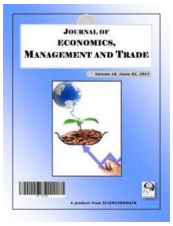

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Growth Effects of Public Recurrent Expenditure in Kenya

Alex Oguso[1*]

[1]School of Economics, University of Nairobi, Kenya.

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Aims: There is a growing consensus that economic growth is a key enabler for successful and sustainable fiscal consolidation. In view of this, this paper examines the growth effects of the high budgetary allocation for public recurrent costs in Kenya. Additionally, the paper compares the growth effects of the public recurrent spending and public investment spending in Kenya at sector level.
Methodology: The study makes use of sector level macro panel data from fiscal year 1999/2000 to 2014/2015, with a cross-sectional unit of seven sectors. The Hausman test and Random effects results, the presence of panel cointegration in addition to the fact that the variables included in the model are integrated of different orders led to use of a panel ARDL (Autoregresessive Distributed Lag) model. Specifically, the Pooled Mean Group (PMG) estimator is employed in the analysis.
Results: The findings show that an increase in share of public recurrent costs in sectoral GDP has an insignificant negative effect on sectoral growth in the short run but a significant negative effect in the long run. The results also show that an increase in share of sectoral development expenditure has a positive but insignificant effect in the short run but a significant growth effect in the long run.
Conclusion: The results confirm that the persistent rise in public recurrent costs in Kenya is actually growth retarding whereas development spending is growth enhancing in the long run.

**Corresponding author: E-mail: alexstariko@gmail.com;*

Keywords: Fiscal consolidation; public expenditure; public recurrent costs; development expenditure; economic growth.

1. INTRODUCTION

There is a growing consensus that economic growth is a key enabler of successful and sustainable fiscal consolidation in developing countries [1,2]. Fiscal consolidation refers to steps taken by governments to reduce government deficits, public debt accumulation and consequently the debt burden. The argument is that real output growth reduces the debt burden and raises tax receipts in an economy at the same time [2]. Faster growth implies larger tax revenue, reduced demand for social security expenditures and reduced public debt and deficit to GDP ratios [3]. Public expenditure composition influences both economic growth and success of fiscal consolidation efforts [4]. Therefore, the composition of public expenditure and its effects on economic growth in a resource-constrained country like Kenya really matters. Composition of public spending has been considered an important determinant of growth since development of endogenous growth models [5]. The debate has been on what components of public expenditure are considerably productive and those viewed as non-productive. However, categorization of expenditure items a priori as productive or unproductive remains debatable in view of inconclusive results from various studies.

In Kenya, there is little empirical evidence on growth effects of public expenditure composition and public recurrent costs in particular. It is not clear whether the public recurrent costs are growth enhancing, growth retarding or ineffective. The public recurrent costs in Kenya can be categorized into those committed towards compensation of employees and those committed towards non-wage recurrent costs. Compensation of government employees consists of basic salaries to both permanent and temporary employees, personal allowances paid as part of salary, employer contributions to compulsory National Social Security Schemes, government pension and retirement benefits. On the other hand, non-wage recurrent costs consist of costs of goods and services utilized by government. These include utilities supplies and services, communication services, travel, subsistence and other transportation costs, printing, advertising and information services, rentals of produced assets, training expenses, hospitality supplies and services, office and general supplies and services, fuel oil and lubricants, electricity costs, routine maintenance, purchase of office furniture and general equipment. The debate on productive and non-productive components of public expenditure, together with the realization that economic growth enhances chances of successful and sustainable fiscal consolidation, informed the need for this study. The paper therefore contributes to the debate on growth effects of government expenditure compositions.

Sector level data is employed in the analysis. For purposes of analytical convenience, the sectors used as units of analysis for this essay are: Agriculture and Rural Development Sector (ARD); Human Resource Development Sector (HRD); Energy, Infrastructure Development, Information and Communications Technology Sector (EIICT); Environmental Protection and Water Sector (EPW); General Economic and Commercial Affairs Sector (GECA); Social Protection, Culture, Recreation, Other Services, Governance, Justice, Law and Order Sector (SPGJLO); and National Security, Public Administration and International Relations (NSPI) sector. This classification borrows from Kenya's Office of the Controller of Budget (OCOB) classification of the sectors, with a little manipulation. The OCOB classifies the sectors into: Agricultural, Rural and Urban Development (AR&UD) Sector; Education Sector; Energy, Infrastructure and Information Communications Technology (EI & ICT) Sector; Environmental Protection, Water and Natural Resource Sector; General Economic and Commercial Affairs (GECA) Sector; Governance, Justice, Law and Order Sector (GJLOS); Health Sector; Public Administration and International Relations (PAIR) Sector; Social Protection, Culture and Recreation Sector (SPCR); and National Security Sector. A trend analysis of non-wage recurrent costs (NWRC) and compensation of government employees (CE) as a percentage share of total sectoral public expenditure (SE) for the seven sectors shows that non-wage recurrent costs forms a higher proportion of the public recurrent costs in the sectors relative to compensation of government employees. The trend analyses also show that the proportion of resources committed to compensation of government employees and that committed to non-wage recurrent costs move in opposite directions in most of the sectors. This is witnessed mainly in the ARD

sector, HRD sector, EPW sector, SPGJLO sector and the NSPI sector. This implies that when the government focuses on reducing public wage bill, the non-wage recurrent costs are always on the rise thus neutralizing or even overriding the effect. The net effect is no reduction or a rise in aggregate public recurrent spending in the specific sectors. Overall, the national aggregate of the public recurrent costs persistently grows from time to time.

1.1 Problem Statement

Kenya needs to allocate resources optimally to enhance building of the platform for realization of development goals set in the vision 2030 blueprint. However, adequately financing the public investment projects remains a challenge due to limited state resources with competing needs. In this regard, the government of Kenya has attempted to control the persistent rise of the public recurrent costs (deemed to be less growth enhancing) to release more resources towards public investment spending (deemed to be more growth enhancing). However, the argument that public recurrent costs are less growth enhancing than the public investment costs remains debatable in view of limited empirical evidence in the case of Kenya and the inconclusive results from various studies. There are arguments that agitations to allocate more resources to public investment spending could be motivated by other factors such as rent seeking behavior of public officers and not the fact that they are actually productive. In fact, some public investments turn out to be of undesirable quality, but over-valued, as the public officials seek rent through tendering and execution of contracts. Therefore, the central question is, “which component of public spending increases the steady growth rate of the Kenyan economy”. To this end, this study seeks to establish the relative growth effect of the high and rising budgetary allocations for public recurrent costs in Kenya.

1.2 Objectives

The main objective of this study is to examine the relative growth effects of public recurrent costs in Kenya. Specifically, the study seeks:

(i) To determine the growth effects of public recurrent costs using sector level data in Kenya.
(ii) To relate the growth effects of public recurrent costs and that of public investment spending in Kenya.

1.3 Policy Relevance

Implications of the composition of public expenditure are important for public policies on economic growth. One of the challenges in allocation of budgetary resources is assessing the quality and effectiveness of the expenditure items on which the resources are located. This study attempts to generate empirical information that is critical for a country with limited fiscal space and in dire need for effective allocation of budgetary resources like Kenya. The focus on economic growth is justified since the literature shows that a country can achieve sustainable fiscal consolidation through economic growth. The findings from this study informs policies on fiscal adjustments and budgetary resource allocations in Kenya.

1.4 Literature Review

Over the years, growth theories have developed from the work of Harrod [6] and Domar [7] to neoclassical theory and then to endogenous growth theory that emerged in the 1980s. The endogenous growth models argue that steady state growth is endogenously determined while the neoclassical models postulate that the steady state growth results from exogenous factors such as exogenous technological change. In neoclassical growth models, long-term economic growth is determined outside of the model and none of the fundamentals of the economy matter for long-term growth. The endogenous growth theories by Romer [8], Lucas [9] and Rebelo [10] are captured by the basic equation $Y = AK$ where Y is output, A represents factors affecting technology and K represents both human and physical capital. In this case, there is no diminishing return to capital, which is achieved by invoking some externality that offsets any propensity to diminishing returns [11].

In neoclassical growth model with exogenous population expansion and exogenous technical change there was virtually no role for government to play, however, with endogenous growth models the role of government has been emphasized [12]. In 1990, Robert Barro developed a model of endogenous growth for the relationship between fiscal policy and economic growth, based on a consumer-producer representative agent set-up. In the model, the government uses tax revenue to finance government expenditure that enters into the production function as a productive input. The production function consists of productive public

spending which enhances the private capital marginal productivity and a non-decreasing (constant) allowing for perpetual growth [13].

The other theory that explains the growth effect of public spending is the theory of public expenditure composition. This theory argues that public expenditure can be categorized in terms of those deemed productive and those deemed unproductive. Expenditures are categorized as productive if they are included as arguments in private production functions and unproductive if they are not [14] which implies that productive expenditure have a direct effect on economic growth but unproductive expenditure have indirect or no effect. The theory models the relationship between particular public expenditure categories and economic growth. In support of the theory, [15] argue that growth effect of fiscal deficits in an economy can be positive, negative or ambiguous depending on the budget items being financed.

Several studies have shown that the composition of public spending really matters. A common argument has been for a large increase in public investment spending which is believed to have a strong growth-promoting effect through their impact on the marginal productivity of private inputs, rate of return on capital and private capital accumulation. There are studies that argue that public investment enhances the productivity of the private sector investments, consequently leading to private capital accumulation, which in turn raise economic growth [16,5,17]. [18] observe that externality effect of public expenditure enhances growth by raising private sector productivity. [19] argue that the growth effect of public recurrent costs and public development spending depends on how countries perceive the productivities of the government supplied public goods and that this varies from one country to another. Thus, the public recurrent costs could be growth enhancing in one country but not the other.

There are studies that provide evidence pointing towards a positive relationship between public recurrent costs and economic growth. One of the studies is that by [20] who carried out a time series analysis using Tanzanian data for the period 1965 – 1996. The study proxied private investment with private capital formation, government investment spending with government development expenditure and government consumption expenditure with government recurrent expenditure less expenditure on health and education. They measured expenditure on human capital by the total of health and education spending. The study showed that increased development expenditure has a negative impact on growth whereas increased public consumption expenditure, highly associated with increased private consumption, has a positive relationship with economic growth. However, human capital investment was found to be insignificant. [20] argue that public spending on physical infrastructure or human capital could be growth enhancing. However, they noted that the disincentive effects associated with higher taxation and deficit financing could be growth retarding. In addition to the inefficiencies of public investment spending, derived from rent seeking behavior of public officers, the net growth effect is likely to be negative. [20], therefore, conclude that what matters is whether public investment influences productivity and not their level.

A study by [21] found a significant positive (negative) growth effect of public recurrent costs (public investment) on per capita real GDP growth for 43 developing countries. They also noted that an increase in share of public recurrent costs in aggregate public expenditure has significant positive growth effects. [21] explains that if productive expenditure is already excessive, a further increase in its share in aggregate expenditure would negatively impact on growth. Using a panel of 15 developing countries with a time series dimension of 28 years, [19] confirm the findings of [21]. Their results show that recurrent costs (public investment) spending has a significant positive (negative) effects on economic growth. [19] model solves for three key endogenous variables; optimal expenditure shares of the two expenditure items, optimal tax rate, and optimal growth rate in terms of key technological and behavioral parameters. They take into account possible omitted variable bias that could arise if tax revenue alone was considered on the revenue side of the government budget constrain. [21] argue that, from an optimal fiscal policy perspective, countries which have correctly perceived recurrent spending as being the most productive have increased the share of spending on this category of public goods, and this has led to higher growth. They added that countries that have allocated funds towards capital spending and away from recurrent costs spending have often done so not for productivity considerations but for reasons such as opportunities for rent seeking.

[22] carried out an analysis on composition of public expenditure and its effects on economic growth with a special focus on Brazil's state of Rio Grande do Sul using correlation analysis and linear regression. The results revealed that recurrent costs spending in the state has a positive growth effect. Moreover, recurrent costs subgroups, that is, wages and salaries and other recurrent costs, were found to have positive influence on economic growth. However, they did not test for direction of causality between the recurrent costs spending and economic growth hence the possibility of an opposite effect could not be ruled out. That is, recurrent spending could not be causing GDP growth but rather GDP growth could be enhancing generation of more tax revenue, thus creating room for higher recurrent costs spending by the state. On the other hand, the study found an insignificant growth effect on the part of public investment spending, which according to [22], could be due to low level of capital spending which is insufficient to alter GDP growth rate. [23] also argue that there is a long-run steady relationship between economic growth and recurrent expenditure indicating that recurrent expenditure influences economic growth positively.

There are also studies that have pointed out that increase in public recurrent costs (public consumption) is actually growth retarding. These studies follow [5], which argues that public investment spending is considered 'productive' whereas government consumption spending is considered 'unproductive'. As argued by [5], public investment spending enhances the productivity of private capital whereas an increase in public recurrent spending would create a negative effect, as more tax is needed to finance the increase. One of the arguments placed by the studies that find public recurrent costs to be less growth enhancing is that it introduces distortions in the economy but provide no stimulus to private investments [5]. [24] also observe that analysis based on endogenous growth model suggests that high level of public recurrent costs have adverse effects on economic performance. [25] analyzed data from a sample of 105 developing and developed countries for the period 1970–2001 and found out that public capital, private investment and Foreign Direct Investment (FDI) have a positive growth effect whereas public non-capital (recurrent) expenditure has a negative impact on economic growth. The study used a fixed-effect model to estimate equations with a five-year forward lag structure, following [21]. [26] points out that increase in public recurrent costs is most likely to have a negative growth effect since they could impact negatively on productivity of private sector and reduce returns on investment due to the consequent rise in taxes to finance them.

In the analysis of effects in terms of size and volatility of government revenue and spending on growth in OECD and EU countries, [27] found out that both set of countries subsidies and government consumption had a significantly negative impact on growth whereas government investment did not significantly affect growth. Transfers were found to have a positive and significant effect only for the EU countries. The study used a seven five-year periods from 1970 to 2004, pooled country and time fixed effects, and robust standard errors to control for heteroscedasticity between countries. Moreover, the study found out that for the EU countries, public consumption and investment volatility have a sizeable, negative and statistically significant effect on growth. [27] argue that public capital formation may indeed turn out to be less productive if devoted to inefficient projects, or if it crowds out private investment. They explained that the negative effect of subsidies and government consumption on growth could be because of subsidies providing some disincentives and being distortionary. An increase of public expenditures requires an increase of tax, which directly reduces the benefits of taxpayers and eventually lowers the economic growth rate [25].

Using 1950 – 1981 panel data for 113 countries, [28] show that increase in government recurrent costs is negatively correlated with the economic growth. Similar results were realized by [29] who used 1970-1990 panel data of 33 Sub Saharan Africa countries. In Nigeria, [30] found out that capital expenditure enhances economic growth while public recurrent costs are detrimental to economic growth. Using Kenyan data, [31] examines the impact of sectoral public expenditure on economic growth for the period 1972 to 2008 and show that public spending on education is critical in enhancing economic growth. However, the study does not look at recurrent versus public investment components of the sectoral expenditures. Similarly, [32] focusing on Kenya does not disaggregate public expenditure into recurrent and development items.

In summary, the literature reviewed show that the growth effect of spending on public recurrent

costs is inconclusive. Some of the studies reviewed show a positive relationship between public recurrent costs and economic growth whereas others show otherwise. Studies that show a positive relationship between public recurrent costs and economic growth include [20,21,19,22,23]. On the other hand, studies by [25,4,5,26,27,28,29,30] show a negative effect of public recurrent costs on economic growth. The inconclusive results could be due to differing methodologies and/or data problems. Most of the empirical studies are cross-country studies. Specific country case studies are limited. Focusing on a specific country avoids the difficulties of cross-country studies regarding omitted or poorly measured country-level factors. This study therefore focuses on a single-country, Kenya, using disaggregated sector specific data. The studies specific to Kenya, that is [31] and [32], do not disaggregate public expenditures in terms of public recurrent and investment spending. Instead, they focus on the functional allocation of public expenditure per sector and analyze the growth effect of total sector public expenditure allocation without disaggregating them. Empirical evidence on growth effect of increase in public recurrent costs in Kenya is therefore scarce. This study attempts to fill this research gap by focusing on the public recurrent costs at the sector level. The study also contributes to literature on whether growth in public recurrent costs spending is growth enhancing or growth retarding.

2. METHODOLOGY

This study is anchored on the endogenous growth model developed by Robert Barro in 1990 which is a seminal paper in showing the relationship between fiscal policy and economic growth. The model by [5] consists of a representative, infinite-lived household in a closed economy seeking to maximize the overall utility given by:

$$U = \int_0^{\infty} \frac{c^{1-\sigma} - 1}{1-\sigma} e^{-\rho t} d_t \qquad (1)$$

Where c is consumption per person (population, which corresponds to the number of workers and consumers is assumed to be constant), $\rho > 0$ is constant rate of time preference, $\sigma > 0$ is elasticity which indicate that the marginal utility has constant elasticity $-\sigma$ and t captures the time period. [5] argues that the economy is always at a position of steady – state growth in which consumption per person, capital per worker and output per worker grow at the rate γ given by Equation 2.

$$\gamma = \frac{\dot{c}}{c} = \frac{1}{\sigma} (A - \rho) \qquad (2)$$

Where $A > 0$ is the constant net marginal product of capital and the other variables are as defined before.

[5] incorporates the public sector in the endogenous growth model and argues that public services are provided without user charges, are non-rival and are used as inputs in the household – producer production function. This presents a potentially positive linkage between government spending and economic growth. Since the public services are assumed to be non-rival for the users, it is the total of government purchases, rather than the amount per capita that matters for each individual. The quantity of public services provided to each household-producer (g) is included in the model as a separate argument since it is assumed not to be close substitutes for private inputs (K). The production function is therefore given by:

$$y = \varphi(k, g) = k.\varphi\left(\frac{g}{k}\right) \qquad (3)$$

Where φ satisfies the conditions for positive and diminishing marginal products, k is the representative producer's quantity of capital and g is the quantity of public services provided to each household-producer that can be measured by the per capita quantity of government purchases of goods and services. The production function exhibits constant returns to scale in k and g together but diminishing returns in k separately. [5] normalizes the number of households to unity so that g corresponds to aggregate expenditures and T to aggregate revenues and further assumes that the government expenditure is financed contemporaneously by a flat-rate income tax. [5] notes that in the model the growth-maximizing share of productive government spending is smaller if the government is also using the income tax to finance other types of spending.

Specifically, this study borrows from the empirical works of [19], [21] and [33]. [33] assumes that the economy consists of two sectors, the public sector (G) and the private sector (Pr), whereas output in the two sectors depend on Labour (*L*) and capital (*K*). Output in the private sector also

depends on the externality effect of government output so that the production functions of the sectors are given by:

$$Y_G = f\,(L_G, K_G) \tag{4}$$

$$Y_{Pr} = f\,(L_{Pr}, K_{Pr}, Y_G) \tag{5}$$

Where Y_G is the government output, which is also an input in the private sector production function, Y_{Pr} is the private sector output, and the subscripts denote the respective sector inputs (Labour (*L*) and Capital (*K*)). The total output (*Y*) in the economy is given by the sum of the output of the public and private sector:

$$Y = Y_G + Y_{Pr} \tag{6}$$

[33] also assumes that the factor productivity in the two sectors differ such that

$$\frac{\partial Y_G/\partial L}{\partial Y_{Pr}/\partial L} = \frac{\partial Y_G/\partial K}{\partial Y_{Pr}/\partial K} = (1+\delta) \tag{7}$$

Where δ indicates which sector has higher marginal productivity such that $\delta > 0$ imply that the public sector has a higher input productivity. Upon manipulation of the production functions and using Equation 7, [33] derives the following growth equation:

$$\dot{Y} = \alpha\left(I/Y\right) + \beta\dot{L} + \left[\left(\delta/(1+\delta)\right) - \theta\right]\dot{Y_G}\left(Y_G/Y\right) + \theta\dot{Y_G} \tag{8}$$

Where $\dot{Y}$ is the rate of total output growth, I is investment which is assumed to be equal to ∂K, $\dot{L}$ is the rate of growth in labour force, $\dot{Y_G}$ is the rate of growth of public sector output, α is the marginal product of capital in the private sector, β is the elasticity of private sector output with respect to labour, θ is the elasticity of private sector output with respect to Y_G.

In order to produce public sector output Y_G, [19] who extended the work of [21] specify two types of government spending g_1 and g_2 which can be argued to be public investment spending and spending on public recurrent costs respectively. The model by [5] and [21] assume a balanced budget. However, [19] extend their model by incorporating the public borrowing and interest payment on debt to take the government budget constraint into account more fully. Hence, the government budget constraint is given by:

$$g_1 + g_2 = \tau(y + rb) + \dot{b} - rb \tag{9}$$

Where τ is tax rate (constant over time), b is public borrowing, r is the interest rate on public debt. The right-hand side of Equation 9 presents Net Revenue (NR), that is, total revenue less interest payment on debt. The shares of Net Revenue (NR) that are used to finance government expenditure on the two public goods (g_1 and g_2) are given by:

$$g_1 = \emptyset\,(NR) \text{ and } g_2 = (1-\emptyset)NR \tag{10}$$

Where $0 \leq \emptyset \leq 1$

The representative agent's utility, which is derived from private consumption (c), is isoelastic and is given by Equation 1 whereas the representative agent's budget constrain in the [19] model is given by:

$$\dot{k} + \dot{b} = (1-\tau)(y + rb) - c \tag{11}$$

The representative agent's problem is to choose c, $\dot{k}$ and $\dot{b}$ to maximize utility (U) subject to the budget constrain given by Equation 11, taking τ, g_1 and g_2, and also the initial values of capital and public borrowing (k_0 and b_0) as given.

According to [19], the objective of the government in a decentralized economy is to run the public sector in the nation's interest, taking the private sector's choices as given. The government problem therefore is to choose τ, g_1 and g_2 to maximize the representative agent's utility subject to the government budget constrain, the representative agent's budget constrain and the Euler Equation from the first order condition of representative agent's utility maximization problem. The government takes k_0 and b_0 as given. [19] and [21] consequently specify public investment spending, public recurrent spending, tax rate and technology as the main determinants of economic growth in a CES production function.

In specifying the model, the dependent variable is the growth in sectoral real GDP and government spending enters the sectors production function as inputs and as complements to the private sector investments in the country. Government is assumed to raise

taxes optimally without distortion and then chooses how much to spend on public investment items and public recurrent costs items. In order to avoid perfect collinearity among regressors, the model does not include government revenue and budget balance or public borrowing variables that capture the government budget constrain. Additionally, the public expenditure compositions are not categorized into those that are considered to be productive or unproductive. This is left to come out in the analysis, just like [21] did. Consequently, this study employs the following distributed lag model:

$$\Delta SGDPg_{it} = \sum \beta_j \Delta\left(\frac{G_{rc,it-j}}{SGDP_{it-j}}\right) + \sum \vartheta_n \Delta\left(\frac{G_{de,it-n}}{SGDP_{it-n}}\right) + \sum \varphi_z \Delta\left(\frac{SK_{it-z}}{SGDP_{it-z}}\right) + \sum \omega_r \Delta SLg_{it-r} + \sum \tau_p \Delta\left(\frac{PC_{t-p}}{SGDP_{it-p}}\right) + \rho_i + \sigma_t + \varepsilon_{it} \quad (12)$$

Where: *i* denote the cross-sectional dimensions; *t* denotes time series dimensions (from 2000 to 2015); $\beta_j, \vartheta_n, \tau_p, \omega_r, \varphi_z$ are coefficients; j, n, p, r, z are the lag lengths of the respective independent variables; $SGDP$ is real sectoral GDP; $SGDPg$ is real sectoral GDP growth; G_{rc} is real sectoral public recurrent costs; G_{dev} is real sectoral public development spending; SLg is growth in government labour force in the sector (number of government employees in the sector); SK is real sectoral gross fixed capital formation (which includes private investment); PC is real private final consumption expenditure; ρ_i is time-invariant unobserved sector-specific fixed effect, for instance, differences in the initial level of sectoral GDP growth; σ_t is the unobservable individual-invariant time effects; and ε_{it} is the error terms for sector *i* at time period *t*.

Most of the variables used in the model are expressed in real values to remove the effects of general price level changes over time. The price level used to convert the nominal variables into real values is captured by the average of the quarterly CPIs in the respective fiscal years. The definition and measurement of the dependent and independent variables used in the essay are as explained below.

Real Growth in Sectoral GDP (*SGDPg*) is real growth in Gross Domestic Product for each sector. It is measured by change in a fiscal year's sector GDP divided by the previous (original) value of the sector's GDP. It is the dependent variable in the analysis. Since GDP by activities used to obtain sectoral GDP are reported in calendar years by KNBS whereas the other variables are reported for the fiscal years (July to June), the GDP data is transformed by getting a moving average of the subsequent years. For example, the sectoral GDP for FY 2001/2002 is given by the average of GDP for calendar years 2001 and 2002.

Real Public Recurrent Costs (G_{rc}) captures the aggregate public recurrent costs incurred by the government at sector level in each fiscal year. It includes the costs of compensating public sector employees and all other non-wage recurrent costs incurred by the sectors. The growth effect of the variable remains ambiguous in view of the mixed results from the various studies.

Real Development Expenditure (G_{de}) captures the budgetary costs of government development spending at sector level in each fiscal year. It is expected to have a positive significant growth effect.

Sectoral Gross Fixed Capital Formation (SK) is measured by expenditure on fixed assets by category of item in each fiscal year which is linked to the sectors. Gross fixed capital formation measures the net increase in fixed assets (capital) in an economy. This captures the private sector investments in the sectors as well. The variable is expected to have a positive growth effect.

Growth in Government Labour input (SLg) captures the change in number of government employees per sector in each fiscal year divided by the previous year's (original) number of government employees in the sector. Government labour force is captured by employment stock as at 30th June as reported by the Kenya National Treasury. The data on private sector employees for every sector was not available for the analysis thus the only available data on government employees was employed in the analysis.

Real private final consumption expenditure (PC) was computed by finding the difference between total final consumption expenditure and general government final consumption expenditure in

Kenya. The data on these variables were obtained from the World Bank Economic Indicators' databank. Since the final consumption expenditures are reported in calendar year, the data is transformed by getting a moving average of the subsequent years to obtain fiscal year figures like in the case of the GDP data.

This study makes use of secondary macro panel data for seven sectors in Kenya over a period of 16 years running from fiscal year 1999/2000 to 2014/15. This study period was chosen for ease of collection of the limited disaggregated data for the budgetary votes in the various sectors. More importantly, the study's intention was to focus on most recent data in view of the changes that Kenya has experienced in its governance and public finance management over the recent years. The study makes use of sector level data. For purposes of analytical convenience, the sectors used as units of analysis are Agriculture and Rural Development Sector (ARD); Human Resource Development Sector (HRD); Energy, Infrastructure Development, Information & Communications Technology Sector (EIICT); Environmental Protection & Water Sector (EPW); General Economic and Commercial Affairs Sector (GECA); Social Protection, Culture, Recreation, Other Services, Governance, Justice, Law and Order Sector (SPGJLO) and National Security, Public Administration and International Relations (NSPI) sector (see Appendix Table A1). As mentioned earlier, the study borrows from the categorization of sectors used by Kenya's Office of the Controller of Budgets, with a few modifications for purposes of analytical convenience.

Data on GDP for the sectors was extracted from GDP by activity (see Appendix Table A2) reported in Kenya Economic Surveys [see 34,35,36,37,38,39,40,41,42]. Data on gross fixed capital formation (expenditures on fixed assets by category of item and their expenditure shares at current prices) in the various sectors was also extracted from the Kenya Economic Surveys. The data on disaggregated public recurrent costs, development expenditures and number of employees in the sectors was extracted from Kenya National Treasury's reports on Annual Estimates for Recurrent Expenditures and Development Expenditures (approved gross estimates for the various budgetary votes; Ministries, State Departments, State Corporations and Commissions) and Supplementary Budget Estimates [see 43,44,45,46,47,48,49,50,51,52,53,54,55,56,57, 58,59]. These were categorized into the respective sectors and aggregated to come up with sector level data used in the analysis. The values of the types of assets were categorized into the respective sectors. Data on total final consumption expenditure and general government final consumption expenditure used to compute general private final consumption in Kenya were obtained from the World Bank Economic Indicators' databank [60].

3. RESULTS AND DISCUSSION

The summary statistics for variables employed in the analysis are presented in Table 1. The macro panel consists of seven sectors (n) which were observed at 16 different periods (T). Thus on average, there are 112 total observations (N) for every variable.

Table 1. Descriptive statistics

Variable	Mean	Std. dev	Min	Max	Observations
ID	4	2.0090	1	7	N = 112
Year	2007.5	4.6305	2000	2015	N = 112
SGDPg	0.0446	0.1104	-0.5470	0.4373	N = 112
$Grc/_{SGDP}$	0.33462	0.3630	0.0067	1.2014	N = 112
$Gde/_{SGDP}$	0.1144	0.1018	0.0103	0.58102	N = 112
$SK/_{SGDP}$	0.1196	0.2193	0	0.7436	N = 112
SLg	0.0587	0.6078	-0.9133	5.5382	N = 112
$PC/_{SGDP}$	14.02309	12.6136	2.7951	47.1582	N = 112

Note: SGDPg is real Sectoral GDP growth, SGDP is real Sectoral GDP, G_{rec} is real Sectoral Public Recurrent Costs, G_{dev} is real Sectoral Development Expenditure, SK is real Gross Fixed Capital Formation at sector level, SLg is growth in number of government employees in each sector, PC is real final private consumption
Source: Author (2017)

The cross-sectional units are identified by the variable 'ID' while the time dimension is set by the variable 'Year'. The Min and Max columns present the minimum and maximum values of each variable. The explanatory variables are expressed as a share of sectoral GDP except SLg that captures the growth in government employees in the sectors.

3.1 Diagnostic Tests

The diagnostic tests carried out in the analysis include test for panel unit roots, panel level heteroscedasticity, autocorrelation and contemporaneous correlation. To test for panel unit roots, Levin, Lin and Chu (LLC) test [61], Im, Pesaran and Shin (IPS) test [62], and Augmented Dickey Fuller (ADF) Fisher unit root test [63] were employed. The null hypothesis for Levin-Lin-Chu unit-root test is that panels contain unit roots with the alternative that panels are stationary. For Im-Pesaran-Shin unit-root test, the null hypothesis is that all panels contain unit roots with the alternative that some panels are stationary. The null hypothesis for Augmented Dickey-Fuller Fisher-type unit-root test is that all panels contain unit roots with the alternative hypothesis that at least one panel is stationary. The results from the panel unit root tests (see Appendix Table A3) show that ***SGDPg***, $\boldsymbol{Gde}/_{\boldsymbol{SGDP}}$ and $\boldsymbol{PC}/_{\boldsymbol{SGDP}}$ are integrated of order zero whereas $\boldsymbol{Grc}/_{\boldsymbol{SGDP}}$, $\boldsymbol{SK}/_{\boldsymbol{SGDP}}$ and **SLg** are integrated of order one. All I (0) variables are also stationary at their first difference level.

Panel level heteroscedasticity was tested using the Likelihood-ratio (LR) test and modified Wald test with the null hypothesis that there is homoscedasticity (constant variance) in the panels. Additionally, test for panel level autocorrelation was done using Wooldridge test whereas the test for contemporaneous correlation was done using Pesaran's test of cross sectional independence [64]. The null hypothesis for autocorrelation test is that there is no serial correlation in the panels. On the other hand, the null hypothesis for contemporaneous correlation test is that the residuals are not correlated across entities (no cross-sectional dependence in the dataset). Table 2 presents the results for the heteroscedasticity, autocorrelation and contemporaneous correlation tests.

The results show that there is panel level heteroscedasticity in the model. This is controlled for by using robust standard errors during the analysis. Additionally, the results show that there is no first order autocorrelation. However, there is cross-sectional dependence in the model. This is expected in view of the fact that the data used in the analysis is a sectoral macro panel country specific data. Thus, there is likely to be a lot of commonalities across the sectors that form the respective panels, possibly due to unobserved factors common to all sectors.

3.2 Panel Cointegration Test

Before testing for cointegration, selection of the optimal lags was carried out for each cross sectional unit (sector) using Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quin Information Criterion (HQIC). The results show that the three criteria suggest a maximum lag of 1 for ARD, HRD and GECA sectors/panels and a maximum lag of 4 for EPW, SCGJLO and NSPI sectors/panels. However, in the EIICT sector/panel the criteria suggest a maximum lag of 2. In view of these results, the analysis adopted a maximum lag of 4.

Table 2. Diagnostic tests

Panel Level Heteroscedasticity Test		
Likelihood-Ratio (LR) Test	**Modified Wald Test**	**Conclusion**
LR chi2(6) = 22.39**	Chi2(7) = 109.34***	Heteroscedasticity present
Test for Autocorrelation		
Wooldridge Test	F (1, 6) = 3.413	No first order autocorrelation
Test for Contemporaneous Correlation		
Pesaran's CD Test	Pesaran's Test statistic = 6.129***	Cross-sectional dependence present

Note: (*), (**) and (***) imply statistical significance at 10%, 5% and 1% respectively
Source: Author (2017)

The main tests for panel cointegration are the Pedroni's panel cointegration test and Westerlund four panel cointegration test. Pedroni's panel cointegration test computes seven test statistics with null hypothesis of no cointegration in a heterogeneous panel with one or more non-stationary regressors [65]. Though the Pedroni tests allow for multiple regressors, they are based on the residuals obtained from a static relationship, which are less powerful compared to those based on a dynamic model [66]. Additionally, Pedroni's seven panel cointegration tests assumes cross-sectional independence that is not the case for the model in this study.

This study therefore makes use of Westerlund cointegration test, based on structural rather than residual dynamics, which imposes no common-factor restriction [67]. The null hypothesis is that there is no cointegration (inferring whether the error-correction term in a conditional panel error-correction model is equal to zero). Westerlund cointegration test has four tests, Ga and Gt test statistics which are based on 'group mean' and Pa and Pt test statistics which are based on pooled information over all cross-sectional units [67]. If Ga and Gt test statistics are found to be statistically significant, then this implies that there is cointegration in at least one of the cross-sectional units. On the other, if Pa and Pt test statistics are found to be statistically significant, then there is cointegration in the panel as a whole. [67] indicate that the four tests accommodate unit-specific trend, short-run dynamics, slope parameters, and cross-sectional dependence. They are also normally distributed.

In the Westerlund cointegration tests, stationary variables do not play a role since they do not include the same stochastic trend as the I(1) variables. However, we include the dependent variable at its first difference level and independent variables that were found to be integrated of order one, I(1). In view of the short time series dimension and few cross-sectional units, the results for panel cointegration tests are sensitive to choice parameters like lags, lead length and kernel width [67]. Westerlund cointegration tests results are presented in Table 3, beginning with the one where all the variables are included, followed by test between dependent variable and each of the I(1) explanatory variables.

Westerlund ECM panel cointegration test results present both group mean and panel statistics. At 5% level of significance, test statistics for group and panel statistics show inconclusive results for the first two combinations of variables. However, in the last three combinations where the dependent variable is included in the test with each of the variables, panel cointegration is confirmed. This implies that there is a long run relationship in the model. This calls for panel ECM to be employed in the analysis.

Table 3. Westerlund ECM panel cointegration test

	Group mean statistics		**Panel statistics**		
	Test Statistics (Z-value)		***Test Statistics (Z-value)***		
Variables	***Gt***	***Ga***	***Pt***	***Pa***	**Conclusion**
$SGDPg$, $^{G_{rc}}/_{SGDP}$ and $^{SK}/_{SGDP}$ (Lag = 2)	-6.960***	2.634	-5.155***	-1.157	Inconclusive
$SGDPg$, $^{G_{rc}}/_{SGDP}$ and SLg (Lag =1)	-1.753**	2.294	-2.737***	-0.297	Inconclusive
$SGDPg$ and $^{G_{rc}}/_{SGDP}$ (Lag = 3)	-2.438***	-0.088	-3.049***	-3.273***	Panel cointegration confirmed
$SGDPg$ and $^{SK}/_{SGDP}$ (Lag = 3)	-5.190***	-2.559***	-5.665***	-8.020***	Panel cointegration confirmed
$SGDPg$ and SLg (Lag = 2)	-37.253***	-0.740	-5.338***	-5.817***	Panel cointegration confirmed

Ho: No panel cointegration. Levels of significance for the test = (*), (**) and (***) imply statistical significance at 10%, 5% and 1% respectively
Source: Author (2017)

3.3 Selection of the Regression Model

As indicated earlier, this analysis uses short panels with time series dimension (T) greater than cross-sectional units (N). Therefore, difference or system GMM methods - which require 'small T, large N' panels, heteroscedasticity and autocorrelation within individual units but not across them - could not be applied in the analysis. The difference or system GMM estimators assume that the only available instruments are 'internal' based on the lags of the instrumented variables but also allow for inclusion of external instruments [68; 69]. Thus, to determine the appropriate regression model to use, the analysis relied on panel cointegration test, random effects tests and Hausman test. Null hypothesis for the random effects test is that there is no significant panel effect - no difference across the cross-sectional units [70]. For Hausman test, the null hypothesis is that random effects model is preferred (more consistent and efficient) than fixed effects model. In view of heteroscedasticity and possible contemporaneous correlation, Hausman test that is heteroscedasticity consistent and robust to general forms of spatial and temporal dependence is performed using *xtscc* program. The Hausman test result does not reject the null hypothesis thus the conclusion that the random effects model is more preferred than the fixed effects regression model. The results for random effects test also show that there is no significant panel effect in the datasets implying that random effects model is not appropriate in analyzing the datasets as compared to Pooled OLS regression method. These results, the presence of panel cointegration in addition to the fact that the variables included in the model are integrated of different orders imply that the most appropriate regression model for this analysis is a panel ARDL (Autoregresessive Distributed Lag) model.

In Panel ARDL approach, the variables integrated of order two are excluded from the estimation [71]. In this approach we have Pooled Mean Group (PMG) estimator, Mean Group (MG) estimator and Dynamic Fixed Effects (DFE) estimator. The DFE estimator imposes restrictions on the slope coefficients and error variances to be equal across all cross sectional units and is subject to simultaneous equation bias due to endogeneity between the error term and lagged dependent variable in case of small samples [72]. On the other hand, the MG estimator introduced by Pesaran and Smith [73] does not impose any restrictions but is inconsistent if the data does not have sufficiently large time series dimensions and as large as 20 cross sectional units. The PMG estimator allows short run parameters, intercept terms and error variance to vary across groups just like in the MG estimator but restrains the long run coefficient to be equivalent [74]. The PMG model estimates nonstationary dynamic panels and is suitable when there is reason to expect that long-run equilibrium relationship between variables is similar across all or some of the cross sectional units [74]. Therefore, the PMG estimator is used to estimate the model. The post estimations tests presented in the next section are used to ensure that the established model is consistent and efficient in explaining the relationship between the dependent and the independent variables.

3.4 Test for Consistency and Efficiency of the Empirical Model

The consistency and efficiency of the PMG estimator requires the coefficient of the ECT (error correction term) in the long-run relationship to be significant, negative and not lower than -2, and the residuals of the Error Correction model to be serially independent [74]. The test carried out are Jarque-Bera normality test, test for autocorrelation, and Hausman test for long-run elasticity and homogeneity of the PMG model. The null hypothesis for the Jarque-Bera test states that the 'residuals are normally distributed' whereas that for autocorrelation test is that there is 'no first order autocorrelation' in the model. The Hausman-type test seeks to test the null hypothesis that the PMG estimator is more efficient than the MG estimator (that is, there is homogeneity of the long-run parameters). The results for the post estimation tests are presented in Table 4.

At 5% level of significance, the results show that the residuals are normally distributed and serially independent. The Hausman-type test also shows that the PMG estimator is more efficient in estimating the model than the MG model. The results for the Hausman-type test confirm homogeneity of the long-run parameters meaning that the long-run elasticity is equal across all the panels as stipulated by the PMG model. These results affirm that the estimated model is stable, consistent and efficient in explaining the relationship between sectoral GDP growth and the explanatory variables included in the model.

Table 4. Post-estimation tests

Test	Test Statistic	P-value	Conclusion
Jarque-Bera test	Adj chi2(2) = 5.22	0.0737	Residuals normally distributed
Wooldridge Test for Autocorrelation	F(1,6) = 3.285	0.1199	The residuals are serially independent
Hausman-type test	chi2(5) = 0.14	0.9996	PMG estimator is more efficient (there is homogeneity of the long-run parameters)

Source: Author (2017)

Pairwise Granger causality test was used to determine the direction of causality between sectoral GDP growth and the respective explanatory variables. In view of the fact that for panel models, a variable may Granger cause another in one panel and not the other, the Granger causality test was done on each of the panels separately. The results showed that public recurrent costs as a share of sectoral GDP granger causes sectoral GDP growth in the NSPI (National Security, Public Administration and International relations) sector whereas government development expenditure as a share of sectoral GDP granger causes sectoral GDP growth in ARD (Agriculture and Rural Development) and EPW (Environmental Protection & Water) sectors. Additionally, the results show that growth in government employees in the sectors granger causes sectoral GDP growth in HRD (Human Resource Development) and EPW (Environmental Protection & Water) sectors. The causalities are unidirectional thus there are no concerns for endogeneity problem in the model. The short-run and long-run empirical results from the PMG estimation are presented in Table 5.

After adjustments, the number of observations used in the analysis was 77. Since the PMG estimator does not give the F-statistic and the R-squared figure, the statistics are obtained from a modification of the Driscoll and Kraay's original covariance matrix estimator [75] that controls for heteroscedasticity, autocorrelation and the general forms of cross-sectional dependence [76]. In contrast to Driscoll and Kraay's original covariance matrix estimator that is used with balanced panels only, the *xtscc* program by Hoechle works with both balanced and unbalanced panels [76]. The F-statistic was found to be significant, an indication that the variables included in the model are jointly significant in explaining the sample variations in sectoral GDP growth. The R-squared indicates that the variables included in the model explain 26.31 percent of the variations in sectoral GDP growth. The regression results show that the error correction term (ECT) is negative and significant at 1% level of significance. This implies that in the model, the system adjusts towards long run equilibrium at a speed of 80.82 percent.

Table 5. Pooled mean group (PMG) estimation results

Short Run Results	
Dependent Variable: $\Delta SGDP_{g,it}$	
Regressors	
$\Delta\left(\frac{G_{rc,it-1}}{SGDP_{it-1}}\right)$	-2.7771 (3.9225)
$\Delta\left(\frac{G_{de,it}}{SGDP_{it}}\right)$	9.1389 (8.9447)
$\Delta\left(\frac{SK_{i\,t-1}}{SGDP_{it-1}}\right)$	0.2194 (1.0023)
ΔSLg_{it}	-0.5454** (0.2174)
$\Delta\left(\frac{PC_{it-2}}{SGDP_{it-2}}\right)$	-0.0138 (0.0527)
Constant	0.0462 (0.1635)
ECT	-0.8082*** (0.3133)
Long Run Results	
$\frac{G_{rc,it-1}}{SGDP_{it-1}}$	-1.1295*** (0.1599)
$\frac{G_{de,it}}{SGDP_{it}}$	0.4529** (0.2121)
$\frac{SK_{i\,t-1}}{SGDP_{it-1}}$	0.3243***(0.0737)
SLg_{it}	1.4157***(0.3741)
$\frac{PC_{it-2}}{SGDP_{it-2}}$	-0.0089** (0.0045)
Number of observations	77
F - Statistic	17.39**
Within R-squared	0.2631

*Note: Level of significance are denoted by * p=0.1, ** p=.05, and *** p=.01. The numbers in parentheses are the standard errors.*

Most of the variables included in the model are in ratios. Therefore, a unit change in such variables is interpreted as a 100% change in their share in sectoral GDP. The empirical results found out

that an increase in the share of public recurrent costs in sectoral GDP has an insignificant negative effect on sectoral GDP growth in the short run but a significant negative effect in the long run. Specifically, the long run results show that at 1% level of significance, a unit (100%) increase in share of public recurrent cost in sectoral GDP would lead to a decline in sectoral GDP growth by 1.1295 units (112.95%) with a lag of 1 year. These results are evidence that the persistent rise in the various components of public recurrent costs is detrimental to growth in sectoral GDP. The result supports the findings of [4,5,25,26,27,28,29] and [30] who found out that there exists a negative relationship between rise in public recurrent spending and economic growth. However, this does not support the findings of [19,20,21,22] and [23] who found a positive effect for public recurrent spending.

An increase in share of sectoral development expenditure was found to have a positive but insignificant effect in the short run but a significant positive effect on economic growth in the long run. The long run results show that at 5% level of significance, a unit (100%) increase in share of sectoral development spending in sectoral GDP would lead to a 0.4529 units (45.29%) increase in sectoral GDP growth with no lag. The results on public development spending support the arguments by [4,5,16,17], and [26] that it is the public investment spending rather than public recurrent spending that has a positive effect on economic growth. On the other hand, the results do not support the findings by [19,21] and [22] that public development spending has negative growth effects.

The results also show that the share of sectoral gross fixed capital formation in sectoral GDP has an insignificant positive effect in the short run but a significant positive effect on sectoral economic growth in the long run. The long run results show that at 1% significance level, a unit increase in share of sectoral gross fixed capital formation in sectoral GDP would lead to a 0.3243 units increase in sectoral GDP growth with one-year lag. This is in line with the results from several studies such as [5,16,17,19,21].

A surprise finding from one of the control variables is that growth in government labour force in the sectors has a significant negative effect in the short run but a positive significant effect in the long run. The short run results show that at 5% level of significance, a unit increase in growth of government employees in the sectors would lead to a 0.5454 units decline in sectoral GDP growth. However, the long run results show that at 1% level of significance, a unit increase in growth in government employees would lead to a 1.4157 units increase in sectoral GDP growth. These results point out that growth in government employees may lead to more resources being committed to compensation of employees thus suppressing economic growth in the short run. However, the resulting increase in employment in the economy would have a positive effect in the long run as the government employees among other citizens continue to spend and invest in the domestic economy.

The second surprise finding from the analysis was the significant negative growth effect of the share of private consumption in sectoral GDP in the long run. The short run results show an insignificant negative effect. However, the long run results show that at 5% significance level, a unit increase in share of private consumption in sectoral GDP would lead to a 0.0089 units decline in sectoral GDP growth with a lag of two years. Though this decline in sectoral growth is marginal, it brings to question the composition of private consumption in the country. It is a pointer to the fact that a greater proportion of private consumption could be from imports which is a leakage from the domestic economy.

4. CONCLUSION

This study concludes that the persistent rise in sectoral public recurrent costs is actually growth retarding whereas sectoral development spending is statistically significant in explaining sectoral economic growth in the long run. The result supports the findings of [4,5,25,26,27,28,29] and [30] who found out that there exists a negative relationship between rise in public recurrent spending and economic growth. On the other hand, the results on sectoral development spending supports the findings by [4,5,16,17,26] that it is the public investment spending rather than public recurrent spending that has a positive effect on economic growth.

The study makes the following policy recommendations. First, from the initial analysis of the components of public recurrent costs, the study showed that non-wage recurrent costs forms a higher proportion of the public recurrent costs in the sectors relative to compensation of government employees in the sectors. The trend analysis in most of the sectors also showed that

the proportion of resources committed to compensation of government employees and that committed to non-wage recurrent costs move in opposite directions in most of the sectors. This implies that when the government focuses on reducing public wage bill, the non-wage recurrent costs are always on the rise thus neutralizing or overriding the effect. The net effect is no reduction or a rise in aggregate public recurrent costs in the sectors. Therefore, the government needs to focus on both components of public recurrent costs when carrying out austerity measures. More specifically, more focus need to be placed on the non-wage recurrent cost in view of their relatively high discretionary nature as compared to compensation of employees' component.

Second, the study shows that growth in government labour force in the sectors has a significant negative effect on growth in the short run but a significant positive growth effect in the long run. This shows that while committing more government resources towards employment of more public servants may suppress economic growth in the short run, the long run effect is enhanced economic growth that could be because of increased aggregate employment and investment in the domestic economy.

Third, the finding that the share of private consumption in sectoral GDP is growth retarding in the long run calls for further investigation since this was expected to be positive. Though the effect is marginal, this result brings to question the composition of private consumption in the country. It is a pointer to the fact that a greater proportion of private consumption could be from imports which is a leakage from the domestic economy. This trend should be checked since it could be having other macroeconomic effects on stability of the Kenyan Shilling in the international market and the reduction in the foreign reserves held at the Central Bank of Kenya. There is need to encourage local production of the consumer items which form significant proportions of the private consumption expenditure.

5. AREAS FOR FURTHER RESEARCH

The study faced a limitation in the unavailability of audited sector level expenditure data for the whole study period. Therefore, the study utilized approved public expenditure data for the various government Ministries Department and Agencies (MDA) budget votes that were extracted from the Kenya National Treasury's Approved Budget Estimates Reports and Supplementary Budget Reports. There were also challenges in obtaining consistent and complete disaggregated data on the approved gross estimates for the various MDA budget votes to enable a time series analysis. In view of this, the study employed a macro-panel data analysis for the period 1999/2000 to 2014/2015 using disaggregated data of public recurrent costs and development expenditures (public investment spending). Therefore, a similar analysis using government audited disaggregated data for the various public expenditure components at sector level, when available, is recommended. Analysis using a further decomposition of the public recurrent costs into components such as operations and maintenance costs, expenditure on goods and services, public transfers, and interest payments on government debt is encouraged to determine the magnitude and effects of these components on economic growth.

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NOTE

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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APPENDIX

Table A1. Categorization of the MDA Budget Votes for Sectoral Expenditures

1. Agriculture and Rural Development (ARD) Sector
Ministry of Agriculture; and Ministry of Livestock & Fisheries Development
2. Human Resource Development (HRD) Sector
Ministry of Education, Science & Technology; Ministry of Health; Ministry of Labour; Teachers Service Commission; and Ministry of Public Health and Sanitation
3. Energy, Infrastructure Development, Information & Communications Technology (EIICT) Sector
Ministry of Roads & Public Works; Ministry of Transport; Ministry of Energy; Ministry of Local Government & Nairobi Metropolitan Development; Ministry of Lands & Housing; Ministry of Information & Communication; and National Land Commission
4. Environmental Protection & Water (EPW) Sector
Ministry of Water & Irrigation; Ministry of Environment, Mineral Resources & Forestry & Wildlife; Ministry of Mining; and Ministry of Forestry and Wildlife
5. General Economic and Commercial Affairs (GECA) Sector
Ministry of Trade & Industrialization; Ministry of Regional Development Authorities; Ministry of Tourism; Ministry of Co-Operative Development & Marketing; Ministry of Planning, National Development $ Vision 2030; Ministry of Finance; Commission of Revenue Allocation; Auditor General / Kenya National Audit Office; and Office of the Controller of Budget
6. Social Protection, Culture, Recreation, Other Services, Governance, Justice, Law and Order (SPGJLO) Sector
Ministry of Justice, National Cohesion and Constitutional Affairs; State Law Office; Judicial Department; Ministry of Home Affairs; Ministry of State for Immigration & Registration of Persons; Ministry of Gender, Children & Social Development; Ministry of State for National Heritage & Culture; Ministry of Youth Affairs & Sports; Ministry of State for Special Programmes and Development of Northern Kenya & Other Arid Lands; Parliamentary Service Commission; Kenya Anti-Corruption Commission/Ethics And Anti-Corruption Commission; National Gender & Equality Commission; Electoral Commission of Kenya / Independent Elections and Boundaries Commission; Directorate of Public Prosecutions; Commission for the Implementation of the Constitution; Registrar of Political Parties; Commission on Administrative Justice; Witness Protection Agency; Kenya National Human Rights and Equality Commission; and Commission on Administrative Justice
7. National Security, Public Administration and International Relations (NSPI) sector
State House; Cabinet Office; Ministry of State for Public Service; Public Service Commission; Ministry of Foreign Affairs; Ministry of East Africa Community (EAC); Ministry of State for Provincial Administration & Internal Security; Ministry of State for Defense and National Intelligence Service; Ministry of State for Immigration and Registration of persons; Salaries and Remuneration Commission; Office of the Prime Minister; National Police Service Commission; and Independent Police Oversight Authority (IPOA)

Table A2. Categorization of the Economic Activities for Sectoral GDPs

1. *Agriculture and Rural Development Sector*
Agriculture and Fishing
2. *Human Resource Development Sector*
Education; Human Health and Social Work Activities
3. *Energy, Infrastructure Development, Information & Communications Technology (EIICT) Sector*
Electricity Supply; Construction; Transport and Storage; Real Estate; Information and Communication; and Post and telecommunications
4. Environmental Protection & Water (EPW) Sector
Water Supply, Sewerage & Waste Management; Forestry & logging; and Mining and Quarrying
5. General Economic and Commercial Affairs (GECA) Sector
Manufacturing; Wholesale and Retail trade & repairs; Accommodation and Food service activities; and Financial and Insurance activities
6. Social Protection, Culture, Recreation, Other Services, Governance, Justice, Law and Order (SPGJLO) Sector
Arts, Entertainment and Recreation; Other community, social and personal services; Activities of Households as Employers; Other Service Activities; and Professional, Scientific and Technical activities
7. National Security, Public Administration and International Relations (NSPI) sector
Public Administration and Defense; and Administrative and Support Service Activities

Table A3. Panel Unit Root Tests

Variable (Specification)	Test in…	LLC Test	IPS Test	Fisher -ADF Test	Conclusion
		Adjusted t-statistic	***W-t-bar Statistic***	***Inverse chi-squared(14) Statistic***	
$SGDPg$ (Trend & Lag length =1)	Levels	-7.2061***	-4.3358***	60.5372***	$SGDPg$ *is I(0)*
	1st Difference	-8.6226***	-6.0578***	88.7802***	
$G_{rc}/_{SGDP}$ (Lag length =1)	Levels	0.4446	1.1465	5.9791	$G_{rc}/_{SGDP}$ *is I(1)*
	1st Difference	-2.7447***	-2.1571**	28.0916**	
$G_{de}/_{SGDP}$ (Trend & Lag length =1)	Levels	-10.2004***	-2.3383 **	50.2594***	$G_{de}/_{SGDP}$ *is I(0)*
	1st Difference	-3.4505***	-2.7242**	37.8955***	
$SK/_{SGDP}$ (Lag length =3)	Levels	-1.6415*	*Insufficient number of time periods*	19.7602	$SK/_{SGDP}$ *is I(1)*
	1st Difference	-4.3268***		44.8262***	
SLg (Trend & Lag length =1)	Levels	-0.4622	-0.9663	34.4095***	SLg *is I(1)*
	1st Difference	-4.3580***	-3.5469***	73.3203***	
$PC/_{SGDP}$ (Lag length =1)	Levels	-3.6890***	-1.7017**	26.0982**	$PC/_{SGDP}$ *is I(0)*
	1st Difference	-2.8603***	-3.3968***	42.3708***	

***Note*: *LLC* = Levin, Lin and Chu test; *IPS* =Im, Pesaran and Shin test; *ADF* = Augmented Dickey Fuller - Fisher unit root; The values in the table are the Test Statistics; (*), (**) and (***) = the series is stationary at 10%, 5% and 1% respectively; The null hypothesis is that there is panel level unit roots (Non-Stationarity)**

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