

Impact of Public Spending in Infrastructure on Influencing Economic Development from East Africa Countries: The Vector Auto Regressive Analysis

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ABSTRACT

Infrastructure development is essential for a country's growth and development. The goal of this study is to look at how public infrastructure expenditure affects economic growth in East Africa. Countries: The Vector Auto Regressive Analysis. The study employed a time series data research approach using secondary data. The population was applied to the financial records from 1984/85 to 2015/16. (Annual Data). The study's sample size was 32 yearly observations. The study's research site was purposefully chosen in Uganda. The data was gathered from a variety of trustworthy sources, including the World Bank. The Johansen co integration test shows a long-run relationship between public investment in infrastructure, communication, and electricity and the rate of economic growth. Simultaneously, the Granger-Causality test revealed indirect causality between economic development rate and all components of public spending used, with a P- Value of 0.04; and the Vector Auto Regressive (VAR) consequences revealed that public spending on infrastructure, communication, and energy had a direct effect on economic development rate. According to the study, increased investment on major infrastructure such as water facilities, airports, highways, power, trains, and communication adds considerably to the rate of economic development by boosting the efficiency of the public and private sectors.

Keywords: East Africa countries, economic development, GDP, infrastructure, public spending

1. INTRODUCTION

Infrastructure development is compulsory for a country's improvement and development since infrastructure services such as telecommunications and electricity projects, access to water and sanitation, and transportation are important for family circle behavior and economic creation, which improves economic development (Gisore, et.al, 2019). Infrastructure, for example, added 89 foundation points to per capita economic development in Africa between 1990 and 2005,

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compared to 69 foundation points for extra structural programs (World Bank, 2017). This is totally achievable since long-term designed arrangements facilities, equipment, and the services they provide are employed in the trade sector and family circle to generate economic growth. According to the World Development (WD) report (1993), this infrastructure includes electricity, telecom projects, access to water and sanitation, and transportation. As a result, the amount and quality of existing infrastructure, as well as its ease of use for receivers, may be viewed as an indication of expansion (Solow-Swan, 2020).

Furthermore, the availability of functional infrastructure has a substantial influence on the quality of life of residents in the region in which it is located. It has also been established that one of the indices of growth is the excellence of life, which is assessed by essence such as convenience to the basic necessities of existence, which include openness to key infrastructure (Mary, 2019).

Infrastructure development is a type of development, and over the last two decades, most governments, particularly those in developing countries, have invested heavily in infrastructure development to boost economic growth. As a result, Africa's growth has been significantly improved in the last decade, with African economies growing at a steady 4% per year between 2001 and 2005 (Abu & Abudullahi, 2020). Tanzania, Kenya, Rwanda, Ethiopia, and Uganda have completed the most infrastructure investments in the last five years, including hydropower dams, roads, and railroads (Jeffrey, 2018). According to Yepes, et.al, (2019) infrastructure investments are categorized by the initial big quantity of cash and indivisibility, which results in externalities, and the government is accountable for the obligation most of the time at sponsored rates. As a consequence, multiple managements met financial infrastructure needs from year to year, justifying massive public spending (Loto, 2018).

Most of these countries spend more than they earn. For example, the International Monetary Fund (IMF) predicts that Uganda's national borrowings will continue to rise due to continued ambitious government savings; they believe that the existing continuing determined infrastructure speculation will result in an increase in national borrowings, Total national borrowings are expected to peak in 2020/21, at around 50% of GDP, and national borrowings at around 36% of GDP, before declining as the scale-up procedure is completed (Verbeck, 2022).

Following the declaration by several international institutions, including the International Monetary Fund (IMF) and the World Bank, that public investment in infrastructure, such as electricity, telecommunications projects, access to water and sanitation, and transportation, among others, leads to industrialization and urbanization, which leads to economic growth and cost competence in social service provision (Solow, 2020). Despite huge infrastructure investments expanding at a 27% annual rate, the Ugandan economy has not achieved significant predictable progress, with a standard GDP growth rate of 5%, which is lower than that of its East African neighbors (Samli, 2017; World Bank, 2017). The main objective of the study is to assess the impact of public spending in infrastructure on influencing economic Development from East Africa Countries (Solow, 2020).

2. LITERATURE REVIEW

There is a long-run association between economic success and elected components of public expenditure, according to (Solow, 2020). In contrast, there is evidence of a link between

economic performance and certain components of government spending (Verbeck, 2022). Previous study has revealed that infrastructure is a substantial obstacle to doing business in the majority of developing nations, particularly in low-income countries, lowering corporate efficiency by around 40%. Furthermore, the indirect impact of a lack of infrastructure is at least as detrimental in most nations as crime, red tape, corruption, and stock market constraints (Yepes, et.al, 2019). Infrastructure added 99 foundation views to African economic growth between 1990 and 2005, compared to 68 foundation views for extra physical programs (Solow, 2020).

Wagner (1893) discovered a long-run association between economic advancement and government spending. According to the study, government spending on transportation and communication, as well as health care, has a negative influence on development, but spending on security and agriculture has no impact on economic growth. To boost economic growth, the government must establish rigorous limits on infrastructure investment in order to avoid fraud, financial diversion, and misconduct. Furthermore, government expenditure monitoring and evaluation must be prioritized. This will help ensure that government spending objectives are met. Their findings demonstrated a negative link between national total investment spending, total recurring expenditure, and education and economic growth. Furthermore, government investment on transportation and health communication influences economic growth. They recommend that the government increase mutually recurring and capital expenditures, including education spending, and ensure that money allocated for development in these areas is used properly (Loto, 2018).

According to empirical studies, government spending has a direct influence on economic development and that there is no link between gross fixed capital formation and GDP (World Bank, 2017). The efficiency with which government spends on such services and commodities will have a direct and significant influence on development (Gisore, et.al, 2019). According to Samli (2017) infrastructure is an important factor in a country's success and health because it allows private businesses and people to generate goods and services more efficiently. The findings suggest that transportation facilities are a key differentiating element in explaining the development gap, and they emphasize the importance of telecommunication in relieving the burden of segregation (Verbeck, 2022).

Peacock and Wiseman (1961) conducted a fresh analysis based on Wagner's Law to assess its validity. They investigated public spending in the United Kingdom from 1891 to 1955 and discovered that Wagner's law is still applicable. They also asserted that "the rise in governmental expenditure is substantially contingent on tax collection." In 1976, Peacock and Wiseman conducted an analysis known as the Spend- Tax- Hypothesis, assuming that the amount of taxes is a limit on the growth in expenditures and introducing the idea of an acceptable level of taxation. "Changes in public expenditure result in changes in public revenue," according to this theory. In reality, any increase in spending to deal with extraordinary circumstances will only be temporary. This rise in spending, however, will result in an increase in tax revenues produced through tax hikes. This assumption implies that the direction of government revenue is determined by public expenditure. Governments want to spend more money, but individuals do not want to pay more taxes; as a result, governments must pay attention to their residents' choices.

This approach also eliminates the percentage of benefit citizens receive from government taxes paid. The benefit received theory is employed to hide a flaw.

The idea was developed in the twentieth century by British economist John Maynard Keynes. The concept first focuses on government expenditure and taxation as a mechanism for modifying and increasing GDP. Furthermore, the concept contends that slow economic growth is caused by a lack of utilization spending and general demand in the riches. This viewpoint holds that economic development may be enhanced by altering expenditure and income through economic policies (Solow-Swan, 2020). Furthermore, the fiscal basis of the government budget for maintaining expenditure and promoting economic development is not only insufficient but also borrowed. The government can sponge from both internal and foreign sources. sources within the company.

Furthermore, the assumptions suggested that there was a negative association between foreign borrowing and economic development. For fiscal year 2018/19, Tanzania's ministry of finance and planning has included internal obligations such as treasury bills, special bonds, and government stocks in the same calculation. The author is uninterested in researching the effects of different forms of internal debt and government expenditure on economic growth. Similarly, Yepes, et.al, (2019) examined the impact of government spending as a substitute for domestic borrowings on investment, savings, and consumption. As a result, the current study does not advocate for the use of parallel variables in research.

Similarly, the government's budget can be supported by borrowing from international organizations such as the IMF, World Bank, and other developed-country partners (foreign loans). The Tanzanian government, for example, has informed MoFP that it has borrowed money from bilateral multilaterals and enterprises. Furthermore, Yepes, et.al, (2019) observed that government expenditure, exports, investment spending, subsidies, and imports of taxes, government stocks, and subsidies are markers of foreign loans. The author investigated the association between these metrics and economic development.

The theory originally addressed public expenditure and taxes as instruments of changeable and inspiring GDP, according to this theory. Furthermore, the concept contends that slow economic growth is caused by a lack of utilization spending and general demand in the riches. Economic development can be improved, according to this vision, by adjusting expenditure and income through economic policies (World Bank, 2017).

3. RESEARCH METHODOLOGY

This study employed a quantitative research technique since it examined Uganda's government spending on infrastructure and GDP development. Secondary data and a time series research approach were employed in the study. The population was applied to financial records from 1984/85 to 2015/16. (Annual Economic Statistics) The study's sample size was 31 yearly observations. The study's research site was purposefully chosen in Uganda. Uganda was chosen as a research location because it is one of the East African countries that invests the most in public infrastructure. The data was gathered from a variety of trustworthy sources, including the World Bank.

The Vector Auto Regressive Model (VAR) was used to investigate how public infrastructure spending affects economic growth in East African countries. The Vector Auto Regressive Model

(VAR) was chosen since the study's dependent variable is "continuous in nature," and hence the multiple linear regression model is suited for this inquiry.

$$RGDP_t = \beta_0 + \beta_1 EXINF_t + \beta_2 TELEX_t + \beta_3 EXEL_t + \varepsilon \dots \dots \dots (i)$$

Where by: $RGDP_t$ = Economic Development β_0 = Intercept Term; $EXINF_t$ = Public Expenditure on Infrastructure; $TELEX_t$; = Telecommunication Investment Projects with Private participation; $EXEL_t$ = Investment in Energy Projects with Private Participation; ε = Error or Disturbance Term; t = Time Series (Economic Annual Data)

4. RESULTS AND DISCUSSION

The Phillips Perron (PP) and Augmented Dickey Fuller (ADF) tests were used to determine stationarity in time series data. Both tests were used in this study because they both disclose various interpretations; the ADF preserves the soundness of the tests based on white-noise errors in the regression model by establishing that the errors are really white-noise. While Phillips Perron (PP) completed a non-parametric correction to the standard measurement, it also acts to change the statistics after the computation to clarify the effect of auto linked errors on the penalty. The implications are shown in Table 1.

Table 1
Unit Roots Tests Results

Variables		Augmented Dickey Fuller Test		Philips Peron Test		Order of Integration
		t- statistic	Critical Value (5%)	t- statistic	Critical Value (5%)	
GDP	At levels	-3.473	-2.983	-3.340	-2.983	I (0)
	After differencing					
EXINF	At levels	3.669	-2.983	2.422	-2.983	I (1)
	After differencing	-6.046	-2.989	-6.035	-2.989	
EXEL	At levels	-4.887	-2.983	-4.884	-2.983	I (0)
	After differencing					
TELEX	At levels	-2.096	-2.983	-2.157	-2.983	I (1)
	After differencing	-4.473	-2.986	-4.377	-2.986	

Source: STATA, 2021

The Johansen Co-integration Test: Johansen test was then permitted available to scrutinize whether there was more than a one co- integration association between economic development and the public spending variables. The answers of the Johansen tests of variables are demonstrated in Table 2 below. The Johansen Co-integration Test was subsequently made accessible to examine if there was more than one co-integration connection between the variables of economic development and public spending. The results of the Johansen variable tests are shown in Table 2.

Table 2
The Johansen Co-integration Test Results

Theorized no. of CE(s)	Eigen value	T-statistics	Critical value (5%)
0		63.0763	47.21
1	0.60509	35.2033	29.68
2	0.47889	15.6493	15.41
3	0.40400	0.1237*	3.76
4	0.00411		

Source: STATA, 2021

The T-statistic test is derived from the Johansen test process and is used to examine the implication of Eigen value approximations. Furthermore, the data demonstrated the existence of a co-integration relationship between GDP growth rate, government expenditure on energy, physical infrastructure, and telecom projects. At the 5% level of significance, the T-statistic test revealed three (3) co-integrating equations. This meant that the variables had a long-run relationship that they might not necessarily embrace in the short run (Jeffrey, 2018; Verbeck, 2022; World Bank, 2017).

Analysis of VAR (Vector Auto Regressive): The co integration tests also revealed that the variables in the level form had a long run connection, suggesting that the model approximation should be shown using the VAR model. Because VAR results in Table 3 were interpreted similarly to regular regression equations, remained resulting from physical equation.

Table 3
The Vector Auto Regressive (VAR) Results

Variables	Lags	EXINF	EXEL	TELEX
	Lag (-1)	7.62	2.01	1.12
Standard errors		(2.93)	(0.87)	(0.55)
T-statistics		(0.003)	(0.02)	(0.04)
	Lag (-2)	-2.08	-0.55	- 0.42
Standard errors		(2.92)	(0.50)	(0.54)
T-statistics		(0.001)	(0.000)	(0.043)

Source: STATA, 2021

N (adjusted): 1985-2016

Number of observations: 32 years

Standard errors and T-statistics are in paranthesis

According to the VAR results in Table 3, public infrastructure investment has a positive influence on economic development at both the first and second lags, with a 1% change in infrastructure spending resulting in a 7.6% rise in GDP. The P-Value is 0.00, meaning that at the 5% level, it is statistically significant. This finding is similar with the findings of Mary (2019) who identified a positive link between infrastructure spending and economic development. According to the study, public spending on telecom and energy projects has an optimistic effect on economic development only at the first lag, but both have a negative effect at the second lag, with a 1% change in telecommunication and energy spending resulting in 0.42% and 0.55% decreases in GDP, respectively. They both had statistically significant P-Values of 0.04 and 0.02 at the 5% level of significance at the first lag. The positive result is similar with the findings of (Mary, 2019) who observed that government investment in communication and power had a positive impact on economic development. Though the VAR analysis discovered that government spending on energy, telecommunications, and infrastructure aided economic development, it did not reveal the long-run link between variables. Furthermore, continuing co-integration means that Granger-causality exists from GDP growth rate to public spending, or vice versa, or both. As a consequence, the following step was to run Granger-causality tests, which is a means of identifying the method of connection between variables after the continuation.

VAR Diagnostic Tests: Many diagnostic tests were run to check that the anticipated VAR was correct; this assured that the study did not produce erroneous VAR approximation results. The results are reported in Table 4. At both delays 1 and 2, the findings demonstrated that the VAR scheme remained constant. Despite the lack of serial correlation at lag order 2, the VAR method with lag order 1 was favored. The lag barring test identified lag one as significant in the VAR system that provides the lag assortment conditions.

Table 4

VAR Diagnostic Statistics

VAR Condition Check	Statistic	Conclusion
Stability condition	Roots are within unit cycle with highest at 0.91%	All the eigenvalues lie inside the unit circles. AR satisfies stability condition
Lag exclusion test	Wald test for 1 lag, 15df, Chi-square = 80.90139, p-value = 0.000	1 lag is important
Residual serial correlation	LM test statistic	Shows no serial correlation at both however lag 1 is used
Residual multivariate normality	Jarque-Bera test statistic (joint) = 91.675 p-value = 0.0000	Residuals are multivariate normal.

Source: STATA, 2021

Based on the Jarque-Bera statistics and P-Values used to test the null hypotheses, the remainders are multivariate normal. The null hypothesis of normal distribution may be rejected since the P-Values for all (joint) are less than the 0.01 level of significance. The P-Values for Jarque-Bera test statistics were all less than 0.01 for separate series, indicating that the null hypothesis of normal distribution can be rejected.

The Granger Causality Tests: Following the VAR model with the least Akaike and Schwarz in arrangement principle and the best lag of one resulted in a superior model construction. The model passes the Granger - causality test. The null hypothesis of no causation is rejected, implying that a sequential change in government expenditure categories results in a continuous change in GDP growth rate. Failure to reject the null hypothesis of no association, on the other hand, showed that the GDP expansion rate was not directly controlled by government expenditure categories. The Granger-causality test results are summarized in Table 5.

Table 5
Granger Causality Tests Results

Null hypothesis	F-statistic	df	Probability	Conclusion
GDP growth does not Granger – Cause government expenditure on infrastructure	27.934	2	0.000	Bi-directional
Government expenditure on infrastructure does not Granger - Cause GDP growth	34.459	6	0.000	
GDP growth does not Granger – Cause government expenditure on energy	5.6211	2	0.000	Bi-directional
Government expenditure on energy does not Granger - Cause GDP growth	18.701	6	0.000	
GDP growth does not Granger – Cause government expenditure on telecom project.	18.645	2	0.000	Bi-directional
Government expenditure on telecom project does not Granger - Cause GDP growth	24.397	6	0.000	

Source: STATA, 2021

The Granger causality test results indicate that government expenditure on physical power, telecommunications projects, infrastructure, and economic development is bidirectional. These variables may be on the other side of the equation since they have been determined. In this study, Granger causality is empirically investigated in connection to the variable star of suggestion. Economic success is predicted by government expenditure on physical electricity, infrastructure, and telecommunications networks. This study backs up the usage of the VAR model by demonstrating unexpected connection between public investment in physical infrastructure, telecommunications projects, infrastructure, and economic development.

The granger causality results show that there was a negative impact between all public spending sectors and GDP growth rate, and it links Wagner's hypothesis, which states that an increase in GDP leads to an increase in public spending, and the Keynesian hypothesis, which

states that an increase in public spending leads to an increase in GDP. This suggests that the allocation of public resources be determined carefully in order to promote the nation's economic progress. The findings contradict those of (Verbeck, 2022), who discovered no causal association between public investment on infrastructure and economic development. Solow-Swan (1956) discovered a long-run negative relationship between public infrastructure spending and economic development.

5. CONCLUSION

According to the Johansen co integration test, there is a long-term relationship between the amount of public investment in communications, power, and infrastructure and the rate of economic growth. With a P-value of 0.04, the Granger-Causality test identified indirect causality between the pace of economic development and all of the factors used to calculate public spending. With a P-value of 0.00, the vector auto regressive (VAR) effects showed a clear relationship between public investment on infrastructure, communications, and energy and the rate of economic development.

Long-term economic growth is benefited by spending on investments in telecommunications, energy, and physical infrastructure. The government should play a substantial role in formalizing the model of economic growth through public spending reforms, which decide where and how much of an economy's money should be invested, diverted, or employed, as well as how those funds should be split. The study's conclusions therefore concentrated on the significance of infrastructure spending for comprehending economic advancement (Verbeck, 2022; World Bank, 2017). Future researchers are advised by the researcher to use several important social service sectors and to make more observations.

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