Strathmore UNIVERSITY

Sectoral Public Investment on Economic Growth

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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20-11-2015 [*Date*]

This Research Project has been submitted for examination with my approval as the Supervisor.

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Content

ABSTRACT

The purpose of this study was to find out the impact of sectoral public investment on economic growth in Kenya. This paper uses a Vector Autoregressive (VAR) Model to analyze the impact of sectoral public expenditure on economic growth. Time series data from the Kenya Bureau of Statistics and the World Bank Development Indicators for the period 1964-2014 was used. The study finds a long run relationship between aggregate government expenditure and economic growth. The sectoral analysis indicates a positive impact on public expenditure in infrastructure on economic growth whereas a periodic negative and positive impact on economic growth as a result of public expenditure in public administration and defense and education.

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List of Abbreviation

GDP-Gross Domestic Product

VAR-Vector Auto Regression

OLS -Ordinary Least Squares

OECD -Organization for Economic Co-operation and Development

1 INTRODUCTION

1.1 Background

Public investment involves government expenditure in the public sector. Public sectors include health, infrastructure, education, security and defense among others. Economic growth refers to the expansion of the output of an economy, usually expressed in terms of increase in national income in terms of GDP. There are interesting implications regarding the relations between the size of government, the productivity of the public sector, the saving behavior, the social security system, and the rate of economic growth.

Causation and endogeneity are some of the econometric pitfalls that have been observed and (Stefan & Magnus, 2001) addressed the issues. They say that the more the econometrics problems are addressed, the more robust the relationship between government size and economic growth appears. Taxes and government spending have been found to affect economic growth. (Ohlsson & Skogman, 2006) say that taxes and government spending affects growth via a standard supply side relation, while growth affects tax revenue and spending decisions via the income elasticity of the demand for public -sector activities. For this reason it was found that a negative correlation exists between growth and government spending which may reflect nothing more than the fact that the demand for spending on unemployment benefits and social assistance increase in recessions.

(Wu, Tang, & Lin, 2010) Further explain that government spending tends to be insignificant for low income countries as they have poorer institutional quality and more corrupt governments. Consequently, their government budgets are more likely to be embezzled for private uses or spent on unproductive projects. (Bruno, 2006) Found out that public spending modifies the potential for

macroeconomic growth. He further explained that the effects of public spending on growth appear decisively higher when envelopment methods are used as a prerequisite for the econometrics.

(Barro R. , 1990) and (Jones & Manuelli, 1990) developed a constant return models on economic growth which had implications regarding the size of the government, the productivity of the public sector ,the saving behavior ,the social security system and the rate of economic growth (Ihori, 1995).This shows that the size of the government is a determinant of government spending . (Wu, Tang, & Lin, 2010) imply that, the efficiency and content of government services deserve much more concern than the government size.

Through the infinite horizon model with private and public capital, a case of Japan and the United states (Ihori, 1995) found out that when public investment is financed by capital income taxes and is very low, and increase in capital income tax may lead to an increase in growth. Also he found that in the finite lifetime consumer model, intergenerational transfers can ensure a positive growth rate.

However Public investments have also been found to be a hindrance to economic development from the way it is financed. Borrowing to finance public expenditure creates competition with the private sector. Kenya for example is not usually able to meet all its expenditures and hence has to borrow funds which are in form of loans and grants. Kenya being one of the developing countries it highly depends on donor funds. Since both the private and the public sectors need these funds competition rises as they both require the capital to finance their expenditure. This brings about crowding out effect where the private sector is faced out. Government deficits are thought to have a variety of effects on the private economy, ranging from forcing up interest rates and 'crowding out'

private investment in additional plant and equipment to raising wealth and stimulating household consumption demand.

Government expenditure in Kenya is guided by several sessional papers, medium term plans, Vision 2030 and the constitution. Currently, Kenya is been guided by the second Medium Term Plan.

Table 1.1: Kenya GDP Growth Rate in percentage

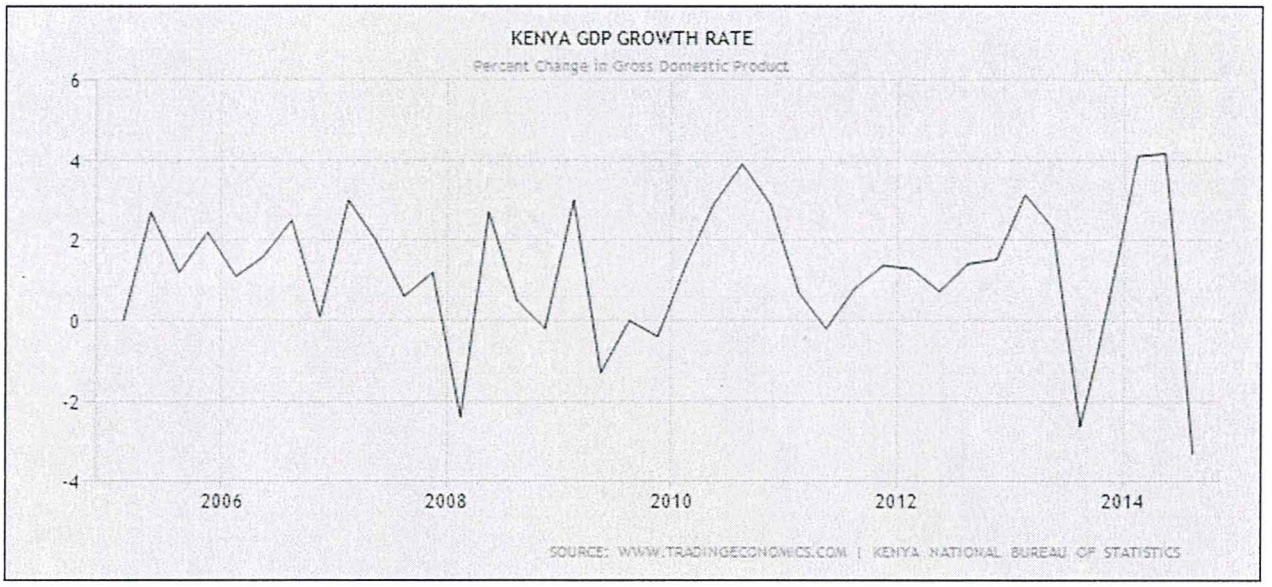


Figure 1 Kenyan GDP Growth Rate in Percentage

Source: www.tradingeconomics.com Kenya National Bureau of Statistics

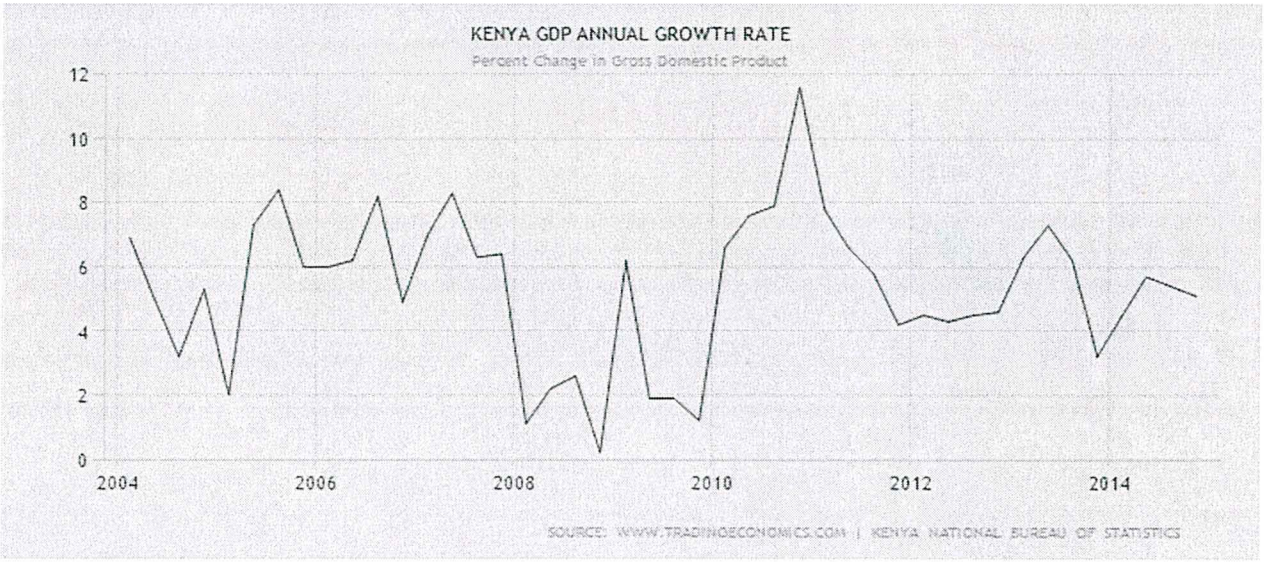


Figure 2 Percentage Changes in Gross Domestic Product

Source: www.tradingeconomics.com Kenya National Bureau of Statistics

1.2 Problem statement

Several studies have been conducted by academics to examine the long run effect of public investment on economic growth. One of the most controversial issues studied in the literature on growth is whether a large public sector is growth-promoting or growth-retarding (Ohlsson & Skogman, 2006).Empirical analyses of the impact of overall government expenditure on long-run economic growth include,among,others, (Barro R. , 1990), (Levine, 1992), (Devarajan & Zou, 1996) and (Sala-I-Martin, 1997) (Kosimbei, 2013), (Ohlsson & Skogman, 2006) has come up with mixed results. Again these studies merely interpret the significant results as causality. However, these results may suffer from endogeneity problems due to causality from government expenditure to growth, or growth to government expenditure or bi-directional causality. This in effect renders the results in such literature to suffer bias. It is also worth mentioning that these studies primarily use do cross-country analysis. However, countries may differ from one another hence presenting another challenging task for empirical estimation and policy relevance of such studies to the countries involved. Due to

this, this study seeks to examine the relationship between government expenditure and economic growth taking Kenya as a case study.

This study differs from the existing empirical works in two ways. First is that it examines the effect of government expenditure on growth and latter present a deaggregated effect of government expenditure on growth. This is to tease out the and have knowledge on which government expenditure that fosters economic growth.Secondly,this study use VAR which present the researcher a chance to run both the short run and long run equilibrium relationship and also captures the forward-looking nature of investment spending.

1.2.1 Research Objectives

This study seeks to

I. Examine the effect of government expenditure on economic growth
II. Find out the effect of public infrastructure expenditure on economic growth in Kenya
III. Establish the effect of public education expenditure on economic growth in Kenya
IV. Determine the impact of public administration and defense expenditure on economic growth in Kenya.

1.2.2 Research questions

I. What is the effect of government expenditure on economic growth?
II. What is the effect of public infrastructure expenditure on economic growth?
III. What is the effect of public education expenditure on economic growth?
IV. What is the effect of public administration and defense expenditure on economic growth?

1.2.3 Significance of the study

The purpose of this study is to evaluate the impact of specific components of government spending on economic growth and examine the effect of government expenditure on economic growth. This is to know which government expenditure fosters economic growth. This will assist the policy makers to have an empirical way of determining the economic components allocation of public funds and avoid intuition in making misinformed expenditure decisions which may lead to bad economic consequences. This is critical as the government seeks to reduce recurrent expenditures and increase expenditures on development as there is conclusive evidence on the impact of public investment on economic growth. This study is meant to contribute to the body of knowledge which exists, by providing empirical evidence mainly on the impact of public investment on economic growth in Kenya.

The reason for looking at education, public administration and defense and infrastructure is because over the past three financial years most of the budget allocation has been directed to them.

Table 1 Budget Allocation in Million Kshs

Sector	2012	2013	2014
General public service	110.6	168	190.5
Defense	65	72.7	80.5
Public order &safety	86.9	102.2	201.2
Environmental Protection	10	23.7	37.3
Health	61.1	41.9	38.5
Education	205.3	220.3	302.2

2 LITERATURE REVIEW

There has been a lot of literature done on public investment and economic growth. This chapter will focus on public expenditure relationship with economic growth as well as analyze the impact of education expenditure, military expenditure and infrastructure expenditure on economic growth.

Different schools of thoughts have had intense debate on whether the government should intervene to correct for short-run fluctuations in economic activity. Classical economists oppose intervention while the Keynesian school of thought advocates the use of fiscal policies to boost economic activity in times of recessions. Thus, Keynesians prescribe expansionary fiscal policies to avoid long recessions.Classicals and Neoclassicals deem fiscal policies ineffective on the grounds of the well-known crowding-out phenomenon, i.e., as public spending rises, public goods are substituted for private goods, thus causing lower private spending on education, health, transportation, and other goods and services (Suleiman & Aamer, 2003).

When governments borrow heavily to fund spending, pressures in the credit market result in higher interest rates which hamper private investment. In practice, the effectiveness of fiscal policies may be hindered by the relatively long time lags from recognizing a need for action until realizing the results of the policies.Keynesian approach causality runs from government spending to economic growth, Wagner's law postulates that causality runs in the opposite direction. Several theories explain government expenditure. They are explained below.

2.1.1 Musgrave Rostow's theory

It asserts that in early stages of economic growth, public expenditure in the economy should be encouraged. The theory further states during the early stages

of growth there exist market failures and hence there should be robust government involvement to deal with these market failures. This theory is faulted because it ignores the contribution to development by the private sector by assuming the government expenditure is the only driver of economic growth (Kosimbei, 2013)

2.1.2 Wagner Theory of Organic state

The literature states that growth of public expending was a natural consequence of economic growth. Wagner law viewed public expenditure as behavioral variable that positively responds to the dictates of a growing economy. The hypothesis tries to find either a positive relationship between government spending and income and or a unidirectional causality running from government spending to economic growth. The Wagner law is admired because in many ways attempt to explain public expenditure and economic growth. The law is faulted because of its inherent assumption of viewing the state as separate entity capable of making its decisions ignoring the constituent's populace who in actual fact can decide against the dictates of the Wagner law (Kosimbei, 2013)

2.1.3 Keynesian Theory

Keynesians see demand as a prequisite for growth hence their analysis conclude that aggregate demand management policies can and should be used to improve economic perfomance. It states that during recession, a policy of budgetary expansion should be undertaken to increase aggregate demand in the economy thus boosting Gross Domestic Product. On supply side, saving is a function of Gross Domestic Product while investment is an important component of the demand of an economy's output. The equilibrium growth rate is obtained by

matching proportionate change in output with ratio of savings- output to that of capital- output. This sustains the economy along some warranted steady growth path whereby temporary deviations will not be self correcting. Increase in government spending due to the GDP boost will lead to increase in employment opportunities in the public sector, employment of more workers will lead to increase in income and profits of the firms. In the work of (Barro R. , 1990), the authors employes Cobb Douglas Model and found that government activity influences the direction of economic growth. (Kosimbei, 2013)

2.1.4 The peacock and Wiseman Theory

It's based on premise that, the populace is naturally tax averse while the government on the other hand has an inherent appetite for expenditure. During times of shocks like calamities and war, the government would expeditiously increase the public expenditure, this necessitates moving taxes upwards, the researchers argued that the populace (tax payers) would allow and condone such an increase in tax known as displacement effect which assumes a long term trend. (Wiseman and Peacock, 1961). This can attempt to explain how government expenditure in Kenya has taken unrelenting upward path. One of it's shortcomings is that it sidelines the fact that government can finance an upward displacement in public expenditure using other sources of finance such as donor funds, external borrowing or even sale of government fixed asset and this needless to say may not affect taxes in an upward trend (Kosimbei, 2013).

2.2 Government expenditure and economic growth

As mentioned earlier public expenditure accelerates economic growth but the method of financing expenditures could have adverse consequences. Market borrowing for example may financially crowd out the private sector. (Govindra,

1998) says that sustained borrowing over a period of time can create a fiscal imbalance which may spill into macroeconomic and current account imbalances. On the other hand increase is spending financed by taxes can adversely affect private sector incentives (Chu and Hemming 1991).However, an increase in public consumption expenditure affects economic growth. In that the overall level of savings will reduce causing interest rates to increase and hence affect the level of investment that eventually affect economic growth.

(Grossman, 1988), (Barro R. , 1991) and (Easterly & Sergio, 1993) infer a negative relationship between government consumption expenditure and economic growth.(Devarajan et al,1990) obtained the most counterintuitive result where he found that the level of current expenditures has a significant positive effect on economic growth and the effect of capital spending is negative and insignificant. There has been found to be a strong link between public expenditure reform and growth. Fiscal consolidation tend to have the most positive effects on growth when they lead to a reduction in the domestic borrowing requirement of the government (Gupta, Clements, Baldacci, & Mulas-Granados, 2005).Reduction of government deficits and debt accumulation is dependent on a country's degree of macroeconomic stability whether it has a reached a certain degree or not.

2.3 **Military expenditure and economic growth**

National security is very important in every country. However it has been found that it is difficult to balance national security and economic growth. Huge military expenditures can be a large burden for government and detrimental to the welfare of the people. Therefore, an effective budget plan for military spending is required. However after the Cold War, spending on military had temporarily decreased but it has been found to rise again since 1990s.Moreover, this trend is continuing in spite of the global economic crisis during the last 10

years. This trend demonstrates that, in most countries, security principles are considered more important than economic conditions. In particular, a country such as South Korea, which is facing military conflicts and tensions, prioritizes security issues.

(Yang, Hong, & Jung, 2015) analysed military expenditure and economic growth across different groups using a dynamic Granger-Causality approach by applying GMM to panel data of 90 countries over 1992-2006.They found that based on long-term effects, raising the tax rate was a more effective policy response in terms of freeing up more resources for the supplementary defense budget than a reduction in non-military expenditure coupled with a decrease in educational investments. Further said that one cannot consistently conclude what the effects of military spending would be as between military spending and economic growth the relationship of two variables may depend on the measurement period and financial resources.

Fiani, Annez, and Taylor (1984) Lim (1983) found a negative effect of defense spending either directly or indirectly through their negative impact on saving, Deger and Smith (1985) investment, Deger and Sen (1983) or exports. Rothschild (1977), Biswas and Ram (1986) found no consistent, statistically significant connection between military spending and economic growth.

Military spending can have an adverse effect on economic growth by crowding-out private investment. Higher military spending results in distorted resource allocation, and the diversion of resources from productive activities to the accumulation of armaments and the maintenance of sizeable military forces. According to Benoit (1978), in lower developing countries, only a small percentage of the decrease in military spending, if any at all, goes to productive investment. Therefore, reducing military spending will not necessarily increase economic growth. (Suleiman & Aamer, 2003). He further argues that in Least

Developed Countries, military spending will increase growth through different channels; it may contribute to the civilian economy indirectly by providing education and vocational and technical training that can boost human capital. Military forces also engage in certain R&D and production activities that spread to the civilian sector Benoit (1973, 1978).

In the case of Egypt, Syria and Israel, military burdens negatively affected economic growth; civilian government spending positively affected economic growth in Israel and Egypt but negatively affected long-run economic growth in Syria. Therefore, reallocating resources from military to civilian spending may not result in increased growth unless the civilian allocation favors productive activities to be exogenous both to government civilian expenditures and economic growth. This result supports earlier findings that military burdens in Middle Eastern countries are not determined by economic factors but rather by the geopolitical situation in the area.

(Chen, Chang, & Huang, 2011) grouped countries into three panels: low-income, middle-income and high income countries. In the 3 income panels, military spending was found to lead negatively economic growth in the low-income panel. Of the 4 geopolitical panels: Middle East-South Asia, Africa ,Europe and Pacific Rim, military spending causes negative economic growth in the Middle East-South Asia and Europe regions. Well known throughout history, frequent conflicts between nations give rise to higher military expenditures, which more likely slowdowns economic growth. This intuition is supported by the result of the dynamic panel data (DPD) model used by (Chen, Chang, & Huang, 2011) .One important conclusion is that regardless of using income or geopolitical panels, once the Granger-causality is identified, the sign of the causality points to the same direction: military expenditure indeed impedes economic growth.

2.4 Public education expenditure and economic growth

There is considerable evidence that at the micro level to support that there is a link between government education expenditure and human capital. However, this does not clearly translate to a relationship between education expenditures and growth in the macro-level data. (Blankenau & Simpson, 2004)The positive direct effect of public education spending on growth can be diminished or even negated when other determinants of growth are negatively affected by general equilibrium adjustments. The relationship depends on the level of government spending, the tax structure and the parameters of production technologies.

Since the work of Lucas (1988), human capital accumulation has been identified as a potential engine of long-run growth. In most countries, government plays an important role in human capital accumulation by providing funds for formal schooling. The direct effect of public education expenditures depends only on the relative importance of public expenditures in creating human capital while the general equilibrium adjustments vary with the level of expenditures, the method of finance and several technology parameters. When non-distortionary taxes are used to finance expenditures, public education spending lowers both the ratio of physical capital to human capital and the level of private human capital investment.

In most poor countries, education is considered a priority to reduce poverty and has been supported by several studies. (Barro R. , 1990) argue that public expenditure allocation can improve economic growth while promoting equity. Gupta and Verhoeven (2001) and Gupta, Verhoeven, and Tiongson (1999) suggest that both the size and the efficiency of public education expenditure are important in improving socioeconomic performance. Promoting the economic sector normally entails increasing public expenditure on education. (Jung &

Thorbecke, 2003) in his research concluded that an increase in public expenditure can contribute to economic growth and poverty elleviation.However,the poverty and growth effects of education expenditure will differ across countries.

Significant poverty alleviation can be achieved most effectively through better targeting of educational expenditure to poor households. Under most scenarios, higher public expenditure on education provides higher economic growth and higher incomes for the poor. However, without better targeting, the impact on poverty reduction remains marginal, as a comparison of the results of the three simulation scenarios reveals. To achieve better targeting, the government could, for example build more schools in and attract more teachers to rural areas as seen by (Jung & Thorbecke, 2003)

In the case of Zambia, many educated workers are poor, in large part because of low growth in the past and few job opportunities. Because of this mismatch between skilled labor supply and demand, the expansion of the education system has had a limited effect in alleviating poverty. The government should implement policies that enhance the demand for labor through appropriate pattern of economic growth. Sufficient investment is necessary to improve labor productivity. When investment rates were low, as in Zambia, wage increases were limited, and the relative value of capital and capital income increased relatively more, worsening income distribution. However, poverty reduction strategies should ensure that efforts to strengthen human capital are complemented by sufficient levels of public and .private investment.

(Blankenau & Simpson, 2004) Concluded that there is no clear empirical validation of the link between public education expenditures and growth. One of the reasons he gave was that public education expenditures crowd out other factors which also contribute to growth. Human capital accumulation drives

growth and in turn is driven by public and private human capital expenditures. The direct effect of increasing the share of output devoted to public education expenditures is an increase in the steady-state growth rate. However, general equilibrium adjustments in other factors that affect growth may act in the opposite direction.

Were (2001) looked at the impact of external debts on economic growth and investment in Kenya, found out that current investment in human capital development to be growth supporting. But lagged public investment in human capital was found to adversely affect growth. The weaknesses of the study were that the time series data used was for a short period of time and it took into account investment in human capital ignoring investment in physical infrastructure.

Jerono (2009) conducted a study on the impact of government spending on economic growth in Kenya and found that though expenditure on education had a positive relationship with economic growth; it does not spur any significant change to growth. Given the reason that the expansion of education is higher than that of job growth in Kenya and there are relatively few job opportunities outside government for secondary and university graduates hence education have been blamed for producing surplus graduates, and long waits for government jobs. The study also asserted that a mare expenditure growth does not necessarily bring potential to spur growth; growth on the GDP was dependent on other factor too such as political will efficiency and also prioritization on the key components of the economy.

Whether public expenditure stimulates expenditure economic growth or not has dominated both theoretical and empirical debate for a long time. Different schools have different views on government intervention and economic growth. In the empirical literature, results are also mixed. Most evidence is based on

developed countries .However, all results have come up with similar relationship between public expenditure and economic growth but some contradict sharply.

On the other hand, methodologies used in those literatures reviewed might not be very applicable in Kenya as a result of difference in geographical region, political difference and level of economic growth between the studied countries and Kenya. Kenyan studies on public expenditure impact on economic growth are few such as (Maingi, 2010)and (Kosimbei, 2013). The ones available have reported contradicting results as to the impact of public expenditure on economic growth (Jerono, 2002). As shown on the empirical literature the results of Kenya's expenditure on economic growth (Kosimbei, 2013) have been divergent, some say its growth enhancing, other studies indicate public expenditure is growth impending while still others argue that the expenditure cannot predict economic growth. However, the argument is that public expenditure is capable of enhancing economic growth in short and in the long run in both developing and developed countries.

3 RESEARCH METHODOLOGY

This chapter begins by specifying the methodology and the model that is used to examine the relationship between public investment and economic growth in Kenya. The purpose of this study is to find out the impact of sectoral public investment on economic growth in Kenya.

3.1 Research design

This study made use of a quantitative approach to test the research hypothesis. The study used data for the period 1964-2014 for the following government expenditures; education, defense, health, agriculture and forestry, infrastructure, public administration and economic growth. The study also used data on net imports, net exports, government expenditure, private investment and foreign aid to examine the relationship between economic growth and aggregate government expenditure. The data was collected from secondary sources including The World Bank Development Indicators database and the Kenya National Bureau of statistics. A VAR model was used to test for the impact of public expenditure on economic growth after undertaking times series property tests on all the data collected. This was done on both an aggregate level and the sectoral level and OLS was used to estimate the elasticities of the different variables.

3.2 Theoretical framework

Keynesian theory states that public expenditure determines economic growth The Keynesian modeled economic growth as a function of public expenditure.

$$gpk = f(GEPGDPt)$$

3.3 Variables

The dependent variable used in this research is real GDP growth. The independent variables are: Foreign Aid, Government Expenditure, Private Investment, Net imports, Net Exports and Inflation.

The growth equation adopted to test the impact of aggregate government expenditure on economic growth was in the form

$$GDP\ growth = F(Aid, Net\ Exp, Net\ Imp, PInvt, Inflation, Govt\ Exp)$$

Where Aid is Foreign Aid which includes both commitments and disbursements made by donors .Net Exp refers to Net Exports variable made in that particular year while Net Imp refers to Net Imports variable .PInvt refers to Private Investment variable which is calculated as $Gross\ Capital\ Formation - Public\ Investment$.Inflation refers to the annual inflation rate variable.Govt Exp refers to the Government Expenditure variable which is the public expenditure. Government Expenditure includes government investment on Education, Public administration and Defense, Health, Infrastructure and Agriculture and Forestry.

3.4 Model specification

For the purpose of this study will pursue VAR to investigate the relationship between public expenditure components and economic growth. The VAR methodology is preferred in this study for at least two reasons. First, it avoids any *a priori* restrictions on the variables appearing in the VAR and captures the forward-looking nature of investment spending. Second, the VAR methodology allows the study of both long run equilibrium relationship and short run dynamics. (Ejaz & Musleh-ud, 2006)

Consider

$$y_{1t} = \beta_{10} + \beta_{11} y_{it-i} + \alpha_{11} x_{2t-1} + u_{1t}$$

$$x_{2t} = \beta_{20} + \beta_{21} x_{2t-1} + \alpha_{21} y_{1t-1} + u_{2t}$$

$i = 1,2,3 \ldots, y_{it}$ is defined as the endogenous variable at time t, y_{it-i} is the i^{th} lag of y_{it}, $\propto_i$ is a $k \times 1$ vector of constants (intercepts) for the 'i^{th}'variable, and u_{it} is a $(k \times 1)$ vector of error terms.

Take y_{it} as GDP growth rate and x_{2t} as total government investment. This study will develop a structural VAR, where it will be adding variables as well eliminating some variables in order to establish a relationship in regard to the explanatory power of the added variable.

3.5 Working hypothesis

i) Government expenditure on education contributes negatively to economic growth in Kenya (Blankenau & Simpson, 2004)

ii) Public expenditure on infrastructure has a positive contribution to economic growth in Kenya (Kosimbei, 2013)

iii) Public expenditure on military contribute positively to economic growth in Kenya (Chen, Chang, & Huang, 2011)

Table 2: Definition and Measurement of Variables

Variable	Definition
(gdp)	**Economic Growth** This is the percentage rate of increase in gross domestic product. Where it captures the change in the value of goods and services produced in a given economy, for a specified period of time and calculated as a percentage of rates of change in GDP. This will be measured as percentage growth in GDP. (Kosimbei, 2013)

$(pivt)$	**Public Investment** Money a government spends on public services such as education, health, infrastructure, among others, which takes a long time to complete. It will be measured as percentage growth in public investment. (Ejaz & Musleh-ud, 2006)
$(texp)$	**Total Exports** This refers all the goods and services exported to other countries by Kenya.
$(faid)$	**Foreign Aid** Economic assistance given by one nation to another for purposes of economic stabilization in forms of grants or loans.
$(privt)$	**Private Investment** Money invested by companies, financial organizations, or other investors rather than by the government. (Ejaz & Musleh-ud, 2006)
(i)	**Inflation** This refers to a sustained increase in the general price level of goods and services in an economy over a period of time.
$(gmtl)$	**Public Investment on Military** This is the fraction of government investment on military. (Kosimbei, 2013)
$(gedu)$	**Public Investment on Education** This is the fraction of government investment in education. It includes expenditure the government incurs to invest in higher education and also expenses on scholarships. (Kosimbei, 2013)
$(gtrc)$	**Public Investment on Infrastructure** This is the fraction of public funds that is used on construction of transport. (Kosimbei, 2013)

3.6 Data type and Source

The study made use of secondary data for the period 1964-2014 for the analysis. The data on government expenditure (aggregate) and for the different sectors expenditure, health, infrastructure, agriculture and forestry, public administration and defense was retrieved from the Kenya National Bureau of Statistics. This is so because the Economic Surveys for each financial year are accurate and hence reduce estimation error and provide accurate data which is reliable.

Data on GDP growth and inflation rates was retrieved form the World Bank Development Indicators database which is known to be a relatively reliable source. Also data on net imports and net imports was also extracted from the World Bank Development Indicators database. The data is quite reliable and is consistent. The study also made use of OECD Development Co-operation Directorate to retrieve data on foreign aid.

3.7 Data analysis

From the variables identified above this study applied a VAR model. To examine the response of changes of the variables, it used VAR's impulse responses and variance decomposition. Impulse responses trace out the responsiveness of the dependent variables in the VAR to shocks to each of the variables. Variance decomposition gives the proportion of the movements in the dependent variables that are due to their 'own' shocks, versus shocks to the other variables.

Also run a Granger-causality test to examine whether the variables to be tested add explanatory power to an existing relationship between one (or more) other variable(s) and its (their) lags. The equation used to test is

$$\Delta \ln(y_t) = \alpha + b_1 . \Delta ln y_{t-1} + b_2 . \Delta \ln(x_{t-1})$$

Where y is growth in real GDP, x is the government spending variable to be tested and$\propto, b_1$ and b_2 are parameters to be estimated. The notations Δ and ln

represent, one-year first difference and natural logarithms respectively, and the "subscripts are time indexes (in years).All estimations will use OLS.

4 DATA ANALYSIS

4.1 Introduction

This chapter presents empirical findings of the study based on the model developed in chapter three to achieve the objectives of the study.

4.2 Times series property results

4.2.1 Stationarity tests

Each of the variables in the study was tested for stationarity using both the Phillips-Perron (PP) and the Augumented Dickey Fuller (ADF) approach.

According to both tests GDP growth was the only stationary variable at I(0).The logarithm form of government expenditure, Foreign Aid, Private Investment, Net Imports and Net Exports were found to be stationary at I(1) with trend and intercept. Inflation was also found to be I(0) with intercept.

Natural logarithm of government expenditure on Education, Health, Public Administration and defense, Infrastructure and Forestry and Agriculture was found to be I (1) with trend and Intercept using both tests.

4.2.2 Cointegration Tests

As the variables are not stationary at level there is evidence of a long run relationship between a linear combination of one or more of the variables. Using Johansen (1990) system Cointegration tests the different variables. The number of cointergrating equations is presented below in table

Table 3 Cointegration output

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.615826	141.5946	125.6154	0.0037
At most 1	0.531743	95.67490	95.75366	0.0506
At most 2	0.388905	59.25546	69.81889	0.2589
At most 3	0.306222	35.61535	47.85613	0.4160
At most 4	0.185311	18.06642	29.79707	0.5612
At most 5	0.144362	8.228886	15.49471	0.4412
At most 6	0.015407	0.745304	3.841466	0.3880

4.2.3 Lag Selection Criteria

The study employed the Alkaike Information Criterion (AIC) for lag selection. The decision is to choose the model which has the lowest information criteria value so as to ensure that the error term is not mispecified (Enders 1995)

Table 4 Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-466.1258	NA	2.025055	20.57069	20.84896	20.67493
1	-238.3886	376.2615*	0.000876*	12.79950	15.02568*	13.63344*
2	-196.0375	57.08192	0.001356	13.08859	17.26266	14.65222
3	-145.8353	52.38489	0.001961	13.03632	19.15829	15.32965
4	-68.46761	57.18482	0.001506	11.80294*	19.87281	14.82596

4.2.4 Granger Causality Test

Granger causality Test was conducted to determine the direction of causation.

Table 5 Granger Causality

Null Hypothesis	Observations	F-statistic	Probability	Conclusion
GDP does not granger cause Education	48	0.27478	0.7611	No Granger causality
Education does not granger cause GDP	48	0.03249	0.9681	
Agriculture does not granger cause GDP	48	0.01817	0.9820	Uni-directional causality
GDP does not granger cause Agriculture	48	0.58222	0.5630	
Health does not granger cause GDP	48	0.01612	0.9840	No Granger causality
GDP does not granger cause Health	48	0.01930	0.9809	
Infrastructure does not granger cause GDP	48	0.04434	0.9567	Uni-directional causality
GDP does not granger cause infrastructure	48	0.98867	0.3804	
Public administration and defense does not granger cause GDP	48	0.18749	0.8297	Uni-directional causality
GDP does not Granger	48	0.55776	0.5766	

cause public administration and defense				

Rejection of null hypothesis is at 5% significance level

4.3 Empirical Results and Discussions

Table shows the long run dynamics for growth using aggregate government expenditure.

Table 6 Aggregate Public Expenditure Regression

Dependent Variable: GDP___GROWTH_				
Method: Least Squares				
Date: 11/04/15 Time: 16:15				
Sample (adjusted): 1966 2014				
Included observations: 49 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.120728	1.562663	1.357124	0.1825
GE	4.40E-13	2.95E-13	1.490906	0.1440
INFLATION	-0.191613	0.055010	-3.483276	0.0012
NE(-1)	5.14E-11	2.11E-11	2.441850	0.0192
NI_KSHS_(-1)	-3.26E-11	1.33E-11	-2.449566	0.0189
PI(-1)	2.11E-11	5.41E-12	3.898778	0.0004
FOREIGN_AID(-1)	7.16E-12	6.13E-12	1.166986	0.2503
D71	14.37098	2.717186	5.288921	0.0000
D70	-12.43610	2.715602	-4.579501	0.0000
D66	12.94719	2.918287	4.436572	0.0001
R-squared	0.726405	Mean dependent var		4.818675
AdjustedRsquared	0.663268	S.D. dependent var		4.441960
S.E. of regression	2.577607	Akaike info criterion		4.911505
Sum squared resid	259.1183	Schwarz criterion		5.297591
Log likelihood	-110.3319	Hannan-Quinn criter.		5.057985
F-statistic	11.50518	Durbin-Watson stat		1.751001
Prob(F-statistic)	0.000000			

Discussion

Inflation has a negative and significant impact on Economic growth.Net exports have a positive and significant impact on economic growth. However, net imports have a negative and significant impact on economic growth. Private investment on the other hand has a positive and significant relationship on economic growth. The coefficient of foreign aid is positive and not significant indicating the presence of macroeconomic policy stability in Kenya. Also government expenditure has a positive and not significant impact on economic growth. However, from theory it indicates that when a government increases its expenditure on the different sectors it should be reflected on economic growth increase.

The dummy variable for the year 1966 is to cater for the persistence of balance of payments deficits in the main reserve centers. The United States and Britain attempted to bring these deficits under control. This led to corrective policies based initially on high interest rates and physical controls rather than fiscal correctives. This resulted to generally high interest rates throughout the world.

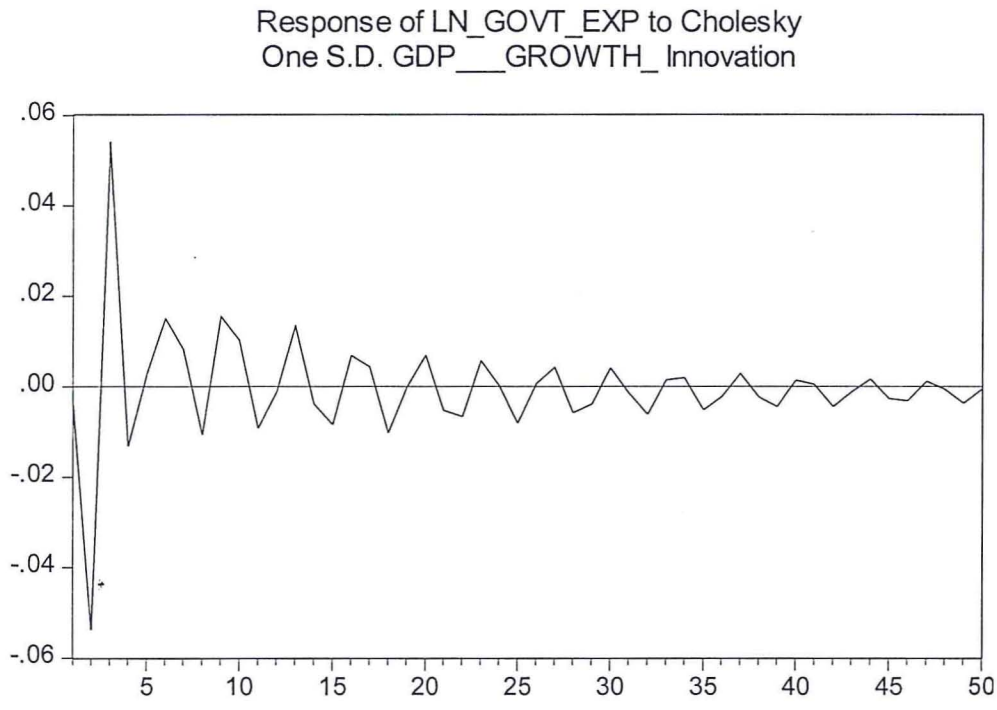
The most notable feature of the World economy in 1970 was the continued high level of growth in the World trade from the point of view of developing countries. For Kenya it was the first full year of the Association Agreement of the partner states with the European Economic Community.

In 1971 Kenya was experiencing continued inflation which led to a sharp increase in the value of imports and consequent adverse effects on the balance of payments. This was made worse by the weak commodity prices. This was accompanied by stagnated economic growth.

Impulse response

There is an immediate negative effect of GDP growth. The negative effect starts from the first year to the third year. In the fourth year the negative impact fizzles

out and is followed by an immediate positive impact on economic growth as a result of one standard deviation on public expenditure. Around the fifteenth year there is a gradual negative impact on economic growth. This continues till the thirty sixth year. Economic growth hits a positive change in the following year. Economic growth change is fluctuates but in a decreasing manner. As the years go by the change in GDP growth as a result of one standard deviation Public expenditure decreases with increase in time.



Variance Decomposition of GDP___GROWTH_:

Table 7 Variance Decomposition 1

Period	S.E.	GDP___GROWTH_	INFLATION	LN_AID	LN_GOVT_EXP	LN_NET_EXP	LN_NET_IMP	LNPINV
1	4.858390	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000
2	5.619760	93.31019	1.713435	0.067474	0.555550	0.011523	4.278848	0.0629
3	5.877332	87.85434	1.975616	4.383763	0.511833	0.194929	5.018771	0.0607
4	6.162655	86.65616	2.029882	4.065591	1.277555	0.435779	5.324823	0.2102
5	6.436829	85.08754	2.399544	3.783006	1.323619	1.112772	6.100808	0.1927
6	6.732443	83.47651	3.243003	3.458091	1.436442	1.049373	7.133903	0.2026

7	6.969205	82.53184	4.026708	3.248523	1.535921	1.022756	7.419556	0.2146
8	7.208395	81.72426	4.182003	3.186448	1.828748	1.041718	7.820946	0.2158
9	7.452070	81.42496	4.446349	3.042949	1.880052	1.011296	7.991560	0.2028
10	7.680857	80.92180	4.886505	2.950430	1.905214	0.963164	8.171981	0.2009

In the,short run shocks in Economic Growth is explained by its own shocks and shocks from inflation, foreign aid, net imports, net exports, private investment and aggregate government expenditure. A large percent is explained by shocks in GDP growth (93%).

However, in the long run shocks in economic growth are explained by shocks in inflation (4.88%), net imports (8.17%), foreign aid (2.95%) and shocks in GDP growth (80%).

Both in the short run and long run a higher percentage of economic growth change is explained by its own shocks. However, the explanatory power of aggregate government expenditure to change in economic growth increases over time.

4.3.1 Sectoral Analysis

Table 8 Sectoral Analysis Output

Dependent Variable: D(GDP___GROWTH_)
Method: Least Squares
Date: 11/19/15 Time: 18:05
Sample (adjusted): 1969 2014
Included observations: 46 after adjustments

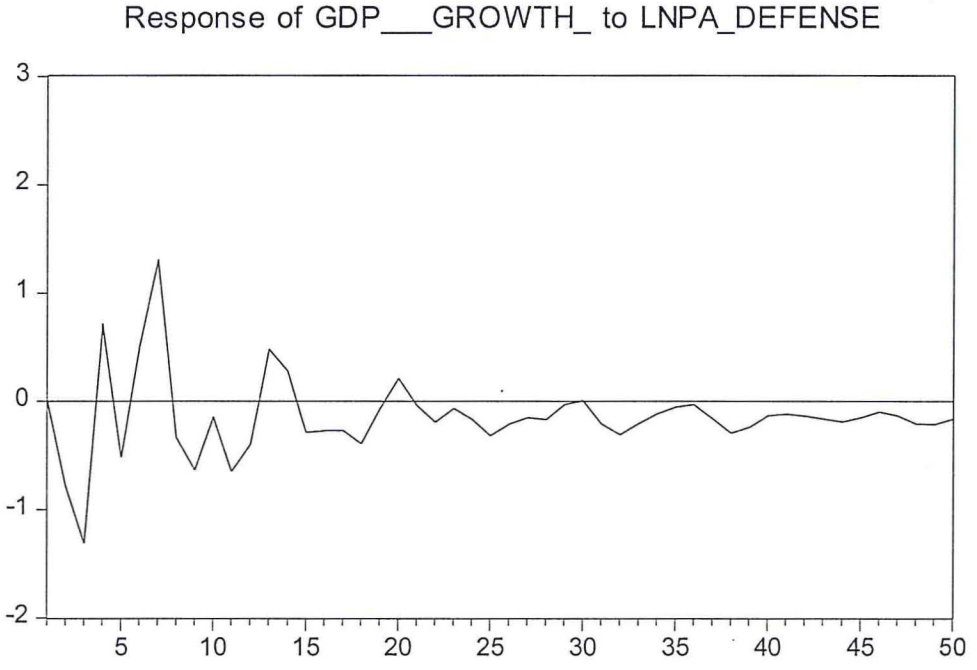
D(GDP___GROWTH_) = C(1)*(GDP___GROWTH_(-1) + 75.5588951676 *LNPA_DEFENSE(-1) - 86.2043198196*LN_AGRI_FORESTRY(-1) + 115.620213884) + C(2)*(LNEDU(-1) + 0.380460763995 *LNPA_DEFENSE(-1) - 1.61462028955*LN_AGRI_FORESTRY(-1) + 3.31156133121) + C(3)*(LNHEALTH(-1) + 1.56493583136 *LNPA_DEFENSE(-1) - 2.89471516525*LN_AGRI_FORESTRY(-1) + 4.85810971035) + C(4)*(LNINFTR(-1) + 16.9730417278 *LNPA_DEFENSE(-1) - 20.639184375*LN_AGRI_FORESTRY(-1) + 32.9325167477) + C(5)*D(GDP___GROWTH_(-3)) + C(6)*D(LNEDU(-3)) + C(7)*D(LNHEALTH(-3)) + C(8)*D(LNINFTR(-3)) + C(9) *D(LNPA_DEFENSE(-3)) + C(10)*D(LN_AGRI_FORESTRY(-3)) + C(11)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.658574	0.105985	-6.213834	0.0000
C(2)	15.26632	3.408211	4.479276	0.0001
C(3)	-15.41558	3.714660	-4.149929	0.0002

C(4)	3.527030	0.600265	5.875787	0.0000
C(5)	0.226596	0.070903	3.195859	0.0030
C(6)	-37.58182	5.462414	-6.880077	0.0000
C(7)	9.099796	5.993376	1.518309	0.1379
C(8)	-1.914449	1.897423	-1.008973	0.3199
C(9)	7.050519	5.060910	1.393133	0.1724
C(10)	3.196941	1.127711	2.834893	0.0076
C(11)	3.448810	0.939794	3.669751	0.0008
R-squared	0.810057	Mean dependent var		-0.057709
Adjusted R-squared	0.755788	S.D. dependent var		5.389131
S.E. of regression	2.663192	Akaike info criterion		5.001895
Sum squared resid	248.2407	Schwarz criterion		5.439179
Log likelihood	-104.0436	Hannan-Quinn criter.		5.165705
F-statistic	14.92659	Durbin-Watson stat		2.117960
Prob(F-statistic)	0.000000			

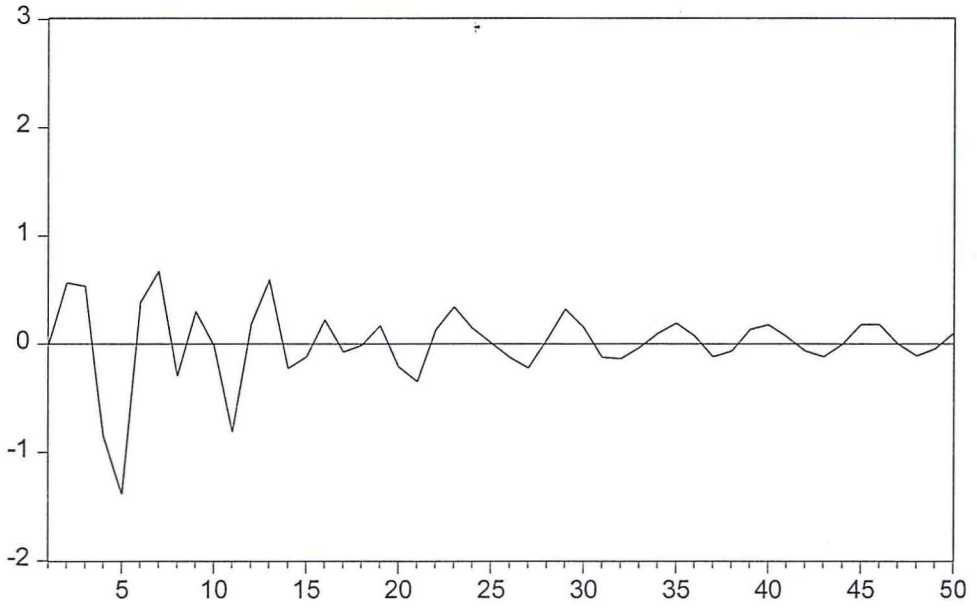
The long run speed of adjustment is negative and significant at 65.86%. The short run speed of adjustment for logarithm of health and education are negative and significant. However, the short run speeds of adjustment for education, Infrastructure and Agriculture and Forestry are positive and significant.

The Impact of public expenditure on Public Administration and defense on Economic growth



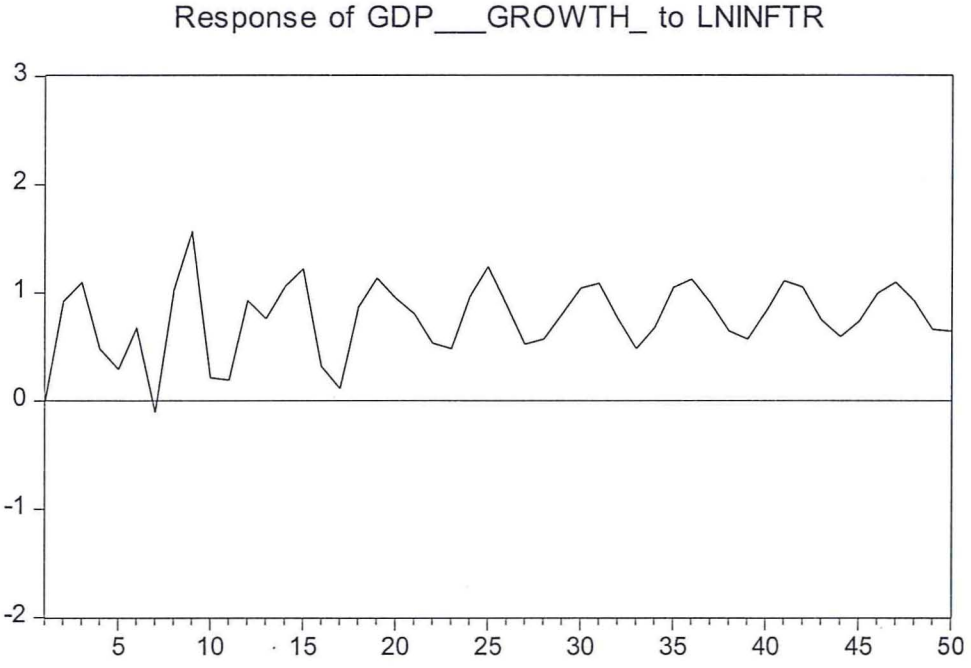
There is an immediate negative change in economic growth as result in to a one standard shock in public expenditure on public administration and defense. The negative impact fizzles out in the third year and is followed by an immediate positive change in economic growth.However,in the fifth year there is a sharp negative impact on economic growth as a result of a one standard shock. This comes to an end in the seventh year where there is a sharp positive impact on economic growth. The positive impact on economic growth decreases gradually till the ninth year. The consequent years the shocks on economic growth are minimal to a one standard shock in public expenditure on Public Administration and Defense. However, the intensity of the shocks to GDP growth as result of one standard deviation change in public expenditure on Public Administration and Defense is decreases as at a decreasing rate. In the past three financial years most of government expenditure has been directed to this sector. This is so because of the fight against terrorism and the Kenyan soldiers in Somalia.

The Impact of Public Expenditure on Education on Economic Growth



The study showed that there is an immediate positive effect on change in Economic Growth as result of one standard shock in public expenditure on Education. The positive impact fizzles out by the fourth year. By the end of the fifth year the negative impact fizzles out and by the sixth year there is a positive impact. However, there are minimal shocks on GDP growth in subsequent years. This is in line with the work done by (Kosimbei, 2013) where he found that the impact of one standard deviation shock to public expenditure allocation to education on GDP does not fizzle out for forty years.

The Impact of Government Expenditure on Infrastructure on Economic Growth



The study found out that there is an immediate positive change in economic growth as a result of a one standard shock in public expenditure on infrasture.The positive impact fizzles out gradually till the end of the sixth year. In the seventh year there is a negative impact on change in economic growth which is very minimal. In most years a one standard deviation change in Public

Expenditure on infrastructure has a positive impact on GDP growth. This is the case because a robust infrastructure saves on manpower and time which results to better productivity consequently increase in GDP growth.

Variance Decomposition of GDP growth

Table 9 Variance Decomposition 2

Period	S.E.	GDP___GROWTH_	LN_AGRI_FORESTRY	LNEDU	LNHEALTH	LNINFTR	LNPA_DEFENSE
1	3.072762	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	4.073417	58.79935	27.40794	5.306402	4.514322	1.381836	2.590147
3	4.997006	40.94145	28.13541	7.701359	13.44266	5.564655	4.214464
4	5.099381	40.34948	27.52927	7.635371	12.93758	5.967558	5.580740
5	5.422874	38.65741	26.59251	9.588512	12.34497	5.333344	7.483264
6	5.522758	37.43993	25.65078	9.872802	13.04710	6.695979	7.293410
7	5.685773	36.86970	25.56286	9.445411	12.32856	6.346676	9.446792
8	5.912056	35.52535	25.43178	9.545392	11.80634	7.446079	10.24505
9	6.086114	33.52370	24.30949	10.63486	11.34708	10.39358	9.791288
10	6.175491	32.56802	23.61094	11.71524	11.03432	11.55990	9.511572

The study showed that in the short run GDP growth rate change was explained by its own shocks (58.8%).Shocks of change in Public expenditure on education, infrastructure and public administration and defense in the short run did not explain much on changes in GDP growth.

However, in the long run the explanatory power of GDP shocks on its own change shows a decline. It only explained 33% of its change .Shocks as a result of Public Expenditure change on infrastructure, education and public administration and defense had more explanatory power on GDP growth as compared in the short run.

5 Summary, Conclusion and Policy Implications

5.1 Summary

The main objective of the study was to analyze the impact of government expenditure on specific sectors and how they affect economic growth. Time series data for the years 1964-2014 was used to achieve the objectives of the study. The data was testes for stationarity and corrected for Cointegration which was an indicator of a long run relationship between the macroeconomic variables.

Past research has shown that public expenditure and economic growth have a relationship and in Kenya specifically a bi-causality relationship has been found. From the study it was found that public expenditure generally had a positive but not significant impact on economic growth.

Public expenditure on education was found to have periodic positive and negative impact on economic growth. However, Public Expenditure on Public Administration and defense was found to have both positive and negative impact on economic growth. This is so because of the unexpected terrorist attacks and insecurities that the government has to deal with. Public expenditure on Infrastructure was found to have a positive impact on Economic Growth in Kenya.

5.2 Conclusion

On an overall view, aggregate public expenditure and economic growth have a long run relationship. However there are some other factors such as net imports, net exports, inflation, foreign aid and private investment that affect economic growth. Increase in government expenditure does not necessarily increase economic growth. There are other factors such as the efficiency of implementation of the increased public expenditure and the political and macroeconomic stability of the country.

Depending on the size and efficiency of a particular sector they have different impact on economic growth. It is evident form the study that public expenditure on infrastructure is a driver for economic growth. However, it is a key factor to note that sectors such as infrastructure, health, education, agriculture and forestry and public administration and defense are some of the major drivers of economic growth in Kenya .The main reason why public expenditure on public administration and defense has a negative impact on economic growth is that a lot of weapons are imported and at the same time the soldiers are compensated for hardship allowances. Public expenditure on education has a period impact of both positive and negative impact on economic growth because it's impacts are more of long term.

5.3 Policy Implications

Based on the study the following policy recommendations arose:

Aggregate government expenditure increase does not necessarily increase economic growth .The government should implement policies that ensure that the public expenditure is efficiently implemented so as to spur economic growth.

Given the reason for impact of public expenditure on public administration and defense having a negative impact on economic growth, the government should ensure security stability in the country that will attract private investment. Private investment has been found to have a positive and significant impact on economic growth. This can be attained through both political stability and security.

Based the periodic positive and negative impact of economic growth ,the government should invest in more and better distributed education in labor force which would help create conditions that could lead to higher productivity and higher economic growth. Also the government should employ competitive sectors that are capable of absorbing the more educated labor force to translate human capital into higher economic growth.

5.4 Suggestions for further study

An area for further study would be the composition of government expenditure and how effective each composition is. The different composition of government expenditure may have a significant impact on economic growth. Composition of government expenditure may explain further why an increase in government expenditure does not necessarily cause economic growth.

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