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Effect of Government Transport Infrastructure Development Expenditure on Share of Manufacturing in GDP In Kenya

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Abstract
Infrastructure development has continued to attract attention both globally and nationally because of its critical contribution to sustained economic growth and development. Due to the high cost associated with infrastructure investment and development, national governments have remained the main financiers. Various studies conducted in Kenya have concluded that transport infrastructure has a positive and significant contribution in driving economic competitiveness of Kenya. However, the studies missed to analyze the effect of government transport infrastructure development expenditure on performance of manufacturing in Kenya that the current study is anchored on. This study adopted a non-experimental research design for the purpose of explaining the effect and relationship between transport infrastructure development and performance of manufacturing sector since independent variables were not manipulated to show statistical relationship with the dependent variable. Time series data collected from the World Development Indicators and Central Bank of Kenya databases, economic surveys and national financial budget reports covering the period 1982-2018 for the following variables was considered. A linear equation was used: Ln Mng = $ln\alpha_0 + \alpha_1 lnL + \alpha_2 lnPO + \alpha_3 lnLIT + \alpha_4 lnPS_T + \alpha_5 lnP_{CI} + \mu$. The coefficient of annual government expenditure on transport infrastructure was 0.128 with a P-value of 0.03526. The coefficient was found to be positive and statistically significance at 5 per cent level of significance. Therefore, the government should concentrate more on the development of transport infrastructure such as roads, railway lines, expansion of airports and sea ports for faster movement of goods and other products in order to boost performance of manufacturing sector hence increasing its share in GDP.

Key Words: *Government; Transport; Infrastructure; Expenditure, Manufacturing; Development*

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I. Introduction

Infrastructure development has continued to attract attention both globally and nationally because of its critical contribution to sustained economic growth and development (Saxena, Chotia & Rao, 2018). Due to the high cost associated with infrastructure investment and development, national governments have remained the main financiers. According to El-Makhloufi (2016), existence of quality and reliable infrastructure is the foundation underpinning a modern economy's sustained economic growth, productivity as well as development. According to Kenya Economic Report (2017) infrastructure development contributes significantly in the Kenyan economy through linkages with other sectors of the economy. Chingoiro and Mbulawa (2016) suggest that there is a bidirectional flow of causality between infrastructure expenditure and economic growth in Kenya. This argument was also echoed by Mburu (2013) and Mugambi (2016) that development expenditure in transport specifically road transport has significant and positive impact in the growth of Kenya's economy.

The manufacturing sector in Kenya has for many years featured in the government's agenda in pursuit of economic growth and development due to its critical contribution to rapid industrialization and employment creation (Odhiambo, 1991). This has made the government since independence to pursue various polices aimed at improving productivity as well as general growth and performance of the manufacturing sector. The relatively high growth rates recorded in the sector during the early post-independence years were also attributed to the official recognition of the informal sector by the International Labour Office (ILO) in 1972 (Chege, Ngui & Kimuyu, 2016). It is worth noting that the Import Substitution strategy led to availability of basic products in the domestic market. They were however overpriced resulting to the distortion of industrial evolution by encouraging the excess capacity and generalized inefficiencies. This undermined the ability of Kenyan product to penetrate and compete in the external markets.

STATEMENT OF THE PROBLEM

The government of Kenya has continued to emphasize the importance of manufacturing sector growth in its efforts to realize economic transformation and increased standards of living for its citizens. To realize the

annual 10 per cent GDP growth as envisioned in the Kenya Vision 2030, the sector was expected to grow its share in GDP to 10 percent from 2008-2017. This however, has not been realized as the sector's current share is recorded at 7 per cent (Republic of Kenya, 2018). Chingoiro and Mbulawa (2016), Mugambi (2016), and Njoro (2016) conducted studies on Kenya focused on the relationship between government expenditure and specifically road infrastructure expenditure and economic growth. Their studies concluded that transport infrastructure has a positive and significant contribution in driving economic competitiveness of Kenya. However, the study missed to analyze the effect of government transport infrastructure development expenditure on performance of manufacturing in Kenya that the current study is anchored on.

II. Literature Review

Theoretical Perspective

Theory of Industrial Location postulated by Alfred Weber in 1909 attempts to explain the regionally operating variables or factors that influence the setup location of industries. Weber identified the two key operating location factors as transportation costs and labour costs. Being a strict function of space, these factors were analyzed from the point of view of individual, isolated production process. Weber therefore grouped all other factors of location work between industries as the agglomerative factors (Reid, 1966). According to Weber, an industry will move to a location where its transportation costs and labour costs will be low or minimized. Weber also argues that the forces produced within the framework of these regional factors, create and promote the degree of agglomeration. That is, benefits that comes from firms and workers being close to one another which include market size of the industries.

Industrial Growth Theory developed by Hollis Chenery in 1960 states that the growth of industry and industrial output is as a result of increase in per capita income in an economy. Chenery argues that an increase in per capita income leads to a change in the composition of demand. That is, individuals begin to demand more than just the basic commodities and demand other luxury goods thus the share of food demanded declines as the demand for industrial goods increases. This therefore makes the manufacturing or industry sector grow and become vibrant. According to Chenery, the growth of industrial sector is determined by increase in per capita income as well as the population. Hence the two parameters should be included as explanatory variables in models of growth in manufacturing.

Empirical Review

Stephan (1997) conducted a study to examine the impact of road infrastructure on private production in Germany. The study used three different approaches, a Cobb-Douglas production function, a translog production function and a growth accounting approach. The study made use of panel data collected from the manufacturing sector of 11 states from 1970-1993. The study found that road infrastructure is significant for the production in manufacturing sector. The study also revealed that variations between states are more important for explaining infrastructure's contribution to the production than across years. Although the study considered infrastructure development as a factor that affects growth in the manufacturing sector, it solely concentrated on road infrastructure and not transport infrastructure- road, air, railway and port in totality.

Mburu (2013) carried out a study to establish the relationship between government investment in infrastructure and economic growth in Kenya. The study used time series data for the period 2005-2012 and a regression analysis. Key variables considered by the study were government investment in transport, communication, water and energy and fuel infrastructure and GDP. The results from the study showed that the investment made by the government in the considered infrastructure sub-sectors- transport, communication, water and energy and fuel- had significant effect on economic growth in Kenya as well as a positive relationship. Although the study considered infrastructure development in the key sub-sectors of the country's infrastructure, it failed to consider the effect it has on the performance of the manufacturing sector.

Transport Infrastructure Investment and Manufacturing Sector Growth

Public infrastructure such as transport infrastructure is considered as public capital (Shanks & Barnes, 2008). Since transport infrastructure -public capital- is not subject to user charges, it is not accounted for as direct input into the production of goods and services. It is therefore considered as a free input in the production process. This is because it increases market access, enables efficient delivery of goods and reduces wear and tear costs of firms' trucks hence increasing firms' output.

Njoro (2016) and Mugambi (2016) have shown that public infrastructure development is positively and significantly linked with growth and development of an economy as well as its productivity. Therefore, the discussion shows how public infrastructure development is critical for growth and productivity of manufacturing sector. Studies carried reviewed above have only considered the effect of public infrastructure development on growth of the economy but none has considered the effect of public infrastructure development on the growth of

manufacturing sector. Furthermore, Chingoiro and Mbulawa (2014), Moyaki (2015) have considered only the development of road infrastructure and not the transport infrastructure in totality- road, air, port and railway.

III. Methodology

This study adopted a non-experimental research design for the purpose of explaining the effect and relationship between transport infrastructure development and performance of manufacturing sector since independent variables were not manipulated to show statistical relationship with the dependent variable. Time series data covering the period 1982-2018 for the following variables was considered; manufacturing value added as a percentage of GDP, infrastructure development expenditure on transport –road, air, port and railway transport.

Public capital includes transport infrastructure and ICT infrastructure. In order to make equation a linear function and interpret the coefficient as elasticities we take the natural logarithm on either sides of the equation to get equation; $\ln Y = \alpha_1 \ln L + \beta_1 \ln K_1 + \beta_2 \ln K_2$. Where: lnY is natural log of output, lnL is natural log of labour force, $\ln K_1$ is natural log of private capital, $\ln K_2$ is natural log of public capital. α_1, $\beta_1 + \beta_2 = \alpha_1$ and α_2 are coefficients.

This study therefore estimated the linear equation: $\text{Ln Mng} = \ln\alpha_0 + \alpha_1 \ln L + \alpha_2 \ln PO + \alpha_3 \ln LIT + \alpha_4 \ln PS_T + \alpha_5 \ln P_{CI} + \mu$.Where: Mng is manufacturing output, L is Labour, LIT is lending interest rate, PO is population, PS_T is public spending on infrastructure development on transport, P_{CI} is per capita income, M is imports of manufacturing products, X is exports of manufacturing products, FDI is foreign direct investments, $\alpha_{1...}$ α_{10} are a coefficients and μ is the error term.

Time series data was collected from the World Development Indicators and Central Bank of Kenya databases, economic surveys and national financial budget reports for the period 1982 to 2018. A unit-root test on both dependent and independent variables was conducted to test for stationarity before the analysis was done. This was to ensure that the series had a constant mean and variance thus spurious results were not obtained. In case some variables were found not to be stationary, they were differenced in order to attain stationarity. This study adopted the Augmented Dickey Fuller (ADF) test to test for unit root.

To test for a long-run equilibrium relationship between considered variables, this study carried out a cointegration test using Johansen test. It therefore made it suitable to capture the relationship between non stationary time series in a stationary model (Adam, 1988). The test ensured that there was no long-run relationship among the independent variables. The study employed Variance Inflation Factor (VIF) to test for multicollinearity among the explanatory variables. The test was necessary to ensure that spurious results were not obtained during analysis by eliminating the variables which depicts close multicollinearity.

IV. Findings

Descriptive Statistics Analysis

Imports had the maximum value of 74.90 while information, communication and technology had the minimum value of 0.0000. The findings also showed that annual share of manufacturing in gross domestic product (Mng), annual exports of manufacturing products, annual imports of manufacturing products and annual per capita income were negatively skewed, annual interest rate (INT), annual labour employed in the manufacturing sector, annual government expenditure on transport (PS_T) and annual population growth (PG) were positively skewed. Some variables such as share of manufacturing in gross domestic product, imports of manufacturing products, annual interest rates had kurtosis values close to 3 while foreign direct investment, information, communication and technology and per capita income had a kurtosis values more than 3 hence were found to be leptokurtic and expenditure on energy, export of manufacturing products, labour and expenditure on transport had kurtosis less than 3 hence were platykurtic.

Time Series Test Results

Unit root tests were carried out using Augmented Dickey Fuller (ADF) to ensure that both the independent and dependent variables were stationary before other analyses were done in order to avoid probability of getting spurious results. The test was done at both intercept and at trend and intercept with some variable being stationary at level and some after first difference.

The results were obtained at 5 per cent level of significance and according to the rule of the thumb a P-value greater than 0.05 signifies non-stationarity while a P-value less than 0.05 signifies stationarity. Therefore, the study concluded that all the variables were stationary at level, first difference and second difference. Variables such as foreign direct investment, imports of manufacturing products and annual per capita income were found to be stationary at level while variables such as expenditure on exports of manufacturing products, lending interest rates, labour employed in manufacturing sector, share of manufacturing in the GDP and expenditure on transport were found to be non-stationary at level hence were differentiated ones in order to be stationary.

Co-integration test was carried out to ensure that no long-run relationship among the independent variables. The test was carried out using Johansen Co-integration test and the results are shown in Table 3. Johansen Co-integration test states that if there are n-variables in an equation then co-integrating equations should be n-1. From the analysis, there are ten (10) co-integrating equations obtained from eleven (11) explanatory variables at 5 per cent significance level. Therefore, the study concluded that there was co-integration among the variables.

Co-integration Test Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.999451	785.4370	285.1425	0.0000
At most 1 *	0.982299	522.6791	239.2354	0.0000
At most 2 *	0.949283	381.4837	197.3709	0.0000
At most 3 *	0.875864	277.1317	159.5297	0.0000
At most 4 *	0.824291	204.1084	125.6154	0.0000
At most 5 *	0.741875	143.2461	95.75366	0.0000
At most 6 *	0.720504	95.84520	69.81889	0.0001
At most 7 *	0.475788	51.22833	47.85613	0.0233
At most 8	0.397122	28.62327	29.79707	0.0678
At most 9	0.267237	10.91186	15.49471	0.2170
At most 10	0.000835	0.029225	3.841466	0.8642

Trace test indicates 10 co-integrating equations at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

From the correlation analysis it was found that all the variables were not highly correlated to one another as the coefficient of correlation matrix was less than or equals to 0.8. Hence, the variables were used in the analysis as there was no sign of singular matrix problem.

Correlation Test Results

	X	FDI	M	INT	LABOUR	PC	PG	PS_T
X	1.000							
FDI1	0.358	1.000						
M	-0.054	-0.117	1.000					
INT	0.176	0.033	0.303	1.000				
LABOUR	0.787	0.329	-0.057	-0.276	1.000			
PC	-0.141	0.077	-0.010	0.081	-0.287	1.000		
PG	0.781	0.384	-0.008	-0.176	0.954	-0.103	1.000	
PS_T	0.594	0.403	-0.088	-0.201	0.805	0.002	0.875	1.000

The coefficient of annual government expenditure on transport infrastructure was 0.128 with a P-value of 0.03526. The coefficient was found to be positive and statistically significance at 5 per cent level of significance. The finding was in agreement with that of Mugambi (2016). This implies that one (1) per cent increase in government expenditure in transport infrastructure results to an increase in the share of manufacturing in gross domestic product in Kenya by 12.8 per cent. The findings that transport sector significantly contribute to the growth of manufacturing and its share in the GDP is also in tandem with the findings by Mburu (2013).

The above scenario could be as a result of continuous increase in allocation of more funds to the development of transport infrastructures during annual budgeting by the government. This has enables the development of more roads, railway lines, sea transport and upgrading of airports in the country which facilitates the movement of manufacturing products from the production to consumption or value addition points. The development of transport infrastructures has also opened up areas for the established of more manufacturing firms. This is due to easy accessibility and low transportation costs which facilitates faster movement of products or goods and services to the markets and raw materials to the firms. This has tremendously contributed to the growth and particularly share of the manufacturing in the gross domestic product in Kenya (Stephen, 1997).

V. Regression Analysis Results

Dependent Variable: Share of Manufacturing in GDP				
Independent Variables	**Coefficient**	**Std. Error**	**t-Statistics**	**Probability**
Constant Term (C)	-12.00869	7.781500	-1.543236	0.01349
Exports of manufacturing products	0.00517	0.043609	0.118548	0.0907
Foreign Direct Investment	-0.32874	0.211752	-1.552487	0.0133
Imports of manufacturing products	-2.14432	2.032352	1.369976	0.0182
Lending interest rate	2.06663	1.044273	1.504935	0.01444
Labour force	0.510854	0.601598	0.849162	0.4035
Per capita income	0.509219	1.350905	0.376946	0.7093
Population	0.236753	0.102072	2.319478	0.0285
Expenditure on transport infrastructure	0.128208	0.135442	0.946586	0.03526
R-Squared	0.919671			
Adjusted R-Squared	0.888775	**F-Statistics**		49.76681
Durbin-Watson Statistics	2.319416	**Probability (F-statistics)**		0.00000

VI. Summary and Conclusion

The share of manufacturing sector to the gross domestic product has been low due to undeveloped transport sector, adoption of less capital intensive method of production, high rate of importation of manufacturing products and high lending interest rates. In order to increase the contribution from the current 7 per cent to 10 per cent as envisioned in the vision 2030, the government has put in place measures like the "Big Four Agenda", to help realized this growth. The study found that the coefficient of development expenditure on transport infrastructure was positive and statistically significant at 5 per cent level of significance. Government should concentrate more on the development of transport infrastructure such as roads, railway lines, expansion of airports and sea ports for faster movement of goods and other products in order to boost performance of manufacturing sector hence increasing its share in GDP.

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