Gross Capital Formation, Infrastructure, and Economic Development in Nigeria

Abstract
In Nigeria, the reduction in capital formation and the extent to which the dismal state of most infrastructure facilities, as well as their state of disrepair, impair the nation's growth potential are relatively unknown. Given this, this study the Johansen co-integration test and the Vector Error Correction Model (VECM) to examine the impact of gross capital formation and infrastructure on the economic development of Nigeria throughout the period spanning from 1991 to 2021. The findings of the co-integration analysis indicate the existence of a long-term relationship among the variables under investigation. Additionally, the results of the Vector Error Correction Model (VECM) suggest that gross capital formation did not exert a statistically significant influence on economic development in Nigeria during the study period. However, it was observed that infrastructure had a significant positive impact on economic development in the country. The study's findings suggest that a collaborative effort between the government and private sectors is recommended in order to establish a conducive climate that promotes capital investments within the larger economy. Also, gross capital formation should be efficiently channeled with a sizable amount accorded to infrastructural development which in turn translates to economic development.

Keywords: Gross Capital Formation; Economic Development;Infrastructure; Nigeria; VECM.
JEL Classification:H41, H54, O11

Introduction

The recent globalization across nations has facilitated greater achievement of macroeconomic goals, which, while not automatic, do necessitate governmental guidance and give adequate contributions to varied economic forces (Adefeso&Bolaji, 2010). As a result, both economists and policymakers have been paying close attention to the debate over economic progress.

As a development policy objective, all governments throughout the world, particularly African states like Nigeria, have emphasized quick, sustained, and beneficial GDP growth and expansion. After six decades of independence, Nigeria's economy has tremendous challenges in terms of attaining sustained economic growth, alleviating poverty, and lowering unemployment (Okuneye*et al.*, 2023). The economy remains mostly focused on primary products, heavily dependent on imports, consumption-driven, and lacks diversification. Despite the availability of natural resources such as oil and gas,

68 percent of the country's nearly 170 million population lives below the international poverty line of US$ 1.25 per day (Opadeji*et al.,* 2021). Agriculture employs approximately 70% of the workforce and generates 40% of GDP; while over ninety percent of merchandise exported and foreign exchange revenues are accounted for by crude oil.

The development of the economy necessitates significant financial investments in infrastructure, education, health, and other social services. As a result, substantial capital formation is critical for achieving these developmental needs.Infrastructure is essential to nationhood and economic growth globally (Olaniyi *et al.,* 2023). Public capital, healthcare facilities, educational institutions, transportation networks like port facilities, airport terminals, railways and highways, and basic amenities like drinking water, energy, and sewage facilities make up a country's infrastructure. Infrastructure is seen as a way for governments to attract private sector investments in various economic forms. Public infrastructure, especially in emerging African nations, has been a major issue in economic development due to structural inflexibility, rising corruption, weak policy structures, inadequate technical support, lower productivity, and policy volatility. Infrastructure investment should reduce transport and energy bottlenecks, and boost GDP, employment, and mobility.

Thus, a well-designed infrastructurehas been shown to provide economic benefits by boosting economic growth and productivity, as well as having a positive socio-economic impact (Pereira & Pereira, 2018). Infrastructure development as a pure public good can enhance economic development directly through productivity effect as it serves as a complement for other production inputs through increasing factor productivity. However, it contributes indirectly to economic development through adjustment costs, private capital, and labour productivity. Infrastructure spending can be influenced by population size, government policy, foreign reserves, urbanization, and national income (Olaniyi, *et al*., 2023; Javid, 2019).It can also be used as a catalyst to boost economic growth. Infrastructure, according to previous research, boosts economic activity since it is employed in practically every manufacturing process, including telecommunications, energy, water, and transportation.Thus, infrastructure, which is an input into all manufacturing processes, has a beneficial impact on economic growth, productivity, and growth rates (Almeida &Mendonca, 2019).Infrastructure has three effects on economic development: it increases production and employment; it increases human capital and improves people's social lives by providing better facilities such as education and health; and, finally, it improves financial facilities such as monetary transactions, loans, and other services (Straub, 2008; Sahoo& Dash 2009; Shi *et al.* 2017; Olaniyi *et al*, 2023).

So far, no country has achieved long-term economic progress without substantial capital investment (Onyinye*et al.,* 2017; Ugwuegbe&Uruakpa, 2013). Poor infrastructure has a negative impact on economies in a variety of ways, including hindering market accessibilities, increasing amenities costs as well as business risks and uncertainties. In other developing economies, slower productivity growth is related to stagnating investment (International Monetary Fund, 2014; Palie, 2015; Asian Development Bank, 2017; Fay &Rozenburg, 2019; Fay *et al.,* 2019).

Infrastructure has long been considered a necessary condition for industrialization and economic growth (Sawada, 2015). It is critical for poverty reduction, enhancement of economic growth, andattainment of Millennium Development Goals (MDGs). Savings, foreign direct investment, gross domestic product, interest rate, population growth, money supply, and exchange rate are some of the factors that influence capital formation (Jhingan, 2014; Soludo, 2014). Changes in any of these variables have an effect on capital formation, which has an effect on economic development. Appropriate investment, on the other hand, is required for economic growth and development; this means that any economy must amass a large amount of internally produced capital for investors; However, most African countries, including Nigeria, have struggled to provide the required capital, resulting in lower national output and revenue, as well as an increase in the vicious circle of poverty on both the demand and supply sides (Olaniyi&Adekanmbi, 2021).

The poor infrastructure in most developing countries has sparked curiosity about whether funds spent on infrastructure have achieved significant results over time. The poor status of most infrastructural facilities, its degradation, and lack of maintenance culture, especially in electricity, roads, railways, and water systems, hinder Nigeria's development potential. Infrastructure gives social comfort to citizens, therefore its shortfalls degrade employees' conditions, limit productivity, and adversely affect the development of the economy.

Low capital formation is also one of the challenges attributed to developing nations (Holtz-Eakin, 1993; Jhingan, 2006; Emeka*et al.,* 2017). Gross capital formation promotes technological improvement, which supports the realization of large-scale production economies and promotes specialization through the provision of machinery, tools, and equipment for a rising workforce. However, macroeconomic imbalances and deficiencies in economic infrastructure, such as faulty electricity generation, poor road networks, and inadequate health and educational facilities, all contributed to a decline in capital formation in the Nigerian economy (Bakare, 2011; Siyan*et al.,* 2015; Emeka*et al.,* 2017; Younsi*et al.,* 2021).

While the debate over gross capital formation and economic development has continued in the literature due to mixed and inconclusive submissions (Ugwuegbe&Uruakpa, 2013; Seidu*et al.,* 2020; Farah *et al.,* 2020), scholars have paid little attention to the understanding of how such impacts or otherwise. However, studies such as Gruneberg*et al.,* (2013) and Onyinye*et al.,* (2017) contend that effective government commitment accelerates capital formation, while Zhou *et al.,* (2021) confirm that infrastructure investment improves economic growth by facilitating the physical and material circulation of resources, market integration, and the evolution of knowledge capital. Thus, gross capital formation not only improves economic development; but the importance of infrastructure investment in the economy cannot be overestimated. However, given the aforementioned motivations and the lack of studies on the joint role of gross capital formation and infrastructure investment in Nigerian economic development, as well as the conflicting opinions in the literature, it is pertinent to state that these relationships require further investigation.

As a result, objective of this study is to investigatethe combined effectsof gross capital formation and infrastructure on the economic development of Nigeria for the period, 1991 to 2021. Telecommunications, electricity, and transportation, which form the foundation of public infrastructure, are inextricably tied to productivity (Estache*et al.,* 2013; Almeida &Mendonca 2019). Using principal component analysis (PCA), a composite infrastructure index will be created from these three major infrastructures.

2Empirical Literature

The amount of newly created value that is invested rather than consumed in the economy is measured by gross capital formation, which is a component of GDP spending. It is the overall change in the economy's fixed asset values in relation to the growth in newly produced capital. It shows how governments can influence the direction of other investments by crowding in investments in the desired direction. According to Onyinye*et al.,* (2017), capital formation is the most essential component in economic growth since it reflects effective demand on the one hand while also creating productive efficiency for future output on the other. The strength of its drivers determines its impact on economic growth. However, its potential drivers include foreign direct investment (FDI), interest rates, savings, money supply, exchange rates and population growth.

Hansen (1965) broadly classified infrastructure into;economic infrastructure which includes the basic facilities and services that directly benefit the production and distribution processes of the economy such as power, transportation and irrigation, as well as social infrastructure which are the basic activities and services that achieve social goals and indirectly support other economic activities such as education, health, telecommunication etc. Aschauer (1989) classified infrastructure into core and not-core infrastructures. He stated that the core infrastructure which includes road, electricity, airport and water are the main determinants for a country’s economic growth while the non-core infrastructure are the residual components. Also, Sturm and Jakob (1995) classified infrastructure into basic infrastructure which includesrailways, drainage dikes, land reclamation and highways. While the complementary infrastructure are the tramways, electricity, water supply, and local telephone networks. Another classification of infrastructure is the network and nucleus infrastructures as proposed by Biehl (1991). Roads, railroads, the water's highway, communication networks, and energy and water provisioning systems are examples of network infrastructure, while schools, hospitals, and museums are examples of nucleus infrastructure, which is distinguished by a high degree of immobility, indivisibility, non-interchangeability, and multi-purpose features.

According to Gaal and Afrah (2017), infrastructure investment is the basic equipment and structures required for a country, region, or organization to function properly, and it contributes to economic development by improving productivity and providing services that improve people's quality of life. Despite the fact that infrastructure development is not officially stated as an indicator for the Millennium Development Goals (MDGs), it is critical to achieving of many of the goals. Investment in infrastructure is crucial to a country's socioeconomic success. However, inadequate infrastructure hinders citizens' access to markets, as well as livelihood opportunities and services such as clean water, education, health, transportation, and communication, and hence hinders economic development (Olaniyi *et al.,* 2023).

Reviewing earlier empirical evidence on the effect of infrastructure on economic development, Hulten and Schwab (1991) utilized the growth analysis to investigate the relationship between public infrastructure and economic performance at the state and municipal levels in the USA. The study came to two striking findings: that public infrastructure does not significantly impact economic performance and that the effects of increases in public capital are greater during the early stages of a country’s development when the stock of public capital is still relatively low than are exhibited by mature societies. In support of this assertion, Holtz-Eakin (1993) revisited the empirical performance estimates using the Solow growth model with data from each state in the USA. The study found that a strong increase in the investment rate failed to yield a permanent increase in the rate of economic growth; however, there was temporary faster growth and an extended temporary growth period before the output per effective worker stabilised at a new, higher level.

Canning and Fay (1993) investigated the contribution of the transportation network to economic growth and found that the infrastructure variable is significant in developing countries and positively correlated with economic growth. This is evident as the output elasticity of transportation infrastructure is 0.10, implying a relatively high rate of return for developing countries. Similarly, Tatom (1993) modified the macro time series analysis approach used by Aschauer and others using first differenced data to eliminate the non-stationary problem. Another relevant variable (energy prices) was included and tested for causality using a lead-lag causal relationship. The result showed that the causation direction from output to infrastructure capital. In a different study, Demurger (2001) used panel data of 24 Chinese provinces between 1985 and 1998 to provide empirical evidence on the links between infrastructure investment and economic growth in China and found that transport facilities are a key differentiating factor in explaining the growth gap between the study periods. The observation from empirical literature which shows the effect of public infrastructure investment on economic growth is ambiguous led to the study of Fedderke and Bogetic (2006) in re-examining the impact of infrastructure investments in South Africa. They study found that the previous result is due to not controlling the endogeneity of infrastructure investment. Thus, when it is controlled infrastructure investment has a positive effect on economic growth and development.

Reviewing empirical evidence on capital accumulation and economic growth, using multiple regressions, Kanu and Ozurumba (2014) found that gross fixed capital formation had no significant impact on Nigerian economic growth in the short run but had a significant relationship in the long run. Emeka*et al.* (2017) examined Nigeria's domestic investment, capital formation, and economic growth. The results indicate a considerable long-term link between domestic investment and capital buildup includingboosted Nigeria's economy over the study period. In another study, Ajose and Oyedokun (2018) found a long-term significant relationship between capital accumulation and Nigerian economic growth from 1980 to 2016. Seidu*et al.* (2020) examined how infrastructure investment affects UK economic growth. Infrastructure investment may help the UK economy despite Brexit uncertainty and potential economic damage. The findings imply that UK infrastructure investment is crucial for economic growth via producing jobs through factor productivity. However, the investment must be directed to regional opportunity areas that can unlock economic growth, optimize earnings, and boost growth in other regions.

This study also considers recent studies on gross capital formation, infrastructure, FDI, and economic growth from various viewpoints. However, in both developed and developing countries, the relationship between these variables is largely mixed. Infrastructure and FDI reduced poverty in 29 Sub-Saharan African (SSA) nations from 1990 to 2017, according to Anetor*et al.* (2020). It was revealed that infrastructure, Gross Capital Formation, and FDI were insufficient to end poverty and boost GDP growth. The study discovered trade significantly and positively reduces poverty, notably in SSA. Conversely, Dutta *et al.* (2020) used GMM estimator system analysis and the instrumental variable approach on panel data from 2004 to 2009 to examine how gross capital formation affects government business climate regulation in 64 MENA and sub-Saharan African countries. The authors concluded that inadequate gross capital formation enhanced government restrictions thereby worsening the business environment. However, Wen and Shao (2019) showed that China's transport infrastructure can reduce inter-regional trade costs, enhance industrial development, and increase economies of scale. Highway development lowered manufacturing companies' inventory costs and boosted economic growth efficiency during the period. Zhou, *et al.* (2021) used regional panel data from 29 Chinese provinces to build a composite index with the PCA to examine how infrastructure investment affects economic growth. The regression results reveal that infrastructure spending in China has not crossed the threshold while there has been a great improvement in the growth of their economy.Following the empirical evidence of infrastructure and economic growth in developing countries, Javid (2019) utilized the Fully Modified OLS to investigate the relationship between infrastructure investment and economic growth at aggregate sectorial levels in Pakistan between 1972 and 2015. The study found that both public and private infrastructure investment have positive effects on growth within the study period. In a similar study conducted on 96 countries using the system GMM, Almeida and Mendonca (2019) analyzed the impact of infrastructure and indirect taxation on economic growth and found that between 1976 and 2011, core public infrastructure has contributed positively to the enhancement of economic growth. In a more recent study, Ekeocha, *et al.* (2022) examined the effects of both aggregate and disaggregated infrastructural development indices on economic performance in Africa using the dynamic system GMM. The study found that both aggregate and disaggregated infrastructural indices impact positively on economic performance in Africa. The study recommends that policymakers should evolve policies that will enhance infrastructural development, human capital development and capital accumulation. Similarly, Olaniyi *et al.* (2023) used ridge regression to evaluate how physical infrastructure impacts Nigeria's economic performance from 1990 to 2019. Infrastructure considerably improved economic performance during the study. As a result, it is imperative for the Nigerian government and its affiliated agencies to consistently monitor infrastructure expenditure and strictly adhere to due process in alignment with the fundamental principles of fiscal policy.

3Theoretical framework and model specification

The Harrod-Domar growth model posits that the economic growth rate of a country is influenced by its saving rate, capital-output ratio, and capital accumulation. Hence, it is imperative for any economy to allocate a portion of its gross domestic product towards the preservation of capital stock, primarily aimed at replacing depreciated or obsolete physical assets such as machinery, infrastructure, and other related resources. However, in order to achieve growth, it is necessary to make new investments that contribute to the overall increase in the capital stock. Consequently, any net augmentations to the aggregate capital stock, encompassing both human resources and other types of productive investments, will lead to commensurate enhancements in the national production flow, as measured by the Gross National Product (GNP).

The model emphasizes the dual character of investing, which are: It generates income, which is known as the "demand effect and "supply effect" of investments is that they increase the amount of capital in the economy, which makes it more productive.

The basic assumptions of the growth theoryare: The economy is assumed to be closed with full employment of income, no government intervention, constant capital-output ratio with the average propensity to save (APS) and the marginal propensity to save (MPS) are both equal$\frac{S}{Y} = \frac{\Delta S}{\Delta Y}$, Saving and investing are equivalent in both the ex-ante and ex-post sense.

Mathematically, the growth model thus stated:

$$\frac{\Delta Y}{\mathrm{Y}} = \frac{S}{K} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where $\frac{\Delta Y}{Y}$ is the growth rate of GNP, *s*represents the rate of savings, and k is the stock of capital.

This model posits that for economic growth to occur, a specific proportion of a nation's GDP must be allocated towards savings and investment. The rate at which a nation can achieve economic growth is contingent upon the magnitude of its savings and investment. The inverse of the capital-output ratio, denoted as k, quantifies the effective growth rate that a nation may achieve given a specific level of saving and investment. In other words, it represents the incremental production resulting from an additional unit of investment. Nonetheless, the inverse of capital-output ratio $\left(\frac{1}{k}\right)$depicts the output-investment ratio.

Thus, multiplying the new investment rate,$S = \frac{1}{Y}$, by its productivity, $\frac{1}{k}$, givesthe national income growth rate. The shortcomings of the growth model which formed the basis of its criticism are: it is based on the assumption of exogeneity of all critical growth parameters, it neglects technical development as a factor that contributes to growth, and it does not account for decreasing returns when one factor grows in relation to another.

Specifically, this study adopted the popular Harold- Domar growth model and followed a multiple regression approach, thus the growth equation.

$$\frac{\Delta Y}{\mathrm{Y}} = G = \frac{S}{K} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where ΔY= the rate of change of GNP: Y is the national income; G is GNP growth; S represents national savings ratio; K is the capital-output ratio.

However, the Harrod-Domar Model was criticized based on the following:

i. Developing countries find it difficult to increase saving. When you are having difficulty finding enough to eat, boosting savings ratios is also not the best strategy.
ii. The model ignores factors such as labour productivity, technological innovation and levels of corruption.
iii. The model makes the assumption that there is a dependable financial and transportation system. Investments in these areas are typically insufficient, which is a challenge for emerging economies.
iv. The model assumed there was no reason for the actual growth to equal natural growth and that an economy had no tendency to full employment. However, this was based on the assumption of wages being fixed.

This study used RGDP as the dependent variable to measure economic development, while gross fixed capital formation which represents the national capital-output ratio and infrastructure (INFRA) are the independent variables. A composite index of infrastructure was developed from telecommunications, electricity, and transportation which are the

basic public infrastructure with the use of Principal Component Analysis (see Yoantika & Susiswuo, 2021; Zheng &Rakovski, 2021). Principal Component Analysis (PCA) is a statistical method used for multivariate analysis, specifically in decision-making processes. It involves the creation of a composite index by objectively defining a real-valued function that incorporates relevant study variables. The fundamental principle that forms the foundation of this approach posits that when many attributes of a set of occurrences are examined, the attribute exhibiting the greatest degree of variability accounts for a larger proportion of the variability in the dependent variable compared to avariable with lesser variability. As a result, the issue at hand is the determination of the appropriate weights to assign to each of the variables under consideration. The allocation of weight to each variable is based on the premise that the linear composites of these variables should exhibit maximum variance. This study adopted an *ex-post facto* research design and employed annual time series data from the Central Bank of Nigeria (CBN) and World Bank in World Development Indicators (WDI, 2022).

Expressing the equation to accommodate the variables of this study in structural form, we have

$$RGDP = f(GFCF, INFRA,) \dots\dots\dots\dots\dots\dots (3)$$

The functional form of the equation above is stated in a linear form and converted through pleasing the natural logs as;

$$lnRGDP = \beta_0 + \beta_1 lnGFCF + \beta_2 lnINFRA + \mu_t \dots\dots\dots (4)$$

Where β_1 and β_2 are parameters and are expected to

4 Results and Discussion

The study utilized the Augmented Dickey-Fuller (ADF) statistical test to determine the presence or absence of unit roots in the dataset. The findings displayed in Table 1 indicate that all variables exhibited non-stationarity at level I (0), but demonstrated stationarity at first difference I(1).

Table 1: Unit Root Test Result

Variables	Level			First Difference			Order
	ADF statistics	Critical Value	P-value	ADF statistics	Critical Value	P-value	
lnRGDP	-1.1737	-4.2967	0.8980	-3.6891	-4.3098	0.0394	I(1)
lnGFCF	0.2273	-4.2967	0.9971	-4.5009	-4.3098	0.0064	I(1)
lnINFRA	-1.9162	-4.3561	0.6175	-5.2704	-4.3098	0.0010	I(1)

Source: Authors' Computation 2023

4.1 Co-integration Test

A co-integration test was performed using the Johansen (1988) approach to find out the existence or inexistence of a long-run relationship among the series of the same order of integration employed for this study. The results show one (1) co-integrating equation as the Trace Statistic (38.16428) is greater than the Critical Value (29.79707) at a significance level of 5%. Thus, the presence of a co-integrating vector among the variables evaluated in the equation implies a long-run link between them. Table 2 presents the Johansen co-integration result.

Table 2: Johansen cointegrationn test result

logRGDP, logGFCF, logINFRA			
Lags 1 to 3 (in first differences)			
Trend: Linear deterministic			
Hypothesized No. of C.Eqn(s)	**T- Statistic**	**Critical Value (5%)**	**P-values****
None *	38.16428	29.79707	0.0043
At most 1 *	13.29441	15.49471	0.1045

At most 2 *	5.208033	3.841465	0.0225

** 1 co-integrating equation at 5% significance level. ** P-values.*
Source: Authors' Computation 2023

4.2 Vector Error Correction Model

Based on the co-integration test result which indicated the presence of a co-integrating equation, the VECM is estimated to ascertain the speed of adjustment as well as the dynamic relationships associated with the study variables both in the short and long-run. The VECM result is presented in Table 3.

Table 3: Vector error correction Result

Error Correction	Co-efficient	Standard Error	T-statistics	Prob*
ECT	-0.216930	0.080538	-2.693517	0.0140
D(lnGFCF(-1))	0.201534	0.098728	2.041309	0.0546
D(lnINFR(-2))	0.042255	0.016942	-2.494117	0.0215

R-squared= 0.569336, Prob. (F-statistics) = 0.049081, DW= 2.1778
Decision rule: Reject the null hypothesis ifthe p-value is less than the critical value at 5%.
Source: Authors' Computation 2023

From Table 3, the speed of adjustment of the study variables around equilibrium in the long term is anticipated to be negative (-0.216930), with a probability value of (0.0140) indicating statistical significance at 5% significance level. Thus, from 1991 to 2021, gross capital formation and infrastructure have a long-term impact on Nigeria's economic development. However, GFCF with p value 0.0546 in the short term means that gross capital formation did not significantly contribute to economic development in Nigeria during the study time at 5% significant level but significant if inferences are drawn at 10%. This can happen for several reasons namely; Private investment data is more difficult to obtain due to public institutions' inefficiencies as well as Nigerian businessmen's aggressive habits of falsifying records to avoid taxes. Public-sector corruption also drives capital investment over inflation.This negative result thereby agrees with the findings of Odo*et al.,* (2016) and Onyinye*et al*, (2017). While INFR with ap-value of 0.0215 indicates that infrastructure has contributed significantly to Nigerian economic development between 1991 and 2021.This is so because, at the aggregate level, the availability of infrastructure influences the marginal productivity of private capital. While at the microeconomic level, the effect of infrastructure is visible through reduced costs of production. Infrastructure can affect the profitability, levels of output, income, and employment, particularly for small-medium scale enterprises. Infrastructure also has an impact on the costs and service quality in international trade (trade logistics), which determines competitiveness in export/import markets. Finally, it has an impact on domestic transaction costs and access to market information-thus permitting the economy to enjoy efficiency gains from policies of market liberalization.This result is consistent with the results of Olaniyi *et al.*, (2023); Ekeocha*et al.,* (2021); Khan *et al.* (2020) and Almeida and Mendonca (2019)

Also, the Adjusted R-squared is 0.569336 showing that 56.9percent variation in the dependent variable isexplained by the explanatory variables as 43.1percent difference being explained by variablesnot captured by this model which is representedby error termμ_t. F-statistics have an estimated probability less than 0.05, indicating that the explanatory factors have a statistically significant effect on the explained variables. This suggests that the development of Nigeria is influenced by all of the independent variables. Furthermore, the value of Durbin Watson (2.1778) indicates that there is no autocorrelation among residuals.

4.3 Implications of Result

The variables' long-term equilibrium was achieved via Johansen co-integration. This means that this estimation can be used to make long-term economic policy decisions. More so, the gross capital formation and infrastructure policies, if maintained and directed to productive activity, can increase economic development. In the short run, gross capital formation reflects a positive relationship with economic development in Nigeria at the time of this study, implying that capital formation has not significantly contributed to the development of the Nigerian economy, as stated by the Harrod-Domar model of economic growth. This is owing to challenges in gathering statistics on private investment due to the inefficiency of data collection officers, record manipulation by Nigerian businessmen, and widespread public corruption. However, the positive and large influence of infrastructure on economic development demands that infrastructure is appropriately directed to Nigeria's economy. In the long run, gross capital formation and infrastructure both contributed positively to the economy's development during the study period.

Conclusion and Recommendation

This study examined how gross capital formation and infrastructure affect Nigerian economic development using the Vector Error Correction Mechanism. The study revealed that infrastructure has contributed more to Nigeria's economic development than gross capital formation.Infrastructure is significantly associated with increased economic development as it presents tremendous opportunities to raise a nation's economic performance. Nigeria is characterized as one of the countries with high infrastructural deficits, having ranked 24th of 54 African countries (African Infrastructure Development Index, AIDI, 2021). Based on the findings and implications for policy of the study, it is recommended that the government and private sectors collaborate in order to promote capital investment within the economy. Also, agencies involved in gathering of statistical data should be more effective so as to capture all private investments in the country. Furthermore, gross capital formation should be efficiently channeled with a sizable amount accorded to infrastructural development which in turn translates to economic development. Also, there is a need for the Nigerian government to introduce more projects within the country aimed at improving and increasing access to all infrastructure variants while funds efficiently allocated and utilized with a sizable amount of infrastructural development. Finally, government has to be proactive and make strong policies to block the loopholes and tackle the problem related to corruption in the economy.

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