THE IMPACT OF EXTERNAL DEBT SERVICING ON CAPITAL FORMATION AND GROSS DOMESTIC PRODUCT IN KENYA

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF APPLIED ECONOMICS IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTERS OF ECONOMICS (FINANCE) OF KENYATTA UNIVERSITY

JULY 2018
DECLARATION
This research project is my original work and has not been presented for any award in any other University.

Signature ........................................... Date ........................................

Ndemange Francisca Ndoti
K102/CITY/PT/25262/2011

I confirm that this research project has been developed by the student under my supervision.

Signature .................................................. Date ......................................

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DEDICATION

I dedicate this work to my dear husband, sons and my entire family at large.
ACKNOWLEDGEMENTS

I start by giving thanks to the Lord Almighty for His sufficient grace in this work. I am also greatly indebted to my supervisor Dr.J. Korir whose invaluable advice, support and contribution has been instrumental to me in this study. Secondly, I appreciate all the Lecturers in the school of Economics Kenyatta University for their immense support and extend my gratitude to the support staff for their tireless encouragement. Thirdly, I thank my employer, the management and staff of National Bank of Kenya who have been of great help both financially and psychologically. I salute all my classmates for their moral support and constructive criticisms which have added value in realization of this work.
ABSTRACT

Kenya is seeking to meet the Sustainable Development Goals-2030 agenda. The serious challenge to this course remains the soaring debt obligations, capturing a significant portion of the national budget. Kenya has been borrowing externally at higher rates and continually expanding the debt ceiling. The government will therefore in future spend a significant portion of its revenue repaying the debts at the cost of important local investment. The government is therefore limited to fully fund critical sectors of the economy that will spur sustainable growth and investment opportunities; key to widening the tax base. This has an overall implication on the country’s revenue, income, employment and poverty levels. Many researchers have recommended that external debt is one of the key sources of financing capital formation in developing countries. However, debt repayment can have adverse effect on capital formation and gross domestic product in a country. Although all the studies done on Kenya have found out that external debt has negative effect on economic growth, the channel through which the effect of debt is transmitted have not been examined. This study examined the effect of foreign debt service on GDP in Kenya through savings and capital formation transmission channel. The first specific objectives of this study is, what is the effect of external debt servicing on Kenya’s capital formation? The second objective is, what is the effect of external debt servicing on gross domestic growth in Kenya? Longitudinal research design was adopted where time series data on external debt, capital formation was analyzed. Time series properties of the data was checked in terms of stationary tests, and the standard diagnostic tests of regression such normality, autocorrelation, multicollinearity and specification. Regression of capital formation on lagged debt service was carried out which indicated negative relationship between the two variables. Regression of gross domestic product on labour and predicted capital was done, the results obtained was that, debt service affect gross domestic product negatively through its effect on capital formation. It was recommended among others that policies of the government should therefore be guided towards reducing debt stock. It is important for policy makers to be cautious on implementation of projects that raise public debt and there should be controlled measures on debt management profiles especially in government expenditure by evaluating funded projects to gauge the utilization of funds. Also, reducing the rate of borrowing by sourcing alternative means of financing projects was recommended.
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ABBREVIATIONS AND ACRONYMS

GDP Gross Domestic Product
GNP Gross National Product
IMF International Monetary Fund
HIPC Highly Indebted Poor Countries
MDRI Multilateral Debt Relief Initiatives
MDG Millennium Development Goals
DSA Debt Sustainability Analysis
ERS Economic Recovery Strategy
MTDS Medium Term Debt Strategy
OLS Ordinary Least Squares
IRF Impulse Response Functions
VDA Variance Decomposition Analysis
EMU European Monetary Union
ARDL Autoregressive Distributed Lag Model
RGDP Real Gross Domestic Product
NX Net Exports
TDS Total Debt Service
RER Real Exchange Rate
RIR Real Interest Rate
PIGR Private Investment Growth Rate
PI Private Investment
INFL Inflation
ARDL Autoregressive Distributed Lag Model
DSR Demand to Supply ratio
OPERATIONAL DEFINITION OF TERMS

**Capital formation** - The net accumulation during an accounting period for a particular country, and the term refers to additions of capital stock, such as equipment, tools, and transportation assets and electricity.

**Debt sustainability**; The ability of a nation to service its debts without opting for debt relief or accumulating arrears

**Debt overhang hypothesis** - A debt burden that is so large that a country cannot take on additional debt to finance future projects, even when those that have higher returns enough to enable it reduce its indebtedness over time.

**Debt Burden** - This is a large amount of money that one country or organization owes to another and which they find very difficult to repay.

**Debt service** - The amount of money that is required to make payments on the principal and interest on outstanding loans, the interest in bonds, or the principal of maturing. Debt service is the cash that is required to cover the repayment of interest and principal on a debt for a particular period.

**External debt ceiling** - Also referred to as debt limit in this study; refers to the maximum amount a country can borrow from foreign lenders.

**Goss Domestic Product**; The monetary value of all the finished goods and services produced within a country’s borders in a specific time period (calculated on an annual basis). It includes all of private and public consumption, government outlays, investments, and exports less imports that occur within a defined territory.

**Vector Auto regression** - A forecasting technique in economics that treats all variables symmetrically but is concerned with the path through time of a vector of variables.
CHAPTER ONE

INTRODUCTION

1.1 Background

One of the main sources used to finance capital formation in economies is external debt. It is generally expected that most developing countries Kenya included, which are faced with capital scarcity are expected to obtain external debt to supplement domestic saving (Ihoya, 1999; Pattillo, 2002). The borrowing rate of nations abroad will depend on the links counties have among foreign and domestic saving, investment, and gross domestic product. There is a suggestion in Economic theory that when developing countries reasonably apply good levels of borrowing this will lead to enhanced economic growth. When a country’s economic growth is enhanced, at least by more than five percent growth rate, the living standards of people in the economy will be affected positively.

According to Rusike (2007) most policymakers and academicians have always questioned the impact of accumulated external borrowing on investment and economic growth of a country. There has never been an agreement on the role of external debt on economic growth. External debt has both positive and negative effects on the growth of an economy. Different experts have argued that external debt will have positive effect on economic growth because it leads to increased capital inflow. When external borrowing is utilized properly, for expenditures which are growth related, accelerated pace of economic growth will be realized. It provides foreign capital for industrial development, managerial know-how for internal institutions, advanced domestic
technology, internal technical expertise acquiring knowledge from external markets and mobilization of a nation’s human and material resources from access to foreign markets (Reinhart and Rogoff, 2012).

External debt does not automatically harm an economy; this means that high external indebtedness does not automatically translate to low growth of an economy. The detrimental factor for many developing countries is that they are faced with the inability to meet current debt obligations; the major factor leading to this hurting situation of these economies is inadequate information on the nature of the external debt, its structure and the magnitude of the debt. In most cases, a country is able to generate the required foreign exchange through export, buy the increasing imports associated with rapid growth of the economy and still be in a position to service a high level of debt. Or increase external borrowing to obtain the necessary foreign exchange. But the concept of solvency implies that it is not possible for this process to go on forever (Williamson, 1996)

Soludo (2003) asserts that there are two major factors leading to massive borrowing of nations. One is increasing investment and two, increasing consumption. Increasing investment is boost to economic growth. A country that attracts capital or has the ability to borrow externally, can provide a source for necessary imported goods for investment by obtaining foreign debt, this will ease the shortage of foreign exchange of the economy. Increased investment will lead to increased economic growth and thus improved economic status of the nation. It should be noted that, investment links capital
inflow to economic growth of an economy. High economic growth will translate to increased country’s credit-worthiness and this is a positive factor to attract more capital inflows.

It should be noted that when external debt accumulation rises to extremes, it contracts the growth of the economy by hampering investment, this happens because rate of investment will be low. Debt overhang is a good explanation for the negative relationship between external debt and economic growth. Debt overhang hypothesis states that high levels of indebtedness discourage investment and negatively affect growth as future tax revenues go to repay debt (Baum, et.al. 2013).

On the other hand, rising debt means that the government will in future spend most of its revenue repaying it at the cost of important local investment. Important investments, such as infrastructure development, are sacrificed as debt repayment takes a significant share of budgetary allocation. This may have negative effect on income levels and may lead to rising unemployment. According to Awiti (2015), when more funds are concentrated more on debt servicing rather than on the social and economic sectors, the government will not be able to fully fund critical sectors of the economy which can spur increased growth and open up more investment opportunities.

1.1.1 The Kenyan Debt Structure
In Kenya, the structure of the national debt shows that 51.6 percent of the total debt is domestic debt while 48.4 percent is external debt { The National Treasury Report 2013}. Kenya qualifies to be a developing country and thus a medium performer in
terms of the quality of its policies and institutions as measured by a three-year average of the World Bank’s Country Policy and Institutional Assessment (CPIA) index. In 2015 Kenya’s Government Debt to GDP ratio stood at 52.80 percent of the country’s Gross Domestic Product. The average of Government Debt to GDP in Kenya was 54.93 percent from 1998 until 2015; it reached an all time high record of 78.30 percent in 2000 and a low record of 42.80 percent in 2008. Government Debt to GDP in Kenya is reported by the Central Bank of Kenya.

The rate at which Kenya is borrowing has gone in the rise in the past five years to harmonize the budget deficit resulting from insufficient revenue collection and the desire to expand the nation’s economy and development of infrastructure (Kenya Central Bank, 2014). For instance, external debt ceiling doubled from ksh.1.2 trillion by 2012 to 2.5 trillion by 2013 (Kenya Central Bank, 2012). Debt servicing captures a large proportion of government recurrent expenditures and total revenue. This poses risk to the national budget and the country’s financial stability.

Escalating debt signals that the government will in future spend a significant portion of its revenue repaying it at the cost of important local investment (Easterly, 1993). The government therefore fails to und critical sectors of the economy fully that can spur sustainable growth and increased investment opportunities; key to widening the tax base. This has an overall implication on revenue, country’s income, employment and poverty reduction effects. It is therefore of essence to assess the effect of rising debt levels on the government’s future spending and the country’s economic growth (Cottesi, 2012).
Kenya’s external debt is on the rise and portrays a state of concern. According to the IMF (2007), between 1995 and 2000 total debt in sub-Saharan Africa comprised of 23 percent domestic debt, these indicated a 3 percent increase compared to the status between the years 1990 and 1994 where the average was 20 percent. Furthermore, the ratio of domestic debt to GDP for these countries increased by 4 percent in the same period. Since independence, Kenya has experienced economic shocks as a result of poor governance and political instability.

The increase in GDP as a result of inflation exhibited reduction in agricultural produce at an annual rate of 3.9%. According to Treasury’s latest debt figures, Kenyan external debt rose by Sh20.14 billion in a span of one year; from May 2011 to stand at Sh721.04 billion in May 2012. According to Treasury Bulletin (GoK, 2013) as at end of June 2013 external debt was at 45% of GDP and this increase was due to increased disbursements and depreciation of Kenyan currency against the major currencies. Euro forms the largest share in the composition of external debt of Kenya. In the debt portfolio a portion of 34 percent is formed by euro and dollar forms the second largest portion of 32%. The result of the debt rise therefore has placed Kenya in the second most indebted country in sub-Saharan Africa (IMF, 2013). In the recent study by IMF, the sustainable analysis on external debt exhibits a wide threshold to future expectations.

The creditors’ investment projects taken by Kenya depict a boost in the value of debts accrued. Currently, multilateral creditors continue to take a bigger portion of external credit of the Kenyan economy. Debt to bilateral creditors takes approximately half to
Paris Club creditors while other bilateral creditors account for a half, mainly semi-concessional loans from China to finance construction of the first phase (Mombasa-Nairobi) of the Standard Gauge Railway project (IMF, 2016). These findings support and explain the reason why Kenya’s debt is on the rise.

An increase in the rate of domestic interest payments for sub-Saharan African countries was shown through a study carried out by Christensen in 2005. The domestic interest payments increased from 49.7 percent of total debt service between 1990 and 1994 to 51.9 percent between 1995 and 2000. Intuitively, the rate of domestic interest payments to government revenues increased from by a margin of 0.6 percent; 10.9 percent to 11.5 percent during the period while the ratio of the interest payments to GDP increased by 0.3 percent, from 2.0 percent to 2.3 percent (IMF, 2001). According to the World Bank (2001) the rise in the domestic interest rates is more pronounced if the investor base for domestic debt is relatively narrow as the government may be held hostage by a particular group of investors.

The level of economic performance depends highly on the relationship between domestic financial state and debt servicing. Kenya has been experiencing high growth of gross external debt over the years. Part of this debt is very old, over 50 years old with low expectations of repayment. The country has shown no effort to repay; over the years the country has been doing occasional debt rescheduling, short term borrowings to finance government expenditure which is expensive.

The Table below shows trends in Kenya’s external debt stocks, debt service and GDP.
Table 1:1 Kenya’s External debt stocks and debt service, 1980-2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Ext. Debt (% GDP)</th>
<th>Debt service (% GDP)</th>
<th>GDP growth (%)</th>
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<tr>
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<td>6.1</td>
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<tr>
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<td>62.7</td>
<td>8.9</td>
<td>1.3</td>
</tr>
<tr>
<td>1984</td>
<td>58.6</td>
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<tr>
<td>1986</td>
<td>65.8</td>
<td>9.7</td>
<td>7.2</td>
</tr>
<tr>
<td>1987</td>
<td>75.2</td>
<td>8.9</td>
<td>5.9</td>
</tr>
<tr>
<td>1988</td>
<td>72.3</td>
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<tr>
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<td>73.4</td>
<td>8.8</td>
<td>4.7</td>
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<td>4.2</td>
</tr>
<tr>
<td>1991</td>
<td>95.8</td>
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<td>1.4</td>
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<tr>
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<td>87.7</td>
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<td>11.7</td>
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<tr>
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<tr>
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<tr>
<td>2010</td>
<td>27.5</td>
<td>1.3</td>
<td>5.6</td>
</tr>
</tbody>
</table>

From Table 1.1 the external debt issue in Kenya has been historical and has been increasing over the years. External debt as percentage of GDP between years 1980 to 2000 ranged from 48% to 131.9%. Over the same period GDP growth ranged from as low as -0.8% to 7.2%. From 2000 external debt began went down until in 2011. Debt service remained above 5% between 1980 and 1997 and declined to 4.7% in 1998 then went back to over 5% in 1999. However, in the year 2000 there is a decrease in debt service while the growth rate of GDP rose from as low as 0.6% in 2000 to reach 7% in 2007. In the year 1993 the highest debt ratio of 131.9% was experienced while the lowest ratio of 25% was experienced in 2008. The corresponding GDP growth rates were 0.6% in 1993 and 1.5% in 2008.

1.1.1 Trends in Debt Service, Capital Formation and GDP in Kenya

Figure 1.1, Figure 1.2 and Figure 1.3 show trend in GDP, debt service and capital formation, respectively.
Figure 1.1: GDP trend at current prices
Source: own computation

Figure 1.1 shows that GDP in current prices has been increasing over time, from about US$ 10 billion in 1984 to about US$ 60 in 2014. However in the year 1994, GDP was below US$ 10 billion. This is as a result of high debt service, low capital formation or other economic factors. This led us to the conclusion that low capital formation or decreasing capital formation leads to a decrease in GDP. High debt servicing means that more cash is utilized to repay national debt principal and interests; this has a negative effect to the GDP.

Figure 1.2: Trend in external debt service
Source: Own computation

In Figure 1.2, foreign debt repaying has been generally declining over time with the highest debt service in the year 1994-1996. The year 1984 and 2001 external debt
service was generally on same level. Debt repayment was in its lowest in the year 2014 as shown on the diagram. However, fixed capital formation has had a generally increasing trend.

Figure 1.3: Trend in fixed capital formation
Source: Own computation

Figure 1.1, Figure 1.2 and Figure 1.3 show that there is some relationship between external debt servicing, capital formation and GDP in Kenya. For instance, periods of high debt service amounts; such as the years 1994-1998 are associated with generally low GDP. From mid-2004 to 2010, GDP has improved where debt servicing is generally low. However, this trend is not consistent across all the years since the reverse can be observed for particular years, for example in 1990 where the debt service ratio
was relatively high, the GDP was also high.

The fundamental factor leading to the increasing debt is the tendency of developing countries to rely on external resources to complement capital formation in the domestic economy. Most developing nations like Kenya are embarking on external debts without considering the consequences attached to them. It should be noted that, the higher the interest payment and the heavier the deficit on the current account, the heavier the debt burden. When Kenyan government source finance from external borrowing, it means that there are fixed contractual obligations which will require collateral meaning that future resources of the nation will have to be pledged. For a nation to cope well in the long run, with debt servicing requirement, the ability to service debt must grow at a rate higher than that of its financial risk exposure. The non-debt resources on the other hand represent funds flow without fixed or compulsory servicing obligations on the government (Klein, 2001)

The relationship between capital and debt depends on their level of contribution. Therefore, high level of capital formation portrays improvement in economic growth of a country. High capital formation result to improved economic growth through increased investment in capital equipment that will lead to an increase in production and create employment opportunities. (Klein, 2001) further stressed that high capital formation leads to improved technical progress which will help a nation to realize the economies of large-scale production, increase specialization and provide machines, tools and equipment for the growing labour force.
Capital formation have another positive effect on economic growth, this is by leading to expansion of market. Klein (2001) further stressed that capital formation will help in removing market imperfections. It does this by creating economic and social overheads capital, and thus breaking the vicious circles of poverty from demand side and supply side. Increasing capital formation will make development possible even when the population is growing. In overpopulated and developing countries as it is in sub-Saharan Africa, where most countries are underdeveloped, increasing per capita output is related to the increase in capital-labour ratio (Jhingan, 2006).

1.2 Statement of the problem

As mentioned in the background, the rate at which Kenya is borrowing has gone in the rise in the past five years to harmonize the budget deficit resulting from low revenue collection which cannot cater for the desired expansion of the economy and development of infrastructure (CBK, 2014). For instance, external debt ceiling doubled from ksh.1.2 trillion by 2012 to 2.5 trillion by 2013 (Kenya central Bank, 2012).

Kenya’s external debt is on the rise and portrays a state of distress. According to the IMF (2007), in sub-Saharan Africa, domestic debt accounted for 23 percent of total debt between 1995 and 2000. This was a rise from an average of 20 percent between 1990 and 1994. The domestic debt to GDP ratio for these countries increased considerably from 12 percent to 16 percent in the same period. Since independence, Kenya has experienced economic shock as a result of poor governance and political instability.

The increase in GDP in 1990 and 1994 as a result of inflation exhibited reduction in
agricultural produce at an annual rate of 3.9%. The Treasury's debt figures show that, external debt rose by Sh20.14 billion from May 2011 to stand at Sh721.04 billion in May 2012. According to treasury bulletin (GoK, 2013) as at end of June 2013 external debt was at 45% of GDP and this increase was due to the increase in disbursements and the Kenyan currency depreciation against the major currencies. In Kenya the external debt portfolio has Euro forming the largest share of 34 percent, followed by dollar which holds 32 percent of the total external debt in the country. The result of the debt rise therefore has placed Kenya in the second most indebted country in sub-Saharan Africa (IMF, 2013). In the recent study by IMF, the sustainable analysis on external debt exhibits a wide threshold to future expectations.

Many researchers, academicians and policy makers have looked in to the relationship between debt servicing, capital formation and economic growth. Several empirical studies have been done in various countries yielding mixed results, some researchers have come up with results showing negative relationship between debt and GDP, others realizing no insignificant negative effect of debt to GDP while other researchers concluded that debt has no effect on GDP. These studies include Mishra, 2014; Agu, 2012; Were, 2001; Maana, Owino and Mutai, 2008; Matiti, 2013; Hameed et.al 2008; Ahmed, 2005; Elbadawi, 1999 Agu 2012 and Ayadi, 1999 their results are well discussed in Chapter two. All these studies have found a direct link between debt and economic growth.

The knowledge about the link/channel through which the effect of debt servicing is transmitted to affect Kenyan economic growth is key in this research paper. It should be
pointed out that external debt will affect economic growth indirectly through its effect on domestic savings and capital formation. Knowledge of such channels is vital in informing policies to enhance economic growth in a country. Direct relationship between external debt and low economic growth has been assumed in the literature. The channels through which the effect of debt is transmitted to economic growth have not been examined in any of the earlier studies. This study will fill this gap by investigating the effect of external debt (overall and debt servicing) savings, capital formation and gross domestic product.

1.3 Research questions

The study is guided by the following questions:

i. What is the effect of external debt servicing on Kenya’s capital formation?

ii. What is the effect of external debt servicing on gross economic growth in Kenya?

1.4 Study Objectives

The broad objective of the study is to examine the effect of foreign debt servicing on capital formation and gross domestic product in Kenya. However, the study specifically seeks to:

i. Determine the effect of external debt servicing on capital formation in Kenya.

ii. Establish the effect of external debt servicing on economic growth in Kenya.
1.5 **Significance of the Study**

This study is significant to the Government of Kenya. This is because the study seeks to show relationship between debt servicing and economic growth in Kenya. The Government can therefore make policy decisions regarding how to control the external debt. The is also important to theory of international finance as it contributes to the theory by focusing on the effect of debt servicing on GDP especially in developing countries like Kenya. It will specifically shed more light on the role of external public borrowing on economic growth.

The study is also important to investors, researchers and academicians. Investors will be able to make informed decisions towards risk reduction and profitability in their businesses. They will embark on loans considering the repercussions of repayment of such loans. They will put money acquired through loaning to profit generating projects so as to make profits to cover debt servicing, that way, the principal of the loan will not be used to repay the loans, this will lead to growth in their business ventures.

This study will open a wider field for researchers and academicians, providing a basis to look in to the indirect link between debt and GDP. It will be a useful guide to those interested in undertaking studies on the effect of debt servicing on gross domestic product in developing economies. The study will be used as a reference to improve future related studies.
1.6 Scope of the Study

This study covered the period from 1984 to 2014 which spans across thirty years. This helped to find out the long run interactions between external debt servicing, capital formation and the Kenyan GDP. On the other hand, the study was limited to the interdependency between debt service, capital formation and GDP in Kenya. This led to the discovery that there is direct and indirect underlying relationship between these variables.
CHAPTER TWO

LITERATURE REVIEW

2.1. Theoretical Literature Review

The effect of public debt on capital formation and growth of economies is the concern of this paper. Different theories have come with different opinions about the role and how public debt affects an economy. The Classical economists like Hume, Smith, and Ricardo, in general terms studied public debt effects on an economy. They analyzed the economic effect of government debt, looking at its neutrality aspect (i.e., the hypothesis that government deficit financing and tax financing of government budgets are equal with respect to the accumulation of capital in the country) and they also agreed to consider all government expenditure a waste and also non productive to the economy; therefore, the real evil of public debt lay in the destroying the capital which has been acquired through external borrowing, not in the obtained debt itself. On the other hand J. S. Mill, claim that the public debt has a double burden, one which is brought up by the current generation of laborers through withdrawing resources from private employments, and the other which is shifted forward by the current generation to future generations in form of taxes required for the interest payments

Barrow (1979) argued that tax is smoothing and shows one way in which external borrowing and deficits can lead to improved welfare of residents of an economy. The crucial finding in BarroW (1979) is that those who are concerned in social planning should ensure that they keep the rate of tax constant. The level of tax in an economy is
determined by the budget constraint of the government which is inter-temporal, it says that the present value of spending and the present value of taxes has to be equal. It should be noted that the present value of spending is the exogenous variable in the model. Budget deficits and/or surpluses are very essential in that, they act as a buffer when spending goes up or down temporarily. When revenues also decrease or increase significantly to affect the economy, budget deficit and surpluses will act as a buffer to neutralize the temporary situation.

Ricardian theory under theoretical framework explains that augment in borrowing calls for compensation promptly as agreed by the parties involved. As a result, when current taxes decrease, this must be matched by an increased future tax burden for debt repayment, this will leave interest rates and consequently private investments essentially equivalent Omoruyi (2005). However the relevance of this theory has been criticized when it comes to developing countries because the planning scope of individuals is not diverse as assumed in this model. Moreover, adequate information on the effect of current deficits on future tax burdens is not easy to obtain thus it is unclear to point out the implications of current deficits on expected taxes in future which translate to irrelevancy in government finance (Ricardo, 2001).

The Keynesian theory on the other hand suggests that increase in external borrowing results in increase in domestic production, which further boosts investor sentiments about the expected future path of the economy by pointing out the multiplier effects of external debt. Additionally, borrowing suggests investment in infrastructure, which
could lead to a decrease in the cost of trade (Eisner, 2001).

According to Khan (2000) when the marginal return on the investment of a nation is compared to the marginal cost of external borrowing, marginal returns on investment are greater than the marginal cost of funds borrowed from abroad. From the results obtained by Khan, the conclusion is that, the combination of the debt and capital expenditure will actually make the future generation worse off. This is because if the project’s return will be less than the marginal cost of the project, this will render the future generation to be worse off. For peripheral debts, the future generation certainly bears a burden if the money borrowed will be used to finance current consumption because the consumption level is reduced by an amount equal to the loan plus the accrued interest that must be paid to external lenders (Ajayi and Khan, 2000). Otherwise, the loan is utilised to finance accumulation of capital whose results rely on the output from the project.

Taking into consideration the current living individuals with respect to time, a pay off in debt translate to a transfer of income from one section of individuals to another who are considered the bond holders. Hence debt creates no burden for the coming generation for they owe each other as far as debts are concerned as far as perceived by the Lerner’s model (Rosen and Gayer, 2008).

The overlapping generation’s model on the other hand assumes no private savings and the situation is expected to continue simultaneously. This model assumes that the population consists of equal number of the young, middle-aged and old people and that,
the load of debts may be transferred across generations; the old age passes the burden to the middle-aged and the middle-aged to the young. In this model, there is no internal-external debt distinction which is vital in Lerner’s model; even though the debt is all internal, it is assumed to create burden for the future generation.

In comparison of the amount of contribution made by various generations as far as taxes are concerned, an assumption can be made on how income is redistributed across productions by government policies. In the generations overlapping model, there is no possibility that individuals in a given generation may care about their descendants as well as themselves, that is individuals do not care about future generation.

Though generalization is emphasised in the two theories they however criticize the fact that government debt policy can affect a nation’s economic decisions, and asserts that changes in such decisions have consequences for whoever bears the burden of the debt. As an alternative, it is assumed that the taxes levied to pay off the debt affect neither work nor savings behaviour. Intuitively suppose taxes distort the proposed choices, real costs will be imposed on the economy which causes imbalance in the economic performance of a country (Elbadawi 1997).
2.1.1 *Neoclassical Growth Theory*

The Neoclassical theory as developed by Solow (1956) assumes that planned investment is always equal to savings because prices adjust immediately; this will also apply to interest rates. With these assumptions, neoclassical growth theory focuses its attention on capital and technology. According to this theory, only the supply side factors determine rate of economic growth of a country. In the model, the growth of output is achieved in the short run through higher rate of saving which leads to higher rate of capital formation. However, diminishing returns to capital poses a limitation to economic growth in this model. Intuitively, the neoclassical growth model assumes constant returns to scale which exhibits diminishing returns to capital and labour separately.

Neoclassical theory is considered a pillar in the execution of a country’s economic growth; however, it exhibit weaknesses where growth is assumed to depend on the exogenous technological progress and the apparent inconsistency of the unconditional convergence hypothesis with the actual data prompting investigation of alternative growth theories. The theories as well do not consider the other factors, other than technology that indirectly affect the labor productivity.

The conclusion of neoclassical growth models hold that for economies with similar technologies the level of output should converge to a certain level in the stable state; a paradigm that has appeared to contradict empirical evidence, unless where the per capita growth of the economy’s rate of investment and public policies are taken into
account (Meade, 1996). The neoclassical growth theorists widely imply that, external borrowing to finance government spending will lead to reduction of private investment and this will raise real interest rates for the economy. The result will be decreased economic growth.

2.2. Empirical Literature Review

Various studies have carried out investigations on the effect of debt repayment on economic growth and capital formation; some find a negative impact of debt service on economic growth while others find insignificant relationship between economic growth and debt repayment. Most of these studies have researched on the effect of external debt on per capita GDP, real GDP, GDP growth rate, and long term consumption pattern and capital formation. However, the results of these studies portray mixed findings; rendering it difficult to conclude on whether external debt servicing affect economic growth positively, negatively or whether it does not have any significant impact on economy’s GDP.

Later, in a study done by Stoneman (1975) testing the impact of borrowed capital on the economic growth of poor countries, where criticism was raised against the earlier studies was done. The researcher felt that it was a big failure to ignore the distinction between two major effects of borrowed capital, the effect of balance of payments that is; capital inflow will enable high investment and consumption, and effects on the structure of economy that is the inflow of externally borrowed capital reduce exports, change the ratios of capital output and the effect on income distribution. Stoneman
applied ordinary least squares (OLS) technique to carry out regression analysis, the study covered a period of five-years, between 1965 and 1970, applied on a main sample of 188 countries and a set of sub-samples. The following explanatory variables was used: gross domestic savings, net inflow of direct investment, net inflow of foreign aid and other long term foreign flows, and the foreign direct investment stock. The dependent variable used was the annual average growth in GDP. The results confirmed that there is a positive effect of foreign aid and domestic savings on economic growth. The results also suggested that the foreign direct investment stock had a negative effect on economic growth; this implied a retarded growth and the significance of the increase when the lagged annual average growth in GDP was used.

Gulati (1978) carried out a test on the Galbraith hypothesis. In the study, all less developed countries (LDCs) were categorized into one homogenous block of “Third World” and prescribing the same remedy for each case. Gulati classified thirty eight less developed countries into two broad categories. In the first model, classification of the countries whose development was low due to lack of sufficient investment funds were put together, implying that these were the only countries that could largely benefit from externally borrowed capital, applying capital inflows to the best of their advantage. The countries classified under Model II included twenty one countries from African and Latin American continents, these were the countries which lack of good cultural base or lack of development-oriented social structures were the major factors leading to low economic development in such economies.
In the study done by Gulati (1978), regression technique was applied on the rate of growth in GDP on all capital inflows and savings in each of the categories of countries for the period of the 1960s. The study results concluded that the inflow of savings and that of capital were significantly affecting the rate of growth of incomes in Model I countries. For Model II countries, there was no significant effect of increased savings and capital inflow on the growth rate of these countries, and thus these financial variables seemed to be irrelevant in explaining the growth rates of these countries. Thus, Gulati concluded that, not all less developed countries in Asia needed foreign capital inflow to boost their economic development efforts.

A study carried out by Mosley in 1980, disaggregated the inflows of foreign capital into aid and other various financial inflows. Foreign aid inflows were lagged by five years. A sample of eighty three countries was used and the period considered for the study was the years 1969 to 1977. In the study two stage least squares (TSLS) regression was applied on a system of two equations. In the first equation, the dependent variable was the growth in GDP while savings, foreign aid, and other foreign capital inflows were the explanatory variables. In the second equation, the dependent variable was the foreign aid and GDP per capita was used as the explanatory variable. The results showed a negative effect of foreign aid and other inflows on economic growth; however the effect was statistically insignificant in the case of all eighty three developing countries. The results concluded that in the thirty poorest countries, foreign aid had significantly positive effect on economic growth when lagged by five years.
Dowling and Hiemenz (1983) in the presence of policy variables carried out a test on the relationship between foreign aid, savings and growth. Their sample consisted of 52 countries of the Asian region and the study period was the years 1968 – 79. They performed ordinary least squares regression on foreign aid, other capital inflows and savings, and four policy variables. The results showed that, all the three standard variables positively and significantly affected economic growth for all the countries. The study also reported that economic policies adopted in the countries have been encouraging which has invited allocation of foreign aid leading increased economic growth (and other resources) especially in the countries of the Asian region associated with high growth. Various aspects of government policies were incorporated into the regression model and the results give a conclusion that, for countries experiencing high growth, liberal trade and financial policies leads to improvement of overall growth. From the results, it was also concluded that for countries which are experiencing low economic growth, liberal trade policies and improved government tax revenues lead to increased economic growth.

Gupta and Islam (1983) carried out a study on 52 developing countries; they made three income groups and three geographical regions. They specified and estimated a nine-equation simultaneous model and applied both OLS and TSLS methods to obtain estimates. From TSLS technique and based on usual statistical criteria, they obtained estimates which were not encouraging for the two sets of equations. These resulted to them
reporting only the OLS results. The major finding reported was that domestic savings and foreign capital made a positive and significant contribution towards economic growth but domestic savings was relatively more significant than foreign capital. When foreign capital is disaggregated into foreign aid and foreign private investment, the study easily compared the significance of both, it suggested a slight advantage of foreign aid over foreign private investment but there was a trade off encountered. Foreign private investment was found to have a less significant effect on domestic savings than aid, while foreign aid was found to contribute more towards growth.

In 1987, Mosley continued with the study on foreign aid, similar to the previous study (Mosley 1980); in 1987 lagged aid and various foreign inflows were used. This time a study period of seven years was used, previously the study period applied was five years. The analysis technique included OLS, TSLS and the Cochrane-Orkut iterative procedure for the period 1960-83. The results obtained through OLS technique showed that, there was insignificant effect of foreign aid to economic growth for the entire sample of countries and for sub-samples and for the entire study period. Under TSLS and foreign aid being used as a function of growth, foreign aid was found to be insignificant in determining economic growth. Under Cochrane-Orkut iterative method of estimation, foreign aid flows was still insignificant in determining the growth of GDP.

Mosley, Hudson ad Harrell (1987) carried out another significant study, they used a cross-country specification reminiscent of Balassa (1978), and they found no significant
statistical impact of foreign aid to GNP. They also confirmed that there was no significant relationship between aid as a percentage of GNP for the eighty one developing countries for the period 1960 to 1983. When various subgroups were used, there was noticeable but little improvement in the study results. A positive relationship which was statistically significant at 5 percent level was realized for Asia in the 1970s and early 1980s, while a negative relationship was found for all the developing countries in 1960s. Their results also showed a strong correlation between export growth and the performance of developing countries, this was the only factor/variable which seemed to be strongly correlated with developing countries economic performance.

In a study done by Morisset (1990) to examine the effect of reduction of debt within a macroeconomic framework, various estimation methods were applied to test both direct and indirect relationships between external debt, investment and economic growth. Using three stages least squares, they carried out estimation models and simulations for Argentina in the years 1962 to 1986. In effort to explain the extreme fall in private investment, consideration of some direct and indirect channels were done. Most authors have argued against increasing external debt. Through conducting research and arguing from their obtained results, if private sector is rationed by credit, then the high level of external debt will affect productive investment negatively through a disincentive effect. Since in most countries which have acquired external debts the governments appear unable or unwilling to meet the increasing debt-service requirements, there is anticipation of higher taxation rates by private investors on real and financial assets as
well as more unstable factors in relation to the economic environment.

Khan and Rahim (1993) carried out a similar study, estimating the foreign assistance impact on the economic growth and development in Pakistan. A Single-equation model was employed to estimate savings and economic growth functions over a period of twenty eight years, 1960 to 1988. They also disaggregated different types of foreign capital and estimation on their impact on the growth of GNP and savings rate using the OLS estimation method was carried out. Their results showed that there is a negative and insignificant impact of foreign assistance on savings. The results also argued that, the different types of capital from foreign countries affected GNP differently.

Two researchers by the name Levy and Chowdhury (1993) carried out a study to examine the full effect of external debt on GNP. They focused on both direct and indirect effects of borrowed capital on economic growth. These researchers utilized a system of simultaneous equations which showed the possible interactions between GNP, capital stock accumulation, public and publicly guaranteed external debt and private external debt accumulation. The estimation was done using panel data for the study period 1970-1988 on thirty six highly indebted developing countries which were facing a crisis of high debt. These countries were grouped in to three distinct regions namely; Latin America, Asia Pacific and Sub-Saharan Africa. Their results showed that given a country’s level of indebtedness, the countries which had larger number of incidences of financial distress and liquidation were faced with larger effect to the GNP directly and indirectly through the channel of discouraged domestic investment. Furthermore, increased public and publicly guaranteed external debts have the
possibility to bring down the level of GNP directly by decreasing capital formation through decreased capital formation and encouraging capital flight due to the expectations of tax increase. Government raises taxes in order to meet the obligations to finance external debts.

Various researchers came up with different conclusions after examining the effects of external debt on economic growth rate of an economy. These different results leading to different conclusions came from similar units of analysis. Cunningham (1993) examined 16 highly indebted countries (HICs) for a period of sixteen years between the years 1971 to 1987 and tabled various results for different time periods in a similar context. The researcher employed similar methodology techniques for empirical analysis and found out that during 1971-1979, there was a negative effect of external borrowings on economic growth, this impact was significant. On other side, using the data set of the same variables there was no proof of any significant impact of debt on economic growth for the study period of 1980-1987.

Chowdhury (1994) carried out a study the using granger causality tests on the significance of foreign debt on growth of economy on pacific and Asian countries over the period 1970-88. The results show a relatively very small impact of external debt on GDP and both have opposite signs. The results confirm that any growth in GNP led to an increased level of external debt, but there is no prove of negative impact of overall external debt on economic growth.
There was a study carried out by Ogun in 1998 which tested the interactions between capital inflows, foreign debt stock, economic growth and investment. The researcher applied time series technique to analyze the data from Turkish Turkey covering the period between 1965 and 1997. The estimation method employed was two stage least squares (2SLS) employing three stage least squares (3SLS) method to the equations. The model included five equations this model was similar to the model applied by Metwally and Tamaschke in 1994 with very few different equations and exogenous variables in their equations. The results showed two way statistical relationship between the debt stock and debt service, and thus and there was an increase in the rate of growth in debt servicing which will raise the growth rate of the debt service and this does not have any effect the rate of economic growth.

Were (2001) explains the Kenyan external debt and its implications on GDP. OLS estimation technique was used, covering the period 1970-2000. In the study, the channels through which the effect of foreign debt is transmitted to the economic growth included stock of external debts as a ratio of GDP, accumulation of debt in the past debt servicing ratio. The empirical results showed that the growth of the economy is significantly and negatively affected by external borrowing and private investment, confirming that there exists debt overhang problem in the Kenyan economy. Nevertheless, from the results there was an indication that current debt inflows lead to increased private investment.

Hansen and Tarp (2001) carried out a study to examine the relationship between
foreign aid and the growth in real GDP per capita. They applied regression technique to carry out their analysis on the average rate of growth of GDP in fifty six countries. They used a study period of nineteen years covering the years 1974 – 1993 in five periods considering several policy and institutional control variables and foreign aid. From their results, a conclusion was made that foreign aid is likely to increase the GDP growth rate regardless of the policies adopted by the government. Burnside and Dollar (2000) had suggested that with good policy by the government, foreign aid would affect GDP growth positively. They nonetheless, found out that the returns from foreign aid were decreasing and the estimated value of foreign aid was very sensitive to the kind of estimator a researcher will apply and also the set of control variables selected.

Patenio and Tan-Curz (2007) used Granger to carry out a study on the relationship between external debt repayment, servicing level and economic growth in Philippine for period 1981 to 2005. They adopted granger causality technique to carry out their analysis. Their results led to the conclusion that, external debt repayment affected economic growth but the impact was insignificant. These results were associated with probably external debt repayment in Philippines and this was not yet a threat in economic growth and thus, Philippines was not prone to experiencing debt overhang in the nearest future

In a study carried out by Mutai (2008) to analyse the effect of domestic debt on the Kenyan GDP for the period 1996–2007. Generalised method of moments regression model was applied. The results indicated that, lagged values of gross domestic product in Kenya, government expenditure to GDP ratio, broad money supply, secondary school enrolment, private sector credit, ratio of debt to GDP and trade affect the level of
economic growth.

Maana, Owino, and Mutai (2008) analysed the impact of domestic debt on the economic growth in Kenya. They employed a study period of eleven years between 1996 and 2007 using generalised method of moment’s regression model. The results indicated that, GDP values when lagged, government expenditure to GDP ratio, broad money supply, enrolment of secondary school, private sector credit, ratio of debt to GDP and trade have an impact to the level of economic growth. From the results, increase in domestic debt resulted to increase in interest payments without crowding out private investments due to the favourable level of financial development.

Yadi (2008) examined the effect of external debt and along debt servicing in Nigeria. Time series data was used for a selected period between 1970 to 2007, the researcher employed OLS and GLS techniques to estimate the framework and concluded that the external debt and its repayment has unfavourable impact on the economic growth of Nigeria.

Arshad Hasan and Safdar But (2008) carried a study using ARDL model to analyse external debt and growth rate for the period between 1975 and 2005 in Pakistan. Their results led to the conclusion that external debt has no relationship with the economic growth either in long run or short run. They obtained results which led to a different conclusion that in-efficient use of the debt leads to slowing down of the economic growth but the debt itself has no negative impact on economic growth.

Another study was carried out by Cholifihani in 2008 to analyze the short run and long
run relationship between external borrowing and income in Indonesia from the year 1980 to 2005. Co integration analysis of time series model was applied. The findings led to the conclusion that GDP, DSR, capital stock, labor force and human capital inputs have a long run equilibrium relationship. From the results, a significant negative relationship of external debt servicing with GDP was found.

Okafor Luke and Tyrowicz Joanna (2008) did a study on foreign debt and domestic savings in developing countries. The study covered the period between year 975 and 2004 for Subsaharan Africa and Latin America. They employed regression analysis and their results indicated a negative impact of foreign debt on domestic savings especially in the long run.

Imran Sharif, Shahnawaz Malik and Muhammad Ramzan (2009) carried out a study on the impact of foreign debt on savings and investment in Pakistan for the period 1973 – 2006. Regression analysis was employed and the results showed a negative effect of foreign debt on savings.

Safia and Shabbir (2009) carried out a study to analyze the impact of external debt on economic growth in 24 developing countries. Their study covered a period of twenty seven years from 1976-2003. They employed random effect and fixed effect estimation in their study. Their results gave the conclusion that high ratio of debt servicing to GDP will affect the economic growth negatively and may leave insufficient funds available to finance private investment. These will have a negative effect because it will lead to crowding out effect.
Sheikh (2010) highlighted the domestic debt and economic growth in Pakistan. Time series data for 1972-2009 was analyzed through ordinary least squares method. Findings determine domestic debt positively contributes to the economic growth of Pakistan. The study found inverse relation between domestic debt and economic growth.

Rais and Anwar (2012) investigated the public debt and economic growth in Pakistan using Time series data (1972-2010). The researcher employed ordinary least square technique for estimation. Investigation reported that both domestic and external debt are inimical to economic growth for Pakistan. The authors strictly suggested that loans from IMF should be avoided.

Nurazira and Podivinsky (2012) carried out an analysis of the input of external borrowing to the increase of economic growth for 31 developing countries over a period of 36 years. They used a dynamic panel data econometrics estimation and found out that accumulation of external debt have a negative relationship with economic growth since it leads to a slowdown in the development of gross domestic product of developing countries. In addition, they also arrived to an evidence to support spatial dependence in the growth model; this has the suggestion that, there will be a spillover effect of growth in the surrounding countries.

Agu (2012) examined debt servicing, capital inflow and economic growth in Nigeria over 35 years from 1975-2009. The basic purpose was to establish the relationship among this variables. The study adopted 2SLS estimation method. The results showed that the impact of external debt servicing on economic growth is negative while capital
stock and labour positively impact on economic growth. Also exchange rate and economic growth positively influence external debt servicing with external debt stock having a negative relationship. The last result was capital inflow was negatively and positively affected by external debt service and economic growth respectively.

Umaru (2013) evaluated the impacts of external and domestic debt in Nigeria. Ordinary least square method and granger causality test was used on the annual time series data (1972-2010) for examination. Bi-directional causation between external debt and gross domestic product was reported. Study concluded that external debt had obstructed the Nigerian economy. Meaning external debt had hindered economic growth of Nigeria.

Mishra (2014) carried out a study on public debt, capital formation and economic growth in Ethiopia in the recent four decades. This study was carried out to identify the existence cause, effect and connection between external debt, capital formation and economic growth in Ethiopia. Secondary time series data was collected and analyzed by qualitative description and quantitative econometric technique. The results were that Ethiopia was under serious external debt problem until 1990’s.

Muinga (2014) examined the relationship between external public indebtedness and economic growth in Kenya in the period 1970 to 2010.Econometric technique of ordinary Least Square was employed and the results were that external debt and interest payments on external debt payments contribute negatively to economic growth in Kenya.Capital formation and labour force have significant positive contribution to economic growth.
Moreputla Oageng and Moffat Boitumelo (2017) studied the effects of external debt on national savings in Botswana using time series economic tools for the period 1980-2014. Vector error correction model showed that external debt had a negative and statistically significant effect on national savings.

2.3. Overview of Literature

Generally studies have concentrated on the outcome of debt levels on economic growth. There are limited studies on the association between debt servicing, capital formation and gross domestic product. Most of these studies have been carried out on other economies and not Kenya. Mixed results have been reported; with some studies showing insignificant consequences of external debt levels on economic growth for and others reporting negative effects of debt on economic growth. All the studies in the literature review have assumed direct association between debt and economic growth; there is no literature on the channels of transmission of the impact/effect of external borrowing on gross domestic product.

These studies have adopted different theoretical models, using various variables to analyse the effect of debt on economic growth. Some studies adopt debt inclusive production function $Y=A[K,L,DEBT]$ others have used direct relationship of real gross domestic product and domestic borrowing, external debt and exchange rate, that is $R_{gd}=f[T_{dd},T_{dd},I_{ted} ]$, while others adopting simple open growth models to gauge the effect of debt on economic growth expressing National income as function of debt service payments, external debt and interest rate.
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter explains the design of the study, theoretical framework, empirical model, definition and measurement of variables. Presentation of the data source and collection and their contribution to the dependent and independent variables are also discussed. The chapter further provides the various methods used to analyze the presented data.

3.2 Research Design

This study’s main aim was to find out the relationship between external debt servicing, capital formation and Kenyan GDP. The study adopted longitudinal research design. The study used time series data for the period 1984 to 2014. The time series data was analyzed to determine effect of debt on capital formation, and recursively on gross domestic product.
3.3 Theoretical Framework

The study adopts neoclassical growth theory developed by Solow. The neoclassical growth theory focuses its attention on supply side factors such as capital and technology for determining economic growth in an economy. The Solow model is specified as:

\[ Y_t = F(K_t, L_t) \]

\[ Y_t = \frac{Y_t}{K_t} \]

where \( Y_t \) is gross domestic product in period \( t \), \( K_t \) is capital in period \( t \), and \( L_t \) is labour in period \( t \).

In the model investment is assumed to be equal to saving:

\[ I_t = S_t = \]

\[ sY_t \]

\[ I_t = S_t = sY_t \]

Where \( I_t \) is Investment in period \( t \), \( S_t \) is savings in period \( t \) and \( sY_t \) is savings rate in period \( t \).

Further capital evolves according to the standard equation:

\[ K_t = (1 - \delta)K_{t-1} + I_t \]

\[ K_t = (1 - \delta)K_{t-1} + I_t \]

Where \( K_t \) is capital in period \( t \), \((1 - \delta)K_{t-1}\) is capital depreciation in period \( t \).

Substituting 3.2 into 3.3 yields

\[ K_t = (1 - \delta)K_{t-1} + sY_t \]

\[ K_t = (1 - \delta)K_{t-1} + sY_t \]
Defining domestic saving as a sum of private saving, government saving and foreign saving (see for example Sepheri and Akram-Lodhi (2005),

\[ S_t = S_t^p + S_t^G + S_t^F \]  

.................................................................3.5

Where: \( S_t^p \) is domestic private savings

\( S_t^G \) is government savings

\( S_t^F \) is foreign savings

The total saving in the economy is reduced through repayment of debt by government given as follows:

\[ S_t^G = E_t - DS_t \]  

.................................................................3.6

Where government fiscal effort is given by \( E_t \).

\( DS_t \) is Debt service in period \( t \)

Equation 3.6 indicates that total saving in the economy is reduced through debt repayment and this will have negative effect on the economy ability to investment.

Therefore, saving can be made a function of debt service as follows:

\[ S_t = sY_t = f(DS_t) \]  

.................................................................3.7

Where \( DS_t \) is Debt service in period \( t \)
Substituting 3.7 into 3.4 gives:

\[ K_t = (1 - \delta)K_{t-1} + f(DS_{t-1}) \]

This implies that, as a consequence, capital formation in the economy is negatively affected by debt service. The relationship is given as:

\[ K_{t+1} = f(DS_t) \]

Or

\[ K_t = f(DS_{t-1}) \]

Where \( f' < 0 \).

Substituting 3.8 into 3.1 yield the following production function

\[ Y_t = F[f(DS_{t-1}), L_t] \]

3.4 Model Specification

Using equation 3.8, the following equation is specified:

\[ K_t = \beta_0 + \beta_1 DS_{t-1} + \epsilon_t \]

In the analysis equation 4.2 was estimated and its predicted value used in the production function. Therefore production function in 4.1 was specified as follows, taking into consideration equation 4.2
\[ Y_t = \alpha_0 + \alpha_1 \hat{K}_t + \alpha_2 L_t + \nu_t \]

Where \( \hat{K}_t \) is predicted value of capital from equation 4.2

### 3.5 Definition and Measurement of Variables

Table 3.1 Definition and Measurement of Variables

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DEFINITION</th>
<th>MEASUREMENT</th>
<th>SOURCE OF DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Gross domestic product</td>
<td>Total monetary value of all the finished goods and services in a specific time-period {calculated on annual basis in keys}</td>
<td>Statistical abstracts and economic surveys from Kenya National Bureau of Statistics</td>
</tr>
<tr>
<td>L</td>
<td>Labour</td>
<td>Total number of people employed in the formal and informal sectors in a year.</td>
<td>Statistical abstracts and economic surveys from Kenya National Bureau of Statistics</td>
</tr>
<tr>
<td>DS</td>
<td>Debt service</td>
<td>Amount in shillings of public external debt repayment in one year</td>
<td>Statistical abstracts and economic surveys from Kenya National Bureau of Statistics</td>
</tr>
</tbody>
</table>
### Data Sources

The data in the study were annual and were obtained from Kenya National Bureau of Statistics. CBK statistical bulletin, National Treasury and shall cover the period 1984 – 2014 which is 30 observations and this is adequate for time series.

### Time-series Properties and diagnostic tests

Error Correction Model of estimation technique was used in this study for the estimation of long run relationship between the dependent variable and the independent variables. All necessary statistical and econometric tests were introduced. Heteroscedasticity was checked to detect non constant variability of the error term, also known as unequal scatter, White test was employed which confirmed the presence of heteroscedasticity , this was corrected using newey-west HAC.

Autocorrelation also known as serial correlation was tested. Possible causes of this problem are misspecification and omission of variables, the consequences of this problem is inefficient estimators. Durbin Watson Test was employed, it was found out
that the data had autocorrelation problem, this was corrected using newey-west HAC. Unit root tests and multicollinearity was also carried out.

3.8 Data analysis

The first objective of this study is to determine the effect of external debt servicing on capital formation in Kenya. This was achieved by transforming the data in to log form to improve on specification of the equation, and performing regression of capital formation on lagged debt service. Time series properties of the data was checked in terms of stationarity tests, and the standard diagnostic tests of regression such heteroscedasticity, normality, autocorrelation and specification.

To accomplish objective two of the study which was to establish the effect of external debt servicing on economic growth in Kenya, the data was transformed in to log form and regression of GDP on estimated capital and labour was carried out. The variables used were examined in logarithmic forms to help in achieving linearity. As in the analysis of objective one, autocorrelation and normality tests were done.
CHAPTER FOUR
EMPERICAL FINDINGS

4.1 Introduction

This chapter provides the study findings, interpretations and discussions. It starts with presentations and explanations of summary statistics. These are followed by diagnostics tests and finally regression results and their discussions.

4.2 Descriptive Statistics

Table 4.1 presents summary statistics of the variables used in the study.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Std. Dev.</th>
<th>Number of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour force (million)</td>
<td>11.30</td>
<td>17.50</td>
<td>7.00</td>
<td>3.05</td>
<td>35</td>
</tr>
<tr>
<td>Gross domestic product (US$ billions)</td>
<td>26.80</td>
<td>49.40</td>
<td>14.60</td>
<td>9.56</td>
<td>35</td>
</tr>
<tr>
<td>Gross fixed capital (US$ billions)</td>
<td>3.91</td>
<td>11.10</td>
<td>1.60</td>
<td>2.69</td>
<td>35</td>
</tr>
<tr>
<td>Debt service on external debt (US$ billions)</td>
<td>3.59</td>
<td>9.20</td>
<td>0.39</td>
<td>3.25</td>
<td>35</td>
</tr>
</tbody>
</table>

*Source: Own computation*

The four variables were annual values for the period between 1980 and 2014, giving a sample size of 35 years. The statistics shown are the mean, standard deviation, minimum and maximum. As shown in Table 4.1, the mean value of gross domestic
product was US$ 26.80 billion during this period. The mean values of gross fixed capital, debt service and labour were US$ 3.91 billion, US$ 3.59 billion and 11.3 million people, respectively. The results show that the mean gross fixed capital formation was slightly higher than external debt service repayment. However the external debt service repayment exhibited higher variability than gross fixed capital as shown by the standard deviation of US$ 3.25 billion as compared to US$ 2.69 billion. Additionally, gross domestic product was shown to have higher spread as compared to both gross fixed capital and external debt repayment since its standard deviation USD 9.56 billion

4.3 Diagnostic Tests

In the analysis, the four variables were transformed into natural logarithms. Diagnostic tests were carried out using these transformed variables. The tests that were carried out were unit root, autocorrelation, normality and multicollinearity.

4.3.1 Stationarity test

Time series data when they are non stationary and are used in regression may give spurious results because estimates obtained from such data may possess non constant mean and variance. This study used time series data and it was important to establish the stationarity of the variables. In this regard, the test of unit root was carried out based on objective one and objective two. The results of unit root test for objective one are shown in Table 4.2
Table 4.2: Unit root test for fixed capital formation and debt service

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test at level</th>
<th>Alpha</th>
<th>Statistic</th>
<th>Test critical values</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>External debt service</td>
<td>Intercept</td>
<td>1%</td>
<td>0.583465</td>
<td>0.739</td>
<td>Stationary</td>
</tr>
<tr>
<td></td>
<td>Trend and intercept</td>
<td>1%</td>
<td>0.201763</td>
<td>0.216</td>
<td>Stationary</td>
</tr>
<tr>
<td>Fixed capital</td>
<td>Intercept</td>
<td>1%</td>
<td>0.583465</td>
<td>0.739</td>
<td>Stationary</td>
</tr>
<tr>
<td></td>
<td>Trend and intercept</td>
<td>1%</td>
<td>0.201763</td>
<td>0.216</td>
<td>Stationary</td>
</tr>
</tbody>
</table>

Source: Own computation

The results in Table 4.2 show that the variables are stationary at level at one percent. Fixed capital formation was then regressed on lagged external debt servicing as indicated in the methodology. The predicted values of capital formation were then generated and used in the unit root test for objective two. The unit root test results for all the variables used in the second objective are shown in Table 4.3.
Table 4.3: Unit root test for gross domestic product, labour and predicted capital formation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test at level</th>
<th>Alpha</th>
<th>Statistic</th>
<th>Test critical values</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross domestic product</strong></td>
<td>Intercept</td>
<td>1%</td>
<td>0.694479</td>
<td>0.739</td>
<td>Stationary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5%</td>
<td>0.694479</td>
<td>0.463</td>
<td>Not stationary</td>
</tr>
<tr>
<td></td>
<td>Trend and intercept</td>
<td>1%</td>
<td>0.128662</td>
<td>0.216</td>
<td>Stationary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5%</td>
<td>0.128662</td>
<td>0.146</td>
<td>Stationary</td>
</tr>
<tr>
<td><strong>Labour</strong></td>
<td>Intercept</td>
<td>1%</td>
<td>0.70</td>
<td>0.74</td>
<td>Stationary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5%</td>
<td>0.70</td>
<td>0.463</td>
<td>Not stationary</td>
</tr>
<tr>
<td></td>
<td>Trend and intercept</td>
<td>1%</td>
<td>0.082393</td>
<td>0.22</td>
<td>Stationary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5%</td>
<td>0.082393</td>
<td>0.16</td>
<td>Stationary</td>
</tr>
<tr>
<td><strong>Fitted Fixed capital</strong></td>
<td>Intercept</td>
<td>1%</td>
<td>0.651955</td>
<td>0.739</td>
<td>Stationary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5%</td>
<td>0.651955</td>
<td>0.463</td>
<td>Not stationary</td>
</tr>
</tbody>
</table>
The results in Table 4.3 show that the variables are stationary at level at one percent but not stationary at five percent. However unit root test at trend and intercept confirms that gross domestic product, labour and fitted capital formation are stationary at five percent.

### 4.3.2 Multicollinearity

For objective 1 there was only one explanatory variable and therefore multicollinearity test was not conducted. However in the second objective, two explanatory variables were used and correlation analysis was carried out to assess the problem of multicollinearity.

#### Table 4.4 Correlation matrix

<table>
<thead>
<tr>
<th>Variable</th>
<th>Labour</th>
<th>Predicted capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>1.000000</td>
<td>0.974332</td>
</tr>
<tr>
<td>Predicted capital</td>
<td>0.974332</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

*Source: own computation*

Table 4.4 presents correlation matrix results of multicollinearity test which shows the relationships between explanatory variables of the second objective {labour and predicted capital}. The presence of multicollinearity makes the standard errors of the affected coefficient to be large and also affects calculations regarding the individual
predictors. When the correlation coefficient between the explanatory variables is less than 0.5, multicollinearity problem is said to be tolerable.

In the sampled period, correlation coefficients between the independent variables for objective two were on the higher side. A correlation matrix for this study showed that the pair wise correlations are 0.97 as shown in the correlation matrix. This was ignored as it is not a matter to affect the objective of the study significantly.

Autocorrelation and heteroskedasticity were found in this study however, newey-west HAC was applied to correct this error. The test results are on appendix 2.

4.4 Regression Results

To address objective one which is to determine the effect of external debt servicing on capital formation in Kenya, Gross domestic product was regressed on labour and the predicted capital formation obtained from regression of capital formation on lagged external debt service. The regression results for objective one are shown in Table 4.4
Table 4.5: Regression results of fixed capital formation on external debt servicing

Dependent variable is log of fixed capital formation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Newey-West HAC standard error</th>
<th>t-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of lagged external debt servicing</td>
<td>-0.475970</td>
<td>0.050810</td>
<td>-9.367627</td>
<td>0.0000</td>
</tr>
<tr>
<td>Intercept</td>
<td>32.13723</td>
<td>1.130101</td>
<td>28.43748</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Adjusted R-squared = 0.87, F-statistic = 223.81, Prob(F-statistic) = 0.0000, n = 34

*Source:* Own computation

In Table 4.5 the coefficient of lagged external servicing is -4.47597 and this coefficient is statistically significant at one percent level. The value of the coefficient of log of lagged external debt repayment means that one percent increase in external debt repayment results in the decline in fixed capital formation of 0.476 percent. This is because the coefficient is elasticity. The log of lagged external debt explains 87 percent of the total variation in fixed capital formation. The overall regression is good since the F-statistic is statistically significant at one percent. These results show that external debt repayment has negative effect on fixed capital formation in the country.

To address objective two which is establishing the effect of external debt servicing on economic growth in Kenya, regression was done for gross domestic product on labour and predicted capital. Regression results are shown in table 4.5
Table 4.6: Regression results of gross domestic product on labour and predicted capital
Dependent variable is log of gross domestic product

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Newey-West HAC standard error</th>
<th>t-statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of Labour</td>
<td>1.631325</td>
<td>0.158812</td>
<td>10.27203</td>
<td>10.27203</td>
</tr>
<tr>
<td>Log of predicted capital</td>
<td>-0.180739</td>
<td>0.082863</td>
<td>-2.181164</td>
<td>0.0369</td>
</tr>
<tr>
<td>Intercept</td>
<td>1.474877</td>
<td>0.901978</td>
<td>1.635159</td>
<td>0.1121</td>
</tr>
</tbody>
</table>

Adjusted R-squared = 0.98, F-statistic = 1052.01, Prob(F-statistic) = 0.0000, n = 34

*Source:* Own computation

In Table 4.5 the coefficient of lagged labour is 1.631 and this coefficient is statistically significant at one percent level. The value of the coefficient of log of labour force means that one percent increase in external debt repayment results in the increase in gross domestic product of 1.63 percent. This is because the coefficient is elasticity. The log labour force and adjusted capital formation explains 87 percent of the total variation in gross domestic product.

The value of the coefficient of log of predicted capital means that one percent increase in predicted capital leads to a decline of 0.18 percent in gross domestic product. This decline shows the impact of change in debt servicing of a nation which influence gross domestic product indirectly. Increase in debt servicing will lead to a decline of gross domestic product through decreased capital formation.
The overall regression of the second objective is reliable with the F-statistic being statistically significant at one percent. These results show that debt servicing, indirectly through its negative effect on capital formation has negative effect on gross domestic product in the country while labour force has a positive effect on gross domestic product in Kenya.

The findings of this study are consistent with several other studies in the literature review explained as below; in a study done by Were (2001) to explain the Kenyan external debt and its implications on economic growth arrived to the empirical results showing that external debt has a negative impact on economic growth and private investment. In this study the effect of debt service on gross domestic product is negative.

The results of this study shows a significant negative impact of debt servicing to GDP; Chowdhury (1994) tested the significance and the effect of foreign borrowing on economic growth on pacific and Asian countries over the period 1970-88. The results showed a very small effect of external debt on gross domestic product and both have opposite signs. From the results, an increase in GNP led to increased levels of capital obtained through external borrowing; however, the overall external borrowing does not cause any harm or negative effect on economic growth.

A study by Hansen and Tarp (2001) on the analysis of the relationship between foreign aid and growth in real gross domestic product per capita. Their results are contrary to the results of this study. From their results, the conclusion was that increase in foreign
aid by all means will cause increased gross domestic product growth rate. The increase would happen regardless of the government policies adopted in the country, whether bad or good. Burnside and Dollar (2000) had suggested that foreign aid has a positive relationship with economic growth but this is associated with ‘good’ policy. They also found out that decreasing or increasing returns to foreign aid and the estimated effectiveness of foreign aid were highly responsive to the choice of estimator and the selected set of control variables. Their study has a different approach were the negative effect of debt servicing on capital formation is transferred to gross domestic product.

This study yields similar results to the study done by Presbitero (2010), analyzing the effect of public debt on output growth, a panel of low- and middle-income countries over the period 1990-2007 was used. The results showed that public debt will lead to a negative effect on growth of output up to a threshold of about 90 percent of GDP, beyond which its impact becomes immaterial. The explanation of this non-linear effect is associated with country-specific factors since debt overhang leads to slow economic growth posing a constraint to smooth economic development and it is found only in countries with sound macroeconomic policies and unwavering institutions.

This study’s approach is the opposite of the study done by Agu (2012) were he examined debt servicing, capital inflow and economic growth in Nigeria over 35 years from 1975-2009. The results showed that the impact of external debt repayment on economic growth is negative while capital stock and labour positively impact on economic growth. Also exchange rate and economic growth positively influence
external debt servicing with external debt stock having a negative relationship. The last result was capital inflow was negatively and positively affected by external debt service and economic growth respectively. In this study, debt service is found to affect capital formation negative and the effect is channeled to affect the gross domestic product negatively.

Comparing my results to the results for a study done in Ethiopia by Mishra (2014) examining the connection between public debt, capital formation and economic growth, with the purpose to identify the existence cause and effect relationship between external debt, capital formation and economic growth in Ethiopia. The results were that Ethiopia was under serious external debt problem until 1990’s. The results of this study shows that external debt can also be a serious problem in Kenya due to the negative effect of its repayment which eats on capital stock and the result is deteriorating gross domestic product.

A researcher by the name Muinga in 2014 examined the association between external public indebtedness and economic growth in Kenya in the period 1970 to 2010. Using Econometric technique of ordinary Least Square obtained consistent results with the results of this study that external debt and interest payments on external debt payments contribute negatively to economic growth in Kenya and that Capital formation and labour force have significant positive contribution to economic growth. This view is in line with the results of a developing empirical literature which shows that there is a negative connection between public borrowing and growth of the economy, and finds that this relationship becomes more strapping when public debt approaches 100% of GDP (Reinhart
and Rogoff 2010a, 2010b; Kumar and Woo 2010; Cecchetti 2011). Using a different approach of analyzing the channel through which the effect of debt servicing affects economic growth through a negative effect on capital formation, this study shows similar results.

This study gave similar results to a study carried out by Maana, Owino, and Mutai (2008) on examining the effect of domestic borrowing on gross domestic product in Kenya for the period between 1996–2007. They applied generalised methods of moments regression model. Their results showed that, lagged gross domestic product, ratio of government expenditure to GDP, broad money supply, secondary school enrolment, private sector credit, ratio of debt to GDP and trade have significant effect on the level of economic growth. Their results indicated that, increasing domestic debt will result to increased interest rate payments without crowding out private investments due to the favourable level of financial development. This study’s results discourage increasing external debt which will lead to high external debt servicing.

This study is done using Kenyan data to examine external debt servicing, capital formation and gross domestic product of the country. The results and are similar to the results of a study carried out by Yadi (2008) in Nigeria on the effect of external debt alongside its repayment, the researcher employed OLS and GLS techniques to carry out their estimation. The results led to the conclusion that the external borrowing and debt repayment have a negative effect on gross domestic product. In this study the results confirm that the effect of external debt on economic growth is not direct but through its effect on domestic savings and capital formation. The channels through which the effect
of debt is transmitted to economic growth have not been examined in any of the earlier studies; this study has filled this gap by investigating the effect of external debt repayment and capital formation on gross domestic product. The results have shown a significant negative effect of debt servicing on gross domestic product in Kenya.
CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

5.1 Introduction

This chapter gives a summary of the study, conclusions of the study, the suggested policy recommendations and identifies areas for further studies. The study policy recommendations are drawn. From the study findings on each of the specific objectives of the study, the study points out policy recommendations.

5.2 Summary of the study

The study examined the external debt servicing, capital formations and their effect on Kenya’s GDP for the period 1980-2014. Kenya continues to strive to establish sustainable development goals of its 2030 visions. The study presented an empirical result which provided an association between external borrowing and economic growth yielding a negative result. Debt servicing increases with increasing debt ratios of a nation. When a developing country increases the rates of borrowings it amounts to channeling more resources towards debt service. The first objective of this study was to analyze the effect of external debt servicing on capital formation and the second objective was to establish the effect of debt servicing on gross domestic product in Kenya. The results of the first objective show that capital formation is affected negatively by increasing debt service. Diagnostic tests were carried out for the first objective where capital formation and debt service were stationary at one percent whereas for the second objective fitted capital formation, labour and gross domestic product were non stationary at level but became stationary at first difference.
Intuitively, the findings advocated that increased level of external debts would deteriorate the economic growth of a country.

The objectives of the paper were met and tests diagnosed. To address the first objective, regression of capital on lagged debt service was carried out and the time series data checked based on the stationary tests. The regression results of regression analysis for both objectives yielded negative relationship between/among the variables; leading to the conclusion that increasing debt service will lead to decreasing capital stock and the effect is transmitted to gross domestic product of Kenya. Decrease in capital stock in Kenya will lead to a decrease in the GDP of Kenya.

Kenya’s borrowing rate has grown overtime whereby the average economic growth has remained minimal. The results depicted that variables were highly correlated advocating the need to conduct first differencing to avoid absolute error problems. On performing the appropriate measures as a solution to the problem, the results provided an option of eradicating the null hypothesis of constant variance. Capital formation provided a positive impact on economic growth in Kenya prompting the need for the country to indulge into appropriate policies to help strengthen the determinants of economic growth. Intuitively, the effect of external debts is negatively felt in Kenya for the failure of appropriate channeling of such funds to real productive sectors. Government policies in Kenya do not viably address good utilization of borrowed funding to ensure enough returns for loan repayment. Therefore there is an important need for the Kenyan government to avoid mismanaging the external public debts to help boost Kenya’s economy by injecting such funds in productive sectors.
5.3 Conclusion

The study examined the effect of external debt servicing on gross domestic product in Kenya over the period 1980-2014. The results got from the regression analysis showed that external public debt servicing has a negative effect on gross domestic product hence providing a provision that an expansion in external debt creates a strain on economic growth. Expanded external borrowing amounts to increased debt servicing which leads to more resources of the nation being utilized to service external loans.

Before embarking on external debts policy makers should consider the loan repayment amount, interests plus principal, the period of loan repayment and the viability of the projects to utilize the borrowed funds. Policy makers should focus more on projects that flow in capital and increase human productivity to improve economic growth for the economy. Borrowed funds should therefore be applied to selective projects and strict terms, conditions and strategies implemented to ensure that there are no misuse of such funds.

The coefficients of external public debt servicing variables are negative and quite significant. This means any increase in external debt stocks would worsen economic growth in Kenya. Therefore, there is a call for the government to follow economic policies that are geared towards dropping the external debt stock in order to reduce this effect on gross domestic product of the country.

The results of this study stress the fact that, Kenya should strive to ensure that external debt is maintained as low as possible. The current policies should be revised to review
the benefits realized from external borrowing, compared with the harm external debt is causing the nation. New policies to control external borrowing should be implemented to save the economic growth of Kenya. The plan on debt servicing should be provided before going for external debts, it should be scrutinized to confirm viability capturing on how beneficial the debt will be to the Kenyan economy. External debts should strictly be geared towards improving the economy of Kenya.

5.4 Policy recommendation

From the research where debt servicing was deemed important in economic growth, appropriate planning and adoptions of strategies that would enhance economic stability are recommended. It is important for the policy makers in Kenya to be cautious on the implementation of projects that raise the public debt. It is evidential that such costs leads to borrowing from outside sources that may drive the country towards high debt ratio regime associated with lower economic growth. To reduce such attempts, the government need to pursue policies geared towards reducing the debt stock to minimize the strains placed by debts on economic growth. There should be controlled measures on debt management profiles especially in the government expenditure by carrying out evaluation of funded projects to gauge the use of funds in such areas.

Borrowed funds should be injected into productive projects and programmes to ensure sustainable development. Intuitively, there is a need for the Kenya’s laws to enact measures to guide sourcing, management and government borrowing. Consequently, borrowed funds should be tied to productive ventures rather than channeling them to social consumption. To avoid loan build up, the government needs to diversify the
economy to help generate revenues. Conversely, the government should put a measure that increases capital formation because it is one of the major determinants of economic growth. Such decisions will help increase investment which will result to economic growth.

From the strategy prospective it is also suggested that increase in domestic saving and export earnings could also lead to a higher estimated growth rate of GDP and reduce the economy’s dependence on external borrowing. It is very essential to increase domestic currency by creating favorable environment for investment and much focus of the strategies and policies should be on the inflow of Foreign Direct Investment (FDI), while the external borrowing should be discouraged.

The government needs to diversify the economy so as to produce more revenue and shun loans build-up. Since capital is a key determinant of economic growth, it is important for the government to put measures to increase capital formation. This would lead to increased investments hence growth of the economy. Policies of the government should also be channeled towards reducing the rate of external borrowing by sourcing alternative means of financing its project because of its negative impact on gross domestic product of the Kenyan economy and the inflow of capital. Policies of the government should ensure depletion of any existing external debt stock to ensure that the economy does not face problems of debt overhang.
5.5 Areas for further studies

This study sought to investigate on the effect of debt servicing on Kenya’s economic growth by presenting the contribution of its determinants which play an important role in economic stability. For comprehensive analysis of the contribution of debt servicing on Kenya’s economic growth, future studies may focus on:

i) The use of longer time series to provide an insight observation for the study to clarify further the effect of the variables considered in economic growth.

ii) An introduction of a shock variable in the model to help represent unexpected disturbances to help yield a more sensible model.

iii) The exploitation of other models such as dynamic simultaneous equation model to help explain the economic growth and its determinants.
REFERENCES


# APPENDIX 1

## DATA IN ABSOLUTE FIGURES

<table>
<thead>
<tr>
<th>Year</th>
<th>Labour</th>
<th>GDP</th>
<th>Fixed capital</th>
<th>Debt service</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>7,000,000</td>
<td>14,610,577,430</td>
<td>2,228,300,653</td>
<td>433,462,000</td>
<td>2,517,825,945</td>
</tr>
<tr>
<td>1981</td>
<td>7,179,359</td>
<td>15,161,914,027</td>
<td>2,336,669,848</td>
<td>485,008,000</td>
<td>2,965,200,217</td>
</tr>
<tr>
<td>1982</td>
<td>7,363,314</td>
<td>15,390,324,965</td>
<td>1,865,279,351</td>
<td>496,869,000</td>
<td>2,317,708,542</td>
</tr>
<tr>
<td>1983</td>
<td>7,551,983</td>
<td>15,591,792,051</td>
<td>1,680,290,691</td>
<td>515,004,000</td>
<td>2,884,013,103</td>
</tr>
<tr>
<td>1984</td>
<td>7,745,485</td>
<td>15,865,461,832</td>
<td>1,649,091,934</td>
<td>578,690,000</td>
<td>2,230,379,921</td>
</tr>
<tr>
<td>1985</td>
<td>7,943,946</td>
<td>16,547,765,826</td>
<td>1,601,329,598</td>
<td>621,201,000</td>
<td>3,335,141,800</td>
</tr>
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<td>1986</td>
<td>8,147,492</td>
<td>17,735,490,884</td>
<td>1,824,886,257</td>
<td>677,334,000</td>
<td>3,047,041,367</td>
</tr>
<tr>
<td>1987</td>
<td>8,356,253</td>
<td>18,788,466,034</td>
<td>1,998,717,745</td>
<td>691,379,000</td>
<td>3,433,990,848</td>
</tr>
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<td>1988</td>
<td>8,570,364</td>
<td>19,953,949,119</td>
<td>1,975,852,430</td>
<td>737,625,000</td>
<td>4,059,994,056</td>
</tr>
<tr>
<td>1989</td>
<td>8,789,960</td>
<td>20,889,858,926</td>
<td>2,066,418,359</td>
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<td>Per Capita GDP</td>
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</tr>
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<td>------------</td>
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APPENDIX 2

Heteroscedacity results for equation 4.2

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<tr>
<th></th>
<th>Value</th>
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<tbody>
<tr>
<td>F-statistic</td>
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<td>Prob. F(2,31)</td>
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<tr>
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<td>-2.809899</td>
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<td>Fixed capital</td>
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Heteroscedacity results for equation 4.3

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<td>Prob. F(1,33)</td>
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<tr>
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Autocorrelation results for equation 4.2

Breusch-Godfrey Serial Correlation LM Test:

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| Included observations: 34

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<th>Prob.</th>
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Autocorrelation results for equation 4.3

Breusch-Godfrey Serial Correlation LM Test:

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| Included observations: 34

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
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