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Government Expenditure, Budget Transparency and Human Development Infrastructure in Nigeria

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Abstract

This study investigated the effect of government expenditure and budget transparency on human development infrastructure in Nigeria. The study employed a sample size of 36 years of time series data from the period of 36 years covering from 1988 to 2023 fiscal years. Data were extracted from the World Bank's World Development Indicators (WDI), African Infrastructure Development Indicators (AIDI) on the state of national infrastructure development as of December 2023, the Bureau of Statistics, the Central Bank of Nigeria Statistical Bulletin, and the Nigerian Exchange Group (NGX). The result of the estimation using the Autoregressive Distributed Lag Model (ARDL) showed that government expenditure on livestock and agriculture (LGXLA) has a mixed effect on the Human Development Infrastructure (HDI), with short-term fluctuations but an insignificant long-run negative impact. Government expenditure on education (LGXED) positively influences the short and long run, though its statistical significance varies. Similarly, government spending on telecommunications (LGXTC) does not enhance HDI in the long run, while its short-run effects are mixed. Conversely, the impact of government expenditure on road construction (LGXRC) is largely insignificant. The budget transparency (open budget) had the strongest long-run positive effect on HDI, while the error correction term (CointEq(-1)) was negative and statistically significant. The study recommended that Ministry of Finance should prioritize optimal government expenditure and budget transparency to enhance human development infrastructure in Nigeria.

Keywords: Budget transparency, Capital budget, Education, Government expenditure on livestock and agriculture, Government expenditure, Human development infrastructure, Infrastructural development

1. Introduction

Government investment in human development infrastructure enhances the skills and abilities of the workforce to be more productive, innovative and efficient, leading to increased output and economic progress in a nation (Mairafi et al., 2024). Evidence from research showed that government investment in human capital in Nigeria is low which averaged 7% in budgetary allocation between 2021 and 2025 as against the minimum of between 15%- and 20% outlined by United Nations Educational, Scientific and Cultural Organization (Edet et al., 2024; Nduka & Nwankwo, 2023). It has been established that government expenditure and budget transparency

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will enhance the quality of human development infrastructure, which Nigeria is yet to be fully integrated Human development infrastructure, which includes essential facilities such as healthcare, education, sanitation, and housing, plays a crucial role in fostering economic growth, improving quality of life, and reducing poverty in Nigeria (Akinola & Ohomba, 2024).

Human development infrastructures enhances human capital by equipping individuals with the necessary skills, knowledge, and well-being to contribute effectively to national development, while access to quality healthcare reduces mortality rates and enhances productivity, while education empowers individuals with opportunities for socio-economic mobility (Ayeni & Ezirim, 2024; Adegbie et al., 2022). However, despite its significance, Nigeria continues to face numerous challenges in the provision and sustainability of human development infrastructure. These challenges include inadequate government funding, poor budget transparency, weak institutional frameworks, corruption, and rapid population growth, which outpaces infrastructure expansion. Furthermore, disparities in infrastructure distribution between urban and rural areas have exacerbated social inequalities, limiting access to essential services for marginalized communities (Aguguom, 2019).

Existing studies have examined infrastructure from broader economic perspectives, often focusing on GDP growth and physical infrastructure such as roads and electricity, while neglecting the specific role and impact of human development infrastructure on social and economic outcomes. This gap in the literature underscores the need for empirical research that explores the direct effects of human development infrastructure on poverty reduction, employment creation, and long-term economic stability in Nigeria. In the same manner, the problem of infrastructural development from the perspective of human development (HDI) is a growing concern as Nigeria is experiences acute deficit gap and lack consistent human skill and education system capable of producing quality and employable human labour development to stand top and be ranked one of the best among the emerging nations. On the continental level, countries like Somalia, Niger, Ethiopia, Chad, Madagascar, Democratic Republic of the Congo, Eritrea, Sierra Leone, Tanzania, and Mali were among the worst 10 countries, just a little lower than Nigeria., despite that Nigeria is the giant of Africa (Jolaiya, 2024). Also, the perennial challenge of transport composite (TCI), is worsening by the day considering the huge and disturbing security concern along the Nigerian major highways, and this has been compounded by the increasing deplorable roads. According to Ani et al. (2024), the primary issue with rural transportation in Nigeria is the lack of adequate transportation infrastructure (Adegbie et al., 2022; Egwu et al., 2024).

Government expenditure and budget transparency play a pivotal role in addressing the challenges of human development infrastructure in Nigeria by ensuring adequate funding, efficient resource allocation, and accountability in public spending (Igwe & Inyiama, 2024. Increased government investment in critical sectors such as healthcare, education, sanitation, and housing can significantly enhance human capital development, reduce poverty, and promote economic growth. However, the effectiveness of such expenditure depends largely on budget transparency, which ensures that allocated funds are used for their intended purposes without mismanagement or corruption. Transparent budgeting allows for public scrutiny, fosters trust in governance, and

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ensures that spending aligns with national development priorities. It also enables policymakers to make data-driven decisions, track progress, and identify areas requiring urgent intervention (Ekeocha et al., 2022; Ani et al., 2024). Despite its importance, challenges such as weak institutional frameworks, lack of public accountability, and inefficiencies in government financial management continue to hinder the full impact of public expenditure on human development infrastructure. Therefore, strengthening budgetary transparency and implementing robust monitoring mechanisms are essential to maximizing the effectiveness of government spending in addressing infrastructure deficits and improving the quality of life for Nigerians.

The objective of this study is to examine the implications and effect of government expenditure and budget transparency on human development infrastructure in Nigeria. The issue of human development infrastructure has been extensively studied in various forms across both advanced and developing economies (Mairafi et al., 2024; Liu et al., 2023; Tran, 2023; Adegbie et al., 2022; Ayeni, 2024; Ogundajo et al., 2022; Nwaobia & Akintoye, 2020; Oziegbe & Ituah, 2024). However, a comprehensive empirical review of prior studies reveals inconsistencies, divergent opinions, and mixed findings, indicating a lack of consensus on resolving the challenges of human development infrastructure in Nigeria. This suggests that significant gaps persist in the literature. Notably, there is a scarcity of empirical studies examining the role of government expenditure and budget transparency in addressing human development infrastructure, presenting a novel research perspective. This study aims to contribute to the existing literature by extending the frontiers of knowledge through this lens. Additionally, specific gaps were identified in the empirical studies reviewed, underscoring the need for further research in this area.

For instance: Ibrahim et al. (2023) examined the effect of government spending on infrastructure development in Nigeria from 1986 to 2022 using the OLS estimation technique. The regression analysis revealed that government spending positively impacted health, education, and transport infrastructure, highlighting the benefits of increased investment in these areas. However, the study primarily focused on the economic impact of government expenditure, with GDP as the central measure, rather than addressing the broader implications of infrastructural development. Additionally, it did not define or specify the measures of government spending, nor did it explore the aspect of human development infrastructure, which is a key focus of the current study.

To bridge this gap, this study introduces government expenditure and budget transparency as a critical dimension of mitigating the problem of human development infrastructural and this led to research objective, question and Hypothesis formulation, thus:

Research Objective: *To investigate the effect of government expenditure and budget transparency on human development infrastructure in Nigeria*

Research Question: *To what extent do government expenditure and budget transparency affect human development infrastructure in Nigeria?*

Research Hypothesis: *Government expenditure and budget transparency do not significantly affect human development infrastructure in Nigeria*

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The remaining sections of the study are structured as follows: Section 2 covers the literature review and theoretical framework. Section 3 presents the methodology, while Section 4 focuses on data analysis, results, and discussion. Finally, Section 5 provides the conclusion and recommendations.

2. Literature Review and Theoretical Framework

2.1 Conceptual Review

2.1.1 Human Development Infrastructure

The Human Development, or HDI, is defined as a summary of average performance in three important areas of human development: living a long and healthy life, being knowledgeable, and having a good standard of living (Liu et al., 2023). The normalized indices for each of the three dimensions' geometric means make up the HDI. Life expectancy at birth is used to measure the health dimension, while the mean number of years spent in school for persons over 25 and the anticipated number of years spent in school for children who are ready to start school are used to measure the education dimension (Sama & Afuge, 2016; Mairafi et al., 2024; Kaji & Kaji, 2023). Gross national income per capita is used to measure the standard of living. The logarithm of income is used by the HDI to represent how money becomes less significant as GNI increases. The Human Development (HDI) can be used to challenge national policy decisions by posing the question of how two nations with equivalent GNI per capita can have quite different results for human development. The discussion about government policy priorities may be sparked by these contrasts (Fagbemi et al., 2020). The purpose of the HDI is to highlight the importance of individuals, or more accurately, their potential to achieve fulfilling careers and personal lives and an additional criterion for assessing a nation's degree of development, in addition to typical economic growth figures like GDP, is the potential for individual human development in that nation (Bidemi & Itah, 2022; Akinola & Ohambe, 2024).

2.1.2 Sanitation and Clean Water

Access to safe and clean water and sanitation is important in promoting good health, well-being and human dignity a global requirement as posited for basic human rights by the United Nations. Ezeudu (2019) remarked that Nigeria does marginally better in terms of cleanliness than its peer group of resource-rich nations. With 23% of the population having access to flush toilets, this percentage is double that of resource-rich African nations, yet still only half that of middle-income nations. Similar to other resource-rich nations, about one-third of Nigerians rely solely on upgraded latrines for their sanitation needs. With only 13% of the population having access to traditional latrines, this country falls short of others with abundant natural resources. However, one in three Nigerians still defecates in public (Ezeudu (2019). There has been little overall improvement in sanitation, and the habit of open defecation is still on the rise. Within ten years, the percentage of people who practised open defecation has risen from 24% in 1998 to 29% in 2007, but has decline to 15% in 2017. Mixed results have been seen with higher-end modalities. Septic tank expansion has been substantial, but it has been more than compensated by a drop in conventional and upgraded toilets (Adewunmi et al., 2020).

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2.1.3 Government Expenditure on Livestock and Agriculture

Throughout countries that are developing, livestock are an important part of many subsistence farmer households and in addition to providing food in the form of meat, milk, and eggs, animals can be a source of revenue. For many people, eating animals provides a reliable source of daily sustenance (Ekeocha et al., 2022; Usman & Makhdum, 2021). In Nigeria, cattle are important livestock, considering the prevalence of beef consumption in the country. Weak market arrangements for cattle in the nation are one of the reasons the sector is unable to meet this demand (Usman & Makhdum, 2021; Olaniyi et al., 2023). According to an ongoing study by researchers at the International Livestock Research Institute (ILRI), low wholesale prices for cattle and beef are significant obstacles in the value chain and reduce the amount of high-quality beef available for purchase. The majority of meat handlers are also unskilled. The majority of cattle farmers are located in the north of the nation, but they sell their cattle in the south, which creates serious issues with marketing and expensive transportation. These ultimately result in higher market pricing for regular consumers (Michael et al., 2022; Egwu et al., 2024).

2.1.4 Government Expenditure on Education

Government expenditure on education is the amount of money government allocation and spent on education, skills and human development in a country (Tran, 2023). Public spending on education includes both direct funding provided to educational institutions by government agencies and household-based educational incentives managed by educational institutions. Local and regional governments, public agencies, and ministries other than those in education are examples of public entities (Ayeni & Ezirim, 2024). Spending on colleges, universities, and other public and private organizations that provide or support education falls under the category of expenditure. From primary to post-secondary non-tertiary and tertiary levels of education, it encompasses them all. There are two types of public education spending: capital and current. Public education expenditure include government funding for both public and private educational institutions, education management, and student and consumer subsidies for other private businesses.

2.1.5 Government Expenditure on Roads Construction

However, Nigerians frequently blame lawmakers for the bad condition of their roads as a result of their everyday irritation with them. It is remarkable, ironically, that the condition of the roadways seems to have equally defied presidential authority. The government hasn't stopped awarding road contracts, but the funding has been pitiful. Furthermore, he claimed that the government's debt to contractors had increased from N392 billion in 2020 to N420.5 billion in 2021 (Akinola & Ohambe, 2024). Stakeholders and experts agree that these actions are inefficient, non-institutionalized, and reactionary. The worry that Nigeria might still find itself in worse situations if these FG's planned initiatives don't stem from well-thought-out laws Nigeria's overall infrastructure stock represents 30% of its GDP, indicating a severe infrastructure deficit in the nation. This is less than the global standard of 70% established by the World Bank. Nigeria's population is predicted to reach 400 million by 2050, rising at a rate of more than 2.5% annually, placing a strain on the nation's infrastructure. A lack of affordable housing stock and

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inadequate road networks connecting the nation's commercial areas are two major issues with the country's development infrastructure. The construction industry in Nigeria is anticipated to expand by 5.7% in 2022 and by an average of 3.2% each year from 2022 to 2026 (Okolie et al., 2024; Akinola & Ohambe, 2024).

2.1.6 Government Expenditure on Telecommunication

According to Nduka and Nwankwo (2023), the ICT sector include publishing, movies, television, sound recording and music creation, telecommunications and information services, and marketing. Telecommunications contributed N3.27 trillion to the sector, or 81.50% of it. There are several reasons for the telecom industry's performance to have declined. Due mainly to the naira's over 30% depreciation, MTN Nigeria and Airtel Africa reported a combined loss of N511.27 billion in the first quarter of the year. Given that the industry previously contributed N2.4 trillion to government tax income in 2023, this financial strain is also expected to have an effect on revenue from taxes (Okunola et al., 2024). There are ramifications for industry income that extend beyond service providers in the event of a persistent decline. Additionally, the agricultural sector's direct contribution to the nation's GDP is decreased, according to Olaniyi et al. (2023). The nation's GDP will be more negatively impacted by a downturn in the mobile industry. There is a serious lack of road infrastructure in Nigeria (Okoli et al., 2024, Olaniyi et al., 2023).

2.1.7 Budget Transparency/Open Budget

Budget transparency otherwise known as open budget is defined as the World comparative, independent and regular assessment of transparency, oversight and participation in country's budget (Keuffer & Mabillard, 2019). According to Hoyong (2022), open budget is a complete evaluation tool to measure the extent of transparency of a nation's budget process. Barth et al. (2017) also stated that open budget is a globally recognized survey conducted by the International Budget Partnership to ascertain the level of transparency and openness countries budget preparation and implementation have passed through over the specific years. The open budget assess the extent of information availability and complete budget preparation process has the government provided to the citizen and other local; and international stakeholders during the budget process. Three characteristics are used to evaluate budget openness at the national level: transparency in terms of public access to central government and budget information; comparative analysis; and fact-based evaluation using internationally recognized standards.

2.2 Theoretical Review

2.2.1 Transparency and Accountability Theory:

The transparency and accountability theory have been attributed to Vance Lowry and Eggett who propounded the theory in the year 1967. The transparency and accountability theory posit that in a society that is democratic, citizens have a right to accountability and transparency, which includes expecting their leaders to be open and honest about all of their decisions, actions, and financial outlays made while in office. Local government operations should also be transparent

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(Alt et al., 2006; Barbera et al., 2017). Anthony et al. (2017) opined that the ideology behind the transparency and accountability theory hangs on the expectations that the people entrusted with authority and at the same time has the ability to answer for one's deeds or inactions, behavior while holding public office, or position. The process of holding elected officials and other office holders more accountable to the people who nominated or elected them for their actions while in office is another face of symbolic of accountability. Transparency entails responsibility, openness, and communication. Expectations of transparency and accountability theory as presented by proponents of the theory are based on the interest of the stakeholders; expectations regularly discussed in the context of the expected quality governance, availability of required information and consistent stakeholder interest engagement (Arneil, 2017). The theory assumes that authority must align with accountability and there are no limitations to personality and position when it comes to accountability. Supporters of the theory posited that the transparency and accountability theory suggest that when a public office holder is as forthcoming as feasible about decisions and actions they take, this is referred to as transparency in public services. They ought to be able to provide justifications for both their actions and inactions in light of this (Schlenker, 1980).

2.2.2 Infrastructural Theory of Development:

Infrastructural theory of development opined that government expenditure enhances domestic and international trades, it propels businesses and economic expansion, it enables interpersonal connectivity among friends, colleagues and workers to their relatives and to their jobs, infrastructures create much-needed business opportunities, protects properties and lives from potential danger sand preventable natural disasters. The theory equally assumes that the amount of investment a nation made in government expenditure is aligned with the priority and premium the nation attached to the value of human lives (Bakar & Mat, 2017). A nation is classified as a developed economy, emerging economy or developed economy based on the quantum of infrastructure it has embarked upon and the extent the citizens have leveraged on these infrastructures to advance in business opportunities and information technologies. Some studies have been associated with the position of government expenditure by supporting the theory of government expenditure (Bower et al., 2002; Cameron & Trivedi, 2009; Bhat et al. 2018). For instance, the study of Bower et al. (2002) opined that infrastructures are the bane of life and the product of civilization as the backwardness of the society has been concomitant with the inability to embrace and consider infrastructure as a priority and one of the necessities of life. Supporting the infrastructural theory of development, Bhat et al. (2018) submitted that among the nations of the world who have paid the price of government expenditure tend to grow their economy faster and ahead of those who pay lips services and or have downplayed government expenditure in the past and successive governments. According to Cameron and Trivedi (2009) government expenditure is planned and premeditated on strategic visions of the government over the years.

2.3 Empirical Review

Oge and Adejuwon (2022) focused on how capital budgeting influences infrastructural development in Nigeria. The study used secondarily sourced data of government capital

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expenditure extracted from the Office of Budgetary Allocation and the Central Bank of Nigeria for the period under consideration. The findings highlighted that effective capital budgeting significantly enhances infrastructure in key areas such as housing, transportation, and technology. The study suggests that boosting budget allocations in these sectors, as well as in healthcare, could lead to substantial improvements. Based on the finding of this study, that showed a positive and significant effect of government expenditure on infrastructural development, the result was found to be in consonant with some previous where significant effect were reported (Charles et al., 2018; Mustapha et al., 2017; Okunola et al., 2024; Ibrahim et al., 2023; Michael et al., 2022; Adegbie et al., 2022; Wandeda et al., 2021). Some other studies have found contradictory results, as these studies have found and documented negative and insignificant effects (Wokoma & Fubara, 2018; Egwu et al., 2024; Akinola & Ohambe, 2024; Bakar & Mat, 2017).

Michael et al. (2022) investigated the roles that governance and institutional quality play in infrastructure development across Sub-Saharan Africa (SSA) from 1990 to 2019. Using advanced statistical methods, they found that strong governance and institutional frameworks are essential for infrastructure progress. The study also noted that industrialization and economic growth positively influence infrastructure development, while foreign direct investment (FDI) had a less significant impact. Based on the fining of this study, that showed a positive and significant effect of government expenditure on infrastructural development, the result was found to be in consonant with some previous where significant effect were reported (Oge & Adejuwon, 2022; Ahuja & Pandit, 2022; Ekeocha et al., 2022; Adegbie et al., 2022; Wandeda et al., 2021). Some other studies have found contradictory results, as these studies have found and documented negative and insignificant effects (Egwu et al., 2024; Akinola & Ohambe, 2024; Akanbi, 2022).

Hoyong (2022) examined whether making budget processes more transparent could improve budget efficiency in South Korea, focusing on the country's 2017 online open budget system. The study considered data extracted from the national annual expenditure for a period of one year of 2017. The study used simple regression analysis in estimating the effect of budget transparency on budget efficiency in South Korea. The result showed that budget transparency processes had a significant effect on budget efficiency in South Korea. The research found that greater transparency led to a reduction in unused budgets, indicating improved efficiency. The study also highlighted that transparency is particularly effective when it addresses projects vulnerable to agency problems, suggesting that online transparency can enhance public engagement and mitigate such issues. Based on the fining of this study, that showed a positive and significant effect of government expenditure on infrastructural development, the result was found to be in consonant with some previous where significant effect were reported (Michael et al., 2022; Okunola et al., 2024; Ibrahim et al., 2023; Michael et al., 2022; Ahuja & Pandit, 2022; Ekeocha et al., 2022; Adegbie et al., 2022; Wandeda et al., 2021). Some other studies have found contradictory results, as these studies have found and documented negative and insignificant effects (Salisu & Haladu, 2021; Egwu et al., 2024; Shafuda & Kumar De, 2020; Bosco et al., 2019).

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Ebekozien et al. (2022) looked at how infrastructure impacts human development in Nigerian higher education institutions. An ex-post facto research model was adopted for the study, while panel data was used for the data estimation. The study findings supported the idea that good infrastructure positively affects development in this sector. However, this contrasts with other studies that have pointed out the negative consequences of poor tax implementation on infrastructure. The result obtained in this study is in tandem with some prior studies that have found similar negative and insignificant effects (Adole et al., 2021; Orji et al., 2017; Jolaiya, 2024; Akanbi, 2022; Adeloye et al., 2016). However, on the contrary, some other studies have found and documented empirical evidence of significant effects (Ana-Maria et al., 2016; Olaniyi et al., 2023; Oge & Adejuwon, 2022; Okunola et al., 2024; Ibrahim et al., 2023; Cammeraat, 2020). Similarly, Education also came under scrutiny, with Bewaji et al. (2021) assessing the impact of federal government education spending on Nigeria's economic growth. A period of 39 was put into consideration from 1980 to 2018. Descriptive statistics of unit root unit and other diagnostics tests were tested. Despite challenges like instability and insufficient funding, their study found a positive relationship between education expenditure and economic growth. Based on the fining of this study, that showed a positive and significant effect of government expenditure on infrastructural development.

Further investigation by Olanrewaju and Funlayo (2021) tested Wagner's theory and Keynes's hypothesis in Nigeria and Angola. Ex-post facto research was engaged to analyze the model specification of the study. The pooled panel data analysis showed that that government expenditure had an insignificant effect on reliable electricity supply in Nigeria. Their findings validated Wagner's theory in terms of health expenditure in both countries and supported both theories concerning education expenditure in Angola and Nigeria health facilities respectively. However, in Nigeria, only Keynes's hypothesis found support of insignificant effect. The result obtained in this study is in tandem with some prior studies that have found similar negative and insignificant effects (Olarewaju & Funlayo, 2021; Jolaiya, 2024; Akanbi, 2022; Egwu et al., 2024; Akinola & Ohambe, 2024; Amadi & Amadi, 2020; Wang et al., 2020; Onifade et al., 2020; Bosco et al., 2019; Adeloye et al., 2016).

Countering Wagner's law, Kolapo et al. (2021) examined government expenditure's effect on economic growth in Sub-Saharan Africa. Secondary data was considered in the data collection, while the analysis using ARDL revealed that government expenditure positively impacted human development growth, contrary to Wagner's law. However, the result revealed a negative effect on sanitation and other facilities capable of improving standards of living. The study also noted that while total expenditure benefits growth, capital and recurrent expenditures have negative effects. The result obtained in this study is in tandem with some prior studies that have found similar negative and insignificant effects (Okolo et al., 2018; Salisu & Haladu, 2021; Orji et al., 2017; Jolaiya, 2024; Akanbi, 2022; Egwu et al., 2024; Akinola & Ohambe, 2024; Amadi & Amadi, 2020; Wang et al., 2020; Onifade et al., 2020; Bosco et al., 2019; Adeloye et al., 2016). However, on the contrary, some other studies have found and documented empirical evidence of significant effects (Ana-Maria et al., 2016; Olaniyi et al., 2023; Oge & Adejuwon, 2022; Okunola et al., 2024; Ibrahim et al., 2023; Micheal et al., 2022; Jabbar et al., 2021).

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Bolomope et al. (2021) compared private-public partnerships and direct government spending on human development in Nigeria. The use of Granger causality test based on vector error correction mechanism and Autoregressive Distributed Lag limits testing technique to cointegration forms the foundation of the evidence. The study then found that while government spending had a weak positive impact, it did align with other studies showing beneficial effects on human development. However, their findings diverged from studies reporting negative impacts on inflation and life expectancy. The result obtained in this study is in tandem with some prior studies that have found similar negative and insignificant effects (Salisu & Haladu, 2021; Orji et al., 2017; Jolaiya, 2024; Akanbi, 2022; Egwu et al., 2024; Akinola & Ohambe, 2024; Amadi & Amadi, 2020; Wang et al., 2020; Onifade et al., 2020; Bosco et al., 2019). However, on the contrary, some other studies have found and documented empirical evidence of significant effects (Ana-Maria et al., 2016; Olaniyi et al., 2023; Oge & Adejuwon, 2022; Okunola et al., 2024; Ibrahim et al., 2023; Micheal et al., 2022; Jabbar et al., 2021; Omobhude & Chen, 2020; Obasikene, 2017).

Consequent to the empirical review carried out in this section, the studies examined the effect of government expenditure from point of view, of capital expenditure, infrastructural development and budget implementation from scholars in different countries and sectors and the studies found a mixed results, inconsistences and inconclusive results on the effect and relationship between the dependent and independent variables. The major gaps are; in other countries/continent (Mairafi et al., 2024; Chen et al., 2021; Ahuja & Pandit, 2022); in other sectors (Ibrahim et al., 2023; Michael et al., 2022); qualitative studies (Ullah et al., 2021; Olaniyi et al., 2023); comparison between two countries (ARIF ET AL., 2023) limited measurement for tax incentives (Ekeocha et al., 2022; Akanbi, 2022; Akinola & Ohambe, 2024). This current provided the implications and significance of government expenditure and budget transparency to address the identified gaps in the literature.

3. Methodology

The study investigated the effect of government expenditure and budget transparency on human development in Nigeria for the period of 36 years covering 1988 to 2023. The study employed ex-post facto research design, using secondarily sourced data for the study. A total of population of 1988 to 2023 to ensure a robust study and the period when some of the identified variables of taxes were effective and levied in Nigeria. This study focused on the Nigeria, and the total enumeration sampling technique was adopted in this study as the population of the study also serves as the sample size for a 36 year span period of spanning from 1988 to 2023. Ddiagnostic tests were conducted, including the Auto regression Distributed Lag Model (ARDL) Bounds Test to confirm the presence of a long-run relationship, the Jarque-Bera test for normality, the LM test for serial correlation, the Breusch-Pagan Godfrey test for heteroscedasticity, and the Ramsey RESET test for model specification and stability. Additionally, the CUSUM and CUSUMSQ tests were employed to assess the stability of the estimated models over time.

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3.1 Measurement of Variable

Dependent Variable
Human Development Infrastructure (HDI) was measured using: Natural Log of time series data of HDI as ranked by the WDI and AIDI for the period under consideration

Independent Variables:
Government Expenditure on Livestock and Agriculture
Government Expenditure on Livestock and Agriculture (GXLA) = Natural Log of time series data for government expenditure on GXLA over the years for the period under consideration.

Government Expenditure on Education
Government Expenditure on Education (GXED) = Natural Log of time series data for government expenditure on GXED over the years for the period under consideration.

Government Expenditure on Road
Construction Government Expenditure on Road Construction (GXRC) = Natural Log of time series of data for government expenditure on GXRC over the years for the period under consideration.

Government Expenditure on Telecommunication
Government Expenditure on Telecommunication (GXTC) = Natural Log of time series data for government expenditure on GXTC over the years for the period under consideration.

Budget Transparency (Open Budget)
Budget Transparency: The study employed Open Budget (OPBI) as a surrogate to measure budget transparency in this study. Consequently, open budget = Access to precise data regarding public spending and tax collection offers a substitute indicator of transparency.

3.2 Model Specification

$Y_t = \alpha_0 + \beta X_t + \varepsilon_t$
$HDIt = \alpha 0 + \beta 1 GXLAt + \beta 2 GXEDt + \beta 3 GXRCt + \beta 4 GXTCt + \beta 5 OPBIt + \varepsilon t$ ---------Model 2

Where
HDI = Human Development Infrastructure, TCI = Transportation Composite,
GXLA = Government Expenditure on Livestock and Agriculture,
GXED = Government Expenditure on Education, GXRC = Government Expenditure on Roads Construction. GXTC = Government Expenditure on Telecommunication,
OPBI = Open Budget,
$\beta 1$-$\beta 6$ = Coefficients of the of Explanatory variable of the Models,
α = Regression intercept (Constant), t = Time series,
μ = Stochastic Variable (Error Term)

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4. Data Analysis, Results and Discussions

This section presents the regression analysis of the study, results and interpretations and discussion of findings of the using Auto regression Distributed Lag Model (ARDL) in Table 1.

Table 1: Auto regression Distributed Lag Model (ARDL)

Error Correction Regression				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0.061	0.003	-22.633	0.000
D(HDI(-1))	0.566	0.061	9.295	0.003
D(HDI(-2))	0.601	0.082	7.332	0.005
D(HDI(-3))	-0.093	0.039	-2.414	0.095
D(LGXLA)	-0.008	0.000	-20.413	0.000
D(LGXLA(-1))	0.003	0.001	3.958	0.029
D(LGXLA(-2))	0.008	0.001	8.814	0.003
D(LGXLA(-3))	0.003	0.001	5.287	0.013
D(LGXED)	0.003	0.001	4.997	0.015
D(LGXED(-1))	0.002	0.001	3.366	0.044
D(LGXED(-2))	-0.001	0.000	-1.519	0.226
D(LGXED(-3))	-0.002	0.000	-3.790	0.032
D(LGXTC)	0.005	0.000	10.578	0.002
D(LGXTC(-1))	-0.002	0.001	-3.394	0.043
D(LGXTC(-2))	-0.002	0.000	-4.709	0.018
D(LGXRC)	0.001	0.001	1.522	0.225
D(LGXRC(-1))	-0.004	0.001	-5.585	0.011
D(LGXRC(-2))	-0.004	0.001	-5.110	0.015
D(LGXRC(-3))	-0.008	0.001	-12.929	0.001
D(OPBI)	0.050	0.003	15.135	0.001
D(OPBI(-1))	-0.081	0.005	-15.266	0.001
D(OPBI(-2))	-0.059	0.008	-7.681	0.005
D(OPBI(-3))	-0.070	0.006	-10.836	0.002
CointEq(-1)*	-0.171	0.007	-23.601	0.000
Long Run Equation				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LGXLA	-0.055	0.018	-3.089	0.054
LGXED	0.036	0.014	2.524	0.086
LGXTC	0.045	0.017	2.704	0.074

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LGXRC	0.002	0.021	0.102	0.926
OPBI	0.578	0.172	3.351	0.044

ARDL Bound Diagnosis tests: Test @ 5%: *F – stat* = 34.814 (*I* (0) = 2.62, *I* (1) = 3.79

R^2 = 0.996 *Adj.*R^2 = 0.986; *F- stat* = 96.702 (0.000)

$X^2_{JB} = 1.690\ (0.430); X^2_{LM} = 5.10\ (0.299); X^2_{BPG} = 0.527\ (0.847)$ $X^2_{RR} = 0.909\ (0.460)$

STABILITY: *CUSUM & CUSUMSQ*

Source: Researcher's Computation (2025) from E-Views 12. ***Note:*** *SE: standard error;* $X^2_{JB}; X^2_{LM}; X^2_{BPG}; X^2_{RR}$ *represent Jarque-Bera normality test, LM test for serial correlation, Breusch-Pagan Godfrey test for heteroscedasticity, and Ramsey Reset test for linearity respectively. I(0) and I(1) represent lower and upper bound, respectively. While the respective probability values are in bracket; ECT: Error correction term. The dependent variable is Human Development Infrastructure (HDI). The independent variables are Natural logarithm of Government Expenditure on Livestock and Agriculture (LGXLA), Natural logarithm of Government Expenditure on Education (LGXED), Natural logarithm of Government Expenditure on Roads Construction (LGXRC), Natural logarithm of Government Expenditure on Telecommunication (LGXTC), Open Budget (OPBI) for 36 years period from 1988 to 2023 in Nigeria. The estimation process was facilitated using E-views 12.0 @ 5% level of significance*

The combined equation can be structured as:

The ARDL model for the effect of macroeconomic factors on consumer goods (CGI) *can be expressed as follows:*

$HDI_t = C + \beta_1 HDI_{t-1} + \beta_2 LGXLA_{t-1} + \beta_3 LGXED_{t-1} + \beta_4 LGXTC_{t-1} + \beta_5 LGXRC_{t-1} + \beta_5 OPB_{t-1} + \sum_{i=1}^{3} \phi iD(LLGXLA_{t-1} + \sum_{j=1}^{3} \psi jD(LGXED_{t-j}) + \sum_{k=1}^{3} \eta kD(LGXTC_{t-k}) + \sum_{l=1}^{3} \theta lD(LGXRC_{t-l}) + \sum_{m=1}^{3} \theta \xi mD(OPB_{t-m}) + \epsilon_t$

Substituting the Coefficients:

Substituting the specific coefficients derived from the ECM and Levels Equation into the equation yields:

Long-Run Equation:

$HDI_t = -0.055LGXLA_t - 10.036LGXED_t - 10.045LGXTC_t - 10.002LGXRC_t + 0.578OPBI_t + \varepsilon_t$

Short-Run Equation:

$\Delta HDI_t = -0.0610.566\Delta HDI_{t-1} + 0.601\Delta HDI_{t-2} - 0.093\Delta HDI_{t-3} - 0.008\Delta LGXLA_t + 0.003\Delta LGXLA_{t-1} + 0.008\Delta LGXLA_{t-2} + 0.003\Delta LGXLA_{t-3} - 0.008\Delta LGXLA_t + 0.003\Delta LGXLA_{t-1} + 0.008\Delta LGXLA_{t-2} + 0.003\Delta LGXLA_{t-3} + 0.003\Delta LGXED_t + 0.002\Delta LGXED_{t-1} - 0.001\Delta LGXED_{t-2} - 0.002\Delta LGXED_{t-3} + 0.003\Delta LGXED_t + 0.002\Delta LGXED_{t-1} - 0.001\Delta LGXED_{t-2} - 0.002\Delta LGXED_{t-3} + 0.005\Delta LGXTC_t - 0.002\Delta LGXTC_{t-1} - 0.002\Delta LGXTC_{t-2} + 0.005\Delta LGXTC_t - 0.002\Delta LGXTC_{t-1} - 0.002\Delta LGXTC_{t-2} + 0.001\Delta LGXRC_t - 0.004\Delta LGXRC_{t-1} - 0.004\Delta LGXRC_{t-2} - 0.008\Delta LGXRC_{t-3} + 0.050\Delta OPBI_t - 0.081\Delta OPBI_{t-1} - 0.059\Delta OPBI_{t-2} - 0.070\Delta OPBI_{t-3} - 0.171CointEq_{t-1} + \varepsilon_t$

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4.1 Interpretations of results

Bound Testing

The ARDL Bound test confirms a long-run relationship between human development infrastructure (HDI) and government expenditures across various sectors, alongside budget transparency. The computed F-statistic (34.814) significantly exceeds the upper bound critical value (3.79) at the 5% significance level, suggesting that the variables are cointegrated. This result implies that despite short-term fluctuations, these variables share a stable long-run equilibrium, reinforcing the necessity of long-term policy consistency to sustain human development in Nigeria.

Short-Run Coefficients and Error Correction Model (ECM)

The error correction term (CointEq(-1)) is correctly signed and highly significant (-0.171, p = 0.000), indicating that approximately 17.1% of deviations from the long-run equilibrium are corrected each period. This suggests a relatively moderate speed of adjustment, with short-run shocks to HDI gradually dissipating over time. Past values of HDI significantly affect its current level, as indicated by the first (0.566, p = 0.003) and second (0.601, p = 0.005) lags, which exhibit strong positive effects. However, the third lag (-0.093, p = 0.095) suggests some degree of reversal, possibly reflecting diminishing returns or policy inefficiencies that slow down human development progress. Government expenditure on livestock and agriculture (LGXLA) initially has a negative effect on HDI (-0.008, p = 0.000), which could be attributed to resource misallocation or the lagged nature of agricultural investments. However, subsequent lags turn positive (0.003, p = 0.029; 0.008, p = 0.003; 0.003, p = 0.013), indicating that the benefits of agricultural spending materialize over time, reinforcing the importance of sustained investment.

Government expenditure on education (LGXED) enhances HDI in the short run, as indicated by its immediate positive effect (0.003, p = 0.015). However, its influence diminishes over time, with the third lag (-0.002, p = 0.032) turning negative. This may suggest that educational investments require complementary interventions, such as curriculum reforms or improved teacher training, to sustain long-term human development gains. Government expenditure on telecommunication (LGXTC) exerts a strong positive short-run impact on HDI (0.005, p=0.002), reinforcing the role of digital infrastructure in facilitating economic and social development. However, it's first (-0.002, p = 0.043) and second (-0.002, p = 0.018) lags are negative, possibly indicating inadequate complementary investments or initial implementation challenges. Government expenditure on road construction (LGXRC) displays mixed short-run effects, with its third lag (-0.008, p=0.001) showing a strong negative influence. This suggests that inefficiencies, corruption, or delays in infrastructure implementation may limit the immediate developmental benefits of road investments, necessitating stronger governance mechanisms. The Open Budget (OPBI) significantly enhances HDI in the short run (0.050, p = 0.001), highlighting the role of fiscal transparency in promoting human development. However, its later lags turn negative (-0.081, p = 0.001; -0.059, p = 0.005; -0.070, p = 0.002), suggesting that while transparency fosters initial improvements, its long-term impact may require stronger institutional reforms to sustain benefits.

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Long-Run Elasticities

Government expenditure on livestock and agriculture (LGXLA) exerts a negative long-run but insignificant effect at 5% level (-0.055, p = 0.054), indicating that inefficiencies in agricultural spending may hinder its contribution to human development. This could stem from resource misallocation, structural bottlenecks, or delays in realizing the developmental benefits of agricultural investments if properly significant. Government expenditure on education (LGXED) positively influences HDI in the long run (0.036, p = 0.086), though not statistically significant at 5% level, reinforcing the established link between educational investment and improvements in human capital. This finding underscores the need for sustained and efficient funding in education to ensure long-term socio-economic development.

Government expenditure on telecommunication (LGXTC) has a positive and insignificant long-run effect (0.045, p = 0.074), underscoring the position of digital infrastructure in enhancing economic opportunities and access to information. This suggests that policies aimed at expanding telecommunication networks may need more lasting developmental focus. The Open Budget (OPBI) exhibits a strong and positive long-run impact on HDI (0.578, p = 0.044), indicating that fiscal transparency and institutional quality play a crucial role in fostering sustainable development. This finding suggests that governance reforms aimed at enhancing budget accountability and reducing corruption can yield significant long-term benefits.

Diagnostic Tests

The model's robustness is supported by various diagnostic tests. The adjusted R-squared value (0.986) suggests that the independent variables explain a substantial proportion of the variation in HDI, reinforcing the reliability of the estimated relationships. The F-statistic (96.702, p=0.000) indicates that the overall model is statistically significant, confirming that the explanatory variables collectively influence HDI.

Tests for normality, serial correlation, heteroskedasticity, and model specification confirm the reliability of the estimates. The Jarque-Bera normality test (X_JB^2 = 1.690, p = 0.430) indicates that residuals are normally distributed. The Breusch-Godfrey LM test (X_LM^2 = 5.10, p = 0.299) finds no evidence of serial correlation, while the Breusch-Pagan-Godfrey heteroskedasticity test (X_BPG^2 = 0.527, p = 0.847) confirms homoscedasticity. Finally, the Ramsey RESET test (X_RR^2 = 0.909, p = 0.460) suggests no significant model misspecification, ensuring that the functional form is appropriate. Furthermore, the CUSUM and CUSUMSQ tests in the figures 4.2.2.1 and 4.2.2.2 respectively confirm the stability of the estimated coefficients over time, reinforcing the model's reliability for policy analysis.

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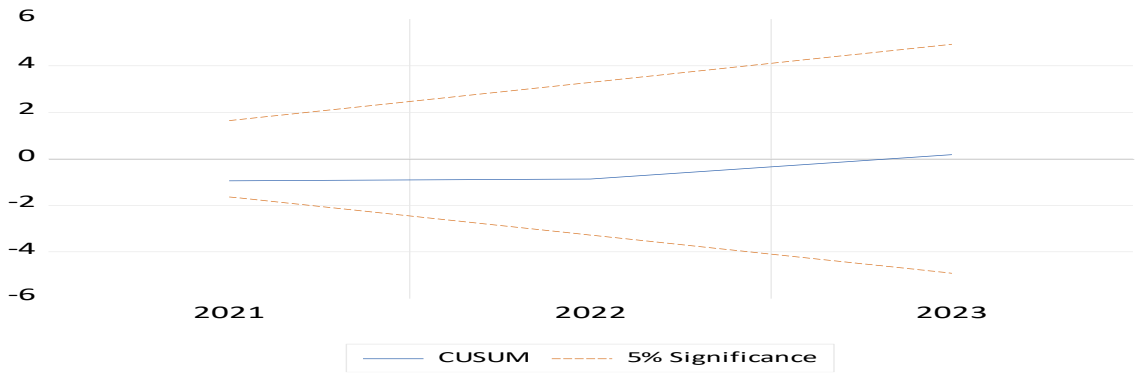
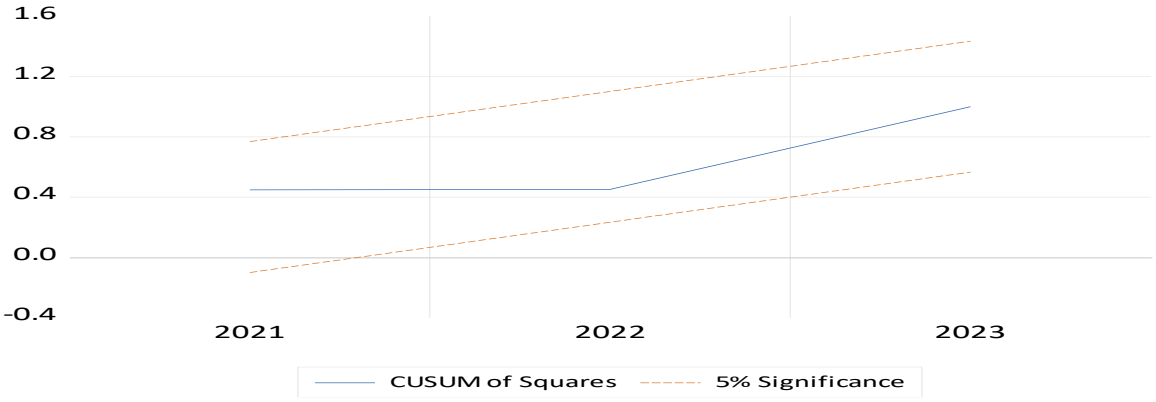
Figure 4.2.2.1: Plot of Cumulative sum of recursive residuals for Model Two



Source: Author's compilation from E-views 12 output

Note: The blue line is the solid line, while the red lines that bounded the blue line are the critical bounds at 0.05

Figure 4.2.2.2: Plot of Cumulative sum square of recursive residuals for Model Two



Source: Author's compilation from E-views 12 output

Note: The blue line is the solid line, while the red lines that bounded the blue line are the critical bounds at 0.05

Significance of Individual Effects of the Variables in the Long Run

To examine the long-run impact of government expenditure and budget transparency on the Human Development Infrastructure (HDI), the estimated long-run coefficients and their significance levels provide insight into whether these components significantly influence HDI. The results are summarized as follows in Table 2

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Table 2: Individual Effects of the Variables in the Long-Run.

Variables	Coefficient	t-Stat	Prob.	Remarks @ 5% Sig. level	Decision on the null hypothesis
LGXLA	-0.055	-3.089	0.054	Insignificant	Do not reject
LGXED	0.036	2.524	0.086	Insignificant	Do not reject
LGXTC	0.045	2.704	0.074	Insignificant	Do not reject
LGXRC	0.002	0.102	0.926	Insignificant	Do not reject
OPBI	0.578	3.351	0.044	Significant	Reject

Explanation of the Table:

LGXLA (Expenditure on Livestock and Agriculture): The coefficient is negative, suggesting a potential adverse effect on HDI. However, the result is not statistically significant at the 5% level, leading to the failure to reject the null hypothesis. LGXED (Expenditure on Education): The coefficient is positive, indicating a favorable impact on HDI, but its significance level is above 5%, so the null hypothesis is not rejected. LGXTC (Expenditure on Telecommunications): The positive coefficient implies a beneficial influence on HDI, but the result is not statistically significant at the 5% level. LGXRC (Expenditure on Roads Construction): The impact is nearly zero, and the insignificance at the 5% level means the null hypothesis is not rejected Open Budget (OPBI): The coefficient is positive and significant, indicating that budget transparency significantly enhances human development infrastructure, leading to the rejection of the null hypothesis. This table summarizes the long-run significance of each variable in relation to HDI, highlighting their individual contributions to the dependent variable.

4.2. Discussion of Findings

The findings from the Auto-Regressive Distributed Lag (ARDL) model reveal that government expenditure on livestock and agriculture (LGXLA) has a mixed effect on the Human Development Infrastructure (HDI), with short-term fluctuations but an insignificant long-run negative impact. Government expenditure on education (LGXED) exerts a positive influence in both the short and long run, though its statistical significance varies. Similarly, government spending on telecommunications (LGXTC) does not enhances HDI in the long run, while its short-run effects are mixed. Conversely, the impact of government expenditure on road construction (LGXRC) is largely insignificant. The Open Budget (OPBI) has the strongest long-run positive effect on HDI, underscoring the importance of fiscal transparency in promoting human development. The error correction term (CointEq(-1)) is negative and statistically significant, confirming a stable long-run relationship, with an adjustment speed of approximately 17.1% per period. The model's explanatory power is exceptionally high, with an R-squared value of 0.996 and an adjusted R-squared of 0.986, indicating that the independent variables explain nearly all variations in HDI. Furthermore, diagnostic tests confirm the absence of serial correlation, heteroskedasticity, and specification errors, while the stability tests (CUSUM and CUSUMSQ) validate the robustness of the model.

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The result was found to be consistent with some previous studies who had documented significant effect (Ana-Maria et al., 2016; Okunola et al., 2024; Ibrahim et al., 2023; Michael et al., 2022; Ahuja & Pandit, 2022; Ekeocha et al., 2022; Adegbie et al., 2022; Wandeda et al., 2021; Abutu & Agbede, 2015). For instance, Saeed (2023) tackled the challenges of estimating how military spending affects economic growth by using innovative methods to address endogeneity. Analyzing data from 133 countries over several decades, the study found that increases in military spending relative to GDP actually reduced economic growth, with consistent findings across various models. Based on the fining of this study, that showed a positive and significant effect of government expenditure on infrastructural development. Some other studies have found contradictory results, as these studies have found and documented negative and insignificant effects (Dikeogu et al., 2016; Egwu et al., 2024; Akinola & Ohambe, 2024; Akanbi, 2022; Apurv & Uzma, 2020; Prandhan et al., 2020; Wang et al., 2020; Shafuda & Kumar De, 2020; Bosco et al., 2019). For instance, Ebekozien et al. (2022) looked at how infrastructure impacts human development in Nigerian higher education institutions. An *ex-post facto* research model was adopted for the study, while panel data was used for the data estimation. The study findings supported the idea that good infrastructure positively affects development in this sector. However, this contrasts with other studies that have pointed out the negative consequences of poor tax implementation on infrastructure.

5. Conclusion and Recommendations

5.1 Conclusion:

The study examined the effect of government expenditure and budget transparency on human development in Nigeria. The descriptive analysis indicated that the mean of 0.467, which is close to its median of 0.472, indicates a fairly balanced distribution. The relatively small variation between the maximum (0.549) and minimum (0.388) values suggests that human development infrastructure has remained largely consistent over time, with gradual improvements rather than extreme fluctuations. The relatively low standard deviation (0.052) reflects minimal dispersion, suggesting homogeneity in human development infrastructure over the study period. In addition, the regression analysis showed that. In addition, the regression analysis revealed that in the short run, HDI significantly affects its current level; LGXLA initially has a negative effect; LGXED, indicated by its immediate positive effect, exerted a strong positive short-run impact; LGXRC displayed mixed short-run effects; and OPBI had a significant effect. But in the long run, the results indicated that LGXLA exerted a negative long-run but insignificant effect, LGXED positively influenced, LGXTC had a positive and insignificant long-run effect, and LGXRC was not significant in the long run, while OPBI exhibited a strong and positive long-run effect. However, the joint statistics using all the explanatory variables revealed a significant effect; hence, the study concluded that government expenditure and budget had a significant effect on human development in Nigeria.

5.2 Implications of Findings:

For government ministries, the findings on road construction (LGXRC) indicate that government expenditure in this area has not been significant in the long run. This suggests that either

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inadequate funding or inefficiencies in project execution have limited the impact of road infrastructure on broader economic and human development. The findings emphasize the critical role of road networks in driving national development and underscore the need for better budgetary allocations, efficient project monitoring, and strict regulatory oversight to ensure the successful implementation of road infrastructure projects. Additionally, the study suggests that underutilization of budgeted funds and lack of financial transparency may be hindering the desired infrastructural development outcomes.

5.3 Recommendations:

The study recommended that the Ministry of Works should reconsider exploring public-private investors in road construction and ensure adequate and strict road construction project monitoring from the concepts to the completion to ensure that government expenditure on road construction makes an appreciable impact on infrastructural development in Nigeria. Road construction is a hub and a critical gateway that drives all other infrastructural development; hence, adequate budget monitoring and implementation are recommended.

5.4 Contribution to Knowledge and Suggestion for Further Studies:

In contributing to knowledge, the policymakers will find this work useful in policy direction and in making impactful future policies in relation to providing enabling environment for effective government expenditure and budget transparency in Nigeria capable of closing the widened infrastructural development gaps in Nigeria. It will serve as vital information to the policymakers in Nigeria, the extent of government expenditure and budget transparency had impacted on set objectives and in broadening infrastructural development in Nigeria a new discovery of policy reform, new policy and implementation

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