EFFECT OF TRANSPORT INFRASTRUCTURE INVESTMENT ON ECONOMIC GROWTH IN KENYA

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ABSTRACT
Transport infrastructure is central to the attainment of sustainable economic growth rate of a country. Due to this reason, the Kenyan government has shown commitment to improve transport infrastructure in the recent past by spending 4.5% of Gross Domestic Product on the transport and infrastructure sector. However, this expenditure is below the global spending threshold of 14% of GDP to the sector and it signifies underinvestment of transport infrastructure that has resulted into poor transport system which is the main bottleneck that not only limits realization of the 10% economic growth rate but also the socio-economic development in the country. While based on unbalanced growth theory, this paper analyzed the effect of transport infrastructure investment on economic growth in Kenya for the period 1990 to 2017. A causal research design was used to establish the cause – effect relationship among the variables of the study. The Error Correction Model was estimated using Ordinary Least Squares regression technique. Granger causality test revealed a unidirectional causality running from economic growth to transport infrastructure investment thus supporting Wagner law. Co-integration test confirmed existence of long run economic relationship among the study variables. The paper found that transport infrastructure investment has a positive coefficient of 0.1120 and statistically significant effect on economic growth with a p-value of 0.0263 < 0.05. This means that a unit increase in transport infrastructure investment increases economic growth by 11.20% other factors remaining the same. The paper also established that public investment has positive and statistically significant effect on economic growth while private investment has negative and statistically insignificant effect on economic growth. Interestingly, labour force had negative and significant effect on economic growth. Therefore, the paper concluded that transport infrastructure investment impacts economic growth in Kenya positively and significantly. Conclusively, the paper recommends the government to increase its annual budget allocation to the transport and infrastructure sector since this will enable development of new integrated transport infrastructure and at the same time allow for rehabilitation and maintenance of existing transport infrastructure facilities. This will go a long way in increasing trade and mobility that will lead to high productivity that ultimately propels the economy into sustainable economic growth.
Keywords: Infrastructure, transport infrastructure, investment, economic growth, Error Correction Model, Kenya

INTRODUCTION

Efficient, affordable and effective transportation systems facilitates rapid economic growth and reconstruction, poverty eradication and wealth creation. United Nations Human Settlement Programme [UN-HABITAT] (2011) defines infrastructure as all basic inputs into production and requirements for the proper functioning of the economy. Transport is classified as economic infrastructure along with energy, water and sanitation and Information and Communication Technology (Fedderke and Garlick, 2008; Hansen, 1965). Mayekiso (2015) defines transport infrastructure as a dynamic group and economic asset that builds space and defines mobility. Good transport linkages reduces transport costs, road congestion and promote industrial development throughout the country (Keho and Echui, 2011). Furthermore, Ighodaro (2009) asserts that transport infrastructure not only facilitate the direct provision of services to consumers but also provides intermediate inputs that enter into the production of other sectors and raise factor productivity. Therefore, conceptually transport infrastructure refers to physical structures, such as roads, railways, ports and airports that enable the passage of vehicles, freight and people. However, inefficient transport systems increases time spent stuck in traffic and also wastes time that could be spent engaged in more productive activities (United States National Economic Council, 2014). It estimated that poor urban transport system in Nairobi accounts to a loss of 2% of GDP (Republic of Kenya, 2007).

Ministry of transport Integrated National Transport Policy (2009) highlights that transport sector in the country consists of road transport, rail transport, maritime and inland water transport, pipeline transport, air transport and Non-Motorized and Intermediate Means of Transport (NMIMTs). Crafts (2009) argued that road network is the most important type of transport infrastructure. In United Kingdom, road network is the dominant means of transport accounting 73% of passenger traffic and 65% of freight moved (Eddington, 2006). UN-HABITAT (2011) also reports

that road transport in Africa is the dominant mode of motorized transportation accounting 80% of goods traffic and 90% of passenger traffic in the continent. However, it is reported that majority of African countries faces huge costs associated with transportation which directly leads to high cost of doing business and indirectly contributes to high cost of goods and services. The road transport in Kenya is unimodal accounting 93% of freight and passenger carriage (Moyaki, 2015). Ethiopia follows closely where it accounts at a range of 90% to 95 % and Nigeria where it carries more than 95% of domestic passengers and freight (Kayode, Babatunde and Abiodun, 2013). This shows the relative importance of road transport in both developed and developing countries and therefore investment in rail, water, and air transport is low.

African Development Bank (2010) reports that the total road network in Sub Saharan Africa is only 204 km per 1,000 km^2 of land area with only about 25% being paved and this compares lowly to the world average of 944 km per 1000 km^2 of land area. Mehne (2002) reports that Kenya's roads covered a distance of about 42,000 km and 63,663 km in 1963 and 1997 respectively, compared to Germany where the entire length of roads was 231,280 km in 1997. As Cheteni (2013) reports, South Africa has 754,600km with 16.7% paved and the remainder gravel roads. Africa Development Bank (2014) reports that there is 160,886km of road network in the country with only 7% paved. Indeed, Poverty Reduction and Economic Management Unit Africa Region (2011) reports that about 56% of the road network is in poor condition which reflects many years of neglect and inadequate financing and maintenance. Interestingly, the paved road network has been expanded from 2000 km in 1963 to 11,600 km in 2006 (Republic of Kenya, 2006).

Furthermore, AfDB reports that the total length of paved roads per 10,000 inhabitants in Kenya is 2.19km, which is less than the East Africa Community member countries' average of 2.53km. The life expectancy of roads in Kenya is 8 years and this is far shorter than the roads in Germany with a life expectancy of 40 years (Mehne, 2002). Cheteni (2013) asserts that in 2007, South Africa had more than 60% of roads with a life span of more than 25 years old and this was an increase from 28% in 1998. Kant attributes the low life expectancy in Kenya to lack of governmental responsibility for road maintenance, the climatic conditions, the condition of vehicles, which are often overloaded and carry inacceptable axle loads and corruption. Moreover, Ministry of Transport Integrated National Transport Policy (2009) highlights that transport sector in the county is characterized by high costs for passengers and freight, weak public and private institutions, and low levels of investment. Kenya Institute for Public Policy Research and Analysis [*KIPPRA*] (2016) reports that public transport system in Kenya is characterized by informal practices, lack of planning and standards in service delivery and poor maintenance thus making it unsustainable.

AfDB (2010) argues that rail networks are least developed in Africa with very little additions developed since the colonial period. The bank further reports that as of 2007, Africa had 69000km of rails of which 55000km were operational most in southern and northern Africa. According to Cheteni (2013) South Africa has the largest rail system in Africa covering about 20 872 km with 8931km electrified. It is reported that, in 1962 the total length of Kenya's rails was 2,069 km and by 1988 it had been extended to an entire length of 2,733 km all one-meter-gauge single tracks.

According to Africa Infrastructure Country Diagnostic [AICD] (2010), due to deterioration of the railway infrastructure, freight traffic on the rail corridor has declined to less than 1 million tons per year and handles less than 6% of the cargo passing through the northern corridor that links Kenya, Uganda, Rwanda, Burundi, the Democratic Republic of Congo, parts of Tanzania, southern Sudan, and Ethiopia. But in order to revive the rail subsector which since 1990 slowed down in its operations and performance National Transport and Safety Authority [NTSA] (2016), the government is investing heavily on Standard Gauge Railway Line with the phase 1 being complete at a tune of Ksh. 327 billion.

Kenya has a domestic air transport market that is the fourth-largest in Sub-Saharan Africa following South Africa, Nigeria, and Mozambique (AICD, 2010). However, Jomo Kenyatta International Airport is one of the three main international gateways in Sub-Saharan Africa but faces capacity constraints as the airport's terminal capacity is 2.5 million seats while actual passenger traffic is much higher reaching 4.3 million seats in 2005 and an estimated 6.3 million seats in 2007. Moreover, marine transport is the main mode of transport for moving freight to and from Africa and it accounts over 92% of Africa's external trade with a total coastline of 30,725 km (UN HABITAT, 2011). However, United Nations Economic Commission for Africa [UNECA] (2009) points out that African ports handle only 6.0% of global traffic, of which about six ports, three each in Egypt and South Africa, handles about 50% of Africa's container traffic. AICD (2010) reports that in Kenya there is lack of rail-port interface and this has become a major bottleneck in the movement of freight. Additionally, AICD reports that

Mombasa port handles more than 16 million tonnes of cargo annually and this number is projected to increase to 30 million tonnes a year by 2030. But, the port is congested because of inadequate capacity, exacerbated by low capacity of rail and road transportation from the port. All the same, to realize integrated transport system in the country and with some of its neighboring countries, Lamu Port South Sudan Ethiopia Transport corridor (LAPSSET) is underway all geared to improve transport infrastructure in the country.

The Kenya's economy grew an average of 6.6% for the period 1964 to 1973. However, this growth rate was not sustainable and the economic growth rate decreased from the late 1970s continuing until 2002 when the economy recorded a negative growth rate of 0.2%. Poor infrastructure mostly bad roads, inadequate energy supply, inadequate water supply, weak institutional framework and weak performance of agriculture and manufacturing sectors were among the key factors which contributed to this economic decline. In 2003 the economy recovered from a low of 0.5% to 6.1% in 2007. With the post-election violence shock in 2007/2008, the growth rate decreased sharply but the economy grew at an average of 4.7% in 2008-2012. During 2013 to 2018, the economy grew at an average rate of 5% which is below the 10% economic growth rate which has not been achieved since 2012.

Transport infrastructure investment is remains critical for sustainable economic growth and development of both developed and developing countries. Due to a period of rapid growth in transport demand in China from 1981 to 1990, transport investment amounted to 1.3% of GDP annually (Byoungki, 2006). Additionally, Byoungki asserts that it has been conservatively estimated that the annual economic costs of not having adequate transportation infrastructure in China during the past several years amount to about 1% of China's GNP. After a long period of low funding to transport sector in Kenya, 1.5% of GDP was allocated for maintenance, rehabilitation and development of the road network in the year 2006 (RoK, 2006).

Furthermore, Nyaosi (2011) notes that transport budget also increased from Ksh 86 million to Ksh 5,864 million in 2002/03 and 2005/06, respectively. Moreover, the Republic of Kenya (2018) reports that an average of 4.5% of GDP (8% of total government expenditure) has been spent by the government on the transport and infrastructure sector against a global benchmark funding to the sector of 14% of GDP. This signifies underinvestment of transport systems in the country and therefore transport infrastructure investment in the country is inadequate to meet the country's needs and envisioned 10% economic growth. Yet, for the country to achieve this growth rate the transport sector is expected to play a greater role than it had previously done in all economic sectors.

According to Ministry of Transport Integrated National Transport Policy (2009), transport sector's contribution to GDP averaged 6.4 % per annum over the period 1960-2000 with very little fluctuation. The policy also argues that ideally this percentage should be around 10% of GDP. From 2002-2006 the contribution of transport and storage to GDP fluctuated from 1.6% in 2002 to 7.3%. KIPPRA (2017) reports that transport sector (road, railway, port, air) contribution to GDP was 7.9% in 2016. This shows an improvement though this contribution is below the 10% ideal rate.

Mixed findings have been obtained on the relationship between transport infrastructure investment and economic growth in literature. Bosede *et al.,* (2013) found that transport infrastructure has positive and significant effect on economic growth in Nigeria, while Chukwuemeka *et al.,* (2013), Charles *et al.,* (2018) found that transport infrastructure has negative and insignificant effect on economic growth. In Kenya, Mburu (2013) established that transportation infrastructure has a positive and significant effect on economic growth in Kenya for the period 2005 to 2012. Additionally, Moyaki (2015) and Mugambi (2016) found positive and significant relationship between road infrastructure and economic growth in Kenya. Therefore, it is evident that few studies have been carried out in Kenya on transport infrastructure investment and economic growth and the existing literature is not in consensus on transport infrastructure investment - growth nexus. It is against this background that a paper on effect of transport infrastructure investment on economic growth in Kenya was carried out from the year 1990 to 2017.

Statement of the Problem

Kenya has been making strides in ensuring a competitive economy through massive public investment in transport infrastructure as guided by Vision 2030 so as to achieve the envisioned 10% growth rate. Globally, 14% of GDP should be allocated to transport and infrastructure sector but Kenya has only managed to allocate 4.5% of GDP (RoK, 2018). This illustrates underinvestment of transport infrastructure in the country , as evidenced by poor transport system characterized by congested and bad roads, lack of road-rail interface thus congested railways, and capacity constraints in airways and ports, compared to ever increasing demand of transport services by the fast growing population. These transport infrastructure bottlenecks have limited economic growth and socio-economic development in

the country. Therefore, this raises doubt on the role of transport infrastructure on the achievement of sustainable economic growth rate of 10% which has not been achieved since the year 2012. Economic theory predicts a positive relationship between transport infrastructure investment and economic growth. Previous international studies in this area have resulted into conflicting findings where some established positive effect and others negative effect thus leading to unending discussion in literature on transport infrastructure investment – growth relationship. Despite Mburu (2013) using a small sample size of 10 years, he found a positive and significant relationship between transport infrastructure and economic growth in Kenya. Though Moyaki (2015) and Mugambi (2016) found positive and significant results, they modelled only road infrastructure and economic growth in Kenya thus leaving other transport systems like air, railway and water. Therefore, these research gaps motivated a paper on the effect of transport infrastructure investment on economic growth in Kenya for the period 1990 to 2017 to be carried out.

Objective of the Study

The main objective of the study was to determine the effect of transport infrastructure investment on economic growth in Kenya.

Hypothesis of the Study

Transport infrastructure investment has no statistical significance effect on economic growth in Kenya

LITERATURE REVIEW

Empirical Literature

Aschauer (1989) has over the years sparked unending debate in literature on the relationship between public infrastructure and economic growth. While using both cross sectional and panel data analysis, Boopen (2006) analyzed the contribution of transport capital to growth for a sample of Sub Saharan Africa (SSA) and a sample of Small Island Developing States (SIDS). In both cases, the analysis concluded that transport capital has been a contributor to the economic progress of these countries. The study further revealed that in SSA case, the productivity of transport capital stock is superior as compared to that of overall capital while such is not the case for the SIDS where transport capital is seen to have the average productivity level of overall capital stock.

By employing OLS regression technique, Bosede *et al* (2013) evaluated transport infrastructure improvement and economic growth in Nigeria for the period 1981 to 2011. Their study adapted a model used by Sahoo *et al*. (2010) and found that transport infrastructure had a positive and statistically significant relationship with economic growth in Nigeria. The study recommended that the waterways and railways to be opened up so as to reduce pressure on the road network. Similarly, Ighodaro (2009), while exploring transport infrastructure and economic growth in Nigeria, found that no causality existed between road development and economic growth and that road development was significant in determining economic growth in Nigeria in the long but not in the short run.

On contrary, Fasoranti (2012) while examining the effects of government expenditures on infrastructure and the growth of the Nigerian economy over the period 1977 to 2009, observed that government expenditure on transport and communication imparted negatively on growth while expenditures in agriculture and security were not significant in the growth of the economy. The recommendation was that the government must adopt stringent controls on its expenditure on infrastructure so as to increase growth rate of Nigerian economy.

In Nigeria, Chukwuemeka *et al*. (2013) investigated public spending on transport infrastructure and economic growth for 1981 to 2010. By employing OLS regression method, the study however found that public spending on transport infrastructure is negatively related to growth and insignificant and it recommended that the government must ensure adequate funding of transport sector. Yet public spending on electricity, water supply, education and health infrastructure had positive and significant relationship with real GDP in Nigeria. Likewise, Charles *et al* (2018) in Nigeria found that government expenditure on construction, transport and communication had negative and insignificant relationship with economic growth and recommended adequate funding to the sectors analyzed so as to boost economic growth.

Kayode et al., (2013) analyzed an empirical analysis of transport infrastructure investment and economic growth in Nigeria from 1977 to 2009 while using OLS estimation technique. The empirical model used by the study was developed from the endogenous growth framework in which transport investment entered into the production function as an input. The study found that transportation played a positive but insignificant role in the determination of economic growth in Nigeria and therefore suggested that an increase in public funding and complete overhauling of the transportation system in Nigeria. All these studies had inconclusive findings on the relationship between transport infrastructure investment and economic

growth in Nigeria thus raising the need to carry out a similar study for the case of Kenya.

Keho and Echui (2011) studied transport infrastructure investment and sustainable economic growth in Côte d'Ivoire using cointegration and causality analysis for 1970 to 2002. The study found that public investment in transport infrastructure, private investment and economic output are cointegrated. The results of the granger causality test revealed that public investment in transport does not have a causal impact on economic growth; conversely economic growth had unidirectional causal impact on transport investment both in short run and long run thus supporting Wagner's law. The study found that an increase in GDP and private investment has a positive effect on government investment in transport infrastructure, associating the level of public spending on infrastructure to the degree of economic development.

Mburu (2013) carried out a study on the relationship between government investment in infrastructure and economic growth in Kenya for the study period 2005 to 2012. Mburu established that transportation infrastructure had the highest effect on economic growth in Kenya with a positive elasticity of 10.56. Additionally, Moyaki (2015) evaluated the relationship between road infrastructure and economic growth in Kenya for the period 1963 to 2014. OLS method was used and simple linear regression was done. Solow's neoclassical growth model of economic growth was the basis of this study unlike this current study which was underpinned on unbalanced growth theory.

The findings were that public investment in road infrastructure has positive effect on economic growth. Similar results were found by Mugambi (2016), who while investigating the role of public and private sectors in road infrastructure investment and economic growth in Kenya between 1980 and 2014, found that public and private expenditures on road infrastructure impact economic growth positively although public coefficient was higher than that of private sector. The study recommended for more sensitization of the Public Private Partnerships (PPP) programme.

Theoretical Literature

The study was based on unbalanced Growth Theory. Hirschman (1958) formulated this theory; it stipulates that investment should be made in selected sectors rather than simultaneously in all sectors of the economy due to shortage of capital in developing countries. The theory argues that a deliberate unbalancing of the economy according to a pre-designed strategy, is the best way to achieve economic growth in an underdeveloped country more so in the early stages of development. Hirschman noted that investments in strategically selected industries or sectors of the economy will lead to new investments and pave way to further economic development.

Further, the theory argues that the unbalancing of the economy with large investment in Social Overhead Capital (SOC) or infrastructure will bring about increase in private investment in the form of direct productive activities (DPA). SOC investments indirectly subsidize agriculture industry by cheapening various inputs, which they use, or by reducing costs. Hirschman points out that the SOC includes investment in education, public health, communications, transportation and conventional public utilities such as electricity, water, irrigation and drainage schemes.

The theory also contends that unless SOC investments provide cheap or improved services, private investments in DPA will not be encouraged. Thus, the SOC approach to economic development is to unbalance the economy so that subsequently investments in DPA are stimulated. However, the balanced growth theory by Nurske (1953) argues that economic growth in underdeveloped countries can also be stimulated by large simultaneous investments in numerous industries and still economic growth occurs.

This theory has been adapted in several studies in Nigeria like Ogundipe and Aworinde (2011) and Chukwuemeka *et al*. (2013) and they found it appropriate in analyzing the nexus between transport infrastructure and economic growth in Nigeria. In Kenya, this theory has not been applied so far in literature and was used now that government is investing heavily in mega transport infrastructure in the country so as to boost economic productivity.

RESEARCH METHODOLOGY

Model Specification

Transport infrastructure investment influences the productive capacity of an economy through its use as a direct input in the production process (Kayode *et al*. 2013). Therefore, transport infrastructure investment entered the Cobb Douglas production function as the third input while public investment, private investment and labour force were used as moderating variables. The equation for modelling was presented as follows:

$Y=f$ (Tii, L, PI, PRV)

Conceptual Framework

The conceptual framework for the paper was presented in the Figure 1

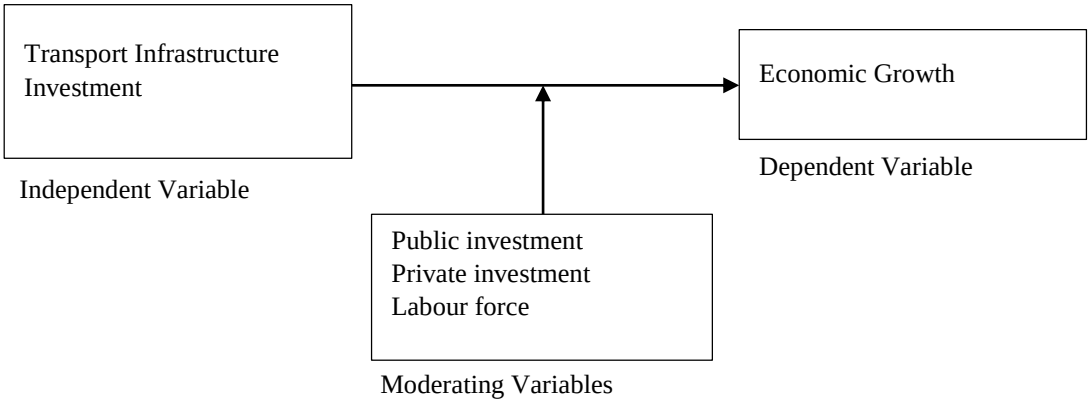

Figure 1. Conceptual framework

Econometrically the model to be estimated was expressed as;

$\log GDPt = \beta_0 + \beta_1 \log (Tii)_{t-i} + \beta_2 \log Pi_{t-i} + \beta 3 \log PRIi_{t-i} + \beta 4 \log L_{t-i} + et$

Log GDP - Logarithm of GDP

Log Tii – Logarithm of transport infrastructure investment

Log Pi - Logarithm of public investment

Log PRIi – Logarithm of private investment

Log L – Logarithm of labour force

Data Collection and Measurement

Data on economic growth, public investment and private investment was obtained from World Development Indicators while data on transport infrastructure investment was obtained from Kenya National Bureau of Statistics Economic Surveys. Economic growth was measured using GDP growth while transport infrastructure investment was measured using real development expenditure. Public investment was measured using gross fixed capital formation while private investment was measured using gross fixed capital formation for private sector.

Data Analysis and Estimation Techniques

Data was log linearized in the excel package and then imported for analysis with the aid of PcGive Ox metrics and Eviews statistical software packages. This involved generation of the Error Correction Model (ECM) and Ordinary Least Squares (OLS) technique was used in regression analysis. The overall significance of the model was tested using F-statistic at 5% significance level. Further, the goodness of fit of the model was evaluated using coefficient of multiple determination R squared. The statistical significance of the coefficients was made using the t - probability value at 5% significance level. To avoid spurious regression, time series property tests carried out were stationarity, granger causality and cointegration.

RESULTS AND DISCUSSION

Stationarity Test

The assumptions of the Classical Linear Regression Model (CLRM) necessitate that the variables under consideration are stationary which means that mean, variance and covariance are time invariant. Augmented Dickey-Fuller (ADF) by Dickey and Fuller (1979) was used to test unit root. Incase ADF test was greater than the critical value at 5% significance level then, the null hypothesis that there is unit root would be accepted. But, this would be rectified by differencing these variables to make them stationary. Stationary test results are discussed in Table 1. The LNGDP, LNPi were stationary in level form. However, LNTii, LNPRIi and LNL were not stationary in level form but upon taking first difference they all became stationary.

Granger Causality Test

Granger causality test help in deciding the direction of relationship between two or more variables (Kaur and Malhotra, 2014). The null hypothesis of non - causality between the variables at 5% significance level was rejected if p-value < 0.05 and accepted if p-value > 0.05. Table 2 shows the granger causality test. From Table 2, economic growth (measured by LNGDP) was found to have unidirectional causality on transport infrastructure investment and not conversely, thus supporting Wagner law. Public investment had unidirectional causality with LNGDP. Private investment and labour force had neutral causality meaning they are independent of each other.

Table 1. Stationarity test on data in level form and first difference

Variables	Form	ADF Test at 5% = -3.60	Status
LNGDP	Level	-4.473**	Stationary
LNTii	Level	-1.880	Not Stationary
DLNTii	1st Difference	-6.430**	Stationary
LNPi	Level	-4.390**	Stationary
LNPRIi	Level	-1.895	Not Stationary
DLNPRIi	1st Difference	-4.669**	Stationary
LNL	Level	-1.821	Not Stationary
DLNL	1st Difference	-4.849**	Stationary

Table 2. Economic growth (measured by LNGDP)

Null Hypothesis:	Obs	F-Statistic	Probability
LNTII does not Granger Cause LNGDP	27	3.12593	0.08977
LNGDP does not Granger Cause LNTII	27	5.60298	0.02634
LNPi does not Granger Cause LNGDP	27	4.76845	0.03899
LNGDP does not Granger Cause LNPi	27	0.01450	0.90516
LNPRIi does not Granger Cause LNGDP	27	2.87418	0.10295
LNGDP does not Granger Cause LNPRIi	27	0.29987	0.58902
LNL does not Granger Cause LNGDP	27	0.03419	0.85485
LNGDP does not Granger Cause LNL	27	0.97613	0.33301

Cointegration Test

Cointegration refers to a long-run equilibrium relationship between variables whereby two or more variables may wander away from each other in the short-run but move together in the long-run (Enders, 1995). Cointegration was tested using Engle-Granger (EG) two step methods. EG test postulates that if the residuals from the OLS estimation of the non-stationary variables are stationary, then the series is cointegrated. This implies that the ECM should be conducted on the variables at their first difference. The null hypothesis was rejected if the p-value was less than 0.05 meaning cointegration exists and accepted if otherwise. Table 3 shows the cointegration test findings and indicates that ADF statistic is less than 5% significance level, leading to rejection of null hypothesis of unit root. Thus, the residuals are stationary signifying presence of cointegration or long run relationship of the study variables.

Error Correction Mechanism

Error Correction Mechanism is a model that tries to restore equilibrium incase the economic variables wander away from their long - run path. The prior test for cointegration revealed existence of long run relationship among the study variables and thus ECM technique was used to determine the speed and adjustment to shocks. The regression results are presented in the following model:

GDP = -0.02588 + 0.1120Tii +0.4276Pi – 0.04344PRIi- 0.7354L- 1.008ECT.

Table 4 shows that the model had a constant of -0.02588 meaning economic growth will grow by negative 2.5% independent of variables included in the model. This denotes importance of transport infrastructure investment, private investment and labour force in expanding productive capacity of an economy. The overall model is significant since the F statistic had a p-value of 0.000. $R^2 = 0.997423$ meaning that 99.74% of the variations of economic growth can be explained by transport infrastructure investment, private investment, public investment and labour force. The DW statistic was 2.22 signifying absence of autocorrelation. The coefficient of Error Correction Term was negative and statistically significant with a speed of adjustment of 100.8% from actual growth in the previous year to equilibrium rate of economic growth. This means that there exists equilibrium between short-run and long-run relationship between economic growth and modeled independent variables.

Transport infrastructure investment had a positive coefficient of 0.1120 with a p-value of $0.0263 < 0.05$. This denotes that a unit increase in transport infrastructure investment will increase economic growth by 11.20% holding other factors constant. The implication of this finding is that increasing government spending on transport infrastructure is an enabler for high economic growth in the country. Since the p-value was 0.0263 and is less than 0.05, the null hypothesis was rejected at 5% significance level. The study findings agree with Boopen (2006), Bosede *et al*. (2013) in Nigeria, Moyaki (2015), Mugambi (2016)

and Mburu (2013) in Kenya who found a positive and significant relationship between the transport infrastructure investment and economic growth. The findings disagree with Chukwuemeka *et al*. (2013) and Charles *et al*. (2018) in Nigeria who found that public spending on transport infrastructure has a negative and insignificant effect on economic growth. Fasoranti (2012) found that government expenditure on transport and communication was statistically significant though it imparted negatively on economic growth.

Table 3. Test results for stationarity of residuals

D-lag	ADF
2	-3.633**
1	-4.876**
0	-5.321**

ADF test Statistic at 5%=-1.96

Table 4. Error correction mechanism results

	Coefficient	Standard Error	t-value	t-probability
Constant	-0.02588	0.01896	-1.36	0.1924
DLNTii	0.3633	0.04605	7.89	0.0000
DLNTii -1	0.1120	0.04544	2.46	0.0263
DLNPi	0.1196	0.01597	7.49	0.0000
DLNPi -1	0.4276	0.01447	29.6	0.0000
DLNPRIi	-0.3506	0.03865	-9.07	0.0000
DLNPRIi -1	-0.04344	0.03551	-1.22	0.2401
DLNL	-0.7857	0.05435	-14.5	0.0000
DLNL-1	-0.7354	0.06288	-11.7	0.0000
ECT	0.9776	0.02969	32.9	0.0000
ECT-1	-1.008	0.03719	-27.1	0.0000

R^2 = 0.997423 F (11, 15) = 527.7 [0.000] ** DW= 2.22

Public investment were found to have a positive coefficient of 0.4276 and a significant p-value of 0.0000 < 0.05. This means that a unit increase in other public investment increases economic growth by 42.76% other factors held constant. This implies that public investment is capable of raising economic growth in Kenya. Private investment had a negative and insignificant effect on economic growth with and it had a coefficient of -0.04344 with a p-value of 0.2401 > 0.05. This means a unit increase in private investment decreases economic growth by 4.344% holding other factors constant. This implies that government investment in transport infrastructure crowds out private investment thus supporting crowding out hypothesis. Labour force had negative coefficient of 0.7354 and significant p-value of 0.0000 < 0.05.This means that a unit increase in labour force decreases economic growth in the country by 73.54%.

CONCLUSIONS

The study determined the effect of transport infrastructure investment on economic growth in Kenya for the period 1990 to 2017. From regression analysis, the conclusion arrived at was that transport infrastructure investment has a positive and statistically significant effect on economic growth in Kenya.

RECOMMENDATIONS

The government needs to increase budget allocation to transport sector in Kenya. This is because transport infrastructure in the country has been cited to be unsustainable, majorly due to inadequate financing, maintenance and congestion. Therefore, budgetary increment will help develop new integrated transport infrastructure and maintain and rehabilitate majority of the existing transport infrastructure facilities in the country thus enable them to be an enabler for the achievement of the 10% economic growth rate.

The government should tighten the control measures that govern infrastructure development for transport projects in the country, especially during planning, execution and implementation phases, while facilitating regular monitoring and evaluation throughout these projects' life cycle. This will help identify loopholes for theft of public funds allocated to the transport sector.

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