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EFFECT OF PUBLIC INVESTMENT ON ECONOMIC GROWTH IN KENYA

MIRIAM WAMAITHA THUO
LECTURER
DEPARTMENT OF BUSINESS ADMINISTRATION
FACULTY OF BUSINESS STUDIES
CHUKA UNIVERSITY
CHUKA

LENITY KANANU MUGENDI
LECTURER
DEPARTMENT OF BUSINESS ADMINISTRATION
FACULTY OF BUSINESS STUDIES
CHUKA UNIVERSITY
CHUKA

ABSTRACT

Public investment plays an important role in maintaining the economic performance of a country especially in the areas of energy, transportation, water and sewerage. It also creates employment and provides infrastructural support to the private sector which increases productivity. Kenya has experienced very low development expenditure since independence. However, with the rolling out of the Economic Recovery Strategy (2003-2007), public investment in infrastructure has increased. Kenya faces a significant infrastructure financing deficit estimated at US$2.1 billion annually, and this imposes a serious constraint to growth and doing business in Kenya. The result of declining and insufficient investments has been a worsening infrastructure deficit and mounting investment needs. This study therefore sought to find out the effect of public investment on economic growth in Kenya as well as the moderating effect of labour, terms of trade and exports to the relationship between public investment and economic growth. The study used the causal-effect research design using a sample of 36 years' time series data from 1979-2015. Diagnostic tests were performed on normality, lag order selection, residual autocorrelation, collinearity, and heteroskedasticity. Using the error correction framework, the findings indicated that public investment has a negative and significant effect on economic growth of Kenya. Exports and terms of trade were found to have a positive and significant effect while labour exhibited a negative and significant effect on economic growth. The study recommends the government shifts focus to more private participation rather than state involvement in investment projects or consider private-public partnerships in infrastructural projects in order for the economy to grow.

KEYWORDS

Kenya, public investment, economic growth, exports, terms of trade.

INTRODUCTION

Public investment in core economic infrastructure in the areas of energy, transportation, and water and sewerage plays an important role in maintaining economic performance. According to Drezgić (2008), public investments establish foundations for economic growth both directly and indirectly. Their effects can be seen through increased employment and wages and the rise of productivity in the private sector. Government expenditure on physical transport and communication infrastructure, health and education facilities, building, plant, machinery and equipment have been noted to generate positive externalities that raise private investment (Njuru, Ombuki, Wawire & Okeri, 2014). In addition, this expenditure by government raises the marginal productivity of factor inputs thus creating an enabling environment for private investment. A good investment environment provides opportunities for investors to invest profitably, create jobs as well as take part in expanding the national output which increases economic growth (Mustefa, 2014).

Public investment is argued to promote economic growth by providing the private investment with infrastructural support, which helps raise the productivity of capital thus expanding the overall resource availability by increasing output. On the other hand, public investment may crowd out private investment especially when increased public spending is done at the expense of a higher tax and domestic interest rate. In addition, crowding out of private investment may occur when the public sector produces investment goods that directly compete with private goods thus depressing the private investors (Saeed, Hyder & Ali, 2006).

Public investment can be analysed by looking at government development expenditure which constitutes investment by government in such schemes as construction of railways, roadways and communication systems, irrigation and power projects, which raise economic growth both directly and indirectly through encouragement of further private investment (Ag'enor, 2007). Kenya has experienced very low development expenditure since independence. During the initial years of independence, the amount of development expenditure was high and these were the years Kenya recorded an impressive private investment performance.

During the initial period of independence, there was an upward trend in development expenditure, reaching 36 per cent of public expenditure in 1970 compared to 17 per cent in 1963. This increase was attributed to increase in the construction costs (Republic of Kenya, 2003). During this period, the country was rebuilding and large amounts of money were spent on infrastructure and services. There was huge expenditure on electricity, roads, telecommunications and airport expansion. A lot of money was also spent on agricultural development. The proportion of development expenditure remained, on average 32 per cent of total expenditure from 1972-1979, but began to decline thereafter and stagnated at about 19 per cent of total government expenditure between 1982 -1996. A sharp decrease to less than 5 per cent between 1999 and 2002 was witnessed. The shrinking trends in development expenditure may be blamed on the Structural Adjustment Programmes (SAPs)by World or IMFs stabilization programmes. Development expenditure however showed an upward trend between 2003 and 2007. This was because of increased infrastructural expenditure in areas of roads, telecommunication, health and education, rehabilitation of airport in Nairobi, Mombasa and Kisumu following the rolling out of ERS (2003-2007).

Kenya however faces a significant infrastructure financing deficit estimated at US$2.1 billion annually, and this imposes a serious constraint to growth and doing business in Kenya (Mburu, 2013). The result of declining and insufficient investments has been a worsening infrastructure deficit and mounting investment needs. According to the 2009 Report Card for Kenya's Infrastructure by the Kenya Society of Civil Engineers (KSCE), Kenya, infrastructure, including aviation, bridges, dams, drinking water, energy, hazardous waste, inland waterways, levees, public parks and recreation, rail, roads, school, solid waste, transit and wastewater, received an average grade of D (Mburu, 2013). Besides its negative influences on productivity improvement, such deficiency in infrastructure will also deeply affect private investment as well as economic growth.

LITERATURE REVIEW

Government investment in infrastructure promotes economic growth through its effect on productivity and creation of an enabling environment for private investors. Mburu (2013) carried out a study on the relationship between government investment in infrastructure and economic growth of Kenya. The researcher

adopted regression analysis and data for the study was for the period 2005-2012. The results from the study indicated that public investment in infrastructure had a positive and significant effect on economic growth of the country. The study recommended that proper reform policies should be complemented with the availability of the necessary infrastructure which will help the country develop. In addition, the researcher recommended that emphasis be given on the public-private partnerships as well as increased joint venture projects with multinational firms and local enterprises to enhance the developments in infrastructure. This study however, used a very small dataset and failed to analyse the short run and long run effect of public capital and economic growth.

Similarly, Zainah (2009) carried out a study on the role of public investment in promoting economic growth of Mauritius. The researcher employed a reduced form of the Solow Growth framework in order to investigate public investment in infrastructure and its role in economic growth for the period 1970-2006. Using the error correction model, pubic investment was seen to have significantly contributed to the country's economic performance. Moreover, the study suggested that there could be some indirect effects through private investment and openness to trade. The policy implications of the study were that the government of Mauritius should work on extending their infrastructural and development loans from the World Bank and other international institutions rather than the capital expenditure cuts in the budget. Although the study employed a larger dataset than that of Mburu (2013), the researcher did not look at the contribution of private investment and the joint effect on the two variables on economic growth.

RESEARCH METHODOLOGY

The study employed a causal research design. The researcher employed the non-probability purposive sampling technique where a sample of 36 years' time series data for the period 1979-2015 was obtained. The researcher used EViews, STATA and PC-Give Ox metrics statistical software to perform data analysis. Estimation of the parameters and hypothesis testing using time series data required an investigation of the data which helped the researcher to avoid spurious results. It involved the use of the error correction model and estimation of the regression using Ordinary Least Square (OLS)technique. The error correction model was best suited for estimation of the short and long-run relationship of the variables when they are non-stationary and co-integrated.

Statistical inferences were made by analysing the signs of the coefficients of the variables and also comparing the p-values of the coefficients to the critical values to check if they were statistically significant. Hypotheses were also constructed whereby the p-values were compared to the critical values. The signs of the regression coefficients were checked and if found positive, then a direct and positive relationship existed between the dependent and the independent variables. The converse was true if a negative coefficient was found. Post-estimation diagnostics were also carried out on the regression to establish whether the OLS assumptions had been met for the results to be trustworthy. The tests included collinearity, autocorrelation and heteroskedasticity.

MODEL SPECIFICATION

$$\Delta \text{LogGDP}_t = \beta_0 + \beta_1 \Delta \text{Log}(GFC_G)_{t-i} + \beta_2 \Delta \text{Log (L)}_{t-i} + \beta_3 \Delta \text{Log (TOT)}_{t-i} + \beta_4 \Delta \text{Log (EXPORT)}_{t-i} + \beta_6 D_j + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(1)$$

Where;

Log GDP- Logarithm of GDP

Log GFC_G - Logarithm of gross fixed capital for public sector

Log L- Logarithm for labour force

Log TOT- Logarithm for terms of trade

Log EXPORT- Logarithm o-f exports

β_0 - This is a coefficient representing other factors that affect GDP growth other than private investment, public investment, exports, terms of trade, and labor force.

$(\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6) > 0$ - These represent the elasticity parameters of the independent variables

D_j is a dummy representing structural breaks

t represents time in years

i is the lag

e_t is the error term

RESULTS AND DISCUSSION

TESTS FOR STATIONARITY

Data is said to be stationary if it has a constant mean, finite variance and the covariance that does not vary with time. Non stationary data could result to spurious results if such series is regressed. The variables in the study were tested for stationarity using both ADF and PP tests. The variables were first tested in their level forms and the results are shown in Table 1.

TABLE 1: UNIT ROOT TEST RESULTS FOR VARIABLES IN LEVEL FORM

Variable	Lag	ADF	PP	Status
LnGDP	1	-3.1645	-3.1945	Not stationary
LnGFCG	1	-2.8990	-1.9002	Not stationary
LnEXPORT	1	-2.4748	-2.3564	Not stationary
LnTOT	1	-1.7931	-2.4060	Not stationary
LnLABOR	1	-2.4341	-0.4519	Not stationary

MacKinnon critical value: 5%= -3.5468

The results in Table 1 indicate that the ADF and PP values for all variables are greater than the MacKinnon critical value of -3.5468 at 5% level of significance. This implies that the data on all the variables was not stationary and therefore not suitable for further analysis in its level form.

FIRST DIFFERENCE

The original data was differenced to make it stationary. The results are presented in Table 2.

TABLE 2: UNIT ROOT TEST RESULTS FOR VARIABLES AT FIRST DIFFERENCE

Variable	Lag	ADF test	Status	PP test	Status
$\Delta \text{lnGDP}_{t-1}$	1	-5.7960	Stationary	-8.4809	Stationary
$\Delta \text{lnGFCG}_{t-1}$	1	-3.1676	Not Stationary	-2.9245	Not Stationary
$\Delta \text{lnEXPORT}_{t-1}$	1	-3.2070	Not Stationary	-3.2193	Not Stationary
$\Delta \text{lnTOT}_{t-1}$	1	-3.2130	Not Stationary	-2.4925	Not Stationary
$\Delta \text{lnLABOR}_{t-1}$	1	-2.3930	Not Stationary	-1.8423	Not Stationary

MacKinnon critical value: 5%= -3.5614

The findings in Table 2 indicate that upon taking the first difference, GDP was found to be stationary. However, public investment, labour, export and terms of trade variables were found to possess a unit root.

SECOND DIFFERENCE

The variables that were not stationary at first difference were further differenced to make them stationary. The results are presented in Table 3.

TABLE 3: UNIT ROOT TEST RESULTS FOR VARIABLES AT SECOND DIFFERENCE

Variable	Lag	ADF	PP	Status
$\Delta\Delta lnGFCG_{t-1}$	1	-5.1172	-7.0270	Stationary
$\Delta\Delta lnEXPORT_{t-1}$	1	-6.3378	-9.1911	Stationary
$\Delta\Delta lnTOT_{t-1}$	1	-6.6625	-12.9201	Stationary
$\Delta\Delta lnLABOR_{t-1}$	1	-4.6299	-4.3456	Stationary

MacKinnon critical value: 5%= -3.5514

From the results in Table 3, all variables namely were found to be stationary after taking the second difference. This is because the ADF and PP statistics were less than the MacKinnon critical value at 5% leading to the rejection of the null hypothesis of a unit root.

LAG ORDER SELECTION

The most appropriate lag length to use for estimation of the model was established by use of the Akaike Information Criterion (AIC)and the Schwartz Bayesian Information Criterion (SBIC). The lag length that minimized the AIC and SBIC values was lag 2 with AIC and SBIC values of 3.3464 and 3.663 respectively.

TEST FOR COINTEGRATION

The Engle-Granger 2-step approach was used to establish whether there was cointegration of variables in the model. The stationarity of the residuals was then tested using PP and ADF test statistics where the statistics were compared to the critical values at 5%. The results indicated that both the PP and ADF statistics were less than the MacKinnon critical values at 5% hence leading to the rejection of the null hypothesis of a unit root. The conclusion is that the residuals are stationary and this indicates that there is cointegration of parameters in the model.

GRANGER CAUSALITY TESTS

Granger causality test was performed for the variables in the model. The null hypothesis of no causality was tested where the p-value was compared with the critical value at 5% significance level. A p-value of less than 0.05 showed presence of causality between the variables while a p-value greater than 0.05 indicated the absence of causality. The results of the test are shown in Table 4.

TABLE 4: GRANGER CAUSALITY TEST RESULTS FOR ECONOMIC GROWTH MODEL VARIABLES

Null Hypothesis	Lag	F-Statistic	P-value
DDLNTOT does not Granger Cause DLNGDP	2	0.3035	0.7406
DLNGDP does not Granger Cause DDLNTOT		0.3349	0.7183
DDLNL does not Granger Cause DLNGDP	2	0.3483	0.0089
DLNGDP does not Granger Cause DDLNL		0.0241	0.9762
DDLNGFCG does not Granger Cause DLNGDP	2	1.4560	0.0253
DLNGDP does not Granger Cause DDLNGFCG		0.0881	0.0459
DDLNEXPORT does not Granger Cause DLNGDP	2	1.4333	0.0490
DLNGDP does not Granger Cause DDLNEXPORT		1.8218	0.0304

From Table 4, neutral causality was found between terms of trade and GDP. However, unidirectional causality was found between labor and GDP while bidirectional causality was found between public investment and GDP and export and GDP.

DIAGNOSTIC TESTS

TEST FOR MULTICOLLINEARITY

Multicollinearity refers to the correlation between independent variables in a model. Presence of multicollinearity makes it difficult to isolate the effect of a given explanatory variable on the dependent variable. Ordinary least square estimation requires that there is no multicollinearity in the regression. The researcher employed the Variance Inflation Factor (VIF)to test for multicollinearity. The decision rule was to accept the null hypothesis of presence of multicollinearity if the value for VIF exceeded 10. The results of the VIF are shown in Table 5.

TABLE 5: VARIANCE INFLATION FACTOR RESULTS

Dimension	VIF (Model 2)
1	1.654
2	1.352
3	1.876
4	1.496

From the results in Table 5, all the VIF values were less than 10. This led to the rejection of the null hypothesis and thus the conclusion that there was no multicollinearity.

TEST FOR AUTOCORRELATION

The classical linear regression model assumes that the successive values of the error terms are sequentially independent. The Durbin Watson test statistic was employed to test for presence of autocorrelation and the results indicated the DW statistic to be 2.3 hence absence of both positive and negative autocorrelation.

TEST FOR HETEROSKEDASTICITY

Heteroskedasticity was tested using the Breusch-Pagan Godfrey test where the null hypothesis of a constant variance was tested against the alternative hypothesis of heteroskedasticity. The decision rule was if the p-values were found to be greater than 5% then the null hypothesis was accepted. The results indicated that the p-value was 0.1356>0.05 thus leading to the acceptance of the null hypothesis of a constant variance hence there was absence of heteroskedasticity.

VAR DIAGNOSTICS

The vector autoregressive model was estimated and the diagnostics involving L-M test and normality tests carried out.

L-M TEST

The Breusch-Godfrey LM test was used to check whether the error terms in the model were serially autocorrelated. The probabilities of the chi-square statistic were checked against 5% significance level. The null hypothesis indicates no serial correlation and is accepted if the p-value of the chi-square statistic is greater than 0.05. The results of the test indicated that the probability of the chi-square was 0.240 and 0.978 both greater than 0.05 for both lag lengths 1 and 2, hence leading to acceptance of the null hypothesis of no autocorrelation of residuals in the model.

NORMALITY OF RANDOM VARIABLE

Ordinary least square estimation requires that the error term be normally distributed with a zero mean and constant variance for all values. The Jarque-Bera, Kurtosis and skewness tests were employed to test for normality of the error term with the null hypothesis indicating that there is normality. The results of the tests are shown in Table 6.

TABLE 6: TEST FOR NORMALITY OF RANDOM VARIABLES RESULTS

Description	P-value
Jarque-Bera	0.175
Skewness	0.135
Kurtosis	0.265

The results on Table 6 indicate that the probabilities of the chi-square statistics are greater than 0.05 thus leading to the acceptance of the null hypothesis of the random terms being normally distributed.

VECTOR ERROR CORRECTION MODEL

The vector error correction model was used to show the relationship between dependent and independent variables. R^2 was used to show the explanatory power of the model whereby the decision criteria was that if $R^2 \geq 0.7$, the model was strong in predicting the variations in the dependent variable caused by the explanatory variables. The overall significance of the model was tested using the F-test. The coefficients of the variables were computed and the significance tested using t-statistics. The decision rule for statistical significance of the coefficients was made through a comparison of the p-values at 5% level of significance. In the model, exports, terms of trade and labor variables were used as moderating parameters. The results of the vector error correction model are shown in Table 7.

TABLE 7: VECTOR ERROR CORRECTION MODEL RESULTS

	Coefficient	Std. Error	t-value	p-value
Constant	0.1674	$3.059*e^{-16}$	$5.473*e^{14}$	0.0000
DDlnGFCG_2	-0.6259	$1.366*e^{-15}$	$-4.582*e^{14}$	0.0000
DDlnEXPORT_2	0.7941	$3.701*e^{-15}$	$2.146*e^{14}$	0.0000
DDlnTOT_2	4.63394	$7.105*e^{-15}$	$6.522*e^{14}$	0.0000
DDlnL_2	-99.3083	$8.509*e^{-14}$	$-1.167*e^{15}$	0.0000
D92_2	-0.3446	$5.383*e^{-15}$	$6.403*e^{13}$	0.0000
Residuals_2	$1.1291*e^{-16}$	$6.432*e^{-16}$	0.1760	0.8692

R-Squared: 0.98

F (20, 4)= $1.801*e^{15}$ [0.000]

Durbin Watson: 2.32

Table 7 presents the regression results. The model can be restated as follows;

$$GDP = 0.1674 - 0.06259GFCG + 0.7941EXPORT + 4.6339TOT - 99.31L - 0.3446D_{92}$$

The results show that the model has a constant of 0.1674 which implies the level of GDP without the explanatory variables. The model results also show that exports and terms of trade had positive and significant effects of economic growth of the country while labor had a negative and significant effect. Interestingly, public investment had a negative and significant effect on economic growth with a coefficient of -0.6259 and a p-value of 0.000<0.05. The model had R^2 of 0.98 implying that 98% of the variations in economic growth were explained by the independent variables and only 2% of the variations were explained by other factors other than the ones in the model. The F-statistic was $1.801*e^{15}$ with p-value of 0.0000<0.05 which implies that the overall model was significant. All coefficients of variables were statistically significant with p-values of 0.0000<0.05.

Public investment was found to exhibit a negative and significant effect on economic growth in Kenya. The coefficient of public investment was -0.06259 (p-value=0.0000<0.05). This implies that an increase in public investment by 1% would lead to a decrease in GDP growth by 6.259% when all other factors are held constant. These findings differ with those of Mustefa (2014), Mburu (2013), Zainah (2009), Kandenge (2007), and Nazmi and Ramirez (1997)who all found a positive effect of public investment on economic growth. Exports and terms of trade both had a positive and significant effect on economic growth while population which was used as a proxy for labour exhibited a negative effect on economic growth. The dummy variable to represent the tribal clashes following the first multi-party elections of 1992 exhibited a negative and significant effect on economic growth arising from uncertainties that faced investors in the period and this had a negative effect on the growth of the economy.

CONCLUSIONS

From the summary of the findings, conclusions were made. It was established that public investment had a negative and significant effect on economic growth. The conclusion made was that increased public investment alone would retard economic growth due to deficit financing. The null hypothesis that public investment had no significant effect on economic growth was rejected and concluded that public investment had a statistically significant effect at 5% level of significance. The study further established that moderating variables namely exports, terms of trade and labour had a significant effect on the relationship between public investment and economic growth in Kenya. Exports and terms of trade had a positive and significant effect on economic growth while population growth which was used as a proxy variable for labour had a negative and significant effect on economic growth.

RECOMMENDATIONS

The researcher recommends that the government should shift focus on more private participation rather than state involvement in investment projects due to the problems in financing. The government could also consider more private-public partnerships in undertaking investment projects. There is also need to improve the productivity of public sector investments by identifying the much more productive types of public investment that have net positive returns and that are more likely to complement the private sector as this will have a positive effect on the growth of the economy.

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