AN ASSESSMENT OF THE IMPACT OF PUBLIC CAPITAL INVESTMENT ON ECONOMIC GROWTH IN NIGERIA: A SECTORAL ANALYSIS OF GROWTH EFFECTS

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Abstract

This study evaluates the productivity of public capital investment in Nigeria, focusing on its impact on real GDP growth in four key sectors: agriculture, education, health, and environment. The analysis spans the period from 2015 to 2024, during which capital expenditure has significantly increased, yet economic growth has remained inconsistent. Applying various econometric techniques like multiple regression analysis, unit root tests, Johansen cointegration, and Error Correction Models (ECM), the study identifies a strong long-term relationship between sectoral capital expenditure and economic growth. The results show that investments in education and agriculture have the most significant short-term effects on GDP growth, while health and environmental investments also contribute but at a lesser extent. The study addresses inefficiencies in public investment management, such as delays and underfunding, which undermine the effectiveness of capital expenditure. The findings provide crucial policy insights, emphasizing the need for targeted sectoral investments, improved governance, and strategic planning to enhance the impact of public capital investment on sustainable and inclusive economic growth in Nigeria.

Keywords: Capital Investment, Economic Growth, Sectors, Investment Management, Strategic planning

1. Introduction

In the quest for sustainable economic growth, the composition and efficiency of public expenditure have garnered significant attention among policymakers and scholars. Capital expenditure, in particular, is pivotal as it encompasses investments in infrastructure, education, health, agriculture, and environmental sustainability, sectors fundamental to enhancing a nation's productive capacity and long-term development. Unlike recurrent expenditure, which covers routine operational costs, capital expenditure is designed to generate future economic benefits by expanding the economy's capacity to produce goods and services.

Nigeria's economic trajectory over the past decade underscores the critical role of capital expenditure. According to the Central Bank of Nigeria, capital expenditure

reached an all-time high of ₦1.87 trillion in March 2022, reflecting the government's commitment to infrastructure development and economic diversification. This investment is particularly significant given the country's efforts to recover from the economic downturn induced by the COVID-19 pandemic and to address structural challenges such as inadequate infrastructure and high unemployment rates (CEIC, 2024).

Empirical studies have highlighted the positive correlation between capital expenditure and economic growth. For instance, Okafor and Ezeaku (2021) found that capital expenditure positively influences human development in Nigeria, with sectoral differences in effectiveness.

Similarly, Adeosun and Onakoya (2022) emphasized that the impact of capital expenditure on economic development varies depending on institutional quality and public expenditure management efficiency. These findings suggest that strategic allocation and efficient management of capital expenditure are crucial for maximizing its growth-inducing potential.

To visualize this relationship, Figure 1 presents the trend of Nigeria's capital expenditure and real GDP growth from 2015 to 2024. The graph illustrates a rising trajectory of capital outlay, accompanied by volatile but improving GDP growth, suggesting a potential correlation worth empirical exploration.

Figure 1: Nigeria's Capital Expenditure vs. Real GDP Growth (2015–2024). *Source: Central Bank of Nigeria, NBS, CEIC Database (2024).*

In light of these considerations, this study aims to empirically assess the impact of government capital spending in key sectors - agriculture, education, health, and environment, on Nigeria's economic growth, as measured by real Gross Domestic Product (RGDP). The analysis employs a multiple regression model to elucidate the relationship between sectoral capital expenditure and economic performance, thereby providing evidence-based insights for policy formulation and resource allocation. Globally, capital expenditure has been recognized as a catalyst for inclusive and sustained growth, especially in low- and middle-income economies. According to the

World Bank (2023), capital investment improves infrastructure, reduces transaction costs, and supports human development. The IMF (2022) similarly concludes that well-managed public investment fosters job creation and productivity. UNDP (2024) and OECD (2021) argue that the developmental impact of capital spending hinges largely on governance, project selection, and fiscal accountability.

In Nigeria, the importance of capital expenditure has been amplified by chronic developmental challenges such as infrastructural decay, low educational outcomes, inadequate healthcare, and climate vulnerabilities. From ₦557 billion in

2015, capital outlays surged to ₦1.87 trillion in 2024, representing over 52% of non-debt expenditure in the 2025 national budget (CBN, 2024; Guardian, 2024). Despite this rise, GDP growth has remained inconsistent, with contractions during economic shocks (e.g., -1.9% in 2020) and moderate recovery thereafter (NBS, 2021; Macrotrends, 2025).

Several studies have explored this dynamic. Okafor and Ezeaku (2021) found sector-dependent impacts on development outcomes, while Onodugo et al. (2022) warned that institutional inefficiencies weaken the transmission effect of capital expenditure to growth.

This mixed evidence reflects the need for nuanced, sector-specific analysis. Moreover, Nigeria's capital spending on health and education remains below international thresholds set by WHO and UNESCO, signaling underinvestment in essential human capital (WHO, 2022; UNESCO, 2023). In agriculture, employing over 30% of Nigerians, capital allocation falls short of the Maputo Declaration benchmark (FAO, 2023). Similarly, investments in environmental resilience remain sparse despite increasing climate risks (UNEP, 2024; World Bank, 2023).

This study addresses these gaps by disaggregating capital expenditure across four critical sectors - agriculture, education, health, and environment, and examining their individual impacts on RGDP. Through rigorous econometric modeling and sectoral analysis, the research seeks to inform strategic public investment and guide fiscal policy for sustainable and inclusive economic development in Nigeria.

1.1   Statement of the Problem

Capital expenditure is a key driver of economic growth, particularly in developing countries, where it plays a crucial role in fostering long-term development by investing in sectors like infrastructure, education, healthcare, agriculture, and environmental sustainability. These investments are designed to expand the productive capacity of an economy, creating a foundation for future growth rather than serving immediate consumption. In Nigeria, the importance of capital expenditure is highlighted by a significant increase in budgetary allocations for capital projects, with expenditure rising from ₦557 billion in 2015 to approximately ₦1.87 trillion in 2024, marking a 230% increase. This surge in capital spending reflects the government's strategy to stimulate economic growth, improve infrastructure, and reduce poverty through strategic public investments. However, despite these financial commitments, the country's macroeconomic outcomes have remained fragile and inconsistent, with GDP growth fluctuating substantially. For instance, Nigeria's GDP contracted by -1.9% in 2020 due to the COVID-19 pandemic, and although there is a modest recovery estimated at 4.2% in 2024, the growth remains volatile and below expectations.

This disconnect between rising capital expenditure and inconsistent economic growth raises important questions about the effectiveness and efficiency of public spending in Nigeria. A closer look at sectoral allocations reveals significant structural imbalances and inefficiencies in public investment management. Despite substantial increases in capital expenditure, critical sectors like education, healthcare, agriculture, and the environment continue to receive insufficient funding, undermining their development potential. For instance, capital expenditure on education remains below 7% of the federal budget, far below UNESCO's recommended 15-20%. This underinvestment has resulted in deteriorating school infrastructure, teacher shortages, and low literacy rates. Similarly, the healthcare sector receives far less than the 5% of GDP benchmark set by the World Health Organization (WHO), leading to a fragile healthcare system marked by limited access to essential services, high medical tourism, and poor health outcomes. Agriculture, which employs a significant portion of Nigeria's population and holds potential for food security and export diversification, is also inadequately funded, with allocations falling below the 10% commitment made under the Maputo Declaration.

Moreover, the environmental sector, despite Nigeria's growing exposure to climate change risks such as flooding, desertification, and pollution, receives minimal attention. This lack of investment has left the country vulnerable to environmental shocks, without a robust framework for climate change adaptation or mitigation. Furthermore, Nigeria's public investment management framework remains weak. Public capital projects are often delayed, underfunded, or abandoned due to institutional inefficiencies, corruption, and poor project execution. In 2022, only ₦1.78 trillion of the ₦3.5 trillion approved for capital projects was disbursed, indicating significant shortfalls in resource utilization and project completion. Transparency International ranks Nigeria 145th out of 180 countries in its Corruption Perception Index, reflecting systemic governance and accountability challenges in public resource management.

In contrast, international experience provides compelling examples of what can be achieved with effective capital expenditure management. South Korea's post-war economic transformation was driven by strategic investments in infrastructure, education, and industrial development. Similarly, Germany's recovery strategy post-pandemic involved over €50 billion in capital projects focused on green energy, digital innovation, and public infrastructure, contributing to significant economic recovery. In Africa, Rwanda's focused capital investments in health and education helped reduce poverty, maternal mortality, and improved life expectancy. These success stories underscore the potential of well-targeted capital investment in driving sustainable

economic growth, demonstrating that strategic planning, institutional accountability, and measurable impact are key to the success of public capital expenditure.

In Nigeria, however, despite the increasing capital budgets, the outcomes in key sectors remain suboptimal. Education and healthcare systems are underperforming, agriculture continues to be underdeveloped, and the country's infrastructure gap continues to widen. Moreover, the lack of robust evidence linking capital expenditure to macroeconomic performance has hindered the ability to assess the effectiveness of these investments. Most studies focus on aggregate public spending, without disaggregating capital expenditures by sector or considering the specific returns on investment for each sector.

As Nigeria faces a shrinking fiscal space, with public debt rising to ₦87.4 trillion as of Q1 2025 and debt servicing absorbing over 60% of federal revenue, the need for efficient use of capital expenditure becomes even more pressing. This financial strain calls for a shift in focus from merely increasing budgetary allocations to evaluating the productivity, efficiency, and impact of public investments. With this backdrop, the current study becomes both timely and critical. By examining the individual and collective impacts of capital expenditure on real GDP growth in key sectors—agriculture, education, health, and the environment—the study aims to fill a significant empirical gap. This sector-specific analysis will provide crucial insights into how capital investments can be optimized to enhance economic growth, improve resource allocation, and guide future fiscal policy in Nigeria, ultimately contributing to a more sustainable and inclusive economic future.

1.2 Objectives of the Study

The general objective of the study is to examine the impact of government capital expenditure on economic growth in Nigeria.

The specific objectives of the study are to:

- To evaluate the impact of capital expenditure on agriculture on Nigeria's real GDP.
- To assess the effect of capital expenditure on education on economic growth.
- To investigate the influence of capital expenditure on health on Nigeria's economic growth.
- To provide evidence-based recommendations for optimizing sectoral allocation of public capital expenditure to enhance economic growth in Nigeria.

2. Literature Review and Theoretical Framework

Public capital investment has long been viewed as a critical engine of economic growth, especially in developing economies were infrastructure deficits and social sector underinvestment hamper productivity and

human development. In the Nigerian context, empirical and theoretical discourse on the growth-inducing potential of public capital expenditure has intensified, especially in the post-COVID-19 period, as the country grapples with economic recovery and structural transformation.

Globally, capital expenditure is recognized as a driver of inclusive development and productivity. The World Bank (2023) argues that efficient public investment reduces transaction costs, supports infrastructure development, and enhances human capital. Similarly, the IMF (2022) emphasizes that well-implemented capital projects contribute to job creation, increased aggregate demand, and long-term output expansion. UNDP (2024) and OECD (2021) underscore that governance quality, project selection mechanisms, and transparency determine the actual growth outcomes of capital spending. These positions are echoed in the ADB (2020) report, which documents how capital investment in infrastructure and human capital spurred inclusive growth in parts of Asia.

In Nigeria, the empirical evidence presents a more nuanced picture. Studies such as Ezeaku and Okafor (2021) find a positive but sector-dependent relationship between capital expenditure and economic development. Their work demonstrates that the effectiveness of capital investment in Nigeria is contingent on the quality of public expenditure management and institutional

governance. Adeosun and Onakoya (2022) similarly conclude that capital expenditure contributes to economic development, but institutional weaknesses reduce its potency. They advocate for better expenditure tracking systems and transparency to enhance fiscal performance.

A critical gap in the literature, however, is the lack of sectoral disaggregation in assessing capital expenditure's productivity. Most prior studies tend to focus on aggregate capital spending without distinguishing between sectors like health, education, agriculture, or the environment. This masks differential impacts and creates challenges for sector-specific policy formulation. A significant exception is the study by Yusuf and Usman (2023), which attempts to explore sectoral capital allocations and their distinct effects on growth. They report that agriculture and education-related capital investments show the highest elasticity in contributing to GDP growth, while environmental spending remains marginal due to chronic underinvestment.

Sector-specific investigations reveal persistent gaps. For instance, capital expenditure on education has consistently remained below UNESCO's recommended benchmark of 15–20% of the federal budget. The resulting low literacy rates, inadequate infrastructure, and teacher shortages undermine the sector's contribution to economic growth (UNESCO, 2023). In the health sector, underfunding relative to

WHO's 5% of GDP guideline has produced a fragile healthcare system, marked by high maternal mortality and reliance on medical tourism (WHO, 2022). In agriculture, despite its potential for employment and food security, Nigeria's public investment falls short of the 10% benchmark set by the Maputo Declaration, resulting in low mechanization, poor rural infrastructure, and limited productivity (FAO, 2023). Environmental capital spending is virtually neglected, despite Nigeria's increasing vulnerability to climate risks such as flooding and desertification (UNEP, 2024).

The disconnect between increasing capital budgets and weak macroeconomic outcomes in Nigeria also finds root in institutional inefficiencies. As noted by Onodugo et al. (2022), the transmission of public investment to economic performance is weakened by corruption, delayed disbursements, and weak public investment management systems. For instance, in 2022, only ₦1.78 trillion of the ₦3.5 trillion approved for capital projects was disbursed (Budget Office, 2023). This inefficiency is reinforced by Nigeria's poor ranking in Transparency International's Corruption Perception Index, where it was placed 145th out of 180 countries in 2024 (Transparency International, 2024).

International comparisons reinforce the potential of effective capital investment. South Korea's post-war transformation and Germany's green recovery strategy post-COVID illustrate the catalytic role of infrastructure and innovation-driven capital spending (ADB, 2022; OECD, 2022). Rwanda is often cited as a best practice example in Africa, where strategic investments in health and education lifted millions out of poverty and improved key human development indicators (UNDP, 2024).

In sum, while capital expenditure is theoretically and empirically linked to economic growth, the Nigerian experience reflects a complex interplay of sectoral underinvestment, weak governance, and fiscal inefficiency. The literature converges on the need for strategic sectoral planning, enhanced fiscal accountability, and better monitoring of capital projects. There remains a significant empirical gap concerning how sector-specific capital investments translate into growth, which this current study seeks to fill through econometric analysis disaggregated across agriculture, health, education, and environment.

2.1   The role of capital expenditure in enhancing public infrastructure and economic productivity

Capital expenditure (CapEx) plays a fundamental role in the enhancement of public infrastructure, a crucial driver of economic productivity. Infrastructure includes roads, electricity, transportation networks, water supply, and communication systems, which are essential for creating the conditions necessary for economic growth. According to the World Bank (2023), capital

investments in infrastructure enhance the efficiency of other sectors of the economy, reduce production costs, and improve economic competitiveness.

In Nigeria, infrastructure development has been a key focus of capital expenditure over the past decade. From 2015 to 2024, capital expenditure in Nigeria has surged, reaching a peak of ₦1.87 trillion in 2024, accounting for over 52% of the non-debt expenditure in the national budget (CBN, 2024). However, while capital spending has increased, the outcomes in infrastructure development remain mixed. Figure 1 (in the document) illustrates the increasing trajectory of Nigeria's capital expenditure alongside fluctuating GDP growth, suggesting that rising expenditure has not consistently translated into steady growth.

Despite the rising budget allocation, infrastructure projects in Nigeria have faced significant challenges. Delays in the completion of projects and the frequent abandonment of partially completed projects have undermined the effectiveness of capital expenditure. The Central Bank of Nigeria (2024) notes that only ₦1.78 trillion of the ₦3.5 trillion approved for capital projects in 2022 was disbursed, signaling inefficiencies in public investment management. Similarly, Okafor and Ezeaku (2021) highlight the poor maintenance of existing infrastructure, which leads to underutilization of capital investments and a failure to deliver long-term economic returns.Countries like South Korea have leveraged public capital

expenditure to drive infrastructure development, facilitating significant economic growth. Post-war South Korea's investment in infrastructure, particularly roads and communication networks, catalyzed rapid industrialization, which led to an average annual GDP growth rate of 6.2% between 1962 and 1990 (ADB, 2022). This demonstrates the transformative potential of infrastructure investment when effectively implemented.

2.2   The Impact of Capital Investment in Human Capital Development

Investing in human capital, education and healthcare, is critical for fostering long-term economic growth and improving the productive capacity of the workforce. OECD (2021) emphasizes that public spending on education and health creates a foundation for increasing workforce productivity, which is key to sustained economic development.In Nigeria, the government's expenditure on education has consistently fallen short of the international benchmark. UNESCO (2023) recommends that 15-20% of total government expenditure be allocated to education (see figure 2). However, Nigeria's capital expenditure on education has remained well below this threshold, averaging just 6-7% of the federal budget in recent years (NBS, 2021). As a result, the sector faces several challenges, including inadequate school infrastructure, a shortage of qualified teachers, and a curriculum misaligned with the demands of the labor market.

Figure 2: Education Expenditure vs Global Average (2015-2024)

This underinvestment has had tangible effects on educational outcomes. According to the World Bank (2023), Nigeria ranks among the lowest in global education indices, with literacy rates of about 62%, well below the global average of 86%. Moreover, Adeosun and Onakoya (2022) argue that the education sector's poor performance limits human capital development, hindering productivity growth in other sectors of the economy.

Similarly, Nigeria's health sector has received inadequate investment. The World Health Organization (2022) recommends that countries allocate 5% of their GDP to healthcare to ensure comprehensive coverage and high-quality services. However, Nigeria spends less than 3% of its GDP on healthcare. As a result, the healthcare system is burdened with infrastructural deficits, insufficient medical personnel, and inadequate healthcare facilities. This underinvestment contributes to high maternal mortality rates (512 per 100,000 live births), infant mortality rates (69 per 1,000 live births), and an over-reliance on medical tourism (see figure 3). The UNDP (2024) report highlights that Rwanda improved its life expectancy from 49 years in 2000 to 69 years in 2020, largely due to targeted investments in healthcare, including maternal and child health programs.

Figure 3: Health Expenditure vs Life Expectancy in Nigeria (2015-2024)

2.3 Capital Expenditure and Economic Diversification: A Sectoral Analysis

The diversification of the economy away from oil dependency is central to Nigeria's long-term economic stability. Capital expenditure plays a crucial role in driving diversification by investing in key sectors such as agriculture, manufacturing, and services. The FAO (2023) emphasizes that capital investments in agriculture, including mechanization, irrigation, and rural infrastructure, are necessary for increasing agricultural productivity and food security.

Agriculture is one of the sectors with the highest potential for economic diversification, employing over 30% of Nigeria's workforce. However, capital expenditure in agriculture has been inadequate. Nigeria's allocation to the agricultural sector falls below the Maputo Declaration's 10% target (FAO, 2023), which has contributed to poor agricultural productivity. Rural roads, irrigation systems, and mechanized farming techniques remain underfunded. Adeosun and Onakoya (2022) highlight that the absence of modern technology and infrastructure in rural areas continues to stifle agricultural productivity, limiting its contribution to GDP growth.Nigeria's agricultural productivity growth remains low, at just 2.3% annually from 2015 to 2024, while countries like

Kenya and Ethiopia have seen higher rates due to better capital investment in the sector

(World Bank, 2024).

Figure 4: Agricultural Investment vs Output growth in Nigeria (2015-2024)

2.4   Manufacturing and Services: The Need for Investment

The OECD (2022) and IMF (2022) suggest that targeted public investment in industrial zones, technology, and infrastructure is essential for fostering diversification. In Nigeria, however, manufacturing and services have received less focus. Onodugo et al. (2022) show that capital expenditure in the industrial sector remains below the optimal level needed to facilitate the transition from an oil-dependent economy to a diversified one.

2.5   Governance and Institutional Efficiency in Public Investment Management

Good governance is fundamental to the effective management of capital expenditure. Transparency International (2024) consistently ranks Nigeria poorly in governance indices, highlighting the issues of corruption, inefficiency, and a lack of

accountability in public resource management.The mismanagement of capital projects, including delays, corruption, and the diversion of funds, has a direct negative impact on economic growth. The World Bank (2023) states that inefficient use of public funds in Nigeria results in significant losses in potential economic returns. In 2022, for example, only ₦1.78 trillion of the ₦3.5 trillion approved capital budget was actually disbursed, representing a significant underachievement in delivering on public investment promises (Budget Office, 2023).

Countries with strong governance structures, like South Korea, have demonstrated the positive impact of effective public investment management. OECD (2022) credits South Korea's post-World War II industrialization to its efficient allocation of capital resources and transparent governance systems. This stands in stark contrast to Nigeria, where poor procurement processes and low technical capacity continue to impede capital expenditure effectiveness.

Figure 5: Government Efficiency vs Public Investment Disbursement in Nigeria (2015-2024)

2.5 The Environmental Impact of Capital Investment: A Sustainable Development Perspective

As Nigeria faces the increasing challenges of climate change, the need for investment in environmental sustainability

has never been more urgent. UNEP (2024) argues that capital expenditure in environmental protection, including climate change adaptation and mitigation projects, is critical for ensuring the country's long-term environmental health and sustainable development.Nigeria's vulnerability to climate change, including flooding, desertification, and pollution, demands

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increased investment in environmental resilience. However, Nigeria's public spending in this area remains disproportionately low. World Bank (2023)

Figure 6: Environmental Investment vs Climate Change Vulnerability in Nigeria (2015-2024)

2.6 Theoretical Framework: Public Capital Investment and Economic Growth in

Nigeria

Public capital investment is a central component of economic policy in many developing countries, and Nigeria is no exception. In the context of Nigeria's economic trajectory, public capital expenditure has been touted as a key mechanism for addressing structural challenges such as infrastructural deficits, inadequate healthcare, poor education systems, and environmental vulnerabilities. This theoretical review delves into the various frameworks that explain how capital expenditure influences economic growth, particularly in Nigeria. The review examines key growth models, the role of public investment in human and physical capital, sector-specific impacts, governance, and institutional frameworks.

reports that the country allocates less than 2% of its budget to environmental projects, despite the escalating risks from climate-related events (see figure 6).

2.6.1 Neoclassical Growth Theory and Public Capital Expenditure

The Neoclassical Growth Theory of Solow-Swan is foundational to understanding the dynamics of public capital expenditure in the context of economic growth. According to Solow (1956), economic growth is driven by three primary factors: labor, capital, and technological progress. In this theory, public capital investment is categorized as physical capital that contributes to a nation's output by improving infrastructure, such as roads, electricity, and public facilities.

In the context of Nigeria, the role of public capital expenditure in infrastructure has been highlighted in numerous studies, including Okafor and Ezeaku (2021), who showed that while there is a positive correlation between infrastructure investment and economic growth, the returns on such investments often diminish over time without accompanying improvements in technology and human capital. The Solow model can be applied to the Nigerian context with the following production function:

In Nigeria's case, capital expenditure has increased significantly, reaching ₦1.87 trillion in 2024 (Central Bank of Nigeria, 2024), but despite these increases, the output (GDP) growth has been volatile, with negative growth recorded in 2020 during the COVID-19 pandemic. The inconsistency in GDP growth, despite rising capital outlays, suggests that public capital expenditure alone is insufficient to drive sustained growth without complementary improvements in technological advancements, governance, and sectoral efficiencies.

2.6.2 Endogenous Growth Theory: The Role of Human and Knowledge Capital

Endogenous growth theory, developed by Paul Romer (1990) and Robert Lucas (1988), asserts that long-term economic growth is driven by internal factors such as human capital and innovation, rather than just external technological progress. This is particularly relevant in the case of Nigeria, where public capital expenditure has not only been focused on physical infrastructure but also on human capital development, particularly in education and healthcare.

In Nigeria, human capital investment through public expenditure in education, healthcare, and skills training is critical for driving productivity and fostering sustainable economic growth. Adeosun and Onakoya (2022) argue that Nigeria's capital spending on education and healthcare has been inadequate, especially when compared

to international standards. According to UNESCO (2023), Nigeria spends less than 7% of its total government expenditure on education, despite the recommendation of allocating 15–20%. Similarly, WHO (2022) suggests that Nigeria's healthcare expenditure is far below the 5% of GDP recommended for achieving universal healthcare.

From an endogenous growth perspective, public capital expenditure in education and health generates long-term growth by enhancing labor productivity and fostering technological innovation. The production function in this context can be extended to include human capital:

The lack of sufficient investment in education and healthcare limits the growth of Nigeria's human capital, thereby undermining its economic potential. According to Okafor and Ezeaku (2021), the lack of a skilled workforce hampers productivity in critical sectors such as agriculture and manufacturing, both of which could help diversify Nigeria's economy away from its oil dependency.

2.6.3 Keynesian Economics and Public Investment as Stimulus

In the Keynesian framework, the role of public investment is critical for stimulating economic activity, particularly in times of economic recession. During periods of low private investment or economic stagnation, Keynes argued that government spending, especially on capital

projects—can boost aggregate demand, reduce unemployment, and spur economic recovery.

In the Nigerian context, capital expenditure has been used as a tool to stimulate the economy, especially following economic shocks like the COVID-19 pandemic. For instance, Nigeria's capital expenditure in infrastructure was ramped up to ₦1.87 trillion in 2024 to address the economic downturn. However, IMF (2022) and Onodugo et al. (2022) highlight that the actual economic impact of this spending has been muted due to inefficiencies in the public investment management system. Public investment in infrastructure often suffers from delays, cost overruns, and poor execution, diminishing its potential to stimulate economic activity.

The Keynesian multiplier effect can be used to understand how public capital expenditure stimulates economic growth:

In Nigeria, the marginal propensity to consume (MPC) remains high, suggesting that public investment could have a stronger impact on growth if efficiently targeted. However, delays in disbursing capital funds and ineffective project management significantly reduce the effectiveness of this multiplier.

2.6.4 Wagner's Law on Increasing State Activity

Wagner's Law (1893) posits that as economies develop, the demand for public goods increases, and therefore, the role of the state in economic activity expands. This suggests that, as Nigeria's economy grows, so too should its capital expenditure, particularly in sectors like education, healthcare, and infrastructure, which are essential for maintaining growth and improving living standards.For Nigeria, public capital expenditure is not just about immediate consumption; it is about creating the foundation for long-term development. According to Adeosun and Onakoya (2022), Nigeria's increasing budgetary allocations to capital projects over the past decade reflect a growing recognition of the importance of public investment in driving economic development. However, despite significant increases in capital spending, the outcomes have been inconsistent, indicating that while capital expenditure is essential for growth, it is not a guarantee of improved economic performance without effective implementation and governance.

2.7 Empirical Literature

In recent years, Nigeria has made substantial investments in infrastructure, education, healthcare, agriculture, and environmental sustainability. Yet, despite these efforts, economic growth has been inconsistent, with periods of contraction followed by modest recovery. The complexity of this relationship has led to the need for a deeper understanding of how public capital expenditure impacts economic performance, particularly within different sectors.

This empirical literature review provides an in-depth analysis of studies published between 2020 and 2025, which explore the effects of public capital expenditure on Nigeria's economic growth. Through the synthesis of various scholarly works, this review highlights key findings, provides insights into the effectiveness of capital investment, and underscores the importance of efficient resource allocation, institutional governance, and sector-specific strategies.

In the analysis of Nigeria's public capital expenditure, several empirical studies have explored the correlation between government spending and economic performance, emphasizing the critical role of targeted investments and sectoral allocation. One notable study by Onifade et al. (2020) employed the Autoregressive Distributed Lag (ARDL) model to assess the relationship between government expenditures and economic growth over the period from 1981 to 2017. Their findings indicated that, although capital expenditure generally has a positive relationship with growth, the effect was not statistically significant. This suggests that while increasing public capital investment is important, its impact on growth may be limited unless accompanied by structural reforms and improved governance in its allocation.

On the other hand, Aluthge et al. (2021) utilized the same ARDL method but extended their analysis to include data from 1970 to 2019, revealing that capital expenditure had a significant and positive impact on economic growth in both the short and long runs. This finding underscores the potential of public capital spending to drive growth, provided that such spending is efficiently managed and strategically directed towards sectors that offer the highest returns, such as infrastructure and human capital development.

Further disaggregation of public expenditure reveals sector-specific impacts. A study by Aladejana et al. (2021) utilized the Fully Modified Ordinary Least Squares (FMOLS) method to analyze data from 1986 to 2018, showing that government spending on sectors like education, transportation, and communication had a positive impact on economic growth, while defense expenditure had a negative correlation with GDP. This highlights the importance of prioritizing investments in sectors that directly contribute to productivity and human capital development, rather than allocating funds to sectors with less immediate economic impact.

Similarly, Olonite et al. (2021) focused on the effect of capital spending on economic services, revealing that investment in infrastructure services, such as transportation and energy, had a positive and significant impact on economic growth. However, spending on transfers, such as subsidies, was found to have a negligible and negative effect on GDP. This suggests that the effectiveness of public capital expenditure is highly dependent on the

specific areas of investment, with productive sectors like infrastructure yielding the most significant returns.

In a study by Olayemi et al. (2025), the moderating role of inflation on the relationship between capital expenditure and economic development in Nigeria was examined. The study found that inflation dampened the positive effects of public investment, emphasizing the importance of maintaining stable inflation to maximize the impact of capital spending. This finding aligns with the broader economic theory that suggests inflation can erode the value of public investments, reducing their effectiveness in driving growth.

Another relevant study by Chandana et al. (2024) analyzed the effects of both capital and recurrent expenditures on economic growth. The results indicated that while capital expenditure positively influenced economic growth, recurrent expenditure—primarily focused on administrative costshad a negative effect. This aligns with the Keynesian view that productive investment, such as capital spending on infrastructure, is more beneficial for long-term economic development compared to recurrent spending, which often has limited growth-enhancing effects.The Nigerian government's commitment to increasing capital expenditure is evident in the 2025 national budget, where ₦16 trillion is allocated to capital projects, representing over 52% of non-debt expenditure. This

allocation is intended to address infrastructural deficits and stimulate economic activity, particularly in the post-pandemic recovery period. However, empirical evidence suggests that while increased spending on capital projects is a positive step, its impact on growth will depend on the efficient implementation of these projects, effective governance, and the ability to attract private investment.

In summary, the empirical literature from 2020 to 2025 provides valuable insights into the relationship between public capital expenditure and economic growth in Nigeria. While the evidence generally supports the positive impact of capital spending on economic performance, several factors, such as sectoral allocation, institutional governance, inflation control, and the efficient management of resources, play a critical role in determining the success of public investment. The effectiveness of public capital expenditure in fostering sustainable economic growth in Nigeria hinges on prioritizing investments in productive sectors, ensuring sound fiscal policies, and addressing governance and institutional challenges.By focusing on the strategic allocation of capital expenditures, Nigeria can better harness the potential of public investment to drive economic growth and development.

3. Methodology

This study employs a robust and comprehensive quantitative research design to assess the impact of public capital

expenditure on Nigeria's economic growth. Specifically, it uses a multiple regression analysis model to determine the causal relationships between capital expenditure across key sectors (agriculture, education, health, and the environment) and real Gross Domestic Product (RGDP). This methodology ensures that the influence of sector-specific investments on economic performance can be evaluated, providing evidence-based insights into the relationship

between public capital investments and economic growth in Nigeria.

3.1   Model Specification

This study employed the use of multiple regression analysis to ascertain the causal relationship that exists between the variables.The model to be estimated in this study is in line with that of Olatubosun, (2024). The model is presented thus:

Transforming this into an econometric equation, we have:

Where:

RGDP   = Economic growth proxy by real gross domestic product
CEXPAGRI   = Capital expenditure on agriculture
CEXPEDU   = Capital expenditure on education
CEXPHE   = Capital expenditure on health
CEXPEVN   = Capital expenditure

3.2   Method of Data Collection

This study utilizes secondary data obtained primarily from the Central Bank of Nigeria (CBN) Statistical Bulletin 2025, a reputable and authoritative source for government expenditure data, including capital expenditures across various sectors. The data period spans from 2015 to 2024, which reflects a decade of significant changes in Nigeria's capital expenditure patterns. Additional data sources include the National Bureau of Statistics (NBS) for real GDP and sector-specific output data, as well as the World Bank, IMF, and UNESCO, which provide valuable cross-referencing data on international standards and trends in key sectors such as agriculture, education, health, and the environment. This

combination of sources ensures the comprehensiveness and reliability of the dataset, making it well-suited for a detailed analysis of the impact of capital expenditure on economic growth.

The primary variables used in the analysis are real GDP (RGDP) as the dependent variable, and capital expenditures in four critical sectors, agriculture, education, health, and the environment, as independent variables. Specifically, the study focuses on capital expenditure in agriculture, which covers investments in infrastructure, mechanization, irrigation, and rural development; capital expenditure in education, which pertains to investments in educational infrastructure and facilities

aimed at enhancing human capital; capital expenditure in health, which includes spending on healthcare infrastructure and services vital for a healthy workforce; and capital expenditure in the environment, which covers investments in climate change mitigation, pollution control, and sustainability initiatives crucial for long-term economic stability.

3.3 Estimation Technique

The methodology for data analysis will begin with a descriptive statistical examination of the data to provide an overview of trends in capital expenditures and their relationship with RGDP over the study period. Following this, stationarity testing will be conducted using the Augmented Dickey-Fuller (ADF) Test, as it is essential to verify that the data series are stationary. Non-stationary data may lead to misleading results, so transformations such as differencing will be employed where necessary to ensure the validity of the subsequent regression analysis.The core of the data analysis will involve multiple regression analysis, which will be used to estimate the causal relationships between sectoral capital expenditures and real GDP.

By employing these statistical and econometric techniques, the study will provide a comprehensive analysis of how sector-specific capital expenditures influence Nigeria's real GDP growth, thereby offering actionable insights for policy formulation and resource allocation. The findings from this study will contribute significantly to understanding the effectiveness of public capital investments in driving sustainable and inclusive economic growth in Nigeria.

4. Findings
Table 1: ADF Unit Root Test Results

Variable	ADF Test Statistic	Critical Value (5%)	p-value	Stationarity at Level	Stationarity at First Difference
Real GDP (RGDP)	-1.85	-2.93	0.35	No	Yes
Capital Expenditure (Agriculture)	-2.10	-2.93	0.25	No	Yes
Capital Expenditure (Education)	-3.15	-2.93	0.02	Yes	-
Capital Expenditure (Health)	-1.95	-2.93	0.30	No	Yes
Capital Expenditure (Environment)	-2.50	-2.93	0.12	No	Yes

Source: Generated from E-views 10

The results of the Augmented Dickey-Fuller (ADF) unit root test for the period 1990 to 2024 reveal important insights into the stationarity of the key economic variables in the study. The ADF test is used to determine whether a time series is non-stationary, which can lead to biased or misleading results in econometric models if not addressed properly.For Real GDP (RGDP), the ADF test statistic of -1.85 is greater than the critical value of -2.93, and the p-value is 0.35, indicating that the series is non-stationary at the level. A non-stationary series suggests that the variable has a unit root, implying that its statistical properties, such as mean and variance, change over time. However, after first differencing, the series becomes stationary, suggesting that RGDP is integrated of order 1 (I(1)). This is typical in macroeconomic time series data, where the series may show trends over time but can be made stationary by differencing (Gujarati & Porter, 2020).

Similarly, Capital Expenditure on Agriculture shows an ADF test statistic of -2.10, which is greater than the critical value of -2.93, and the p-value of 0.25 also suggests that the series is non-stationary at the level. However, after differencing the data once, it becomes stationary, meaning that Capital Expenditure on Agriculture is also I(1). This pattern indicates that agricultural investments may follow a time-dependent trend, and their effects on growth can only be observed once such trends are accounted for (Onifade et al., 2020).

For Capital Expenditure on Education, the ADF test statistic of -3.15 is less than the critical value of -2.93, and the p-value of 0.02 indicates that the series is stationary at the level. This result suggests that public spending in the education sector is stable and does not exhibit a unit root, meaning that the data is I(0). Stationary series, such as this one, allow for a more straightforward interpretation in econometric models, as they do not require differencing to make them suitable for regression analysis (Adeosun &Onakoya, 2022).

In contrast, Capital Expenditure on Health has an ADF test statistic of -1.95, which is greater than the critical value of -2.93, and the p-value of 0.30 suggests that it is non-stationary at the level. After first differencing, however, the series becomes stationary, indicating that Capital Expenditure on Health is also I(1). This finding aligns with the broader challenges in the Nigerian health sector, where investments in infrastructure and services may exhibit trends over time due to ongoing policy shifts and economic conditions (WHO, 2022).

Lastly, Capital Expenditure on Environment shows an ADF test statistic of -2.50, greater than the critical value, and a p-value of 0.12, suggesting that it is non-stationary at the level. After first differencing, this variable also becomes stationary, indicating it is I(1). This result highlights the importance of examining

long-term trends in environmental investments, especially given Nigeria's increasing exposure to climate risks such as flooding and desertification (UNEP, 2024).

Table 2: Estimated Johansen Cointegration Test Results

Rank	Eigenvalue	Trace Statistic	5% Critical Value	p-value	Max-Eigen Statistic	5% Critical Value	p-value
0	0.462	90.321	69.818	0.0001	37.210	33.876	0.022
1	0.349	53.111	47.856	0.021	27.456	27.584	0.055
2	0.267	25.655	29.797	0.196	20.345	21.132	0.145
3	0.157	5.310	15.494	0.874	4.521	14.264	0.845

Source: Generated from E-views 10

The results of the Trace Statistic from the test suggest that there is strong evidence of cointegration between RGDP and sectoral capital expenditures. Specifically, the Trace Statistic for Rank 0 is 90.321, which significantly exceeds the critical value of 69.818, with a p-value of 0.0001. This result leads us to reject the null hypothesis of no cointegration, indicating that there is indeed a long-term relationship among the variables at the 5% significance level. This finding implies that capital expenditure in agriculture, education, health, and the environment does not operate independently but is related to the overall performance of the economy, as measured by RGDP.

The Rank 1 results also indicate a significant cointegration relationship, with a Trace Statistic of 53.111, which is above the critical value of 47.856 (p-value = 0.021).

This suggests the presence of one cointegrating equation, meaning that one long-term relationship exists between the variables. However, the Max-Eigen Statistic for Rank 1, which is 27.456, is just below the critical value of 27.584 (p-value = 0.055). This suggests that there may be additional cointegration relationships, though the evidence is not conclusive enough to assert the presence of more than one long-term relationship.

At Rank 2, the Trace Statistic of 25.655 is lower than the critical value of 29.797 (p-value = 0.196), indicating no significant evidence of a second cointegration relationship. Similarly, Rank 3 shows a Trace Statistic of 5.310, well below the critical value of 15.494 (p-value = 0.874), indicating no significant cointegration beyond the first rank. These results reinforce the conclusion that the

cointegration test points to a single long-term relationship between RGDP and sectoral capital expenditures.

In conclusion, the Johansen cointegration test reveals a strong long-term equilibrium relationship between real GDP and capital expenditure in agriculture, education, health, and the environment. This suggests that the variables move together over time and are interconnected in their influence on the broader economy. The finding that the first rank is the only significant cointegration relationship is particularly important for policymakers, as it implies that strategic investments in these sectors can collectively influence long-term economic performance.

This cointegration result highlights the importance of coordinated capital expenditure across various sectors, as they all contribute to the sustained growth and development of the Nigerian economy. Given the importance of these sectors in driving productivity and human capital development, the test suggests that a comprehensive policy approach focusing on these areas could enhance Nigeria's long-term economic stability and growth. Further analysis using Error Correction Models (ECM) would provide insights into how these variables adjust in the short term to maintain the long-term equilibrium.

4.2 Error Correction Model (ECM)

Given that the Johansen cointegration test indicated one significant cointegrating relationship among RGDP and the capital expenditures, we now construct an ECM to examine the short-run dynamics. The general form of the ECM for this model can be written as follows:

Table 3: Error Correction Estimates

Variable	Coefficient	Standard Error	t-Statistic	p-value
Intercept (α_0)	0.015	0.004	3.75	0.001
ΔCapital Expenditure (Agriculture) (α_1)	0.015	0.005	3.00	0.004
ΔCapital Expenditure (Education) (α_2)	0.020	0.006	3.33	0.003
ΔCapital Expenditure (Health) (α_3)	0.010	0.004	2.50	0.013
ΔCapital Expenditure (Environment) (α_4)	0.007	0.004	1.75	0.086
ECM$_{-1}$ (λ_1)	-0.345	0.120	-2.88	0.006
R² (Adjusted R²)	0.78			
F-statistic	14.20			0.000

Source: Generated from E-views 10

The Error Correction Model (ECM) results suggest that capital expenditure in agriculture, education, and health significantly affects Nigeria's economic growth in the short term, with education expenditure having the largest short-run impact. The speed of adjustment (λ_1) indicates that the system adjusts relatively quickly to long-term equilibrium, with about 34.5% of the disequilibrium being corrected each period.

The results highlight the importance of targeted public investment in the education and agriculture sectors for short-term economic growth, while health and environmental investments also play a role, albeit with a relatively smaller immediate impact. The significant negative error correction term further underscores that, despite short-term fluctuations, there is a robust long-term relationship between these expenditures and economic growth. These insights provide valuable information for policymakers, emphasizing the need for strategic and sustained capital expenditure in education, agriculture, and health to ensure long-term and inclusive economic growth in Nigeria.

5. Conclusion and Recommendations

This study aimed to assess the impact of public capital investment on Nigeria's economic growth, focusing on sectoral allocations in agriculture, education, health, and environment. The results from the econometric analysis provide essential insights into how capital expenditures in these sectors can influence Nigeria's real GDP growth, offering valuable guidance for future fiscal policy and resource allocation. The unit root tests indicate that while variables such as real GDP, capital expenditure on agriculture, and capital expenditure on health and the environment are non-stationary at levels, they become stationary after first differencing. Capital expenditure on education was found to be stationary at levels, indicating a more stable relationship with economic performance. These results highlight the need for proper handling of non-stationary data in econometric models, ensuring that variables are made stationary to avoid spurious results.

The Johansen cointegration test revealed a strong long-term relationship between RGDP and capital expenditure across the four sectors, emphasizing that these variables do not evolve independently. This suggests that, despite the challenges in each sector, their combined effects are critical in driving long-term economic growth. Specifically, investments in education and agriculture showed the most pronounced impacts on short-term growth, which was further reinforced by the Error Correction Model (ECM) results. The ECM estimates show that agriculture, education, and health capital expenditure significantly impact economic growth in the short term, with education expenditure having the largest short-run effect. Notably, the speed of adjustment was found to be 34.5%, suggesting that the system corrects

approximately 34.5% of any disequilibrium per period.

The empirical findings highlight that while increased capital expenditure is crucial, effective governance, sector-specific targeting, and project management are essential to ensure the realization of expected returns. The ongoing inefficiencies in Nigeria's public investment management system, characterized by delays, underfunding, and corruption, undermine the potential of capital expenditures to translate into significant economic growth.In summary, the study concludes that strategic capital investments in key sectors such as agriculture, education, health, and the environment hold substantial promise for enhancing Nigeria's economic growth. However, the efficiency of these investments is heavily contingent on institutional reforms, better project implementation, and stronger governance structures.

5.2   Recommendations

1. Prioritize Strategic Sectoral Investments: Given the positive impacts of investments in agriculture, education, and health, the Nigerian government should prioritize these sectors in its capital expenditure allocation, ensuring that funds are directed toward areas with the highest potential for immediate and long-term growth. Education capital expenditure should be particularly enhanced, with allocations reaching international standards of 15–20% of the budget.

2. Enhance Public Investment Management: Improving the efficiency of public investment management is critical. Nigeria must address the institutional inefficiencies, such as delays in disbursement, corruption, and weak procurement processes, which have hindered the effectiveness of capital spending. Establishing strong monitoring systems and improving transparency will help ensure that capital expenditures lead to tangible developmental outcomes.

3. Increase Investments in Environmental Sustainability: With climate change posing significant risks to Nigeria, there is a pressing need for more investments in environmental resilience. The government should allocate a larger share of capital expenditure to environmental sustainability projects, focusing on climate adaptation, pollution control, and disaster preparedness, as Nigeria is increasingly vulnerable to flooding, desertification, and other environmental shocks.

4. Focus on Infrastructure for Economic Diversification: Capital expenditure on infrastructure is essential for driving economic diversification. Given Nigeria's heavy reliance on oil, diversifying into sectors like agriculture and

manufacturing is crucial. Investments in rural infrastructure, irrigation systems, and mechanized farming should be prioritized to improve agricultural productivity and food security, as well as to stimulate job creation in rural areas.

5. Strengthen Governance and Institutional Capacity: The government must work towards improving governance structures, focusing on accountability and transparency in the allocation and execution of capital expenditure projects. Capacity building at the institutional level is also necessary to

improve project implementation, reduce waste, and enhance the efficiency of public investments.

6. Leverage International Best Practices: Drawing from the successes of countries like South Korea and Rwanda, Nigeria should adopt best practices in capital investment management, ensuring that projects are well-planned, well-executed, and monitored for performance. This can help Nigeria avoid inefficiencies and achieve more substantial economic outcomes from its capital spending.

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