979	13.53954	1.276606	0.564711
31	422535.7	6.833924	74.91175	3.099671	13.33001	1.278800	0.545850
32	434245.3	6.585195	75.69118	2.963983	12.84530	1.367724	0.546625
33	440393.2	6.611783	75.41055	3.033625	13.01529	1.347073	0.581679
34	445257.6	6.660639	75.43544	2.976594	13.01408	1.343974	0.569283
35	453832.7	6.802171	75.27253	2.903800	13.15422	1.315768	0.551508
36	462831.8	6.555947	75.88242	2.841523	12.82151	1.354215	0.544384
37	466846.8	6.525288	75.78565	2.895420	12.87946	1.339293	0.574890
38	469693.2	6.571074	75.86677	2.860464	12.77475	1.358686	0.568257
39	475515.1	6.825033	75.72995	2.798101	12.70237	1.368334	0.576213
40	482679.6	6.649089	76.07719	2.863049	12.35369	1.450289	0.606692

Appendix 4: Diagnostic tests

4.1. Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.004138	Prob. F(1,31)	0.9491
Obs*R-squared	0.005206	Prob. Chi-Square(1)	0.9425

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 03/28/17 Time: 11:16
Sample: 2005Q2 2014Q4
Included observations: 39
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGRICULTURE	0.068480	6.284529	0.010897	0.9914
C	1284.284	54731.76	0.023465	0.9814
EDUCATION	-0.013877	3.942694	-0.003520	0.9972
HEALTH	0.045270	3.821332	0.011847	0.9906
INFRASTRUCTURE	0.039624	1.894935	0.020911	0.9835
SPORTS	0.404917	33.92673	0.011935	0.9906
LAGGDP	-0.005290	0.145950	-0.036248	0.9713
RESID(-1)	0.014255	0.221599	0.064329	0.9491

R-squared	0.000133	Mean dependent var	9.32E-11
Adjusted R-squared	-0.225643	S.D. dependent var	71027.84
S.E. of regression	78634.03	Akaike info criterion	25.56368
Sum squared resid	1.92E+11	Schwarz criterion	25.90492
Log likelihood	-490.4917	Hannan-Quinn criter.	25.68611
F-statistic	0.000591	Durbin-Watson stat	1.985535
Prob(F-statistic)	1.000000		

4.2.Heteroskedasticity Test: ARCH

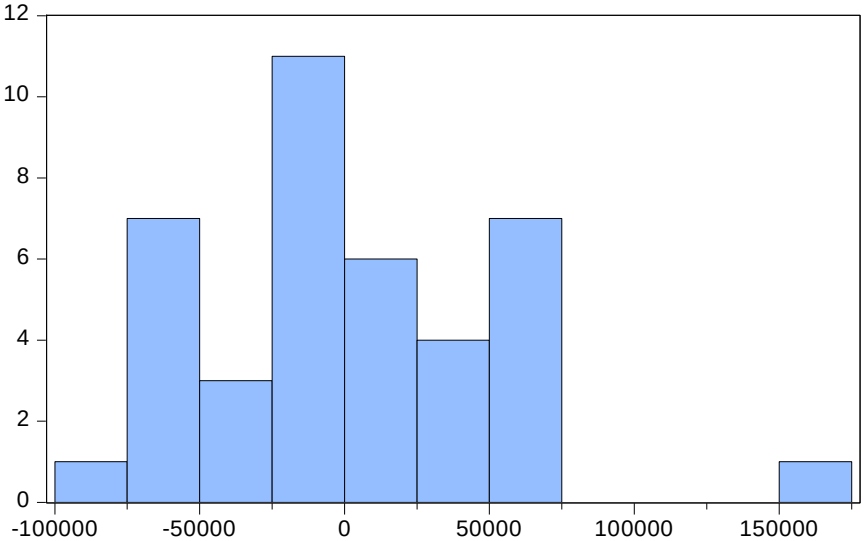
F-statistic	0.176053	Prob. F(1,36)	0.6773
Obs*R-squared	0.184929	Prob. Chi-Square(1)	0.6672

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 03/28/17 Time: 11:20
Sample (adjusted): 2005Q3 2014Q4
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.36E+09	2.28E+09	2.353844	0.0242
RESID^2(-1)	-0.069830	0.166425	-0.419587	0.6773

R-squared	0.004867	Mean dependent var	5.01E+09
Adjusted R-squared	-0.022776	S.D. dependent var	1.29E+10
S.E. of regression	1.30E+10	Akaike info criterion	49.47247
Sum squared resid	6.13E+21	Schwarz criterion	49.55866
Log likelihood	-937.9769	Hannan-Quinn criter.	49.50313
F-statistic	0.176053	Durbin-Watson stat	2.008945
Prob(F-statistic)	0.677281		

4.3. Normality test result



Series: Residuals
Sample 2005Q1 2014Q4
Observations 40

Mean	3.66e-10
Median	-10470.88
Maximum	160768.8
Minimum	-84283.09
Std. Dev.	52327.53
Skewness	0.534535
Kurtosis	3.444626
Jarque-Bera	2.234339
Probability	0.327205