Effect of Public Sector Growth on Private Investment in Kenya

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Abstract: *This study sought to investigate public sector growth and its effect on private investment in Kenya. Kenya has experienced exponential growth in public sector. However private investment has been on the decline over years, and there continues to be concern about the private investment performance in the country. Specifically, the response of private sector investment has been considerably less than anticipated. The growth in public sector could be crowding out the private investment. The study used a correlational research design to explain the relationship between public sector growth and its influence on private investment in the country. The investigation considered Kenya's annual public sector growth and annual private investment data available as provided by the economic surveys, World Bank development indicator and the Government of Kenya public expenditure review reports (2000 to 2019). Secondary data was used. The objective was responded to by use of Vector Error Correction Modelling. The study found that public sector growth aspects had a significant impact on private investment in Kenya. The study recommends feasible measures be taken to limit the disadvantages on private investors. The balance budget policy should be considered as part of development policy.*
Keywords: *Public sector, public sector growth, private investment, annual data, Kenya.*

I.   Introduction

In some countries, public sector growth has been a significant area of concern. Wang (2005) postulates that the private investment importance in the public sector in ideas of "filling in" or "pump priming" do basically react to the longings of the community. However, in different circumstances, this investment is provoked by the way that profit-based organizations/ventures are reluctant to attempt the socially striking investments. Typically, the investments by the public sectors are pointed toward lessening the cost of the products and administrations being referred to, or potentially standardizing such costs as well as improving the services (Mihaiu, Opreana & Cristescu, 2010). Investment is one of the essential components or requirements of public sector growth but investment growth in Africa has been declining steadily from about 26.5% in 1980 to about 22% in the 1990s, and 3.9% in 2020 (Adeosun, Orisadare, Fagbemi & Adedokun, 2020). Studies have identified low investment rate as one of the major factors constraining economic performance in the African continent (Okech, Mweni & Njuguna, 2016; Adeosun *et al.*, 2020).

The large sizes of the government expenditures in the public sector in Africa show a progressively major responsibility of the public sector (Ndou, 2004). This probably reflects the heavy outlay in the early stages of development on construction of physical capital over elementary substructure that is necessary to increase the development course. For instance, Mauritius registers a fairly modest size at 9.1% and 11.1%, with an equally modest, but rising growth at 0.3% and 0.9% respectively (Gor, 2012). However, large growths in public sector have been seen in countries such as Niger, Namibia, Rwanda, Nigeria, Benin, Angola, Burkina Faso and Botswana among others. Public sector growth in these countries therefore provides opportunities for private investors to take part in the growth process.

Private investment, on the other hand, comprises expenditures aimed at expanding the fixed assets of the economy as well as positive adjustments in the level of inventories and includes acquisitions of valuables (Dreger & Reimers, 2016). Agenor and Moreno-Dodson (2006) identify twofold main networks over which government regime activity may affect public sector growth, and in indeed, private investment. Efficient and stable private investment activities present various opportunities to developing countries, including Kenya (Musyoka, 2017). In fact, private investment is associated with both economic and social rewards. That is, private investment not only plays an important role in job and income creation, but also has a role to play in the provision of both infrastructure and social services. Moreover, enabling the people to benefit from productivity

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advances and better service options provided by the private sector is at the core of the development challenge (Ghartey, 2012). Therefore, the development of a strong and dynamic private sector is also a necessary condition for sustained poverty reduction.

Firstly, expenditure by government, especially investment, can give products which come into unswervingly into private subdivision business, including education and infrastructural development. In this way, public expenditure, through investment, therefore contributes to capital accumulation in a country. This is critical in filling the gaps that are absent in a marketplace economic perspective, including community services and healthcare among others. In addition, expenditure by the government may likewise circuitously affect the effectiveness of private subdivision provision of products, for instance, guaranteeing possessions privileges and implementation of agreements, heavy taxation and high cost of capital, thereby affecting private investment.

Kenya, since independence in 1963, has continued to advocate for private sector led growth and development due to its substantial contribution to GDP through employment creation and poverty reduction (UNCTAD, 2012). The Economic Recovery Strategy (ERS) for employment creation, national development blueprints, and the Kenya vision 2030, all have considered private sector as the fulcrum to the renewed growth initiatives in Kenya. Specifically, the goal in Kenya vision 2030 is to increase private investment to at least 22 percent of the GDP per annum by 2020 and thereafter keep the growth at 24 per cent up to 2030. Kenya government has since taken deliberate efforts to influence private sector investment such as the enactment of the Public Private Partnership (PPP) Act, 2013 and the private sector development strategy of 2004. However, the influence on economic development from investments by the country's private subdivision has been dwindling especially from 2014/2015 financial year as shown in Figure 1.
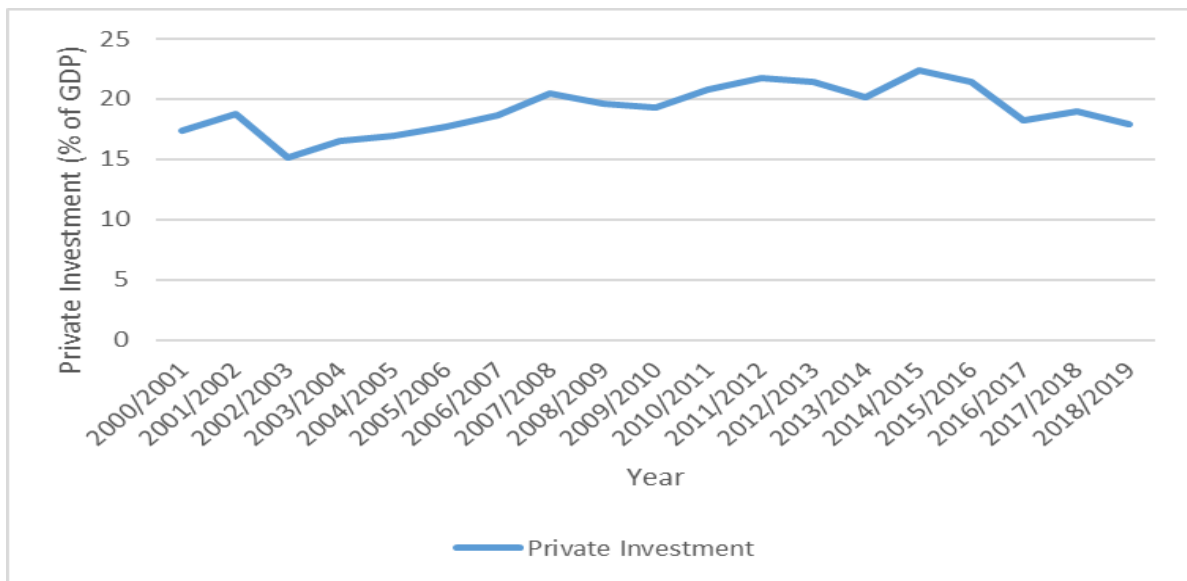

Figure 1: Private Investment in Kenya

Source: World Bank (2019)

Figure 1 shows that private sector investment has been lower than 25% of GDP from the financial year 2000/01 to 2018/19. In Kenya, private investment has been considerably less than anticipated (Njuru et al., 2014). This can be seen by the fact that private investment has been fluctuating, improving from the year 2012 and then reducing between 2013 and 2014, before again increasing in 2015, and then dropping in 2016 through 2018.

With the private investment growth in Kenya lower than 25%, this has always been an issue of concern in the country. The economy cannot grow while the level of investment is very low (Mukui, Awiti & Onjala, 2019). With continuous increases and decreases in private investment, overall, the private sector growth in Kenya has not been satisfactory (Njuru et al., 2014). Private investment as a percentage of GDP stood at 17.1% in 2000 declining slightly in 2002. In 2007, it again went to a high of 20.6% and then reduced over the following years. There was a decline between 2008 and 2009. It then increased to 21.7% in 2011, and then dropping to 20.11% in 2013. There was an overall reduction from 2013 and 2014, and then an increase in 2015, followed by overall decreases through the year 2018.

There have been attempts by the government to boost private investment over time, by trying to respond to changing world business conditions and encouraging private investment. This has been shown

through reforming and privatising the public sector, removing price distortions, liberalising foreign trade and payments, opening the markets up to foreign direct investment and strengthening the capacity of the financial system to mobilise domestic savings and allocate financial resources, factors which have all contributed to increasing the share of private investment. (Njuru et al., 2014). The general decline of private investment in many developing countries, including Kenya, can be attributed to the fiscal stress that accompanies debt problems and restructuring, as postulated by Bonizzi, Laskaridis and Griffiths (2020).

As the public sector expenditure in Kenya continue to rise, mainly supported through borrowing, there is growth in interest rates, increase in political competition, rise in instability and dependence in the country. This may be impacting on private investment in the economy. In terms of economic performance, improved private investment can play a vital role in ensuring long-term growth and sustainability. However, the public sector growth is not commensurate to the growth of the economy. This begs the question of the drivers of the public sector growth. In addition, as the public sector is growing, there is decline in private investment growth in Kenya. There is, therefore, a concern about the private investment performance in the country. There is a likelihood that the noted public sector growth in Kenya is crowding-out private investment. The impact of this growth on private investment through interest rates and other variables has not been quantified. Although Kenya has adopted comprehensive stabilization and structural economic reform programmes aimed at increasing proportion of private investment to GDP, there continues to be concern about the private investment performance in the country. Indeed, as a ratio to GDP, private investment during the recent years has been lower than during the 1970s. Public sector growth in Kenya has however been experiencing upward trajectory. There is a need therefore to look at the association between public sector growth and private investment behaviour through time.

II. Purpose of the Study

The purpose of this study was to find out the effect of public sector growth on private investment in Kenya.

III. Theoretical Framework

The concepts of investment go back to Keynes' (1936) theory, who originally showed the occurrence of an unrestricted/autonomous investment work in the economic arena. Keynes (1936) considered the presence of an autonomous investment work in the economy and saw that notwithstanding the way that hold assets and investment ought to be unclear ex-post, reserve assets and investment decisions are, all things considered, done by different directors and there is no inspiration driving why ex- ante investment funds should approach ex-ante investment. Afterward, Keynes built up the Marginal Efficiency of Investment (MEI) model as a proportion of business interest for investment choice, as shown in Figure 2.
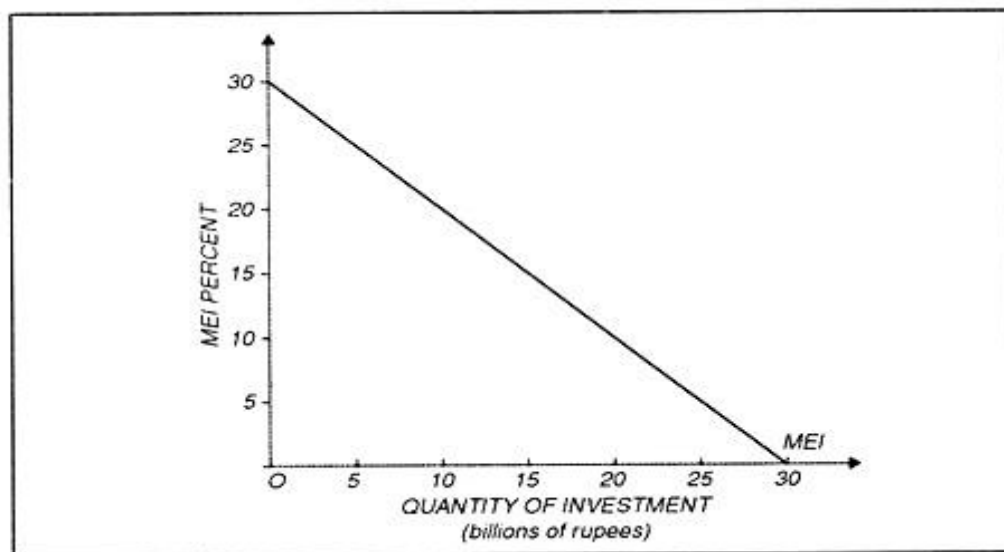

Figure 2: Marginal Efficiency of Investment

Source: Keynes (1936)

Figure 2 shows the MEI curve that indicates the total amount of private sector investment which will be made at various rates. The MEI curve in this chart is the economy's aggregate demand curve for private-sector investment. To Keynes (1936), investment by a firm would happen when the MEI on an extra investment

surpasses the cost of assets that is brought about in settling on investment choices. MEI could hence be characterized as the rate which affects the current estimation of investment.

This proposes that the sophisticated the market rate of revenue, the inferior the investment and the other way around. Nonetheless, this investigation expects assets sources to have a similar opportunity cost. For instance, a firm utilizing held income to finance its exercises can't be contrasted to another firm acquiring from the financial structure. The model additionally doesn't recognize replacement investment and net investment (Durand, 1959). This theory subsequently covers the private investment choices. The current study used the theory in developing its theoretical model on private investment.

Moving on from the Keynesian theory of investment, the subsequent phase in the progression of investment theories offered ascend to the accelerator hypothesis by Carver and others, which brands investment a direct result of changes in output/income yield. In the accelerator framework, assumptions, benefit and capital costs assume no part. Keynesians have generally preferred the accelerator hypothesis of investment while dismissing the part of capital costs (Salahuddin & Islam, 2008). A broader type of the accelerator model is the adaptable model, which is shown below;

$$I_t = \alpha \ (K_t{}^* - K_{t-1}) \ \text{...} \quad 1$$

Given: I_t = net investment, K_{t-1} = last period's capital stock, $K_t{}^*$ = desired capital stock, and α = partial adjustment coefficient.

The fundamental idea or assumption behind this model is that the bigger the difference amongst the current capital stock and the ideal capital stock, the more noteworthy a company's pace of investment. The theory is that organizations intend to close a small portion, of the difference amongst the ideal capital stock, K^*, and the real capital stock, K, in every time.

Inside the structure of the adaptable accelerator model, internal funds, output yield, cost of outer financing and diverse issues might be incorporated as causes of Kt^*. The adaptable accelerator component might be altered into a theory of investment conduct by including a determination of Kt^* and a theory of replacement investment. Elective econometric frameworks of investment conduct vary in the causes of Kt^*, the portrayal of the time construction of the investment cycle and the handling of substitution investment. In the adaptable accelerator model, Kt^* is corresponding to yield, yet in elective models, Kt^* relies upon internal assets, limit use, the expense of outer finances and other different factors. In application to this study, this model/theory therefore covers the determinants of private investment. The current study used the theory in developing its theoretical model on private investment using level of income.

This investigation likewise relied on the neo-traditional theory of investment-growth nexus. The Neo-Classical Model of Growth was first formulated by Robert Solow; henceforth it is known as the Solow model (Solow, 1956). The model accepts that a supported expansion in capital investment expands the growth rate. The neoclassical theory of investment discloses that affectation to invest may likewise be reenacted by good changes in relative costs where user cost of capital administrations infers that the firm needs to reestablish balance by chopping down the marginal profitability of capital stock (Eisner, 1958).

The neo-classical way to deal with investment is an enhancement to the Harrod–Domar model. The Harrod – Domar Model of 1939 and 1946, and features the significance of deciding the proportion of investment (S/Y), that is important to accomplish a specific proportion of economy development. The model indicates the chance of expanding the development, by both decreasing a factor (capital/income) and/or increasing the proportion of investment (income/savings). As indicated by the theory, private investment is affected by the development rate of real GDP and user cost of capital (Jorgensen & Stephenson, 1967). The development rate could be understood as an intermediary for assumptions regarding future interest and gets back from the yield of investments.

Neo-classical concept additionally proposes that, as big loan fees debilitate investment by elevating capital cost, private investment is adversely identified with financing cost. Be that as it may, the loan fee can have a negative impact over the saving network (Odhiambo, 2005). Little or undesirable loan costs debilitate saving, that can lessen the measure of assets for investment. The financing cost can consequently positively affect investment. The theory is anyway scrutinized on its supposition of business sectors and limitation on development and cost of capital. The model is adapted to non-industrial nations to catch a few flaws that incorporate financial constraints, obligations overhang, a prevailing job of imported capital goods, and macroeconomic unsteadiness (Agenor & Hoffmaister, 1996). Thusly, different factors are incorporated while investigating investments in non-industrial nations. Public investment is one of the factors included, where record is taken of government spending which influences accessibility of reserve funds for the private sector.

Inflation is another factor, which influences investment by expanding the vulnerability of investment (Pindyck, 1993). The existence of a huge outside debt is likewise unfavorably influence investment by decreasing the assets accessible to capitalize, based on the fact that the yield from novel investments should be utilized to reimburse the current obligations, as postulated by Cohen (1994). It is obvious from the argument in this part that private investment relies upon 3 general classifications of factors: Neoclassical, Keynesian and insecurity factors. Factors that might be remembered for the Keynesian custom incorporate GDP development degree, interior funds (for instance, modification in credits to the private sectors) and limit usage. The neoclassical causes of private investments incorporate user cost of capital, Tobin's Q, public investment proportion and real interest proportion (Pindyck, 1993; Cohen, 1994). The study made use of the variables identified to influence investment in this theory.

IV.   Literature Review

Ghartey (2012) measured the cointegration and causal connection between public sector growth aspects, expenditure and taxes, for South Africa, Nigeria and Kenya. The study also tried to link the public sector aspects to private investment. Based on an autoregressive distributed lag error-correction model, the study noted that an increment in government expenditure reduces private spending and premium profound investment by expanding the taxation rate on residents which prompts a decrease in private expenditure and investment. In light of secondary data used, the investigation sorted out that government expenditure diminishes reserve funds in the economy, consequently expanding financing costs and this could prompt less investment in beneficial sectors of the economy. Equally, when governments reduce expenditure, there is a deluge in private investment. Though this study used different variables to measure public sector growth as compared to the current study, the study helps describe the association amongst public sector growth and private investment.

Magu (2013) while studying the connection between government revenue and economic growth in Kenya used a descriptive research design to collect secondary data collected from the Central Bank of Kenya, Ministry of Finance, Public libraries and National Budget records. The study set up that insufficient and sporadic income age had antagonistically influenced private investment expenditure. The examination confirmed that the declining patterns in government and expense income had been supplemented with the deteriorating private investment in practically all spending classifications. In cases where government income declined and income development was insufficient, investment expenditure in actual infrastructural frameworks deteriorated. The examination likewise noticed that where government income expanded and tax income execution had been more noteworthy, investment expenditure increased. Difference in sectoral expenditure needs has fundamentally transformed in the country. Expenditure on protection has been decreased; notwithstanding, it has continued to be generally high. The essential subdivisions that have been getting higher portions of government consumptions are overall population administrations, human resources advancement, and infrastructural foundations. This study however, did not devise an actual relationship between public sector growth and private investment, a gap that was filled in this study.

Okech, Mweni and Njuguna (2016) used time series data collected from Government of Kenya published statistics, IMF International Financial Statistics, and World Bank reports to study the relationship between GDP growth rate and external debt in Kenya. The study noted that external debt obligation growth has been ascending throughout the years with obligation trouble pointers expanding consistently in the mid-1990s. Utilizing time-series information for the time frame 1970-95, the data showed that external obligation growth perversely affects private investment. This affirms the presence of an obligation projection issue in Kenya. In any case, the outcomes likewise showed that current obligation inflows invigorate private investment. Obligation adjusting does not seem to influence development belligerently yet makes them reduce impacts on private investment. Though this study has a gap in the study of public sector aspects using GDP growth rate and external debt (borrowing), the study helps describe the association between public sector growth and private investment.

Musyoka (2017) studied the effect of public debt on economic growth in Kenya using secondary data for a period of ten years (2007-2016). This data obtained from Central Bank of Kenya. A regression model, descriptive statistics and correlation analysis were used for analyzing the data. It was found that with a solid financial establishment, any country will have expanded admittance to capital, more assets for future public and private investments, better buyer and commercial certainty, and a more grounded wellbeing assurance. Nonetheless, with availability of debts and more borrowing, there will be reduced public investment in the long run. As the public debt increases, the government will use its budget even more, on interest expenditures, leading to high crowd out effect on public investments. This study, however, did not directly link the relationship between public sector growth and private investment in Kenya, which was done in the current study.

V. Methodology

The study used a correlational research design to explain the relationship between public sector growth and its effect on private investment, using the Kenyan scenario. This study made use of accelerator model. The model implies the use of induced investment which is dependent on the degree of change of output or of sales. The model is shown by Equation 2

$$I_p = f(\Delta Y) \dots\dots\dots 2$$

where I_p is induced private investment which depends on (i.e., is a function of) changes in national income (ΔY) (Wai & Wong, 1982).

The induced investment will be positive if national income increments and induced investment may tumble to nothing if the national income or output yield stays steady. To create a given measure of output, it requires a specific measure of capital. On the off chance that Yt output is needed to be delivered and v is capital-output proportion, the necessary measure of capital to create Yt output is given by the accompanying equation:

$$K_t = vY_t \dots\dots\dots 3$$

given K stands for stock of capital and Y_t is the level of income or output, and v is capital-output ratio. This capital-output ratio v is equivalent to K/Y and in the accelerator theory, this capital-output ratio is presumed to be steady. Thus, in the supposition of steady capital-output ratio, variations in output are made probable by variations in the capital stock. Consequently, as income is Y_t then essential capital stock $K_t = vY_t$. When income or output is equivalent to Y_{t-1}, then essential capital stock will be given by equation 4;

$$K_{t-1} = vY_{t-1} \dots\dots\dots 4$$

Based on the Equation…… that once income rises from Y_{t-1} in time t − 1 to Y_t in time, t, then the capital stock will rise from K_{t-1} to K_t. K_{t-1} is equivalent to vY_{t-1} and K_t is equivalent to vY_t. Therefore, the rise in the capital stock in time t is specified by the subsequent equation:

$$K_t - K_{t-1} = vY_t - vY_{t-1}$$
$$K_t - K_{t-1} = v(Y_t - Y_{t-1}) \dots\dots\dots 5$$

Since rise in the capital stock in a year ($K_t - K_{t-1}$) symbolises investment in that specific year, the above equation 5 is modified as follows:

$$I_p = v(Y_t - Y_{t-1}) \dots\dots\dots 6$$

Equation 6 discloses that as a consequence of rise in income in year t from a preceding year t- 1, rise in investment is said to be v times more than the rise in income. It consequently denotes that investment is a consequence of modification in income. If output or income rises through time, that is, when Y_t is bigger than Y_{t-1} then investment will be positive. If income deteriorates, that is, Y_t is less than Y_{t-1} then disinvestment is likely to occur. Besides, if the income is steady, that is, $Y_t = Y_{t-1}$ the investment is equivalent to nil. Since the study sought to determine the effect of public sector growth on private investment; adding public sector growth to the model, the final equation was as shown in equation 7.

$$I_p = v(Y_t - Y_{t-1}) + D \dots\dots\dots 7$$
where D represents Public Sector Growth

For this study, accelerator model as derived in Equation 7 was used. The model that was estimated is described as in Equation 8 by including other variables identified in the study such as user cost of capital (C) and partial adjustment coefficient (α).

$$I_p = v(Y_t - Y_{t-1}) + D + C + \alpha \dots\dots\dots 8$$
where I_p is the level of private investment and D is Public Sector Growth.

The variables of the study were measured and defined as presented in Table 1.

Table 1: Definition and Measurement of Variables

Variable	Definition	Measurement
Public sector growth (D)	This is the ratio of government spending to GDP.	This was measured as a ratio of government spending to GDP.
Private investment (I_p)	Cash contributed by organizations, monetary associations, or different speculators, instead of by an governmental administration	The variable was measured in Kenyan shillings, and calculated as percentage of GDP
User cost of capital (C)	Costs borne by the proprietor or tenant of a capital resource coming about because of the utilization of the resource for a given timeframe	The variable was measured in Kenyan shillings
Partial adjustment coefficient (α)	A coefficient to minimize the deviations between the expected and observed values of the dependent variable	Adjustment coefficient

Secondary data was used in this study. Secondary data includes the investigation of existing material and data from sources, for example, yearly reports, published research centres and libraries. Secondary data was collected from year 2000 to 2019. The data was gathered from Kenya National Economic Survey (KNES) reports, KNBS's statistical abstracts, and World Bank Development Indicators database.

For Time Series Properties and Diagnostic Tests;
Unit Root Test was done to test for stationarity by using Augmented Dickey–Fuller (ADF) and Philips and Perron (PP) Test.
Co-integration test was determined using the Pesaran co-integration test.
Normality of the Data was done using the Jarque-Bera test.
Multicollinearity test was done using the Variance Inflation Factors (VIF).
Heteroscedasticity Test was carried out using the Breusch-Pagan test.
Autocorrelation was conducted using the Breusch-Godfrey serial correlation LM test.
Omitted variables test was done using the Ramsey reset test.
For data analysis, the objective was responded to by use of Vector Error Correction Modelling (VECM).

VI.   Results

Descriptive Statistics

The data presented in Table 2 the descriptive statistics for private investment (% of GDP), Income (% of GDP), capital-output ratio, user cost of capital and public sector growth measured using government expenditure as a percentage of GDP for the period 2000 to 2019.

Table 2: Summary Descriptive Statistics for Sources of Public Sector Growth

	Obs	Mean	Std. Deviation	Minimum	Maximum	Median
Private investment (% of GDP)	20	19.0565	1.95511	15.14	22.43	18.79
Level of Income (% of GDP)	20	19.13	5.67753	17.7	20.1	19.2
User cost of capital	20	2.6105	1.47445	1.95	3.51	2.5
Public sector growth	20	23.41	2.671073	18.7	27.7	23.1

The results indicate that the mean private investment for the period 2000 to 2019 was 19.0565% whereas the maximum and minimum values were 22.43% and 15.14% respectively, showing that the data points were not far from the mean private investment. However, the trend of private investment has been unstable, with continuous ups and downs, shown from a standard deviation of 1.95511. Level of Income (% of GDP) on average was 19.13% for the period 2000 to 2019, with maximum value of 20.1% and a minimum value of 17.7%, also showing an unstable trend (standard deviation = 5.67753). User cost of capital was 2.6105 on average (standard deviation = 1.47445). Finally, public sector growth had a mean value of 23.41% for the period 2000 to 2019, with maximum value of 27.7% and a minimum value of 18.7%, all showing largely unstable trends.

Time Series Property Results
Unit Roots Tests

Before testing for relationships and co-integration, the stationarity tests were done. Stationarity was checked using both Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF), because ADF shows if data have a unit root, while PP rejects the null hypothesis of unit root. The test findings of the unit roots are shown in Table 3.

Table 3: Unit Root Tests-Level and First Differencing

Variable	ADF test	PP test	1% Level	5% Level	10% Level	MacKinnon approximate p for Z(t)	Comment
Private investment (I_p)	-1.553	-1.421	-4.380	-3.600	-3.240	0.8105	N/Stationary
Level of Income (% of GDP)	-4.214	-4.238	-4.380	-3.600	-3.240	0.0043	Stationary
Public sector growth (D)	-1.340	-1.688	-4.380	-3.600	-3.240	0.8777	N/Stationary
User cost of capital (C)	-0.042	-0.245	-4.380	-3.600	-3.240	0.9938	N/Stationary

The results indicate that the variables are integrated at order I(1). Consequently, co-integration test was conducted.

Cointegration Analysis

Co-integration was determined using the bounds test. The study used the bounds test of Pesaran *et al.* (2001) critical values F statistic tests to test for co-integration among the variables. Cointegration was necessary to determine if VECM could be used. The findings are shown in Table 4.

Table 4: ARDL bounds test

	10%		5 %		1%	
	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
F statistic = 108.8119	7.232	7.234	9.452	9.455	14.981	14.991
K (4): no of independent variables – Private investment (Ip), Level of Income (% of GDP), Public sector growth (D) & User cost of capital (C)						

The findings show that the critical value bounds are more than the Pesaran *et al.* (2001) upper critical values I (1) and lower critical I (0) values at 1 percent, 5 percent and 10 percent significant levels. This therefore means that there is co-integration among the variables for the VECM model. Therefore, VECM was adopted in the study.

Findings and Discussion

The objective of the study was to find out the effect of public sector growth on private investment in Kenya. This objective was responded to through use of Vector Error Correction Model (VECM) on equation 3.9 since the variable were observed to be I(1). Therefore, VECM can be specified to link the effect of public sector growth on private investment. The estimates of the vector error-correction model are given in Table 5.

Table 5: Vector Error Correction Model

Dependent Variable: Private_investment

Date: 08//30/21   Time: 17:22

Sample: 2000 2019

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Private investment (I_p)	0.48265	0.21675	2.23	0.026
Level of Income (% of GDP)	1.159174	0.242911	4.77	0.001
Public sector growth (D)	-1.159174	0.242911	-4.77	0.001
User cost of capital (C)	-1.938645	0.657954	-2.95	0.003
C	-0.755649	0.008216	-1.85	0.064
R-squared	0.781453	Mean dependent var		4.000005
Adjusted R-squared	0.739861	S.D. dependent var		2.590933

S.E. of regression	1.783425	Akaike info criterion	3.219902
Sum squared resid	24.3426	Schwarz criterion	3.767387
Log likelihood	-72.83843	Hannan-Quinn criter.	3.568033
F-statistic	19.34533	Durbin-Watson stat	1.78387
Prob(F-statistic)	0.000013		

A number of tests were conducted including normality of the data, multicollinearity test, heteroscedasticity test, autocorrelation and the test for omitted variables were conducted to establish the models statistical appropriateness for VECM. Before carrying out the diagnostics tests for VECM model, Equation (8) was estimated. This was for purpose of selecting the appropriate model to be subjected to diagnostics for subsequent use in the ARDL analysis. The study first conducted the diagnostic test of normality. The results in Table 6 show the test for normality of the variables used in the study.

Table 6: Normality Tests for VECM

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	Jarque-Bera	Probability
Private investment	19	0.93132	1.568	0.904	0.18313
Level of Income	19	0.89015	2.508	1.847	0.13239
Public sector growth	19	0.97909	0.477	-1.485	0.93126
User cost of capital	19	0.98245	0.401	-1.837	0.9669

The probability value (*p*-value) for all the variables was more than the critical 5 percent and thereby rejecting the null hypothesis implying that the variables have normal distribution. Multicollinearity test was also done, using the VIF values. These findings are shown in Table 7.

Table 7: Multicollinearity Tests for VECM

Variable	VIF	1/VIF
Private investment	1.23	0.815859
Level of Income	1.22	0.821901
Public sector growth	1.03	0.971412
User cost of capital	1.16	0.862068

The VIF values obtained in the study indicate that all VIF values were within the 1 and 5 range, hence no multicollinearity issues in the study. Heteroscedasticity test was also done using the Breusch-Pagan test. The findings are shown in Table 8.

Table 8: Breusch-Pagan Heteroscedasticity Test for VECM

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity	
Ho: Constant variance	
chi2(1)	2.48
Prob > chi2	0.1151

Since the study findings indicate that the *p*-value is 0.1151, which is more than 0.05, then the observations have constant variance and heteroscedasticity is not present in the study. Autocorrelation test was further done using the Breusch-Godfrey serial correlation LM test. These results are presented in Table 9.

Table 9: Test for Serial Correlation for VECM

Breusch-Godfrey LM test for autocorrelation			
lags(p)	chi2	df	Prob > chi2
1	3.091	1	0.0787
H_0: no serial correlation			

The null hypothesis is that there is no first order serial auto correlation existence. The *p* value of 0.0787 indicates that the null hypothesis is not rejected, hence, serial correlation is absent in the study. Finally, the omitted variables test was conducted using the Ramsey reset test. The results are presented in Table 10.

Table 10: Test for Omitted Variables for VECM

Ramsey Reset test Ho: model has no omitted variables	
F-statistic	0.96
Prob > F	0.4435

The *p* value of 0 0.4435 indicates that it is more than 0.05, and therefore the model has no omitted variable.
Form table 10, the long run relationship between private investment and public sector growth is displayed as follows;

$$I_p = -0.755649 + 1.159174 (Y_t - Y_{t-1}) - 1.159174D - 1.938645C + 0.008216.$$

The findings shown in the equation above indicate that public sector growth aspects had a significant negative impact on private investment in Kenya. This shows that public sector growth crowds out private investments in Kenya, as also observed by Musyoka (2017). The R squared coefficient of 0.781453 indicated that the goodness of fit for the model was satisfactory, as it was more than 0.7. The findings show that the variables had a significant impact on private investment. This is in line with the accelerator hypothesis by Carver, which brands private investment a direct result of changes in output/income. Gor (2012) also argued that public sector provides opportunities for private investors to take part in the growth process. In addition, the neoclassical theory of investment discloses that private investors may likewise be reenacted by good changes in relative costs where user cost of capital is negative (Eisner, 1958).

The F-statistic (19.34533) indicates that the independent variables had a good joint explanatory power. The probability value (0.000013) implies that the variables in the model were jointly significant in explaining private investment, that is, the overall model was significantly satisfactory.

VII.   Conclusions and Recommendations

This study confirms that public sector growth has significant negative impact on private investment performance as it crowds out the private sector investments.

The study recommends that investment promotion policies should adopt a proactive approach towards local and foreign investment promotion, and explicitly look for ways to increase its benefits based on public sector growth, user cost of capital and level of income.

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