Analysis of the Relationship between Expenditure on Oil Imports and Public Spending on Selected Social Services in Kenya

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A Research Project Submitted to the Department of Applied Economics in Partial Fulfillment of the Requirements for the Award of Master of Economics (International Trade and Finance) Degree of Kenyatta University

JULY, 2019

DECLARATION

This research project is my original work and has not been presented for a degree award in any other university or for any other award.

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I confirm that the work reported in this research project was carried out by the candidate with my approval as university supervisor.

Signature:…………………………………………. Date:………………………………………...

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DEDICATION

To my dear Dad Benjamin S. S. Imbogo and Mum Monica Mechtilda Imbogo.

ACKNOWLEDGEMENTS

It is with great joy that I take this opportunity to thank God for equipping me with wisdom, strength, and perfect health that successfully powered me through hurdles in the course of this study. The efforts made in this study would have come to naught were it not for the support of particular individuals who sacrificed their time and effort to give a hand in this study. I would like to extend my sincere gratitude to all of them.

I humbly extend thanks and gratitude to my supervisor, Professor Nelson H. W. Wawire for immensely contributing to this project and, thus, making it success. The exceptional supervision by way of detailed critique and guidance simply surpass mere words of appreciation. May the fruits of this project be an intellectual trophy that will add to his many accomplishments.

Sincere thanks goes to my classmates Gideon Wafula, Aaron Ng'eno, Caxton Manzi and Mwenda Elvis who by their inputs were handy in shaping this project. They all expressed concern and encouraged me in the course of this research study. I will not go without mentioning my dear friend Dennis Okova who was an encouragement to me and inspired me by his distinguished writing prowess. He passionately fed me with the literacy skills that enriched this research.

Finally, I am grateful to my parents and siblings for their prayers and love. Their financial and moral support was a core ingredient in this study. Specific thanks to Cyprene, Nancy, Maureen and Moses for always being there in good and bad times. And to Nancy, thank you for allowing me to use your laptop. This project would not be achievable if it wasn't for your incessant support.

Nevertheless, I take full responsibility for any shortcomings in this project.

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ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey-Fuller
ADL	Auto Regressive Distributed Lag
ARDL	Auto-Regressive Distributed Lag
DOLS	Dynamic Ordinary Least Squares
DSGE	Dynamic Stochastic Generalized Equilibrium
GDP	Gross Domestic Product
IEA	Institute of Economic Affairs
KIPPRA	Kenya Institute of Public Policy, Research and Analysis
KNBS	Kenya National Bureau of Statistics
MDGs	Millennium Development Goals
NHIF	National Health Insurance Fund
OLS	Ordinary Least Squares
PP	Phillips Perron
SDGs	Sustainable Development Goals
VAR	Vector Auto-Regressive
VECM	Vector Error Correction Model

OPERATIONAL DEFINITION OF TERMS

➢ *Economic growth:* This refers to the increase in the domestic output of goods and services by country. It is measured by real GDP changes.

➢ *Government expenditure:* This refers to the amount spent by the government on goods and services, public debt servicing and capital investment.

➢ *Government expenditure on education:* This consists of all expenditures made by the Ministry of education including the capital and recurrent expenditures made on pre-primary through tertiary education.

➢ *Government expenditure on health:* This consists of all expenditures made by the government for hospitals, clinics, and public health affairs and services for medical, dental and paramedical practitioners; for medication, medical equipment and appliances; for applied research and experimental development.

➢ *Oil imports bill:* It consists of all expenditure made in the country for importing crude oil and petroleum products in the country.

➢ *Gross domestic product:* This is the total monetary value of goods and services produced in a country over a period of one year excluding net property income from abroad.

ABSTRACT

Since independence, oil imports in Kenya have been rising mainly to sustain the nascent transport, manufacturing, energy, agriculture and maritime sectors among other uses in the country. The growth in the country's oil import bill has however been closely related to public spending in the health and education sectors which experienced shocks owing to the growth in expenditures apportioned to the rising volume of oil imports. Given the significance of the social pillar of the Kenya Vision 2030 and the inconsistency in the progress towards achieving the Sustainable Development Goals, which is inherent in the Kenya Vision 2030, understanding the linkages between the aforementioned trends in expenditures can help in explaining the progress towards attaining the education and health facets of the social pillar. The purpose of this study was to analyze the relationship between aggregate expenditure on oil imports and government expenditures on health and education. The specific objectives of this study were to: estimate the relationship between the aggregate expenditure on oil imports and government expenditure on health; and estimate the relationship between the aggregate expenditure on oil imports and government expenditure on education. The data used was annual aggregate expenditure on oil imports; government expenditure on health; government expenditure on education; exchange rate; and oil prices. The data was sourced from Kenya National Bureau of Statistics, Central Bank of Kenya and World Bank. The study employed granger causality and correlation analysis on the annual time series secondary data spanning 55 years from the year 1963 to 2017. The findings of the study revealed that there exists bi-directional causality between government expenditure on health and aggregate expenditure on oil imports on one hand; and a unidirectional causality running from government spending on education to aggregate expenditure on oil imports on the other hand. They are therefore not independent of each other. The findings were based on standard Chi-square tests and F-tests and revealed that there were causal relationships between the pairs of expenditure variables both in the long-run and short-run. The increase in government expenditure on health and education is however a measure to cushion the society from any education and health related adverse effect following an increase in expenditures on oil imports. On the other hand, education and health sectors are key in the upward surge of oil import demand which in turn increases expenditures on oil imports in the country. The increase in government spending on health and education is also attributed to oil price shocks and exchange rate variations in a situation that can not only lead to inflation but also the prices of imports in the country. The general increase in the prices of goods and services in the country forces the government to increase spending in the health and

education sectors to prevent a social crisis. While the rise in the volume of imported oil seems indispensable, the government needs to focus on the increase in the prices of imports that is triggered by exchange rate fluctuations as well as the inflation that is triggered by global oil price shocks.

CHAPTER ONE
INTRODUCTION

1.1 Background

1.1.1 Total Expenditure on Oil Imports

For many decades, petroleum has been viewed as the major driver of manufacturing, transport and the overall industrial activities in Kenya. It is also used by farm machinery in the agricultural sector and as a power source for households and businesses. The massive energy requirement in a country that has no oil makes oil imports an integral component in the country (Mureithi, 2014).

From the global point of view, petroleum has paved way for a much rejuvenated economic growth through industrialization which boosts production and consumption of materials and final goods in different sectors across countries (Restrepo, 2011). Despite the use of other sources of energy like wood fuel and charcoal, petroleum and electricity are the main primary sources of Kenya's energy requirements accounting for more than 80 percent of the total energy demanded in the country (Mecheo & Omiti, 2003). With Kenya as a net oil importer, it is of great importance that the expenditure pattern on oil imports be considered (Onuonga, 2008).

It is worth noting that the total expenditure of oil imports consists of the importation of crude oil and other petroleum products by all economic actors in the energy sector including the Government and private companies like Shell oil company, Vivo energy Kenya, Libya oil Kenya Limited (Oilibya), and Total Company Limited. Therefore, this study focused on the expenditures on oil imports into the country in aggregate terms.

1.1.2 Government Expenditure on Health

Provision of affordable healthcare has become a very important item in the Big Four Agenda of the government as it directly contributes to the welfare of the society (Republic of Kenya, 2018). According to this study, government expenditure on the provision of affordable health care is the best measurable proxy of the government's commitment in achieving the Healthcare facet (Lu, Schneider, Gubbins, Leach-Kemon, Jamison, and Murray, 2010).

This is even in the face of the much expected upscale of the Kenya National Insurance Fund [NHIF] (Republic of Kenya, 2018). Government expenditures on health care was consistently on the rise from Kshs. 21.1 billion in 2003 to a record Kshs. 71.8 billion in 2012. This later dropped to 65.6 billion in 2017/2018 though intermittently. This increase was attributed to the infrastructural development that was linked to increased distribution of hospitals, clinics and dispensaries across the country. There was a decline in government expenditure on health to Kshs. 38.1 billion in 2013 followed by a period of a sharp rise and decline in the years 2014, 2015 and 2016. The year 2017 however, experienced a rise to Kshs.65.5 billion.

Besides devolution, the period of sporadic variations in government expenditures on health can partially be attributed to oil price shocks, exchange rate fluctuations and variations in the volume of oil that is imported in the country. This may lead to an increase in aggregate expenditures on oil imports in a way that may trigger a response from government expenditure on health hence dampening the progress towards the achievement of the SDGs.

1.1.3 Government Expenditure on Education

As the economy of Kenya aspires to achieve a high and accelerated growth rate and development through the celebrated devolved governments, education is not devolved for complexity reasons as cited by the Ministry of Devolution (Republic of Kenya, 2016). However, this is with the exception of pre-primary education which is now devolved.

In spite of the growing policy attention demanded by the education sector, the trend in figure 1.2 lauds the government in regard to the relatively higher budgetary allocation to the sector compared to health. This is in line with the need to address the ever increasing demand for education in Kenya (Cheserek and Mugalavai, 2012). Since education is deemed pivotal in alleviating the poverty situation in the country and improving the general welfare, there has been a persistent rise in government expenditure in the education sector from Kshs. 80.3 billion in 2003 to Kshs. 415.4 billion in 2017. However, this rise was associated with variations which could be attributed to the oil price shocks which are inherent in the high and rising volume of oil imports.

1.1.4 Overview of the Growth Rates in Government Expenditure on Health and Education

From a global view point, many developing countries were well on their way to achieving the Millennium Development Goals (MDGs) with very promising statistics. Net enrollment rates in primary school increased from 83 percent in 2000 to 91 percent in 2015; gender disparity was eliminated compared to 1995 as girls

gained access to not only secondary and tertiary education but also parliamentary representation; and ultimately, significant strides have been made in ensuring environmental sustainability and forging global partnerships for the purpose of development (Campbell, 2017).

In regard to healthcare, child mortality declined from 12.7 million in 2000 to 6 million in 2015;maternal health improved with mortality declining by 45 percent since 2000; and Diseases like HIV/AIDS and malaria among others have been combated thereby averting infections and deaths (Campbell, 2017). This trend was however beaten by time as the MDGs came to an end in the year 2015 and was replaced by the Sustainable Development Goals (SDGs) which are to be achieved by the year 2030. The SDGs have a broader array of goals but the fact that it is adopted from the MDGs makes it possible for nations to realign their developmental endeavors with the SDGs. For Instance, eradicating poverty and hunger is the overriding inheritance from the MDGs. Other inherited goals include promoting healthy lives and well-being; inclusive and quality education; equality; and fostering global partnerships among other inter-linked goals (Blomstedt, Bhutta, Dahlstrand, Friberg, Gostin, Nilsson, and Alfvén, 2018).

While the global statistics seem appealing, Kenya's statistics are far shy from the set targets. This is because the goal of eradicating extreme poverty and hunger has remained a key challenge despite the decline by 10.5 percent from 46.6 percent in 2006 to 36.1 percent in 2016 (Republic of Kenya, 2017). In spite of the considerable progress towards achieving the SDGs, changing healthcare needs have to be addressed. On the other hand, education is a fundamental human right and a key enabler towards achieving the SDGs. The poverty situation in the country is therefore exacerbated by the fact that the progress towards achieving the healthcare and education targets of the SDGs grow at a rate that is low and inconsistent as illustrated in the figure 1.1 that follows.
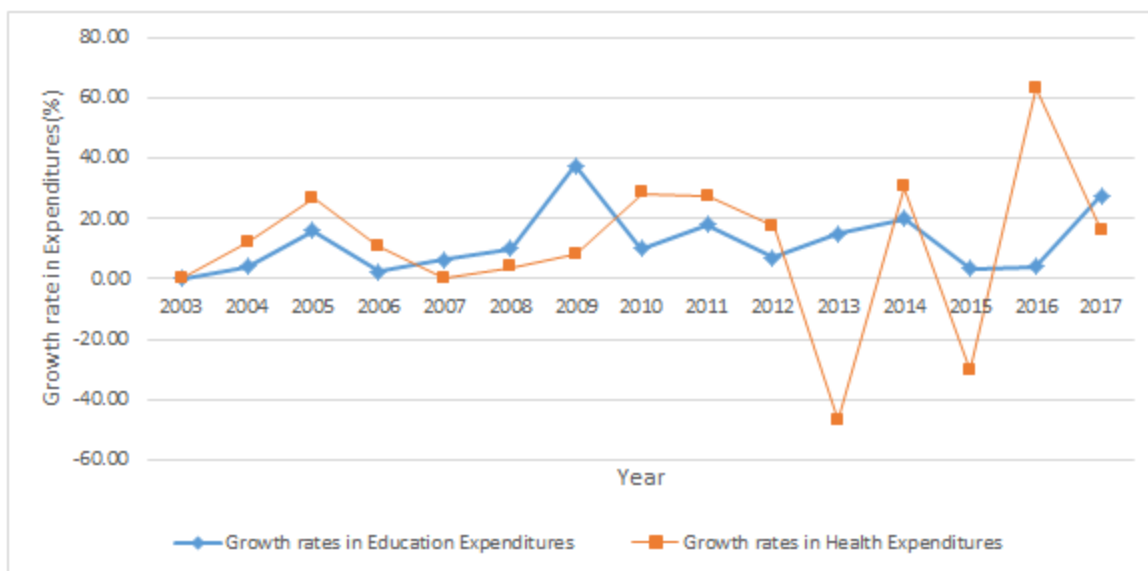
Fig 1.1:- Trends in Annual Growth Rates in Health and Education Expenditures

Source of Data: Annual Economic Surveys and Statistical Abstracts

Despite the essence of government expenditure in keeping the macro economy afloat, there has been a slowdown in addressing the healthcare and education expenditure needs which are necessary in order to keep the country at pace with the Sustainable Development Goals.

More notable is the disproportionate growth in the expenditures apportioned to education which grew at a slower rate compared to health from 2003 to 2004 after which it caught up and later grows intermittently throughout the period. The variations in the growth of health expenditures were more pronounced beyond 2010 probably due to the challenges inherent in the implementation of the new constitution under devolved county governments. The above variations in the growth rates in government expenditure on health and education may also be attributed to the diversionary effect of expenditure patterns. A question this study sought to address.

1.1.5 Trends in Expenditures on Oil imports, Health, and Education

While the Kenya Vision 2030 stands out as the preface of the country's success stories, its achievement largely depends on the relative weights attached to the political pillar, economic pillar and social pillar. The pillars are however interwoven in a manner that can lead to policy conflicts should there lack a balanced approach in assigning priorities to the three pillars (Republic of Kenya, 2007). For instance, many oil producing and exporting countries like Nigeria, Ghana and Saudi Arabia produce oil in large quantities but the economic situation and the politics surrounding oil exploitation ends up injuring the welfare of the masses who end up

being poorer than before oil was exploited in these countries. This is due to the overarching rent seeking activities, corrupt practices, wars and conflicts (Di John, 2007).

In the case of oil importing countries like Kenya, the interwoven nature of the political, economic and social factors is centered on aggregate expenditure on oil imports as this may put pressure on the proportion of the exchequer budget that is allocated to health and education respectively. This may result in significant trickle down effects on the welfare of the country's population (Holzmann, 1990).

Besides political instability, corruption and war, the variations in the growth rates in government expenditure on health and education (shown in figure 1.1 in section 1.1.3) may also be attributed to the high and rising oil import bill and the increase in the number of workers employed by the public service commission in the health and education sectors. Further, the variations can also be attributed to union activities that have seen teachers' salaries rise overtime. Such workers' unions include the Kenya National Union of Teachers [KNUT] and Kenya Union of Post Primary Education Teachers [KUPPET].

Like resource-rich economies which do a very poor job in providing education and health care for the citizens owing to resource curse, resource-scarce economies like Kenya are faced by the challenge of providing affordable health care and quality education to the citizens in the face of the high and rising oil import bills (Ross, 2001; Sachs and Warner, 2001; Patrick, 2012; and Karl, 2007). This might be echoed in figure 1.2 in regard to the total oil import bill in the country. As the oil import bill experienced a rise between 2003 and 2017, the expenditures apportioned to health and education declined periodically and in some instances, it grew at a diminishing rate. As the oil import bill hit a record high of Kshs.335.6 billion in 2014, growth in both health and education expenditures diminished and later recovered beyond 2015 when aggregate expenditures on oil imports experienced a decline. They however move in the same direction as a general trend to indicate that one may be a trigger to the other(s).

The following Figure 1.2 illustrates the trends of aggregate expenditures on oil imports (Kenya's Oil Import Bill), government expenditure on health and education in absolute values from 2003 to 2017.
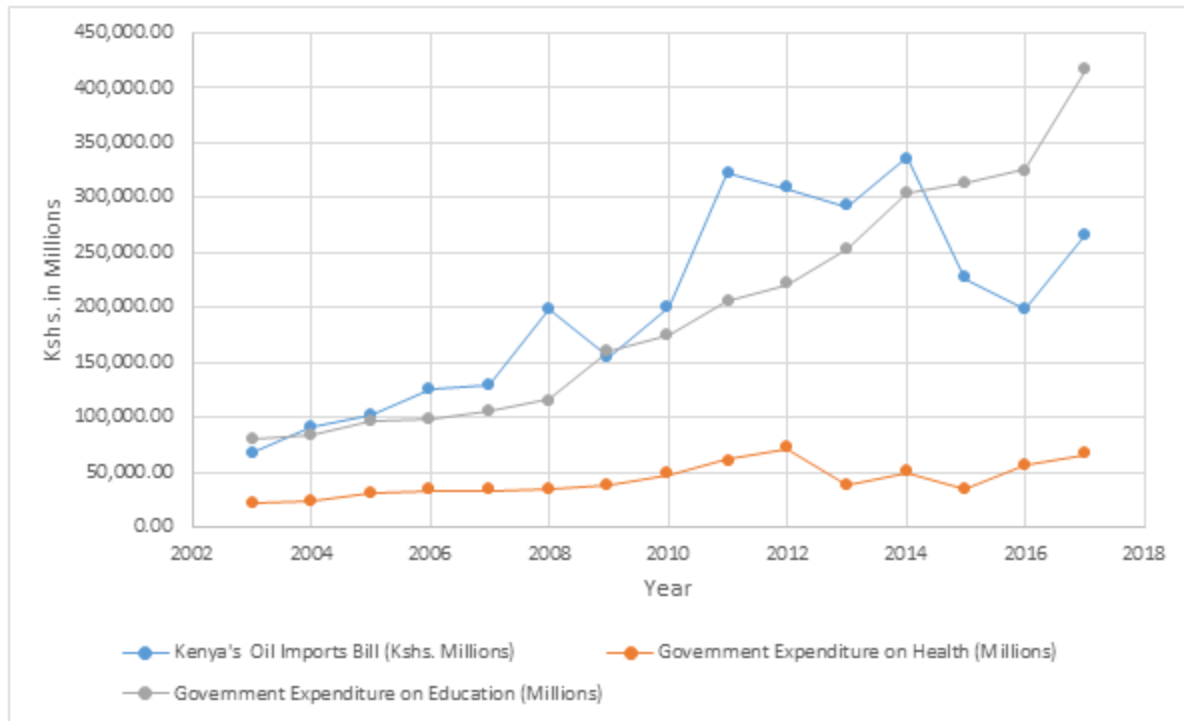
Fig 1.2: Trends in Annual Expenditure on Oil Imports and Government Expenditures on Health and Education.

Source of Data: Annual Economic Surveys and Statistical Abstracts

Despite the variations in the levels of expenditure on oil imports in Kenya, the figure 1.2 generally exhibits a rising trend from the year 2003 to the year 2017. The expenditures on oil import experienced a series of variations but maintained an upward trajectory from Kshs. 66.6 Billion in the year 2003 to a high of Kshs.198.2 Billion in 2008 (Republic of Kenya, 2009). This was however followed by a dip in expenditures to Kshs. 154 Billion possibly due to the 2008 post-election violence which saw the overall economic activities in the country go down (Muhammad; D'Souza and Amponsah, 2011).

The decline in expenditure on oil imports after the year 2008 was also notable at a time when virtually all nations were plagued by the global economic crisis (Kotz, 2009; Korotayev and Tsirel, 2010). The level of expenditure on oil imports however, experienced a recovery in 2009 and grew to Kshs. 321.8 billion in 2011 after which a reduction in the global oil prices once more resulted in a two year plunge to Kshs. 291.6 billion in 2013. This was followed by a rise in expenditures to a record high of Kshs. 335.6 billion due to soaring oil prices in 2014 and a later decline to Kshs. 197.6 billion in 2016 after which there was an eventual rise to Kshs. 265.2 Billion in 2017 (Republic of Kenya, 2017). The rising trend in expenditures on oil imports is attributed to the increased demand for oil that is needed to sustain th2e economy led by transport and industrialization. The

variations from the year 2009 basically capture the changing global oil prices and exchange rate fluctuations. The high and growing oil reliance automatically makes oil an inevitable impetus to the macro economy now that Kenya has predominantly been known as a net oil importer over the years.

The increase in aggregate expenditure on oil imports is not only pegged on the inevitable increase in oil imports but also on global oil price shocks and exchange rate fluctuations. These dynamics have an eventual effect on the domestic economy in regard to the allocative pressure exerted on government revenue. This pressure may be channeled either through inflation that is caused by increasing global oil prices and exchange rate fluctuations or through a rise in the volume of oil imports based on the perpetually increasing demand. The increase in the volume of oil imports has the consequential effect of increasing the aggregate expenditures on oil imports. This study however, focuses on such pressure in regard to government spending on health and education and the counter-effects in the country (Lu; Schneider; Gubbins Leach-Kemon; Jamison & Murray, 2010).

This analysis does not however justify the diversionary effects in the allocation of government expenditure since any definite effects remain unclear. This underscores the significance of other factors in explaining this trend in a manner that outweighs the mere visualization of the relationships between the expenditure variables as presented in figure 1.2. It was therefore of great importance to estimate the causal relationship that can go a long way in explaining the relationship between oil import bill, government expenditure on health and government expenditure on education. An aspect which the visual impression in figure 1.2 can neither express nor explain.

1.2 Statement of the problem

Over the years, there has been a perpetual upsurge in Kenya's oil import bill in a way that may have significant ripple effects especially on health and education. This may explain the relatively slower rate of growth in health and education sectors as reflected by the patterns of government expenditure (Republic of Kenya, 2017). These effects may thus compromise the achievement of education and the universal healthcare objectives which constitute the Kenya Big Four Agenda development plan strategy.

The government has to spend more on oil when there is a rise in oil prices. This increases the government expenditure on oil imports thereby reducing the proportion of the exchequer budget that goes to health and

education yet these are the key services needed to spur economic growth in order to attain the big four agenda and the sustainable development goals.

A number of studies were conducted to investigate the relevance of government expenditure in explaining various social and economic trends (Maina, Nyandemo and Kioko, 2016; Wanjiku, 2013; Maingi, 2010; and Ruturagara, 2013). For developing economies, the studies on the effects of public expenditure on macroeconomic variables yielded varied but related results. Hasnul, (2015) for instance, demonstrated that while government expenditure and economic growth were inversely related, expenditures on health, education, and defense had no impact on economic growth. Since no study directly links public spending to oil import bill, the findings by Hanul (2015) are in view of expenditures on oil imports as a key ingredient in economic growth. Other studies concluded that government expenditure drives economic growth without decomposing this growth to its constituent elements which may include natural resources (Jelilov & Musa, 2016; Carter, Craigwel l & Lowe, 2013; Laharishan & Gunasekara, 2015; Abdieva, Baigonushova & Ganiev, 2016; Suanin, 2015).

These studies therefore focus on the components of public spending and the relative effects on different macroeconomic variables. However, they fail to address the allocative dynamics at play in the case of a budgetary switch between oil imports, healthcare and education among others. A quantitative study that captures cross-sectorial causality in the expenditure patterns can however be informative in regard to shaping policies that safeguard the welfare of the population. That is, it may give an indicator on how to respond to oil price shocks in a way that provides a buffer to the health and education sectors among others sectors which essentially define social welfare.

1.3 Research Questions

This study aimed at answering the following questions:

i. What is the relationship between expenditure on oil imports and government expenditure on health in Kenya?

ii. What is the relationship between expenditure on oil imports and government expenditure on education in Kenya?

1.4 Research Objectives

The main objective of this study was to analyze the relationship between the aggregate expenditure on oil imports and government expenditure on health and education in Kenya. The specific objectives were to:

i. Estimate the relationship between expenditure on oil imports and government expenditure on health in Kenya.

ii. Estimate the relationship between expenditure on oil imports and government expenditure on education in Kenya.

1.5 Significance of the Study

This study aimed at giving an insight into the possible trade-off between expenditure on oil imports and government expenditure on the provision of healthcare and education. The findings herein provides the government, policy makers and other interest groups with the tools necessary to address the government allocation deficits in the social service sectors occasioned by the increasing expenditures on oil imports.

1.6 Scope of the study

This study covered a period of fifty five years from 1963 to 2017 so as to achieve expenditure estimates that were more reliable and identifies more with the current expenditure trends in a more standardized way. The study period was meant to allow this study to capture both the short term and long term variations in the government expenditure patterns on health and education in relation to expenditures on oil imports.

1.7 Organization of the Study

This study is divided into three chapters. The first chapter constituted the introduction which gives a background to the study and the statement of the problem. The second chapter covers the review of related literature further classified into theoretical and empirical literature. This was followed by a brief overview of the literature review. The third chapter focuses on the methodology of the study which basically laid out a plan for statistical data analysis. The empirical findings of the study are presented and further interpreted in chapter four. Finally, chapter five presents the study summary, conclusions, policy implications and areas of further studies.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter captures the theoretical and empirical literature on studies previously carried out to underscore the feedback mechanism of government expenditure on health and education occasioned by expenditures on oil imports.

2.2 Theoretical Review

This first part of literature review introduces and provides a description of the theories explaining government expenditure patterns in relation to the effects on other economic aggregates.

2.2.1 Wiseman and Peacock's Hypothesis

This theory was put forward by Wiseman and Peacock (1967) in an attempt to explain the pattern for government expenditure in the United Kingdom. The theory argues that government expenditure is dictated by the citizens who, as assumed, do not want to pay taxes but at the same time want to benefit from public expenditure. This conflict forces the government to consider the wishes of the public so as to increase their chances of re-election. The model also assumes that there is some tolerable level of taxation which constrains the behavior of the government. Tax revenue increases at a constant rate following growth in the economy and income by extension. This enables public expenditure to grow in line with the GNP (Herenkson, 1993).

This gradual growth in public expenditure would be displaced in an upward fashion during periods of social upheaval like war forcing the government to raise the level of taxation so as to cater for the increase in expenditures. This increased taxation would be deemed acceptable by the electorate during the social upheaval to meet the exceptional needs of the crises. This is the "displacement effect".

On the other hand, the inspection effect occurs when the government increases the services to address the social problems during the period of upheaval. As this happens, the people's view and perception of tolerable levels of taxation does not return to its previous level. The higher level of expenditures is then fully borne by the government. The displacement effect and inspection effect have the effect of perpetuating intermittent short-term shocks in public expenditure within a rising long-term trend.

2.2.2 A Voters' Preference Micro Model

This is a median voter model which assumes that voters have democratically expressed preferences for particular sizes and compositions of public sector services. Voters are therefore the main determinants of public expenditure and its allocation between services as reflected by their voting patterns. The model also assumes that the voter is willing to sufficiently cover the average costs of public sector output by paying taxes with certain demand and supply side factors in consideration (Gramlich & Rubinfeld, 1982).

The demand side factors include: a rise in the voter's disposable income; an increase in the relative tax price of substitutes; and a reduction in the relative tax price of complements. These factors are however effective where there is a positive income elasticity of demand. Population is another significant demand side factor where output for pure private goods increase in line with population increase owing to their exclusive property rights. For pure public goods, output will not rise due to their non-rival nature but the demand may increase should there be a positive income elasticity of demand. The demand for a pure public good may also rise if the rising population increases the tax base thereby reducing the tax price which the median voter faces. In the case of impure public goods where a mix is of rival-use and non-exclusivity features are evident, a less than proportionate increase in supply would be required. Rivalness may however require a more than proportionate growth in supply/output of mixed goods following a population growth. Ultimately, the demographic structure is also a key demand side factor where an increase in the number of the old increases healthcare demand and demand for particular social services. On the other hand, a demographic structure dominated by children increases the demand for health and education services in the country (Ensor & Cooper, 2004; Lindauer & Velenchik, 1992).

Conversely, supply-side factors relate to the service environment, quality of provided goods and services and the productivity of inputs used to provide the goods and services. A deteriorating service environment in terms of pollution and congestion requires more inputs for the required quality of output, ceteris paribus. A more superior quality of public goods and services requires a higher level of government expenditure for the required goods and services. Finally, a greater level of government expenditure will be required where inputs have a lower productivity. This trumpets the contrast between the public sector and the private sector in regard to efficiency where factors of production in the public sector are employed at lower levels of efficiency due to management inefficiencies. This is the rationale for outsourcing and privatization where technology can also be leveraged towards productivity improvements in each sector. This is the relative price effect borrowed from the Baumol's productivity differential model (Fixler & Siegel, 1999).

The voters' preferences micro model assumes that demand for public goods and services increases in line with a positive income elasticity of demand. However, the theory does not address external factors which may influence the allocation of the limited tax revenue. Examples of such external forces include fluctuation in global oil prices and exchange rate fluctuations that curtails the SDGs (Bailey, 1995).

2.2.3 Wagner's Organic State Theory

In an effort to explain the trend in government expenditure in Germany, USA, France and the Great Britain, Wagner (1835) put forward the Wagner hypothesis. This theory argues that growth in government sector is an inherent feature of industrializing countries in the sense that, an increase in per capita income necessitates a proportionate growth in the relative size of the public sector as a share of the Gross National Product (GNP).The increase in expenditures is attributed to the need for administrative and legal services needed to manage the complexities associated with economic growth. It is also attributed to distribution of resources in a much larger allocative spectrum (Peters, Undated).

Wagner's test on the cross linkages between the relative importance of public expenditure and industrialization culminated in what is now known as the Wagner's law of increasing state activity. Wagner's law is strongly supported by historical facts for different countries over the years where economic growth has always been accompanied by increased demand in public expenditure (Peters, Undated).

Wagner's hypothesis can be shown by the following formula.

$$Ln \left(\frac{G}{GNP}\right)_t = \ln \alpha + \beta ln Y_t + \varepsilon_t \qquad \beta > 1 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 2.2$$

Where G_t is Government Expenditure in time t: and Y_t is Economic growth.

Of greater salience and applicability to this study would be the growth-driven and extensive increase in government expenditure which very much relates to sloppiness in addressing new welfare functions. That is, government expenditure on low cost housing, old age pension, subsidized provision of food, sickness benefits, public health, subsidized provision of agricultural products and education among others (Peters, Undated).

Despite the ability of the theory to distinguish the different types of public expenditure into traditional and extensive expenditures, its suitability in explaining economic factors is restricted by the failure of its analytical

framework to capture the interdisciplinary phenomenon it presents. It is also a one-sided approach as it solely focuses on the demand public sector services rather than the relationship between demand and supply (Chand, 2008).

2.2.4 Leviathan Model

This is a macro model of public expenditure growth which was first developed by (Brennan & Buchanan, 1980). The theory states that political constraints on the growth of public expenditure is limited and the government seeks to grow as much as possible but only to the benefit of those who work in the public sector at the expense of public interests.

According to this theory, Government institutions have an intrinsic tendency to grow bigger simply because public servants are prone to more spending and therefore improve service provision and professional standards for their own sake. Owing to their proximity to the government, they also have more political influence than the general public and know how to sway political decisions to their favour rather than the interest of the public. These self-serving government institutions there grow like the literal leviathan (Sea monster). While this model is a macro model of public expenditure growth, it is often classified as micro model since it comprises of separate micro models of public expenditure growth (Brennan, Buchanan, 1985).

2.3 Empirical Literature

Nurudeen and Usman (2010) used a disaggregated analysis to investigate the effects of government expenditure on economic growth by the co-integration and Vector Error Correction Model (VECM). The study considered total capital expenditure by the government, transport and communication expenditures, and health and education expenditures as the key variables. The findings reveal that the economy grows with an increase in government expenditures on health, transport and communication hence a need to increase the capital and recurrent expenditures including education expenditures which has a negative effect on economic growth. This study recommended a boost in funding to anti-corruption agencies in order to tackle the much escalated corruption in public offices.

Olabisi and Oloni (2012) did an analysis of the composition of public expenditure and the effects of the public expenditure components on economic growth spanning from 1960 to 2008. The study used VAR in the determination of the relative weights assigned to different expenditure components in regard to the considerations of urgent needs of the country. That is, welfare. According to the findings, education

expenditures did not enhance economic growth due to corrupt practices, rent seeking activities and unemployment among others. Health and water expenditures on the other hand enhance economic growth.

Mureithi (2014) did a quarter-annual analysis based on the Johansen-Juselius co-integration and VECM approach to study the causes of oil import volatility and the subsequent effects on GDP growth rate. The results indicated that causality from GDP growth rate to oil import volatility was present and positive while OPEC oil production indicated the opposite of this relationship. On the other hand, the causality from oil import volatility to GDP growth was present and negative. However, an increase in expenditures on oil imports leads to increased GDP growth regardless of the expenditures on health and education.

Hasnul (2015) used the Ordinary Least Square technique to analyze the effects of government expenditure on economic growth for forty five years from 1970.The result for the time series analysis indicated that there is a negative correlation between government expenditure and economic growth. This follows from the findings that there is no statistical significance between expenditures on health, education, defense and operation and economic growth.

In a study examining the effects of oil revenue on public expenditure and economic growth rate in Nigeria for the period spanning 1980 to 2012, Aregbeyen and Kolawole (2015) employed OLS, VECM and Granger Causality. According to this study, oil revenue Granger causes both public spending and economic growth. Conversely, there was no causality between economic growth and public spending in the country. While changes in oil revenues can be used as a proxy to oil import bill, the public expenditure components (Health and Education) have not been decomposed to allow for further analysis on the expenditure components.

Ademola, Olasode, Raji, Adedoyin (2015) employed simple regression models in an annual time series analysis on the causality and empirical relationship between crude oil price and inflation from 1982 to 2011.The results on the empirical analysis showed that public spending on health and education has a positive relationship with economic growth but does not capture the feedback mechanism between expenditures on oil imports and health and education expenditures majorly because Nigeria is an Oil producing and exporting country.

The study best informs this research since it focuses on oil-importing countries. It however limits this study by the speculative factor which is not tenable in Kenya's situation owing to successive political conflicts in the

country, rent seeking activities and corruption practices. While this study can capture the expenditure on oil imports, it doesn't encompass the effects on the oil import-induced effects on expenditures in other sectors.

Hitzemann and Yaron (2016) conducted an empirical analysis on the consequential effects of oil production changes and the oil price shocks on the macro economy viz a viz the economic welfare in the United States. Estimation results in this study reveal that the effect of oil production shocks on the aggregate economy is lime and short lived making its impact insignificant and negligible. The study also unearths the insignificance of oil inventories on welfare gain. A Vector error correction model (VECM) is employed in conjunction with autocorrelation to take care of a possibility of co-integration between the variables in the model. This approach is quantitatively and qualitatively most feasible compared to the use of a VAR which would give spurious results. In the analysis of the welfare effects of oil shocks, the study focuses on the welfare costs of oil price shocks in view of the long run and short run productivity shocks in the macro economy.

The analysis indicates the fact that the welfare costs of uncertainty in the macro economy is greater than the welfare costs of uncertainties in oil price shocks in the long-run. This however depends on the consumers' preference on uncertainty resolution captured by the inter-temporal elasticity of substitution. Thus, welfare costs of shocks (Macro and oil shocks) are an increasing factor of inter-temporal elasticity of substitution. The model however fails to capture the technological factor in the oil sector.

2.4 Overview of Literature

From the above review of related literature, many studies have been conducted on the effects of government expenditure on economic growth with only a few studies narrowing down to the components of public expenditure and their relative effects and contributions to economic growth. For instance, Olabisi and Oloni (2012) used simple regression model to explore the effects of government expenditures on education, health and water on economic growth with no regard to the possible inter-linkages between the components of government expenditure. While economic growth has always been considered in aggregate terms without considering the core factors and resources that are constituent, one would be interested in understanding how the respective components of public expenditure relate to each other and to the factors and resources that constitute economic growth. For instance, no study has investigated the link between government expenditure components in relation to natural resources like cobalt, copper or even oil which is relevant to this study.

The analysis techniques vary across the above studies with VAR, VECM and OLS being mostly used. There is however an impressive consistency when it comes to the results of the above studies in both the short run and long run. On the basis of these outcomes and inferences, this study attempts to fill the knowledge gap as it adds to the existing body of knowledge which address shocks in government expenditure trends.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter provides a detailed analysis of the methodology employed in investigating the relationship between aggregate expenditure on oil imports and government expenditures on health and education respectively. It encompasses the research design; theoretical framework; empirical model specification; definition and measurement of variables; data type and sources; diagnostic tests; and data analysis.

3.2 Research Design

In achieving the objectives specified in this study, the design adopted was non-experimental in nature since statistical estimation did not rely on the manipulation of any variable to influence outcome. It instead followed a descriptive approach to analyze the patterns of expenditure.

3.3 Theoretical Framework

This study was anchored on The Wiseman-Peacock model of public expenditure growth. In the context of this study, distortions in public expenditure will arise from shocks in global oil prices and exchange rate fluctuations which has the effect of increasing the aggregate expenditures on oil imports. Since oil is an integral necessity and therefore a complement in almost all the sectors of the economy, the global oil shocks will be transmitted to the domestic economy. A rising oil import bill will have the effect of reducing the demand for public goods and services thereby stifling social progress by exerting pressure on government expenditure on health and education which are the focus of this study.

This results to a period of social upheaval since the public is unwilling to pay a higher tax price for these essential public services. This is because the government is forced to raise the level of taxation to finance the needs in the education and healthcare sectors in what is commonly known as the displacement effect.

On keener scrutiny of social hiccups during the period of oil price shocks and exchange rate fluctuations, the government seeks to improve on the social conditions by increasing expenditure on basic services especially healthcare and education. This arises from the fact that despite the unwillingness of the public to pay for these services, they benefit from the expenditure. The cost of providing these basic services is thus fully borne by the

government so as to increase their chances of re-election by considering the public preferences. This has the net effect of causing short-term shocks in health and education expenditures by the government as public expenditures rise in the long-term.

3.4 Model Specification

In testing for causality between the expenditure variables of interest, this study employed models adopted by Kosimbei (2002); Hiemstra and Jones (1994); and Hoffman *et al.*(2005).

The relationship between the aggregate expenditures on oil and government expenditures on health and education is given by the following equations (3.1) and (3.2).

$$EXH_t = \propto_0 + \propto_1 EXO_t + ROP_t + XR_t + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3.1)$$

$$EXE_t = \beta_0 + \beta_1 EXO_t + ROP_t + XR_t + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3.2)$$

Where:

EXH_t= Government expenditure on health in time t

EXO_t = Aggregate expenditure on oil imports in time t

EXE_t = Government expenditure on education in time t

ROP = Real oil price

XR = Real exchange rate

Specification of Granger causality model can be done by extending equation (3.1) and equation (3.2) by including the lags of both the left-hand side and right-hand side variables as follows:

$$EXH_t = \propto_{10} + \sum_{i=0}^{k} \propto 1i(EXO)_{t-i} + \sum_{j=1}^{k} \beta 1j(EXH)_{t-j} + \sum_{m=0}^{k} \theta 1m(ROP)_{t-m} + \sum_{n=0}^{k} \rho 1n(XR)_{t-n} +$$
$$\mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3.5)$$
$$EXO_t = \propto_{20} + \sum_{i=1}^{k} \omega 2i(EXO)_{t-i} + \sum_{j=0}^{k} \psi 2j(EXH)_{t-j} + \sum_{m=0}^{k} \varphi 2m(ROP)_{t-m} + \sum_{n=0}^{k} \sigma 2n(XR)_{t-n} +$$
$$v_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3.6)$$
$$ROP_t = \propto_{30} + \sum_{i=0}^{k} \partial 3i(EXO)_{t-i} + \sum_{j=0}^{k} \emptyset 3j(EXH)_{t-j} + \sum_{m=1}^{k} \gamma 3m(ROP)_{t-m} + \sum_{n=0}^{k} \tau 3n(XR)_{t-n} +$$
$$\varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3.7)$$
$$XR_t = \propto_{40} + \sum_{i=0}^{k} \pi 4i(EXO)_{t-i} + \sum_{j=0}^{k} \vartheta 4j(EXH)_{t-j} + \sum_{m=0}^{k} \varrho 4m(ROP)_{t-m} + \sum_{n=1}^{k} \varpi 4n(XR)_{t-n} +$$
$$\epsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3.8)$$

$EXE_t = \propto_{10} + \sum_{i=0}^{k} \propto 1i(EXO)_{t-i} + \sum_{j=1}^{k} \beta 1j(EXE)_{t-j} + \sum_{m=0}^{k} \theta 1m(ROP)_{t-m} + \sum_{n=0}^{k} \rho 1n(XR)_{t-n} +$

μ_t………………………………...……………………………...……(3.9)

$EXO_t = \propto_{20} + \sum_{i=1}^{k} \omega 2i(EXO)_{t-i} + \sum_{j=0}^{k} \psi 2j(EXE)_{t-j} + \sum_{m=0}^{k} \varphi 2m(ROP)_{t-m} + \sum_{n=0}^{k} \sigma 2n(XR)_{t-n} +$

ν_t…………………………………...…………………...…...….(3.10)

$ROP_t = \propto_{30} + \sum_{i=0}^{k} \partial 3i(EXO)_{t-i} + \sum_{j=0}^{k} \emptyset 3j(EXE)_{t-j} + \sum_{m=1}^{k} \gamma 3m(ROP)_{t-m} + \sum_{n=0}^{k} \tau 3n(XR)_{t-n} +$

ε_t…………………………..……………………………...…..………………………(3.11)

$XR_t = \propto_{40} + \sum_{i=0}^{k} \pi 4i(EXO)_{t-i} + \sum_{j=0}^{k} \vartheta 4j(EXE)_{t-j} + \sum_{m=0}^{k} \varrho 4m(ROP)_{t-m} + \sum_{n=1}^{k} \varpi 4n(XR)_{t-n} +$

ϵ_t…………………..…………………………………………...…..………………………(3.12)

By estimating models (3.5), (3.6), (3.7) and (3.8) above, causality between aggregate expenditure on oil imports and government expenditure on health was tested. Similarly, by estimating models (3.9), (3.10), (3.11) and (3.12) above, causality between aggregate expenditure on oil imports and government expenditure on education was tested.

By estimating the equations stated above, the expected patterns of causality were unidirectional causality from the second variable to the first, a bi-directional causality and no causality.

For a stationary series, a correlation model was expressed by equation (3.13) and (3.14) as shown.

$$\boldsymbol{Corr}_{EXO,EXH,ROP,XR\,(t_1,t_2)}(\tau) = \int_{-\infty}^{\infty} EXO(t).EXH(t).ROP(t).XR(t+\tau)\partial t$$………..…..……..(3.13)

$$\boldsymbol{Corr}_{EXO,EXE,ROP,XR\,(t_1,t_2)}(\tau) = \int_{-\infty}^{\infty} EXO(t).EXE(t).ROP(t).XR(t+\tau)\partial t$$………...........…..(3.14)

Where:

$\boldsymbol{Corr}_{EXO,EXH,ROP,XR\,(t_1,t_2)}$= Correlation between the aggregate expenditure on oil imports, government expenditure on health, real oil price and real exchange rate in time 1 and time 2 respectively,

$\boldsymbol{Corr}_{EXO,EXE,ROP,XR\,(t_1,t_2)}$= Correlation between the aggregate expenditure on oil imports, government expenditure on education, real oil price and real exchange rate in time 1 and time 2 respectively,

$\boldsymbol{\tau}$= Expected correlation coefficient between the variables.

A statistical package was used in the determination of the correlation between the expenditure variables of interest. However, correlation could also be determined manually using the Karl Pearson's method where the Pearson's correlation coefficient 'r' is required. The "r" ranges from the scale of -1 to +1 ($-1 \leq r \leq +1$). The Karl Pearson's technique is expressed as follows.

$$r_{EXO,EXH} = \frac{cov(EXO,EXH)}{\sigma_{EXO}\sigma_{EXH}} = \frac{cov(EXO,EXH)}{(\frac{n-1}{n})S_{EXO}S_{EXH}} = \frac{\sum_{i=1}^{n}(EXO-\overline{EXO})(EXH-\overline{EXH})}{\sqrt{\sum_{i=1}^{n}(EXO-\overline{EXO})^2}\sqrt{\sum_{i=1}^{n}(EXH-\overline{EXH})^2}} \dots\dots\dots\dots\dots (3.15)$$

$$r_{EXO,EXE} = \frac{cov(EXO,EXE)}{\sigma_{EXO}\sigma_{EXE}} = \frac{cov(EXO,EXE)}{(\frac{n-1}{n})S_{EXO}S_{EXE}} = \frac{\sum_{i=1}^{n}(EXO-\overline{EXO})(EXE-\overline{EXE})}{\sqrt{\sum_{i=1}^{n}(EXO-\overline{EXO})^2}\sqrt{\sum_{i=1}^{n}(EXE-\overline{EXE})^2}} \dots\dots\dots\dots\dots (3.16)$$

Ranging within the scale of $-1 \leq r \leq +1$ as earlier stated, $r_{EXO,EXH}; r_{EXO,EXE} \leq 0$ indicated a negative correlation, $r_{EXO,EXH}; r_{EXO,EXE} \geq 0$ indicated a positive correlation, $r_{EXO,EXH}; r_{EXO,EXE} = 0$ indicated that there is no correlation and $r_{EXO,EXH}; r_{EXO,EXE} = +1$ indicated that there is a perfect correlation.

3.5 Definition of Variables and Measurement

Variables	Definition	Measurement	Source of Data
Government Expenditure on Education	This consists of all expenditures made by the Ministry of education including the capital and recurrent expenditures made on pre-primary through tertiary education.	It was measured by the absolute values of annual government expenditures on education	Economic Surveys and statistical abstracts
Government Expenditure on Health	It consists of all expenditure made by the government for hospitals, clinics, and public health affairs and services for medical, dental and paramedical practitioners; for medication, medical equipment and appliances.	It was measured by the absolute values of annual government expenditures on health	Economic Surveys and statistical abstracts
Aggregate Expenditure on Oil Imports	It consists of the aggregate expenditure made by the government and non-government bodies for importing crude oil and petroleum products.	It was measured by the absolute values of annual expenditures on oil imports	Economic Surveys and statistical abstracts
Real Oil Price	This is the price of oil after accounting for the effects of inflation	The average annual measure of the dollar value of the Dubai spot price (in US$) per barrel of oil.	World Bank
Exchange Rate	Is the average of a country's currency relative to another major currency	Annual average of the Kenya Shillings per US dollar.	Central Bank of Kenya

Table 3.1:- Definition and measurement of variables

3.6 Data Type and Source

This study employed time series secondary data from 1963 to 2017 on the aforementioned variables of interest. Data for aggregate expenditure on oil imports, government expenditure on health, and government

expenditure on education and was sourced from Kenya economic surveys and statistical abstracts. Data on real exchange rate and annual oil prices were sourced from the Central Bank of Kenya and World Bank respectively.

3.7 Time Series Property Tests

3.7.1 Stationarity Tests

For Granger causality and correlation Analysis to proceed, the data on aggregate expenditure on oil imports, real exchange rates, oil prices and government expenditure on health and education were tested for stationarity in order to ensure that the data fits the model. That is, the data should be stationary or integrated of order zero. This was also to ensure that the result from the estimation procedure does not produce spurious results which would yield misleading interpretation. To avoid meaningless results, data that was found to be non-stationary was differenced as necessary to make it stationary (Maina, 2015). Testing for stationarity was also necessary since causality tests can only be conducted on variables which are individually stationary (Kosimbei, 2002).

This study employed the Phillips-Perron and Augmented Dickey-Fuller (ADF) unit root test. The ADF was used to ensure the variables had a constant mean and variance because it has the advantage of applicability either where there is a trend or no trend. It also accounts for the existence of autocorrelation in residuals if present besides ensuring that the errors are indeed white-noise. On the other hand, Phillips- Perron (PP) procedure corrected for serial correlation through a non-parametric correction to the standard statistic (Kosimbei, Wawire & Kimani 2010). In the case where the pairs of variables were integrated of the same order, a cointegration test was to be conducted as in (Gujarati, 2008). This therefore necessitated cointegration tests on the variables before causality could be tested.

3.7.2 Cointegration

Granger Causality tests could be conducted with or without the presence of cointegrating relationships between pairs of economic variables (Kosimbei, 2002). However, an indication of cointegration in the system called for the specification of an Error Correction Model (ECM) (Engel & Granger, 1987).

For this study, the Engle and Granger's Residual Based test approach to cointegration was used. In the case where pairs of the expenditure variables were not cointegrated, Granger causality test was conducted using the

required differences that would lead to stationarity among the variables of interest. In the case of absence of cointegration, the long run relationship between the pairs of variables would be expressed as:

$$EXH_t = \propto_0 + \propto_1 EXO_t + \propto_2 ROP_t + \propto_3 XR_t + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.17)$$

$$EXO_t = \propto_0 + \propto_1 EXH_t + \propto_2 ROP_t + \propto_3 XR_t + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.18)$$

$$ROP_t = \propto_0 + \propto_1 EXO_t + \propto_2 EXH_t + \propto_3 XR_t + \epsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.19)$$

$$XR_t = \propto_0 + \propto_1 EXO_t + \propto_2 EXH_t + \propto_3 ROP_t + \upsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.20)$$

$$EXE_t = \propto_0 + \propto_1 EXO_t + \propto_2 ROP_t + \propto_3 XR_t + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.21)$$

$$EXO_t = \propto_0 + \propto_1 EXE_t + \propto_2 ROP_t + \propto_3 XR_t + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.22)$$

$$ROP_t = \propto_0 + \propto_1 EXO_t + \propto_2 EXE_t + \propto_3 XR_t + \epsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.23)$$

$$XR_t = \propto_0 + \propto_1 EXO_t + \propto_2 EXE_t + \propto_3 ROP_t + \upsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.24)$$

On the other hand, presence of cointegrating equations in the system would require that an Error Correction Model be specified as follows (see for example Kosimbei, 2002).

$$\Delta(EXH_t) = \beta_0 + \sum_{i=0}^{k}(\propto i\Delta(EXO)_{t-i}) + \sum_{j=1}^{k}(\delta j\Delta(EXH)_{t-j}) + \sum_{m=0}^{k}(\rho m\Delta(ROP)_{t-m}) +$$
$$\sum_{n=0}^{k}(\tau n\Delta(XR)_{t-n}) + \lambda_1 ECT_{t-1} + \eta_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.25)$$

$$\Delta(EXO_{t)} = \gamma_0 + \sum_{i=1}^{k}(\omega j\Delta(EXO)_{t-i}) + \sum_{j=0}^{k}(\psi j\Delta(EXH)_{t-j}) + \sum_{m=0}^{k}(\varpi m\Delta(ROP)_{t-m}) +$$
$$\sum_{n=0}^{k}(\pi n\Delta(XR)_{t-n}) + \lambda_2 ECT'_{t-1} + \nu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.26)$$

$$\Delta(ROP_t) = \sigma_0 + \sum_{i=0}^{k}(\partial i\Delta(EXO)_{t-i} + \sum_{j=0}^{k}(\emptyset j\Delta(EXH)_{t-j}) + \sum_{m=1}^{k}(\vartheta m\Delta(ROP)_{t-m}) +$$
$$\sum_{n=0}^{k}(\theta n(XR)_{t-n}) + \lambda_3 ECT''_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.27)$$

$$\Delta(XR_t) = \varrho_0 + \sum_{i=0}^{k}(\zeta i\Delta(EXO)_{t-i}) + \sum_{j=0}^{k}(\chi j\Delta(EXH)_{t-j}) + \sum_{m=0}^{k}(\Phi m\Delta(ROP)_{t-m}) + \sum_{n=1}^{k}(\kappa n(XR)_{t-n}) +$$
$$\lambda_2 ECT'''_{t-1} + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.28)$$

$$\Delta(EXE_t) = \beta_0 + \sum_{i=0}^{k}(\propto i\Delta(EXO)_{t-i}) + \sum_{j=1}^{k}(\delta j\Delta(EXE)_{t-j}) + \sum_{m=0}^{k}(\rho m\Delta(ROP)_{t-m}) +$$
$$\sum_{n=0}^{k}(\tau n\Delta(XR)_{t-n}) + \lambda_1 ECT_{t-1} + \eta_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.29)$$

$$\Delta(EXO_{t)} = \gamma_0 + \sum_{i=1}^{k}(\omega j\Delta(EXO)_{t-i}) + \sum_{j=0}^{k}(\psi j\Delta(EXE)_{t-j}) + \sum_{m=0}^{k}(\varpi m\Delta(ROP)_{t-m}) +$$
$$\sum_{n=0}^{k}(\pi n\Delta(XR)_{t-n}) + \lambda_2 ECT'_{t-1} + \nu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.30)$$

$$\Delta(ROP_t) = \sigma_0 + \sum_{i=0}^{k}(\partial i\Delta(EXO)_{t-i} + \sum_{j=0}^{k}(\emptyset j\Delta(EXE)_{t-j}) + \sum_{m=1}^{k}(\vartheta m\Delta(ROP)_{t-m}) + \sum_{n=0}^{k}(\theta n(XR)_{t-n}) +$$
$$\lambda_3 ECT''_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.31)$$

$$\Delta(XR_t) = \varrho_0 + \sum_{i=0}^{k}(\zeta i\Delta(EXO)_{t-i}) + \sum_{j=0}^{k}(\chi j\Delta(EXE)_{t-j}) + \sum_{m=0}^{k}(\Phi m\Delta(ROP)_{t-m}) + \sum_{n=1}^{k}(\kappa n(XR)_{t-n}) +$$
$$\lambda_2 ECT'''_{t-1} + \mu_t \dots\dots\dots\dots\dots\dots\dots\dots\dots(3.32)$$

Where ECT, ECT', ECT'' and ECT''' error correction terms are represented by residuals of equations (3.25) - (3.32).

If the series would be found to be cointegrated, the Granger Causality test would be based on equations (3.25) - (3.32). In the first step of Granger causality, the null hypothesis was $\alpha_i = \lambda_1 = 0,,\ \omega j = \lambda_2 = 0,\ \partial i = \lambda_3 = 0$ and $\zeta i = \lambda_4 = 0$ for all i and j (see for example Kosimbei, 2002). If the null hypothesis would not be rejected, there was no need for further testing since this indicates that there is no causality in any direction. Further steps would thus follow in case the null hypothesis would not be accepted.

3.8 Data Analysis

The first objective was to estimate the relationship between expenditure on oil imports and government expenditure on health. This was achieved by estimating equations (3.17), (3.18), (3.19) and (3.20) since there was presence of cointegration. To measure the strength of the relationship between aggregate expenditure on oil imports and government expenditure on health, correlation analysis was done by estimating equation (3.13). Besides measuring the degree of association, correlation was also helpful in measuring the direction of association using a scale of -1 to +1. Negative value of correlation indicates that two variables move in the opposite direction and vice-versa (Szarowska, 2014).

Granger causality test (1969, 1980) accounts for whether previous changes in expenditure on oil imports (EXO) explain the present or future values of government expenditure on health (EXH) and vice-versa. As it tests for the direction of causality, it concurrently tests for endogeneity which gives an insight on whether estimations should be executed simultaneously or simply using a single equation. In this study, Granger Causality was tested by estimating a linear equation between aggregate expenditures on oil imports and government expenditure on health followed by an F-test. If there occurs a joint significance of the variables, then aggregate expenditures on oil imports Granger causes government expenditure on health such that the past values of aggregate expenditures on oil imports help in explaining the present and future values of government expenditure on health. In determining whether the government expenditure on health granger cause aggregate expenditures of oil imports, a reverse of the linear equation would be run. The following were the hypothesis for equations (3.25), (3.26), (3.27) and (3.28):

$H_0 = \propto_i = \rho_m = \tau_n = 0, i = 1,2, \ldots\ldots, k$…………………………………….……..(3.33)

$$H_0 = \psi_j = \varpi_m = \pi_n = 0, i = 1,2, \ldots \ldots., k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(3.34)$$

$$H_0 = \partial_i = \emptyset_j = \theta_n = 0, 1,2, \ldots \ldots., k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(3.35)$$

$$H_0 = \zeta_i = \chi_j = \Phi_m = 0, 1,2, \ldots \ldots., k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(3.36)$$

This was for all i and j, using standard F-test or Wald test. For instance, if at least one coefficient $\propto_i$ is statistically different from zero, then government expenditures on health granger causes government expenditures on oil imports; likewise, if at least one coefficient ψ_j would be statistically different from zero, then government expenditures on health are granger caused by aggregate expenditures on oil imports. If the null hypotheses in equations (3.33), (3.34), (3.35) and (3.36) are both rejected, then there is a bi-directional causality and both variables are related to past effects of each another. This is referred to as a feedback system. The bivariate Granger causality test however requires pairs of variables be stationary hence a test for stationarity was conducted.

The second objective was to estimate the relationship between aggregate expenditure on oil imports and government expenditure on education. This was achieved by estimating equations (3.9), (3.10), (3.11) and (3.12). Correlation analysis was done by estimating equation 3.14 in a similar manner as the first objective. Granger causality test was done to account for whether previous changes in expenditure on oil imports (EXO) explain the present or future values of government expenditure on education (EXE) and vice-versa. If there occurs a joint significance of the variables as indicated by F-tests, then aggregate expenditures on oil imports Granger causes government expenditure on education such that the past values of aggregate expenditures on oil imports help in explaining the present and future values of education. A reverse of the linear equation was run to determine whether government expenditure on education granger cause aggregate expenditures of oil imports. The hypothesis for equations (3.9), (3.10), (3.11) and (3.12) was given as follows:

$$H_0 = \propto_{1i} = \theta_{1m} = \rho_{1n} = 0, i = 1,2, \ldots \ldots., k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(3.37)$$

$$H_0 = \psi_{2j} = \varphi_{2m} = \sigma_{2n} = 0, i = 1,2, \ldots \ldots., k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(3.38)$$

$$H_0 = \partial_{3i} = \emptyset_{3j} = \tau_{3n} = 0 \; i = 1,2, \; \ldots \ldots., k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(3.39)$$

$$H_0 = \pi_{4i} = \vartheta_{4j} = \varrho_{4m} = 0, i = 1,2, \ldots \ldots., k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(3.40)$$

This is for all i and j, using standard F-test or Wald test. For example, f at least one coefficient $\propto_{1i}$ is statistically different from zero, then government expenditures on education granger causes government

expenditures on oil imports; likewise, if at least one coefficients ψ_{2j} is statistically different from zero, then government expenditures on education are granger caused by aggregate expenditures on oil imports. If the null hypotheses in equations (3.37) - (3.40) are rejected, then there is a bi-directional causality and both variables are related to past effects of one another.

In summary, the relationship between aggregate expenditure on oil imports and government expenditure on health was determined by estimating equations 3.13, 3.25, 3.26, 3.27 and 3.28. On the other hand, the relationship between aggregate expenditure on oil imports and government expenditure on education was determined by estimating equations 3.14, 3.9, 3.10, 3.11 and 3.12.

CHAPTER FOUR
EMPIRICAL FINDINGS

4.1 Introduction

The empirical findings of this study are presented and further interpreted in this chapter. The chapter comprises descriptive statistics and time series property tests' results which include stationarity and cointegration tests. The empirical results were then discussed as guided by the objectives of the study.

4.2 Descriptive statistics

Descriptive statistics were used in this study to explore the basic characteristics of the data. They were meant to give a feel of the data in determining whether it matches priori expectations and whether itfits the chosen econometric model. This was therefore important before proceeding with the estimation of the model. Table 4.1 shows descriptive statistics consisting of annual mean, standard deviation, median, minima, maxima, skewness, and kurtosis of the main variables of interest in this study.

	Aggregate Expenditure on Oil Imports	Government Expenditure on Education	Government Expenditure on Health	Real Oil Prices	Exchange Rate
Mean	63168.59	65056.11	13665.36	29.508	40.740
Median	9356.200	13738.96	3458.200	18.1	22.922
Maximum	335676.7	415395.1	71851.74	108.9	103.374
Minimum	167.160	136.200	61.080	1.21	6.961
Std. Dev.	98414.91	100470.9	19210.09	29.509	33.900
Skewness	1.635	1.832	1.581	1.396994	0.354
Kurtosis	4.361	5.514	4.444	4.05643	1.477
Observations	55	55	55	55	55

Table 4.1:- Summary of Descriptive Statistics

Source: Computed From Table A1

From the above table 4.1, the average annual government expenditure on education was Kshs 65,056.11 million while the average annual government expenditure on health was Kshs 13,665.36 million. In contrast, the

average annual expenditure on oil imports was Khs 63,168.59 million while the average annual oil price and exchange rate was USD 29.508 per barrel and Kshs 40.740 per USD respectively. There has been a perpetual rise in oil prices from a minimum of USD 1.21 per barrel at independence to a maximum of USD 108.9 per barrel within a 55 year period. A similar trend is seen for exchange rates which rise from a minimum of Kshs 6.961 per USD to a maximum of Kshs103.374 per USD within the same period. This trend basically capture the oil price shocks and exchange rate variations which define the expenditure patterns on oil imports, government expenditure on health and government expenditure on education (Maina, 2015). Government expenditure on education was highest followed by the country's expenditure on oil imports. This can be attributed to the fact that human development drives all the other sectors of the economy which thrive and improve by investing in the education sector (Maina, Nyandemo & Kioko, 2016). A work force which is well educated and trained also increases efficiency in health care hence further reducing health care expenditures by the government (Savić, 2018).

Similar effects are experienced on oil imports where average expenditures on oil imports are lower than education at Khs 63,168.59 million due to such efficiency gains which are drawn from the education sector. This further explains why the minimum expenditures on oil imports and government expenditure on health care are lower at Kshs 167.16 million and Kshs 68.01 million respectively. The average annual expenditure on oil imports was also notably high at Khs 63,168.59 million in absolute terms owing to the rise in oil-reliant production activities in the manufacturing, transport, health, education sectors among others (Cheserek & Mugalavai, 2012; Were, 2016).The misalignment between the median and the mean for all the variables depicts great variation around the mean indicating the presence of outliers in the data. This could be explained by demographic, socio-economic, and political factors like population growth, poverty and post-election violence which constantly shape the expenditure trends in the country (Ross, 2001; Sachs & Warner, 2001; Di John, 2007). Government expenditure on education has the highest standard deviation of Kshs 100,470.9 million followed by expenditure on oil imports at Kshs 98,414.9 million. This can be explained by the expenditure shocks which are exacerbated by the need to increase educational infrastructure, books and other activities needed to sustain free primary education, secondary and tertiary education. The high standard deviation can also be attributed to corrupt practices by high ranking public officials (Cheserek & Mugalavai, 2012). The high variation in oil import expenditures is however not due to varying global oil prices and exchange rate fluctuations as one would suppose. It is rather due to the increased oil demand in the country owing to its great necessity as a complementary good (Mureithi, 2014). Aggregate expenditure on oil imports, government

expenditure on education, government expenditure on health, exchange rate and oil price are all positively skewed and highly peaked. They are therefore asymmetrically distributed.

4.3 Relationship between Expenditure on Oil Imports and Government Expenditure on Health

The first objective of this study was to estimate the relationship between aggregate expenditure on oil imports and government expenditure on health. Before reporting the results, several tests were done.

4.3.1 Stationarity Test Results

Stationarity tests were conducted at several lag lengths as determined by the results which are presented in tables A2, A3 and A4 in the appendix section. From the VAR lag order selection criteria results presented in table A5 in the appendix section, a lag length of 5 was optimal for aggregate expenditure on oil imports, and government expenditure on health. On the other hand, a lag length of 1 was optimal for exchange rate and oil prices but a lag length of 4 was optimal for the entire model as determined by the VAR lag selection criteria results reported in table A5. However, stationarity test results were presented for lags 0, 1 and 2.

From the unit root tests' results, aggregate expenditures on oil imports, government expenditure on health, exchange rate and oil prices were all non-stationary at levels. They were therefore tested for unit root at first difference where they all achieved stationarity as summarized in table A3 in the appendix section. These results heightened the possible presence of valuable long-term equilibrium relationships since cointegrating relationships can only exist where variables are stationary at first difference (Kosimbei, 2002).

4.3.2 Correlation Analysis Results

Correlation analysis was done to determine the direction and strength of the relationship between aggregate expenditure on oil imports, government expenditure on health, exchange rate and oil prices. From the results of the correlation analysis presented as a matrix in table A6 in the appendix section, at stationarity, government expenditure on health and exchange rate move in the opposite direction as shown by the negative sign on the correlation coefficient (-0.034). This means that as the Kenya shilling losses ground against the US dollar (that is, an increase in the exchange rate) by one percent, government expenditure on health falls by 3.4 percent and vice-versa *ceteris paribus*. This is a however a weak correlation but cannot be deemed negligible owing to the inherent welfare implications that it may bear (Lu, Schneider, Gubbins, Leach-Kemon, Jamison & Murray (2010). The fall in government expenditure on health with rising exchange rate is occasioned by the fact that importing medical equipment and services in the health sector become more expensive forcing the government

to seek sustainable alternatives. This relationship is in line with Pilbeam (1992) where savings and imports are considered as leakages from the spending stream. On the other hand, government expenditure on health is positively correlated with oil prices with a correlation coefficient of 0.063. That is, a percentage increase in oil prices is associated with 6.3 percent increase in government expenditure on health and vice versa *ceteris paribus*. Oil price shocks and exchange rate fluctuations might be mildly reflected in aggregate expenditure on oil imports which increases by 32.6 percent following a percentage increase in government expenditure on health and vice versa ceteris paribus. This is in consonance with the findings of Hitzemann &Yaron (2016) who focused on welfare costs of oil price shocks in relation oil production changes rather than oil import bill.

4.3.3 Distributional Test Results

Distributional tests were also conducted on the variables using skewness and kurtosis. Based on the results of the descriptive statistics in table 4.1, government expenditure on health, aggregate expenditure on oil imports, exchange rate and oil prices were all positively skewed. On the other hand, the results on kurtosis showed that with the exception of exchange rate which was platykurtic at 1.477 indicating a large standard deviation, government expenditure on health, aggregate expenditure on oil imports and oil price were leptokurtic at more than 4 with a sharp peak. This was an indication of a smaller standard deviation.

4.3.4 Granger Causality Test Results

The table that follows presents the granger causality test results between aggregate expenditure on oil imports and government expenditure on health.

Null Hypothesis	Chi-square	P- Values
Aggregate expenditure on oil imports does not Granger cause Government expenditure on health	23.768*	0.000
Government expenditure on health does not Granger cause Aggregate expenditure on oil imports	20.560*	0.000
denotes rejection of the null hypothesis at 0.05 significant level.		

Table 4.2:- Granger Causality Test Results between Aggregate Expenditure on oil imports and Government Expenditure on Health, Source: Computed from Research Data

Table 4.2 shows that the Chi-square statistic for the granger causality from aggregate expenditure on oil imports to government expenditure on health was significant at 0.01 significance level. Similarly, the Chi-square statistic for the granger causality from government expenditure on health to aggregate expenditure on oil imports was also significant at 0.01 significance level. This indicates the existence of bi-directional causality in the sense that aggregate expenditure on oil imports granger causes government expenditure on health and vice versa *ceteris paribus*. Similar results were found by Patrick (2012) where oil exploitation dampened the healthcare state in developing countries. According to Patrick (2012), a lower spending on oil imports leads to less government commitment towards healthcare and the overall welfare of citizens. This follows from the assumption that oil production essentially means low importation of oil (Lu, Schneider, Gubbins, Leach-Kemon, Jamison & Murray, 2010). Opposite results were however reported by Mureithi (2014) who indicated that the expenditures inherent in oil import volatility negatively affects GDP growth rate.

Since there is no direct link to this study, however, the study assumed that the economy grows following an increase in government expenditure on health (Nurudeen & Usman, 2010). Expenditure on oil imports does not granger cause government expenditure on health according to Mureithi (2014) and Nurudeen & Usman (2010).

From this analysis, one can infer that as more money is spent to import oil to drive, sustain and improve the health sector, healthier kenyan citizens import more oil to sustain the growing economy as well. Thus, expenditure on oil imports and government expenditure on health are not independent of each other (Blomstedt, Bhutta, Dahlstrand, Friberg, Gostin, Nilsson, & Alfven, 2018).

The following table shows the results for granger causality between aggregate expenditure on oil imports and exchange rates.

Null Hypothesis	Chi-square	P- Values
Aggregate expenditure on oil imports does not Granger cause Exchange rate	10.947*	0.012
Exchange rate does not Granger cause Aggregate expenditure on oil imports	2.287	0.515
denotes rejection of the null hypothesis at 0.05 significant level.		

Table 4.3:- Granger Causality Test Results between Aggregate Expenditure on Oil imports and Exchange rate, Source: Computed from Research Data

The results reported on table 4.3 shows that the expenditure on oil imports granger causes exchange rates as the exchange rates adjusts so as to offset the effects of the rising oil import bill in the country (Pilbeam, 1992; Taylor & MacDonald, 1989). This can be attributed to the fact that oil is not only a necessary good but also a complementary good in virtually all the sectors of the economy. Therefore, an appreciation in the domestic currency cushions such sectors from the adverse effects of rising oil import bills.

On the other hand, there is no causal relationship running from exchange rates to aggregate expenditure on oil imports. This assertion follows from the failure to reject the null hypothesis due to the insignificance of the Chi-square statistic whose probability is more than 0.05 significance level. This finding underscores the centrality of oil imports in driving the economy of Kenya as a necessity resulting in the inelastic nature of oil demand which keeps growing through time (Mureithi, 2014).

The following table presents the granger causality test results between government expenditure on health and exchange rates.

Null Hypothesis	Chi-square	P- Values
Government expenditure on health does not Granger cause Exchange rate	10.212*	0.017
Exchange rate does not Granger cause Government expenditure on health	4.330	0.228
denotes rejection of the null hypothesis at 0.05 significant level.		

Table 4.4:- Granger Causality Test Results between Government Expenditure on Health and Exchange rate

Source: Computed from Research Data

From table 4.4, government expenditure on health granger causes exchange rates. The exchange rates adjust so that the importation of medical equipment and services by the government may be more affordable (Pilbeam, 1992). This follows from the importance of healthcare in the country. On the other hand, exchange rate does not granger cause government expenditure on health. This captures the supply inelasticity inherent in the sensitivity of government expenditure on health in relation to welfare (Blomstedt, Bhutta, Dahlstrand, Friberg, Gostin, Nilsson &Alfven, 2018). This is to say that in the face of high and unfavorable exchange rates, the government cannot adjust its spending on health since health is central to welfare. Adjusting government spending on health might compromise on the health of the Kenyan population. Therefore, government expenditure on health and exchange rates are not independent of each other.

The following table shows the granger causality between oil prices and aggregate expenditure on oil imports.

Null Hypothesis	Chi-square	P- Values
Oil price does not Granger cause Aggregate expenditure on oil imports	2.977	0.395
Aggregate expenditure on oil imports does not Granger cause Oil price	2.333	0.506
denotes rejection of the null hypothesis at 0.05 significant level.		

Table 4.5:- Granger Causality Test Results between Oil prices and Aggregate Expenditure on Oil Imports

Source: Computed from Research Data

Table 4.5 shows that aggregate expenditure on oil imports and oil prices are independent of each other since there are no causal relationships between them. The fact that aggregate expenditure on oil imports is not granger caused by oil price shocks shows that oil demand is inelastic to changing global oil prices. On the other hand, in line with the findings, Kenya's position as a price taker in regard to global oil prices cannot allow aggregate expenditure on oil imports to granger cause global oil prices. It is simply illogical (Mecheo & Omiti, 2003). Therefore, in contrast to the findings by Maina (2015), global oil price shocks cannot be transmitted to the domestic economy through aggregate expenditures on oil imports. This may be attributed to measures by the government to cushion the economy from the adverse effects of rising global oil prices (Musgrave & Peacock, 1967).

Table 4.6 that follows presents the granger causality test results between oil prices and government expenditure on health.

Null Hypothesis	Chi-square	P- Values
Government expenditure on health does not Granger cause Oil price	12.433*	0.006
Oil price does not Granger cause Government expenditure on health	6.315	0.097
denotes rejection of the null hypothesis at 0.05 significant level.		

Table 4.6:- Granger Causality Test Results between Oil prices and Government Expenditure on Health

Source: Computed from Research Data

According to the results reported in table 4.6, there is unidirectional causality running from government expenditure on health to oil prices. That is, government expenditure on health granger cause oil price in a way that defies priori expectations. This is because a domestic phenomenon like government expenditure on health can rarely influence global oil prices which are globally determined. On the other hand, oil prices does not granger cause government expenditure on health. Therefore, oil price shocks cannot curtail the progress towards achieving universal healthcare, Kenya Vision 2030 and ultimately the sustainably development goals (Republic of Kenya, 2007; Republic of Kenya, 2018).

Granger causality test results between oil prices and exchange rates are presented in the following table 4.7.

Null Hypothesis	Chi-square	P- Values
Oil price does not Granger cause Exchange rate	3.980	0.264
Exchange rate does not Granger cause Oil price	0.188	0.980
denotes rejection of the null hypothesis at 0.05 significant level.		

Table 4.7:- Granger Causality Test Results between Oil prices and Exchange rates

Source: Computed from Research Data

From the results presented in table 4.7, exchange rates and global oil prices are independent of each other since there is no causal relationship between them. These two variables are pivotal in this analysis as they help in discussing the changes in aggregate expenditures on oil imports *vis-à-vis* the effects on government expenditure on health and education. Exchange rate being determined cannot granger cause globally determined oil prices. This is consistent with the findings by Mecheo and Omiti (2003), Ndung'u (2013) and Pilbeam (1992). Conversely, oil prices don't granger cause exchange rates because the bulk of foreign exchange transactions involve non-oil commodities which are not directly complemented by oil. Therefore, compared to the total import bill in the country, the fraction of oil import bill is relatively little to influence the exchange rates (Taylor and MacDonald, 1989).

4.3.5 Cointegration and Error Correction Tests Results

Cointegration test was used in the study to determine the possible existence of a long term relationship between aggregate expenditures on oil imports, government expenditure on health, exchange rate and oil prices. This follows from the fact that all these variables are stationary at first difference as explained in section 4.3.1.

Presence of a cointegrating relationship between government expenditure on health, aggregate expenditure on oil imports, exchange rate and oil prices called for the specification of Error Correction Models. Johansen-Juselius test for cointegration was used in this study and the cointegration test results are summarized in the following table 4.8.

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	Critical value (0.05)	Prob.**	Max-Eigen Statistic	Critical value (0.05)	Prob.**
None	0.787	115.153*	47.856	0.000	80.503*	27.584	0.000
At most 1	0.407	34.650*	29.797	0.013	27.208*	21.131	0.006
At most 2	0.119	7.443	15.495	0.527	6.607	14.265	0.537
At most 3	0.016	0.835	3.841	0.361	0.835	3.841	0.361
denotes rejection of hypothesis at the 0.05 significant level. *Max-Eigen and Trace tests indicate that 2 equations are co-integrated at the 0.05 significant level*							

Table 4.8:- Johansen Test Co-integration results

Source: Computed from Research Data

Table 4.8 shows that there exists a long-run relationship between aggregate expenditure on oil imports, government expenditure on health, exchange rate and oil prices. More precisely, there are two cointegrating equations on the basis of the trace and max-eigen statistics. This follows from the rejection of the null hypothesis where probability values were less than 0.05 level of significance. On the basis of these results, the Vector Error Correction Models (VECMs) specified in equations (3.25), (3.26), (3.27) and (3.28) were estimated and used to test for granger causality.

The following table 4.9 shows coefficients, t-statistics and p-values for the cointegrating equation. The p-values were used in testing the statistical significance of the coefficients. The estimates in the tables are essentially the vector error correction model estimates.

Variables		D(Government expenditure on health)	D(Expenditure on oil imports)	D(Exchange rate)	D(Oil prices)
Cointegrating Equation (Error Correction Term)	Coefficient	-2.624*	2.401	0.002*	0.001
	t-statistic	[-3.403]	[0.770]	[2.836]	[0.301]
	p-values	0.002	0.446	0.007	0.765
D(Government expenditure on health) (-1)	Coefficient	1.995*	0.108	-0.002*	0.000
	t-statistic	[3.382]	[0.045]	[-2.742]	[0.141]
	p-values	0.002	0.964	0.009	0.888
D(Government expenditure on health) (-2)	Coefficient	2.054*	3.039	-0.001*	0.001*
	t-statistic	[3.911]	[1.432]	[-3.128]	[1.196]
	p-values	0.000	0.161	0.003	0.239
D(Government expenditure on health) (-3)	Coefficient	0.456	1.324	-0.001*	0.001
	t-statistic	[1.215]	[0.873]	[-2.822]	[0.704]
	p-values	0.232	0.388	0.008	0.486
D(Aggregate expenditure on oil imports) (-1)	Coefficient	-0.122	-0.029	0.000*	-0.000
	t-statistic	[-1.219]	[-0.072]	[3.115]	[-0.546]
	p-values	0.231	0.943	0.004	0.588
D(Aggregate expenditure on oil imports) (-2)	Coefficient	-0.259*	-0.449*	0.000*	-0.000
	t-statistic	[-4.761]	[-2.039]	[-1.219]	[-1.219]
	p-values	0.000	0.049	0.037	0.231
D(Aggregate expenditure on oil imports) (-3)	Coefficient	-0.017	0.006	0.000	-0.000
	t-statistic	[-0.260]	[0.022]	[1.183]	[-1.158]
	p-values	0.796	0.983	0.245	0.254
D(Exchange rate) (-1)	Coefficient	-27.844	267.914	0.212	0.058
	t-statistic	[-0.172]	[0.420]	[1.279]	[0.161]
	p-values	0.864	0.685	0.209	0.873
D(Exchange rate) (-2)	Coefficient	-159.213	-16.966	0.025	-0.088
	t-statistic	[-1.006]	[-0.027]	[0.154]	[-0.251]
	p-values	0.321	0.979	0.879	0.804

D(Exchange rate) (-3)	Coefficient	-270.106	-849.701	0.247	-0.094
	t-statistic	[-1.758]	[1.368]	[1.563]	[-0.274]
	p-values	0.087	0.180	0.127	0.786
D(Oil Prices) (-1)	Coefficient	-272.868*	-215.068	-0.151	0.070
	t-statistic	[-2.332]	[-0.455]	[-1.255]	[0.269]
	p-values	0.025	0.652	0.217	0.790
D(Oil Prices) (-2)	Coefficient	-83.615	-383.693	-0.050	-0.089
	t-statistic	[-0.641]	[-0.728]	[-0.373]	[-0.305]
	p-values	0.525	0.471	0.711	0.762
D(Oil Prices) (-3)	Coefficient	-22.889	759.724	0.204	0.196
	t-statistic	[-0.188]	[1.540]	[1.632]	[0.723]
	p-values	0.852	0.132	0.111	0.474
Constant	Coefficient	71.479	3793.495	2.579*	1.403
	t-statistic	[0.081]	[1.059]	[2.835]	[0.711]
	p-values	0.936	0.297	0.007	0.481

Table 4.9:- Error Correction Model Estimates

Source: Computed from Research Data

According to table 4.9, the previous year's deviations from long run equilibrium is corrected in the current year at an adjustment speed of 262.4 percent *ceteris paribus*. This extreme percentage reflects the government's commitment and effort in safeguarding the welfare of the citizens by cushioning the country's healthcare from harmful oil shocks and exchange rate fluctuations which may have trickle down effects on the welfare of Kenyans (Lu, Shneider, Gubbins, Leach-Kemon, Jamison & Murray, 2010).These dynamics in expenditure may have considerable implications in regard to the progress towards the Kenya Vision 2030, universal healthcare and the Sustainable Development Goals (Republic of Kenya, 2007; Udo & Effiong, 2014).

A percentage change in aggregate expenditures on oil imports in the previous one, two and three years is associated with a decrease in government expenditure on health by an average of 0.122 percent, 0.259 percent and 0.017 percent respectively in the present year *ceteris paribus*. In spite of the statistically insignificant coefficients for the previous one and three years respectively, these dynamics brings to light the diversionary

aspect of government expenditures which are channeled to oil importation so as to satisfy the rising oil demand at the expense of health expenditures (Mureithi, 2014).

On the other hand, a percentage change in exchange rates in the previous one, two and three years is associated with a decline in government expenditure on health by an average of 27.844 percent, 159.213 percent and 270.106 percent respectively in the present year *ceteris paribus*. However, only the coefficient for exchange rate changes in the previous three years (-270.106) is statistically significant at 0.05 significance level. Further, a percentage change in global oil prices in the previous one, two and three years is associated with a decrease in government expenditure on health by an average of 272.868 percent, 83.615 percent and 22.889 percent respectively in the present year *ceteris paribus.* All the coefficients are statistically insignificant. This extreme percentage value shows the importance of oil prices and exchange rates in shaping the health spending patterns (Maina, 2015; Mureithi, 2014 & Ndungu, 2013; Pilbeam, 1992; Taylor & MacDonald, 1989).

Finally, the present year's exchange rates mildly responds to a percentage change in aggregate expenditures on oil imports in the previous one, two and three years respectively *ceteris paribus*. This is because the coefficients are about (0.000) percent on average *ceteris paribus*. However, only the coefficient for the previous three years' changes in oil import bill is statistically insignificant.

In regard to the relationship between aggregate expenditure on oil imports and government expenditure on education, the above results and discussion suggest that aggregate expenditures on oil imports granger cause government expenditure on health and vice versa. This is called bi-directional causality. However, neither aggregate expenditure on oil imports nor government expenditure on health is granger caused by either oil prices or exchange rates. This partially dispels questions on whether oil price shocks and exchange rate fluctuations, which were assumed to be inherent in the rising oil import bill, leads government expenditure on health. The partiality in dispelling the above question arises from the fact that lack of granger causality between variables cannot be necessarily interpreted as lack of a cause and effect relationship (Lutkepohl, 2005). This assertion by Lutkepohl (2005) supports the cause and effect relationships given by the results in table 4.9. It also noteworthy that since there were two cointegrating relationships between the variables as shown by the Max-Eigen and Trace test statistics given in table 4.8, granger causality tests had to be conducted using the Chi-square test statistic only after estimating the error correction model.

4.4 Relationship between Aggregate Expenditure on Oil Imports and Government Expenditure on Education

The second objective sought to estimate the relationship between expenditure on oil imports and government expenditure on education. This objective was achieved by estimating equations (3.21), (3.22), (3.23) and (3.24) in chapter 3.This was after differencing government expenditure on education twice and differencing aggregate expenditure on oil imports, exchange rate and oil prices once so as to achieve stationarity.

4.4.1 Stationarity Test Results

From the stationarity test results in tables A2, A3 and A4, unit root tests results show that government expenditure on education, aggregate expenditure on oil imports, oil prices, and exchange were all non-stationary at levels and had to be tested further at first difference. However, the unit root test results at first difference revealed that only government expenditure on education was still non-stationary. Therefore, a unit root test at second difference was conducted for government expenditure on education after which it achieved stationarity. From the results of VAR lag selection criteria in table A5 in the appendix section, a lag length of 5 was optimal for government expenditure on education while a lag length of 4 was optimal for the entire model. Unit root test were however conducted at lags 0, 1 and 2.

4.4.2 Correlation Analysis Results

In determining the direction and the strength of association between government expenditure on education, expenditure on oil imports, oil price shocks and exchange rate, only stationary values of the variables were considered. From table A6 in appendix B, there was a positive correlation of (0.440) between government expenditure on education and expenditure on oil imports *ceteris paribus*. This indicated that a percentage increase in aggregate expenditure on oil imports leads to a 44 percent increase in government expenditure on education and vice versa *ceteris paribus*. This correlation was considered to be moderate since it lies between 0.40 than 0.59 (Evans, 1996; Cohen, West & Aiken, 2014).There was also a very weak positive correlation of 0.098 between government expenditure on education and oil price shocks at *ceteris paribus*. This is to say that all other factors held constant, as global oil prices increase by one percent, government expenditure on education increases by 9.8 percent. On the other hand, a percentage increase in the exchange rate (depreciation) results in a 9.5 percent decline in government expenditure on education. This is a negative correlation which means that as the dollar becomes more expensive, government expenditures on the importation of materials,

equipment and services in the education sector declines as the government seeks other alternatives to contain costs.

4.4.3 Distributional Test Results

In regard to the distribution of government expenditure on education, the results on skewness and kurtosis in table 4.1 show that government expenditure on education was positively skewed to the right by 1.832. It was also leptokurtic at 5.514 with a sharp peak as an indication of a small standard deviation.

4.4.4 Granger Causality Test Results

Since government expenditure on education was integrated of order 2, granger causality test results were directly achieved by twice differencing it and first differencing expenditure on oil imports, oil prices and exchange rate. The results on granger causality between government expenditure on education and aggregate expenditure on oil imports are presented in table 4.10 that follows.

Null Hypothesis	F-statistic	P- Values
Aggregate expenditure on oil imports does not Granger cause Government expenditure on education	0.395	0.676
Government expenditure on education does not Granger cause Aggregate expenditure on oil imports	6.820*	0.003
denotes rejection of the null hypothesis at 0.05 significant level.		

Table 4.10:- Granger Causality Test Results between Government Expenditure on Education and Aggregate Expenditure on Oil Imports Source: Computed from Research Data

Table 4.10 shows that there is no causal relationship running from aggregate expenditures on oil imports to government expenditure on education as government expenditure on education granger causes aggregate expenditures on oil imports. This unidirectional causality means that being a fundamental human right, education is relatively inelastic to aggregate expenditures on oil imports and is therefore irresponsive to oil-induced pressure.

On the other hand, the causality running from government expenditure on education to aggregate expenditure on oil imports simply means that government expenditure on education leads to an increase in

aggregate expenditures on oil imports through increased demand for oil imports. The increase in aggregate expenditures on oil imports following a rise in government expenditure on education may be attributed to growth in oil dependent sectors like transport and manufacturing which employ a well-educated work-force (Were, 2016). This finding is contrary to the assertion by Wiseman and Peacock (1967) and Herenkson (1993) who suggested that government expenditure on education responds to the pressure exerted by oil to avoid or mitigate the effects of social upheavals and not the otherwise.

The results on granger causality between exchange rate and government expenditure on education are presented in the following table 4.11.

Null Hypothesis	F-statistic	P- Values
Government expenditure on education does not Granger cause Exchange rate	0.356	0.702
Exchange rate does not Government expenditure on education	0.840	0.438
denotes rejection of the null hypothesis at 0.05 significant level.		

Table 4.11:- Granger Causality Test Results between Exchange rate and Government Expenditure on Education

Source: Computed from Research Data

Since education is one of the priority sectors in the country with serious implications on welfare, table 4.11 shows that government expenditure on education is not granger caused by exchange rate variations. Similarly, government expenditure on education does not granger cause exchange rates. Therefore, government expenditure on education and exchange rate are independent of each other since there is no causal relationship existing between them. Table 4.12 below shows the granger causality test results between oil prices and government expenditure on education.

Null Hypothesis	F-statistic	P- Values
Oil price does not Granger cause Government expenditure on education	0.670	0.517
Government expenditure on education does not Granger cause Oil price	3.593*	0.036
denotes rejection of the null hypothesis at 0.05 significant level.		

Table 4.12:- Granger Causality Test Results between Oil prices and Government Expenditure on Education

Source: Computed from Research Data

With no causality running from oil price shocks to government expenditures on education contrary to earlier speculations drawn from Musgrave and Peacock (1967), table 4.12 shows that government expenditures on education granger causes global oil prices in a situation that negates the priori expectations. This is because government expenditure on education being a domestically determined aspect, it can rarely granger cause oil prices which is a globally determined phenomenon (Restrepo, 2011). It is noteworthy that granger causality between aggregate expenditure on oil imports, oil prices, and exchange rates were exhaustively discussed in section 4.3.2.

The above results and discussion relating to the relationship between aggregate expenditure on oil imports and government expenditure on education suggest that government expenditure on education granger cause aggregate expenditures on oil imports. On the other hand, aggregate expenditure on oil imports does not granger cause government expenditure on education. This is therefore a unidirectional causality which is neither informed by oil price shocks nor exchange rate fluctuations. This is because there are no granger-causal relationships running from oil prices and exchange rate to either government expenditure on education or aggregate expenditure on oil imports. Therefore, it is highly unlikely than the oil shocks inherent in the rising oil import bill can cause government expenditure on education. This is to say that aggregate expenditure on oil imports cannot curtail the progress towards the sustainable development goals and the Kenya Vision 2030. The fact that government expenditure on education was integrated of order two did not warrant testing for cointegration. Therefore, the standard F-test was used to test for granger causality since neither vector autoregressive nor error correction models could be utilized for estimation.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Introduction

This chapter presents the study summary, conclusions, policy implications and areas for further studies.

5.2 Summary of the study

In order to attain the big four agendas and the sustainable development goals, the allocation of government expenditure on health and education is indispensable. However, the proportion of government expenditure that goes to health and education is reduced by the increase in government expenditure on oil as oil prices rise overtime. Together with the effects of exchange rate variations, the dynamics in the allocation of government expenditure may have significant trickle down effects on the distribution of social services.

The main objective of this study was to analyze the relationship between aggregate expenditure on oil imports and government expenditures on health and education in Kenya. In achieving this objective, this research study employed correlation analysis and granger causality analysis. The results for granger causality analysis between aggregate expenditure on oil imports and government expenditure on health were achieved through an error correction model. This helped to determine the long run and short run relationship between the aggregate expenditure on oil imports and government expenditure on health in relation to the oil shocks inherent in oil price changes and exchange rate fluctuations. In estimating the relationship between aggregate expenditure on oil imports and government expenditure on education, granger causality analysis was directly employed without specifying an error correction model since the series on government expenditure on education was integrated of order two.

From the analysis, oil prices and aggregate expenditure on oil imports are both positively correlated to government expenditures on health and education. On the contrary, exchange rate was negatively correlated to government expenditure on health and government expenditure on education. On the other hand, there was bidirectional causality between aggregate expenditure on oil imports and government expenditure on health with a unidirectional causality running from government expenditure on education to aggregate expenditures on oil imports.

5.3 Conclusions

On the basis of the empirical findings, the study concludes that aggregate expenditure on oil imports and government expenditure on health are positively correlated with a statistically significant correlation coefficient. In addition, there is a presence of a bi-directional causal relationship between expenditure on oil imports and government expenditure on health in Kenya. Therefore, the study concludes that aggregate expenditure on oil imports influences government expenditure on health in view of the big four agenda and sustainable development goals. On the other hand, government expenditure on health influences aggregate expenditure on oil imports. Aggregate expenditure on oil imports and government expenditure on education are positively correlated with a statistically significant correlation coefficient. With a unidirectional causality running from government expenditure on education to aggregate expenditures on oil imports, this study concludes that aggregate expenditures on oil imports has no influence on government expenditure on health but increases following an increase in government expenditure on health.

In regard to the correlation between oil prices and government expenditure on health, the correlation coefficient is positive and statistically insignificant. Therefore, on the basis of the granger causality results, the study concludes that oil price shocks do not influence government expenditure on health. However, there is a likelihood of health expenditures increasing following an increase in oil prices.

The correlation between oil prices and government expenditure on education is represented by a positive correlation coefficient which is also weak and statistically insignificant. This is however coupled by a unidirectional causality running from government expenditure on education to oil prices. Therefore, the study concludes that despite the possible increase in government expenditure on education with increasing oil prices, government expenditure on education does not respond to oil price shocks.

With a negative correlation existing between exchange rate and government expenditure on health, the correlation coefficient is statistically insignificant. Also, there is presence of unidirectional causality running from government expenditure on health to exchange rate. Therefore, this study concludes that exchange rate fluctuations does not influence government expenditure on health but an increase in government expenditure on health can possibly lead to a fall in exchange rates.

Finally, exchange rate is negatively correlated to government expenditure on education with a statistically insignificant correlation coefficient. The two variables are however independent of each other since there are no

causal relationships between exchange rate and government expenditure on education. Based on the negative correlation coefficient, the study concludes that an increase in exchange rates can possibly lead a decrease in government expenditures on education. However, exchange rate fluctuations don't cause government expenditure on education. Neither does government expenditure on education cause exchange rates.

5.4 Policy Implications

First and foremost, the government should define what is deemed economically sustainable in regard to government expenditure on health as a proportion of the exchequer budget. This will further help the government to put in place policies that will help to monitor the limit beyond which government expenditure on health can hurt other sectors in the long run as it responds to aggregate expenditures on oil imports. However, this is in view of the budget constraint. This implication is supported by the findings that aggregate expenditure on oil imports granger cause and positively correlates to government expenditure on health.

The government should also put in place policies that will institute reasonable margins for government expenditures on health and education to adjust as a measure to keep the rising oil import bill in check. This is because increasing government expenditures on health and education drives demand for oil imports thereby increasing the oil import bill in the country. This policy implication follows from the findings that government expenditures on health and education not only granger causes but also correlates positively with aggregate expenditures on oil imports.

The government should formulate policies that will cushion exchange rates from adverse adjustments to the detriment of the foreign exchange market in regard to terms of trade. That is, a depreciation in exchange rates would results in the country exporting more and importing less and vice versa. This policy implication is supported by the findings that government expenditure on health and education granger causes and negatively correlates to exchange rates as aggregate expenditures on oil imports granger cause and positively correlates to exchange rates.

Policy will help in striking a balance between these conflicting responses to aggregate expenditure on oil imports and government expenditures on health and education.

In light of the diversionary aspect of government expenditure portrayed by the error correction model estimates in table 4.9, the government should reduce aggregate expenditures on oil imports so as to release

funds for healthcare. The government may achieve this reduction by finding alternative sources of cheaper oil or even exploring the possibility of sustainable oil exploitation in the country owing to the discovery of oil deposits in Turkana, Kenya. The government should therefore pursue efficient avenues which are sustainable in regard to oil exploitation as an alternative. This policy implication also follows from the assertion that the lack of granger causality between groups of variables cannot be necessarily interpreted as lack of a cause and effect relationship (Lutkpohl, 2005).

5.5 Suggestions for Further Research

This research study was limited to the relationship between government expenditure on the selected social services and the aggregate expenditures on oil imports in the country. This gives way for further research on the effects which aggregate expenditure on oil imports have on total welfare. More studies can also be conducted on the pathways through which expenditure on oil imports affects the distribution of social services.

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APPENDICES

Appendix A: Data for Aggregate Expenditure on Oil Imports, Real Oil prices, Exchange Rate and Government Expenditure on Health and Education

Year	Aggregate Expenditure on oil imports Kshs.(Millions)	Government Expenditure on health Kshs.(Millions)	Government Expenditure on Education Kshs.(Millions)	Real Oil Prices Dubai $/bbl	Exchange Rate Kshs/USD
1963	167.16	61.08	147.74	1.50	7.148
1964	185.44	63.4	136.2	1.45	7.096
1965	205.62	74.48	137.88	1.42	7.059
1966	236.4	81.4	158.48	1.36	7.105
1967	239.1	102.62	196.88	1.33	7.066
1968	263.88	118.26	237.78	1.32	7.087
1969	268.6	158.82	350.88	1.27	7.131
1970	300.68	202.2	551.66	1.21	7.061
1971	318.288	244.4	673.58	1.69	7.111
1972	394.89	255.46	807.56	1.82	7.139
1973	441.28	288.62	922.48	2.81	6.961
1974	1605.76	414.6	1276.08	10.97	7.049
1975	1886.066	485.9	1444.74	10.43	7.253
1976	2050.712	591.18	1616.48	11.63	8.368
1977	2308.422	737.9	1890.06	12.57	8.334
1978	2318.966	862.48	2182.28	12.92	7.708
1979	2914.272	1,089.48	2740.78	29.82	7.517
1980	5545.4	1305.6	3526.4	35.85	7.356
1981	7163	1422.62	3953.4	34.29	8.994
1982	6555.4	1393.96	4128.58	31.76	10.86
1983	6846.4	1465.76	4401.4	28.73	13.259

1984	6523.4	1654.58	5196.2	27.49	14.424
1985	7507.8	1854.18	6593.8	26.46	16.366
1986	4676.4	2205.4	7929.92	13.20	16.237
1987	5544.8	2358.66	9133.8	16.94	16.465
1988	4851.6	2799.74	10661.6	13.22	17.698
1989	6488	2886.7	11298.58	15.70	20.602
1990	9356.2	3458.2	13738.96	20.46	22.922
1991	9564.4	3800.26	14444.42	16.56	27.503
1992	12174.2	4645.02	17095.66	17.19	32.239
1993	24,493.20	6541.18	21393	14.94	57.511
1994	17817.2	7015.52	28275.54	14.67	56.12
1995	19054.2	9114.6	31813.46	16.12	51.416
1996	23866.2	10567.98	33483.02	18.54	57.192
1997	28998.2	12883.9	46226.3	18.10	58.74
1998	30699	10449.88	48022.2	12.13	60.427
1999	39345.8	9188.64	47736.81	17.17	70.255
2000	63112.3	11898.21	49868.21	26.08	76.112
2001	57039.1	15188.4	55596.46	22.71	78.62
2002	43,457.30	15351.1	65134.8	23.72	78.784
2003	64561.4	16848.7	73941.4	26.74	75.933
2004	88784.8	16308.89	84726.31	33.46	79.208
2005	95669.2	22963.79	96027.43	49.29	75.647
2006	113719.5	27,518.68	109238.9	61.43	72.101
2007	121776	27479.33	127424.18	68.37	67.318
2008	199,799.20	32181.17	144439.15	93.78	69.175
2009	160192.5	37353.42	159339.92	61.75	77.352
2010	200780	47910.58	189845.78	78.06	79.233
2011	321866	61103.11	205510.45	106.03	88.811
2012	307556.1	71851.74	220338.1	108.90	84.53
2013	317902.2	38197.29	253632.21	105.43	86.123

2014	335676.7	49781.69	304248.74	96.66	87.922
2015	226359.4	34654.54	313377.32	51.18	98.178
2016	197590.7	56,605.96	325476.95	41.20	101.504
2017	265253.6	65553.76	415395.07	53.12	103.374

Table A1: Data for Aggregate Expenditure on Oil Imports, Real Oil prices, Exchange Rate and Government Expenditure on Health and Education (1963 -2017) in Million Kshs.

Sources: Republic of Kenya Statistical Abstracts. Nairobi. Government Printer; Republic of Kenya Economic Surveys. Nairobi. Government Printer.

Appendix B: Results for Stationarity, VAR Lag Selection Criteria and Correlation

	Lag Length		ADF test Statistic		PP Test Statistic		
			Statistics	**Critical value**	**Statistics**	**Critical value**	
Aggregate Expenditure on Oil Imports	0	Intercept	-0.143	1%= -3.558 5%= -2.917 10%= -2.596	0.042	1%= -3.558 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	-1.710	1%= -4.137 5%= -3.495 10%= -3.177	-1.628	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary
	1	Intercept	-0.143	1%= -3.558 5%= -2.917 10%= -2.596	-0.104	1%= -3.558 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	-1.710	1%= -4.137 5%= -3.495 10%= -3.177	-1.698	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary
	2	Intercept	-0.143	1%= -3.558 5%= -2.917 10%= -2.596	0.095	1%= -0.095 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	-1.710	1%= -4.137 5%= -3.495	-1.571	1%= -4.137 5%= -3.495	Not Stationary

				10%= -3.177		10%= -3.177	
Government Expenditure on Health	0	Intercept	0.0082	1%= -3.558 5%= -2.917 10%= -2.596	0.858	1%= -3.558 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	-1.938	1%= -4.137 5%= -3.495 10%= -3.177	-1.595	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary
	1	Intercept	0.748	1%= -3.560 5%= -2.918 10%= -2.597	0.494	1%= -3.558 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	-1.938	1%= -4.137 5%= -3.495 10%= -3.177	-1.629	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary
	2	Intercept	0.748	1%= -3.560 5%= -2.918 10%= -2.597	0.4132	1%= -3.558 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	-1.938	1%= -4.137 5%= -3.495 10%= -3.177	-1.743	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary
Government Expenditure on Education	**0**	Intercept	8.662	1%= -3.558 5%= -2.917 10%= -2.596	56.677	1%= -3.558 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	4.953	1%= -4.953 5%= -3.495 10%= -3.177		1%= -3.560 5%= -2.918 10%= -2.597	Not Stationary
	1	Intercept	7.0701	1%= -3.560 5%= -2.918 10%= -2.597	9.821	1%= -3.558 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	5.460	1%= -4.141 5%= -3.497 10%= -3.178	5.724	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary

	2	Intercept	18.404	1%= -3.563 5%= -2.919 10%= -2.597	14.340	1%= -3.558 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	16.156	1%= -4.145 5%= -3.499 10%= -3.179	8.655	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary
Exchange rate	**0**	Intercept	0.775	1%= -3.557 5%= -2.917 10%= -2.596	0.775	1%= -3.557 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	-2.001	1%= -4.137 5%= -3.495 10%= -3.177	-2.006	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary
	1	Intercept	0.775	1%= -3.557 5%= -2.917 10%= -2.596	0.711	1%= -3.557 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	-2.006	1%= -4.137 5%= -3.495 10%= -3.177	-2.043	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary
Oil Prices	**0**	Intercept	-1.414	1%= -3.557 5%= -2.917 10%= -2.596	-1.414	1%= -3.557 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	-2.139	1%= -4.137 5%= -3.495 10%= -3.177	-2.139	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary
	1	Intercept	-1.545	1%= -3.560 5%= -2.918 10%= -2.597	-1.481	1%= -3.557 5%= -2.917 10%= -2.596	Not Stationary
		Intercept and Trend	-2.462	1%= -4.141 5%= -3.497 10%= -3.178	-2.289	1%= -4.137 5%= -3.495 10%= -3.177	Not Stationary

Table A2: Lag length Unit root test Results

Source: Computed from Table A1

	Lag Length		ADF test Statistic		PP Test Statistic		
			Statistics	Critical value	Statistics	Critical value	
Aggregate Expenditure on Oil Imports	0	Intercept	-7.119	1%= -3.560 5%= -2.918 10%= -2.597	-7.104	1%= -3.560 5%= -2.918 10%= -2.597	Stationary
		Intercept and Trend	-7.227	1%= -4.141 5%= -3.497 10%= -3.178	-7.222	1%= -4.141 5%= -3.497 10%= -3.178	Stationary
	1	Intercept	-7.119	1%= -3.560 5%= -2.918 10%= -2.597	-7.116	1%= -3.560 5%= -2.918 10%= -2.597	Stationary
		Intercept and Trend	-6.644	1%= -4.145 5%= -3.499 10%= -3.179	-7.224	1%= -4.141 5%= -3.497 10%= -3.178	Stationary
	2	Intercept	-2.477	1%= -3.565 5%= -2.920 10%= -2.598	-7.102	1%= -3.560 5%= -2.918 10%= -2.597	Stationary
		Intercept and Trend	-2.381	1%= -4.149 5%= -3.501 10%= -3.180	-7.232	1%= -4.141 5%= -3.497 10%= -3.178	Stationary
Government Expenditure on Health	**0**	Intercept	-9.559	1%= -3.560 5%= -2.918 10%= -2.597	-9.559	1%= -3.560 5%= -2.918 10%= -2.597	Stationary
		Intercept and Trend	-9.901	1%= -4.141 5%= -3.497 10%= -3.178	-18.342	1%= -4.141 5%= -3.497 10%= -3.178	Stationary
	1	Intercept	-9.559	1%= -3.560 5%= -2.918 10%= -2.597	-9.521	1%= -3.560 5%= -2.918 10%= -2.597	Stationary

		Intercept and Trend	-9.901	1%= -4.145 5%= -3.499 10%= -3.179	-9.859	1%= -4.141 5%= -3.497 10%= -3.178	Stationary
	2	Intercept	-9.559	1%= -3.560 5%= -2.918 10%= -2.597	-9.492	1%= -3.560 5%= -2.918 10%= -2.597	Stationary
		Intercept and Trend	-5.512	1%= -4.149 5%= -3.501 10%= -3.180	-9.868	1%= -4.141 5%= -3.497 10%= -3.178	Stationary
Government Expenditure on Education	**0**	Intercept	-1.212	1%= -3.560 5%= -2.918 10%= -2.597	-1.212	1%= -3.560 5%= -2.918 10%= -2.597	Not Stationary
		Intercept and Trend	-3.452	1%= -4.141 5%= -3.497 10%= -3.178	-4.235	1%= -4.141 5%= -3.497 10%= -3.178	Not Stationary
	1	Intercept	-1.212	1%= -3.560 5%= -2.918 10%= -2.597	-1.087	1%= -3.560 5%= -2.918 10%= -2.597	Not Stationary
		Intercept and Trend	-3.452	1%= -4.141 5%= -3.497 10%= -3.178	-3.486	1%= -4.141 5%= -3.497 10%= -3.178	Not Stationary
	2	Intercept	2.456	1%= -3.565 5%= -2.920 10%= -2.598	0.153	1%= -3.560 5%= -2.918 10%= -2.597	Not Stationary
		Intercept and Trend	0.259	1%= -4.149 5%= -3.501 10%= -3.180	-2.939	1%= -4.141 5%= -3.497 10%= -3.178	Not Stationary
Exchange rate	**0**	Intercept	-6.480	1%= -3.560 5%= -2.918 10%= -2.597	-6.480	1%= -3.560 5%= -2.918 10%= -2.597	Stationary
		Intercept	-6.664	1%= -4.141	-6.664	1%= -4.141	Stationary

	Lag Length		Statistics	Critical value	Statistics	Critical value	
		and Trend		5%= -3.497 10%= -3.178		5%= -3.497 10%= -3.178	
	1	Intercept	-4.808	1%= -3.563 5%= -2.919 10%= -2.597	-6.480	1%= -3.560 5%= -2.918 10%= -2.597	Stationary
		Intercept and Trend	-5.016	1%= -4.145 5%= -3.499 10%= -3.179	-6.665	1%= -4.141 5%= -3.497 10%= -3.178	Stationary
Oil Prices	**0**	Intercept	-6.494	1%= -3.560 5%= -2.918 10%= -2.597	-6.494	1%= -3.560 5%= -2.918 10%= -2.597	Stationary
		Intercept and Trend	-6.428	1%= -4.141 5%= -3.497 10%= -3.178	-6.428	1%= -4.141 5%= -3.497 10%= -3.178	Stationary
	1	Intercept	-5.244	1%= -3.563 5%= -2.919 10%= -2.597	-6.498	1%= -3.560 5%= -2.918 10%= -2.597	Stationary
		Intercept and Trend	-5.191	1%= -4.145 5%= -3.499 10%= -3.179	-6.432	1%= -4.141 5%= -3.497 10%= -3.178	Stationary

Table A3: Results for Unit root Tests at First Difference

Source: Computed from Table A1

	Lag Length		ADF test Statistic		PP Test Statistic		
			Statistics	**Critical value**	**Statistics**	**Critical value**	
Government Expenditure on Education	0	Intercept	-5.122	1%= -3.563 5%= -2.919 10%= -2.597	-5.122	1%= -3.563 5%= -2.919 10%= -2.597	Stationary
		Intercept and Trend	-5.166	1%= -4.145 5%= -3.499 10%= -3.179	-5.166	1%= -4.145 5%= -3.499 10%= -3.179	Stationary

	1	Intercept	-16.649	1%= -3.565 5%= -2.920 10%= -2.598	-4.733	1%= -3.563 5%= -2.919 10%= -2.597	Stationary
		Intercept and Trend	-17.790	1%= -4.149 5%= -3.501 10%= -3.180	-4.777	1%= -4.146 5%= -3.499 10%= -3.179	Stationary
	2	Intercept	-8.782	1%= -3.568 5%= -2.921 10%= -2.599	-3.191	1%= -3.563 5%= -2.919 10%= -2.597	Stationary
		Intercept and Trend	-11.550	1%= -4.153 5%= -3.502 10%= -3.181	-3.220	1%= -4.145 5%= -3.499 10%= -3.179	Stationary

Table A4: Results for Unit root Tests at First Difference

Source: Computed from Table A1

Lag Length	Aggregate expenditure on oil imports	Government expenditure on education	Government expenditure on health	Real Oil Price	Exchange Rate	Model1(Objective 1)	Model 2 (Objective 2)
	AIC	AIC	AIC	AIC	AIC	AIC	AIC
0	25.906	25.947	22.629	9.627	9.896	62.729	66.081
1	23.493	21.315	20.658	7.73*	6.00*	55.686	56.697
2	23.532	21.255	20.598	7.751	6.044	55.519	57.042
3	23.501	19.894	20.626	7.787	6.082	54.081	55.597
4	23.302	19.929	20.511	7.808	6.122	53.787*	55.376*
5	23.22*	19.82*	20.36*	7.799	6.161	.	.
* indicates lag order selected by the criterion AIC: Alkaike information criterion,							

Table A5: VAR Lag Order Selection Criteria Results

Source: Computed from Research Data

		d(Aggregate Expenditure on Oil Imports)	d(Government Expenditure on Health)	d2(Government Expenditure on Education)	d(Exchange Rate)	d(Oil Price)
d(Aggregate Expenditure on Oil Imports)	**Coefficient**	**1.000**				
	t-statistics	-----				
	Probability	-----				
d(Government Expenditure on Health)	**Coefficient**	**0.326***	**1.000**			
	t-statistics	2.460	-----			
	Probability	0.017	-----			
d2(Government Expenditure on Education)	**Coefficient**	**0.440***	**0.184**	**1.000**		
	t-statistics	3.496	1.333	-----		
	Probability	0.001	0.188	-----		
d(Exchange Rate)	**Coefficient**	**0.001**	**-0.034**	**-0.095**	**1.000**	
	t-statistics	0.004	-0.241	-0.684	-----	
	Probability	0.997	0.811	0.497	-----	
d(Oil Price)	**Coefficient**	**0.243**	**0.063**	**0.098**	**-0.156**	**1.000**
	t-statistics	1.789	0.449	0.704	-1.131	-----
	Probability	0.080	0.655	0.485	0.264	-----

Table A6: Correlation Matrix

Source: Computed from Research Data