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PUBLIC EXPENDITURE AND ECONOMIC GROWTH IN NIGERIA: A TIME SERIES ANALYSIS (2001 – 2019)

Adebayo Oluwaseun Rapheal Department of Economics University of Ibadan Oluwaseunadebayo100@gmail.com

> Akintunde Oluwaseyi Temitope Illinois State University Akingbolahan2007@gmail.com

ABSTRACT

The study looks at the relationship between public spending and Nigeria's economic expansion. The particular goals are to examine the trend of public spending on health, defense, and education as well as the relative efficacy of public spending in advancing welfare in Nigeria. Research design enriched with tables, charts, and internet materials form the study methodology. The variables were Gross domestic product, government expenditure on health, government expenditure on education, government expenditure on defense, and government expenditure on administration The research employs the secondary method of data collection, the estimation techniques used were the augmented dickey fuller unit root test, ordinary last square, and Granger causality test. The findings reveal that investment in education has a positive impact and significant effect in determining the value of economic growth. Based on the findings of this research, the research therefore recommended that the government should allocate more funds to the education sector to improve infrastructure, quality of teaching, and access to education at all levels. And also, establish scholarship and grant programs to support students from disadvantaged backgrounds, ensuring inclusive education for all.

Keywords: Economic growth, welfare, Public Expenditure, Health, Education, Poverty

1.0 INTRODUCTION

The primary responsibility of the government to its people is to protect the country from outside dangers, maintain law and order, and foster an atmosphere that is favorable to economic growth. As a result, maintaining the safety of people and property as well as providing necessary services that the private sector would not be able to effectively supply because of their high costs are all part of the enabling environment. For the population's well-being and the nation's economic development, public goods like defense, water, electricity, education, transportation, agriculture, and healthcare are essential. Increasing government expenditure on social and physical infrastructure would boost worker productivity, and by extension has a multiplier effect on the economic growth of the Country (Nworji and Oluwalaiye, 2021).

Public spending has increased significantly over the world, mostly as a result of the faster-thanaverage rate of population expansion. As a result, the government now has a stronger obligation to promote welfare, progress technology, and supply basic public goods. Public spending on social services like healthcare and education is commonly seen as the main weapon for redistributing income and battling poverty in many developing countries. Comprehending the underlying spending priorities of a government and their congruence with policy objectives necessitates an understanding of the actual levels and distribution of public spending. Countries' socioeconomic structures are greatly influenced by public spending, especially in developing countries like Nigeria (World Bank 2020). Effective utilization and distribution of public monies not only strengthen the economy but also have a big impact on people's welfare and quality of life (OECD, 2019). Therefore, understanding the relationship between public spending and welfare is critical for economists and policymakers alike, providing important insights into how best to employ public resources to enhance societal well-being.

Nigeria, the largest economy in Africa, is baffled by multifaceted economic challenges in allocating public revenue to various sectors while meeting a wide range of socioeconomic demands (IMF, 2021). The stark contrast between the nation's wealth of natural resources and the pervasive poverty and inadequate infrastructure highlights the necessity of evaluating the return on public investment (UNDP, 2020). The allocation of public revenue has a direct multiplier impact on the quality of life of millions of Nigerians by affecting their access to important services and opportunities, in the areas of healthcare, education, infrastructure, or social safety nets. Therefore, examining public spending in Nigeria is important because it can highlight inefficiencies, maximize the use of available resources, and enhance the way that policies are implemented to support sustainable development (Oluwatobi et al., 2023). Policymakers, academics, and development professionals who want to create evidence-based plans that support economic stability, lessen poverty, and enhance Nigerians' quality of life overall must comprehend the dynamics of public spending and how it affects welfare outcomes (Adeyemi, 2022).

A substantial number of research have examined the impact of public spending in various contexts on development and economic growth. To completely analyze the effect of public spending on overall welfare in Nigeria, there is still a study deficit. Existing studies concentrated on general economic results or particular impacts on domains such as healthcare and education, failing to take into account how these investments as a whole enhance the well-being of various demographic segments. By carefully examining public expenditures in Nigeria and determining the extent to which government expenditure raises social welfare metrics, this study seeks to close this gap (Adeyemi & Akinlo, 2022). This research seeks to examine the effectiveness, equality, and efficiency of spending in several sectors to determine what aspects of Nigeria's public finance structure are strong and what needs to be improved. In addendum, it provides evidence-based recommendations to improve the influence of public spending on welfare outcomes, by promoting equitable growth and sustainable development in Nigeria. In a bid to fulfill the objectives of this research study, the study answers the following questions (i) What is the amount of public expenditure in Nigeria? (ii) What is the public spending's comparative efficacy in advancing welfare in Nigeria; and (iii) Examine the public spending trends in the areas of health, defense, and education.

Statement of Research Problem

In Nigeria, there has been a consistent rise in the budget allocated to education, agriculture, and road construction over the years. It is anticipated that the collective impact of the spending in these essential sectors will contribute significantly to the economic development of Nigeria. The increased government spending on education is projected to cultivate a knowledgeable and skilled workforce, which are vital factors for business and economic advancement. Agriculture offers a sustainable and inclusive food system, crucial for achieving economic growth. Government investment in road construction is expected to enhance accessibility to raw materials, target markets, exports, the assessment of business opportunities, and reductions in production costs.

In recent decades, Nigeria's annual spending estimates have shown a consistent increase in total government expenditure across various sectors, with the country's annual budget growing from millions to billions and now into trillions of naira. For example, the Total Appropriation Bill for Nigeria in 2023 was N21.83 trillion, in 2022 it was N17.126 trillion, in 2021 it stood at N13.588 trillion, and in 2020 it was N10.805 trillion, and so forth. Despite the expectation that these expenditures on welfare and other sectors would lead to economic growth, this has not been the case. It is not gain saying that an average Nigerian cannot afford quality education, good food, good health facilities, and no good road facilities either. The relationship between the huge yearly allocation and the economic welfare of the citizens is still a puzzle.

The country's annual appropriation bills report huge amounts, but the lack of good road networks, health facilities, educational facilities, and sanitary systems questions the justification for such

expenditures. The average citizen's welfare is not being improved due to the absence of primary welfare infrastructures despite the high estimated expenditures. Additionally, the stunted growth of the economy is evident as estimates indicate a continuous decline in the Nigerian economy's growth over the years.

Raheem, Ayana, and Fashedemi (2014) contended that the allocation of government funds to primary welfare infrastructure in Nigeria appears to be a misallocation of limited resources and a burden on taxpayers since economic growth does not translate into visible infrastructure development. These observations indicate a flaw in our budgeting system and the evaluation of public expenditure to ensure the effectiveness and efficiency of government spending. The current research was prompted by these findings to investigate the correlation between government spending on the primary welfare sector and Nigeria's economic growth.

2.0 Conceptual Review

2.1 Public Expenditure and Welfare Promotion in Nigeria

Babatunde (2018) describes expenditures in the primary welfare sector as public expenditures such as healthcare delivery, transportation, education, and food security. Others are water, sanitation, and agriculture. The infrastructure level affects the developmental ratings of a nation and contributes to the score of the nation's economic growth. Adamu and Hajara (2015) state that the government performs two functions defense (security) and provision of public goods.

2.1.1 Public Expenditure and Education

The improvement of education needs investment. The public expenditure on education is an important part of investment in education. Unconducive learning environments in most government schools are massively caused by underfunding of the educational sector. This has led to, poor educational infrastructure, a lack of learning materials, and underqualified teachers. Because of these, the Quality of education in Nigeria has been a major cause of concern for the people. Odeleye (2012) asserts that considering the importance of education expenditure in developing countries, it is noted that spending on education contributes to wealth creation. The argument is that the ability to create, adopt, and make better technological and technical progress is combined with the investment in human capital and the efficiency of the education system.

Zouheyr, Mohamed, Abdelli, and Saadaoui (2021) opine that the Nigerian government has broadly ignored the educational sector. Nigeria has one of the lowest expenditure commitments to education in Africa and the world. Education has an effective role in promoting societies to establish continuous development to promote social and economic progress. Other countries around the globe are not left out on this, for example, Saudi Arabia upholds the need to develop its educational system. Nigeria's commitment to creating educational sectors has been substantial, evidently revealed by the budgetary allocation. The education expenditure ratio has been associated with an increase from 105 million riyals in 2010 to 215 million riyals in 2017. Furthermore, the GDP's allocation to education grew from 16.2% in 2010 to 23% in 2017. The criterion set by UNESCO for education is 26% of the yearly national budget; Nigeria has routinely failed to meet this criteria, allocating 10.7% in 2016, 6% in 2017, 7.1 % in 2018, 5.9 % in 2019, 5.2 %, 6.7 % in 2020, and 5.6 % in 2021. The amount of money the government devotes to education is still minimal.

2.1.2 Public Expenditure and Health

Nigeria has allocated a substantial amount of its national budget to education in recent years, demonstrating the importance of this sector on the government's agenda. Still, there are issues with how this money is effectively allocated and used. Furthermore, from 16.2% in 2010 to 23% in 2017, the GDP's expenditure on education grew. 26 percent of the yearly national budget is the UNESCO norm for education, and Nigeria has often failed to meet this criterion, allocating 10.7 percent in 2016, 6 percent in 2017, 7.1 percent in 2018, 5.9 percent in 2019, 5.2 percent, 6.7 percent in 2020, and 5.6 percent in 2021. Government funding for education is still meager.

2.1.3 Public Expenditure and Road Construction

According to Nworji and Oluwalaiye (2021), Nigerian highways, which have a network that spans over 193,200 km, are considered to be the hub of connectivity for all other forms of transportation and play a vital part in the development of social and economic life. More people travel domestically in Nigeria thanks to its roads, and the country's transport industry generates 2.4% of GDP, with road transport making up 86% of total output. The Nigerian economy's arteries, which carry economic activity to the local, state, and federal levels, are represented by the nation's road network. According to Motamed, Florax, and Masters (2014), Nigeria's high-road infrastructure

costs are caused by the country's rapidly rising inflation rate in the cost of construction materials. Generally, road infrastructure plays a crucial role by providing mobility for the efficient movements of people, goods and services as well as providing accessibility to land and a wide variety of commercial and social activities.

The current condition of Nigeria's roads, according to Nworji and Oluwalaiye (2012), greatly raises the poverty rate, especially among the peasantry, who work as farmers, craftsmen, and other smallscale traders and live primarily in the nation's neglected rural areas. Despite the government's apparent abundance of financial resources, the nation's chronic road deterioration has continued to have a detrimental influence on all aspects of the economy, necessitating an immediate response from all parties involved. In Nigeria, funding for road development, extension, repair, and upkeep has been the duty of the government and entities under quasi-government. The financial needs to improve the current state of the roads alone cannot be met alone by the public sector, as the economic realities show.

2.1.4 Public Expenditure and Agriculture

According to Tenaye (2020), the agricultural sector accounts for the majority of employment in developing nations and makes up the largest portion of the GDP. Furthermore, the vast majority of those living in poverty worldwide derived their income from rural agricultural operations and allied industries. Thus, policies from the government must be implemented to support the expansion of agriculture. According to the Food and Agriculture Organization (2016), government spending on agriculture includes costs for sector policies and programs, building flood control, irrigation, and drainage systems, running or supporting veterinary or extension services for farmers, providing grants and subsidies to farmers, and so forth. Investing in agriculture is one of the most effective ways of promoting agricultural productivity, raising real incomes, reducing poverty and food insecurity, and enhancing environmental sustainability.

Nigerian government spending on agriculture is incredibly low, according to the International Foods Research Institute (2008). From 2001 to 2005, the federal government spent less than 2 percent of its entire budget on agriculture, a much less amount than it did on other important areas like water, health, and education. The sector's significance to the Nigerian economy and the government's intent on diversifying away from oil are starkly at odds with this spending. According to Mary (2021), the planned 1.8 percent of the 2022 budget allocated to agriculture by

the Nigerian government fell substantially short of the 10 percent target established by African leaders in the 2003 Maputo agreement and the Maputo Declaration benchmark. Nigeria also falls far behind in agricultural expenditure by international standards, even when accounting for the relationship between agricultural expenditures and national income. The spending that is extant is highly concentrated in a few areas.

2.2 Empirical Review of Empirical Literature

Apata (2021) analyzed the effect of public spending on agricultural productivity in major agroecological regions in Nigeria (1981- 2018). Public spending on drivers of agricultural growth such as education, farm feeder roads, and health care facilities and their effect on agricultural productivity were also examined. Data were analyzed using descriptive statistics and three-stage simultaneous equations. Descriptive statistics analysis results indicated that agricultural public spending as a part of total public spending averaged 4.88% between 1981 and 2018 across zones in Nigeria. Less than 25% of this allocation was spent on agricultural developmental/capital projects. Elasticity results computed from the 3-stage simultaneous equation showed that the access to moderate farm feeder roads variable was 0.045, the access to education variable was 0.071 and the access to health care facilities variable was 0.013. Such outcomes suggested that a 1% increase in the funding of education, farm feeder roads, and health care facilities will enhance agricultural productivity per capita by 0.043.

Olayemi, et al (2019) investigated the long and short-run relationship between agricultural expenditure, health expenditure, and economic growth in Nigeria. Data were collected from CBN Statistical Bulletin for the periods 1981 to 2016. Results from ARDL and ECM models established the existence of a short-run and long-run relationship between the variables of interest in Nigeria. The error correction model revealed that about 19 percent of total disequilibrium due to external shock in the previous year was corrected in the current year. Therefore, it will take about five (5) years for the system to adjust back to its long-run equilibrium path. Results further showed that there was a significant positive relationship between agricultural expenditure and economic growth in Nigeria. However, there was a significant negative relationship between health expenditure and economic growth in the long run.

Agung, Thamer, and Nurwanto (2021) studied the relationship between public expenditure in the educational sector and economic growth in Indonesia for the period 1988 to 2018 using

Autoregressive Distributed Lag bound tests to find the relationship between the variables. Findings showed that public expenditure on education has a positive insignificant relationship in the long and a negative insignificant relationship in the short-term estimation. Gross fixed capital formation showed a positive relationship, and the labor variable had a negative relationship in the short and long terms. Zouheyr, Mohamed, Abdelli, and Saadaoui (2021) studied the effect of education expenditure on economic growth in the Kingdom of Saudi Arabia from 1990 to 2017. Unit root test, regression, and correlation analysis were used to analyze the data collected and Findings showed that education expenses in the Kingdom of Saudi Arabia had a positive effect on economic growth and the relationship between domestic production and the volume of expenditure was also statistically positive and significant. Almajdob and Marikan (2019) used panel data regression analysis to ascertain the effect of education sector expenditure on economic growth in Arab Spring Countries. The study explored the dynamics of education and economic growth expenditure in selected five major Arab countries with balanced panel data from 2000 to 2014. The study focused on Arab Spring Countries (ASC), ASC, including Libya, Yemen, Iraq, Egypt, and Tunisia, and all of these are developing Countries. A sample period of 15 years has been taken from 2000 to 2014 with panel data from ASC countries. Unit root tests and integration tests were applied to the collected data. Results of Pedroni, Kao, and Johansen Fisher's co-integration showed that there was a long-term balance between education and economic growth expenditure in all countries.

Nworji and Oluwalaiye (2021) analyzed the impact of government spending on road infrastructure development on economic growth in Nigeria from 1980-2009. Indicators used for government spending were values for defense, transport/communication, and inflation rate as the explanatory variables, while gross domestic product constituted the explained variable. These data were extracted for the period 1980-2009. Multiple regression analysis was used to estimate the relationship between government spending on infrastructure development and economic growth. Findings showed that transport and communication, including defense, individually exerted a statistically significant impact on economic growth. However, inflation exerted a positive but statistically non-significant effect on economic growth in the period reviewed. However, the variables jointly exerted a statistically significant impact on the growth of the economy.

2.3 THEORETICAL FRAMEWORK

The Endogenous Growth Theory

The endogenous growth theory, which was formulated in the 1980s by prominent economists like Paul Romer and Robert Lucas, highlights the significance of internal forces over external influences in propelling sustained economic progress. The approach emphasises the importance of knowledge, innovation, and human capital investments as major forces behind economic growth. This idea holds that by promoting an environment that is favourable to innovation and the development of human capital, government policies and spending can have a substantial impact on the rate of economic growth. The theory tries to demonstrate that there is a direct correlation between spending that encourages a rise in human capital development and the pace of economic growth. It states that investments in education and training raise the skills and productivity of the workforce. It suffices to say that dissemination of knowledge and technology across industries boosts overall productivity, therefore, active government involvement in creating policies that support education, innovation, and infrastructure is crucial for sustained growth.

Nigerian government spending falls into two main categories: capital (education, R&D, and infrastructure) and recurrent (wages, subsidies, and administrative costs). The budgetary allocation of the Nigerian government has a major effect on the economic performance and development trajectory of the nation. Government spending on education contributes to increased skill levels, literacy rates, and human capital generally in Nigeria. Funding for elementary, secondary, and university education, for instance, can improve the caliber of the labour force and make it more inventive and productive. The idea of endogenous growth emphasizes how crucial infrastructure is to sustaining economic activity. Government investment in Nigeria in telecommunications, energy, roads, and bridges can lower transaction costs, increase productivity, and improve connectivity. Also, Investments in public utilities like water supply, sanitation, and energy can create a more conducive environment for businesses and industries, facilitating economic growth.

Government investment in healthcare enhances worker productivity and general health. A population that is in better health can contribute to economic activity more successfully. The hypothesis that improved health outcomes result in more human capital and economic growth is supported by endogenous growth theory. Vaccination campaigns, mother and child health

programs, and illness prevention strategies are examples of initiatives that can lower morbidity and death rates, improving the development of human capital.

3.0 METHODOLOGY AND RESULT DISCUSSION

The quantitative research design was chosen for this investigation. The kind of data gathered, the characteristics of the variables, and the analysis method were all considered when creating this study. The study's variables are the government's spending on health, defense, education, and administration as well as its spending on gross domestic product, which serves as the dependent variable. Reputable sources include the World Bank Development Indicator and the National Bureau of Statistics provided the data. The model for this study is specified as follows:

$GDP = f(GEX_ED, GEX_D, GEX_AD, GEX_H)$

The model will be transformed into a Log-Linear model to make the distribution of the transformed variable appear more symmetric (normally distributed). Therefore, reducing the effect of the outliers on the dependent variable:

 $LnGDPt = \beta 0 + \beta 1 LnGEX_EDt + \beta 2 LnGEX_Dt + \beta 3 LnDEX_ADt + \beta 4 LnGEX_Ht + \varepsilon t$

Where:

GDP = Gross Domestic Product

- *GEX_ED* = Government Expenditure on Education
- *GEX_D* = Government Expenditure on Defense

GEX_AD = Government Expenditure on Administration

 GEX_H = Government Expenditure on Health

 εt = Error Term



Trend Analysis of GDP, GEX_H, GEX_AD, GEX_ED and GEX_D

Source: Authors Computation 2024

During the studied time, there was little to no substantial increase or reduction, as indicated by the practically flat GDP line. This reveals that over the years, the GDP has been rather steady. The GEX_AD (Red line) indicates a considerable rising tendency, particularly after about 2008, with a notable increase. The cost of administration increases significantly due to other factors. In contrast to GEX_AD, the GEX_H (green line) has a more moderate rising tendency. Over time, the cost of health care steadily rises. The GDP has not increased significantly in tandem with the large increases in government spending on administration, health care, and defense. This implies that other factors may be influencing GDP or that these expenditures may not have a significant direct impact on GDP growth during this time. The consistent yet moderate increase in GEX_H, GEX_D, and GEX_ED suggests steady investments in these areas, which might contribute to long-term developmental goals.

Unit root Test

Variables	Leve	el	First dif	ference	I(d)
	T-Statistics	Prob.	T-Statistics	Prob.	
GDP	0.239801	0.09669	-3.988177	0.0082	I (1)
GEX_H	0.394197	0.9770	-4.579474	0.0023	I(1)
GEX_D	1.268051	0.9973	-2.948641	0.0494	I (1)
GEX_ED	0.878220	0.9927	-3.064712	0.0478	I(1)
GEX_AD	-0.518929	0.03669	-3.741689	0.0126	I (0)

Table 4.1 Augmented Dickey-Fuller Unit Root Test

Source: Author computation 2024

Table 2 shows the Augmented Dickey-Fuller (ADF) unit root test for the entire variable used in the analysis. The decision to reject the null hypothesis was based on a 5% significant level. As shown in the table, all the probabilities are significant at first difference. Hence, we do not accept the null hypothesis of the presence of unit root at first difference. All the variables are all stationary at first difference.

Variable	Coefficient Std.	Error t-Sta	tistic Prob.*	
GDP(-1)	0.070951	0.223291	0.317749	0.7561
GEX_AD	-0.010672	0.006767	-1.577152	0.1407
GEX_ED	0.064030	0.026119	2.451439	0.0305
GEX_D	-0.004495	0.016681	-0.269502	0.7921
GEX_D(-1)	-0.058831	0.022014	-2.672495	0.0203
GEX_H	-0.020309	0.029326	-0.692523	0.5018
С	9.005331	2.376493	3.789336	0.0026
R-squared	0.709941	Mean depen	dent var	5.696456
Adjusted R-squared	0.564912	S.D. depend	ent var	3.638757
S.E. of regression	2.400168	Akaike info	criterion	4.866264
Sum squared resid	69.12966	Schwarz crit Hannan-Qui	terion nn	5.214215
Log-likelihood	-39.22951 criteria.		4.925151	
F-statistic	4.895156	Durbin-Wat	son stat	2.213508
Prob(F-statistic)	0.009436			

OLS Estimation Results

Source: Authors Computation 2024

Investing in education appears to enhance economic output, indicating that educated individuals make a more effective contribution to the economy. This could be attributed to increased productivity, innovation, and greater employability. While not statistically significant, the negative coefficient suggests that health expenditures do not directly result in immediate GDP growth. Similarly, administrative spending shows a negative, though insignificant, impact on GDP. This may suggest inefficiencies or that such spending does not directly contribute to economic productivity. The model accounts for a significant portion of the GDP variance (approximately 71%), underscoring the vital role of the public expenditure categories analyzed in influencing economic performance. The overall significance of the model underscores that public expenditures collectively impact GDP, underscoring the importance of fiscal policy in economic planning

The positive impact of educational spending on GDP emphasizes the need for increased funding in the education sector. Policies should prioritize the improvement of educational infrastructure, teacher training, and access to quality education. The negative impact of delayed defense spending suggests a potential reallocation of resources. While national security is important, it should be balanced with investments in sectors that directly contribute to economic growth and welfare. The results indicate that reducing administrative overhead and improving public sector efficiency can free up resources for more productive uses. Implementing e-governance and reducing bureaucratic inefficiencies could enhance overall economic performance.

Granger Causality

Pairwise Granger Causality Tests Date: 06/25/24 Time: 13:53 Sample: 2000 2020 Lags: 2

Obs	F-Statistic	Prob.
18	1.76938 2.12271	0.2091
18	5.29774 0.04870	0.0208 0.9526
18	3.13143 1.17087	0.0776 0.3408
18	5.22687 0.45334	0.0216 0.6452
18	0.29494 2.67414	0.7494 0.1065
) ¹⁸	1.48163 3.29879	0.2632 0.0694
18	1.44200 3.37407	0.2719 0.0660
18	0.40676 5.34674	0.6740 0.0202
18	0.64689 2.83606	0.5397 0.0950
18	1.71067	0.2190
	0.50445	0.6152
	Obs 18	Obs F-Statistic 18 1.76938 2.12271 18 18 5.29774 0.04870 18 18 3.13143 1.17087 18 18 5.22687 0.45334 0.45334 18 0.29494 2.67414 0.45334 18 1.48163 3.29879 18 18 1.44200 3.37407 18 18 0.40676 5.34674 18 18 0.64689 2.83606 18 18 1.71067 0.50445 0.50445

The analysis of the results indicates that government spending on defense, education, and health leads to higher GDP. Policymakers should utilize these findings to optimize public spending, prioritizing areas that stimulate economic growth and enhance welfare outcomes..

CONCLUSION AND RECOMMENDATION

The findings of this study underscore the significance of strategic public expenditure in fostering economic growth and welfare in Nigeria. By prioritizing investments in education and health, reevaluating defense spending, and improving administrative efficiency, Nigeria can achieve sustainable economic development. The insights offered by this analysis should serve as a guiding framework for policymakers to optimize resource allocation, maximize economic benefits, and enhance the welfare of the Nigerian population. Based on the findings from the study "Welfare Analysis of Public Expenditure in Nigeria," the following policy recommendations are proposed to optimize public expenditure and enhance economic growth and welfare in Nigeria:

- Increase Budget Allocation: Allocate more funds to the education sector to improve infrastructure, quality of teaching, and access to education at all levels. And also, establish scholarship and grant programs to support students from disadvantaged backgrounds, ensuring inclusive education for all.
- Increase Health Funding: Ensure adequate funding for the healthcare sector to improve access, quality, and coverage. And also, strengthen primary healthcare systems to provide essential services, particularly in rural and underserved areas. Invest in building and upgrading healthcare facilities, ensuring they are well-equipped and staffed.

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APPENDIX

Dependent Variable: GDP Method: ARDL Date: 06/25/24 Time: 13:47 Sample (adjusted): 2001 2019 Included observations: 19 after adjustments Maximum dependent lags: 2 (Automatic selection) Model selection method: Akaike info criterion (AIC) Dynamic regressors (1 lag, automatic): GEX_AD GEX_ED GEX_D GEX_H Fixed regressors: C Number of models evalulated: 32 Selected Model: ARDL(1, 0, 0, 1, 0) Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDP(-1)	0.070951	0.223291	0.317749	0.7561
GEX_AD	-0.010672	0.006767	-1.577152	0.1407
GEX_ED	0.064030	0.026119	2.451439	0.0305

-0.004495	0.016681	-0.269502	0.7921
-0.058831	0.022014	-2.672495	0.0203
-0.020309	0.029326	-0.692523	0.5018
9.005331	2.376493	3.789336	0.0026
0.709941	Mean depende	nt var	5.696456
0.564912	S.D. dependen	t var	3.638757
2.400168	Akaike info crite	erion	4.866264
69.12966	Schwarz criteri	on	5.214215
-39.22951	Hannan-Quinn	criter.	4.925151
4.895156	Durbin-Watson	stat	2.213508
0.009436			
	-0.004495 -0.058831 -0.020309 9.005331 0.709941 0.564912 2.400168 69.12966 -39.22951 4.895156 0.009436	-0.004495 0.016681 -0.058831 0.022014 -0.020309 0.029326 9.005331 2.376493 0.709941 Mean depende 0.564912 S.D. dependen 2.400168 Akaike info criterie 69.12966 Schwarz criterie -39.22951 Hannan-Quinn 4.895156 Durbin-Watson 0.009436	-0.004495 0.016681 -0.269502 -0.058831 0.022014 -2.672495 -0.020309 0.029326 -0.692523 9.005331 2.376493 3.789336 0.709941 Mean dependent var 0.564912 S.D. dependent var 2.400168 Akaike info criterion 69.12966 Schwarz criterion -39.22951 Hannan-Quinn criter. 4.895156 Durbin-Watson stat 0.009436

*Note: p-values and any subsequent tests do not account for model selection.

Pairwise Granger Causality Tests Date: 06/25/24 Time: 13:53 Sample: 2000 2020 Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
GEX_AD does not Granger Cause GDP	18	1.76938	0.2091
GDP does not Granger Cause GEX_AD		2.12271	0.1593
GEX_D does not Granger Cause GDP	18	5.29774	0.0208
GDP does not Granger Cause GEX_D		0.04870	0.9526
GEX_ED does not Granger Cause GDP	18	3.13143	0.0776
GDP does not Granger Cause GEX_ED		1.17087	0.3408
GEX_H does not Granger Cause GDP	18	5.22687	0.0216
GDP does not Granger Cause GEX_H		0.45334	0.6452
GEX_D does not Granger Cause GEX_AD	18	0.29494	0.7494
GEX_AD does not Granger Cause GEX_D		2.67414	0.1065
GEX_ED does not Granger Cause GEX_AD	18	1.48163	0.2632
GEX_AD does not Granger Cause GEX_ED		3.29879	0.0694
GEX_H does not Granger Cause GEX_AD	18	1.44200	0.2719
GEX_AD does not Granger Cause GEX_H		3.37407	0.0660
GEX_ED does not Granger Cause GEX_D	18	0.40676	0.6740
GEX_D does not Granger Cause GEX_ED		5.34674	0.0202
GEX_H does not Granger Cause GEX_D	18	0.64689	0.5397
GEX_D does not Granger Cause GEX_H		2.83606	0.0950
GEX_H does not Granger Cause GEX_ED	18	1.71067	0.2190
GEX_ED does not Granger Cause GEX_H		0.50445	0.6152

Null Hypothesis: GDP has a unit root

Exogenous: Constant Lag Length: 3 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.239801	0.9669
Test critical values:	1% level	-3.886751	
	5% level	-3.052169	
	10% level	-2.666593	

Null Hypothesis: D(GDP) has a unit root Exogenous: Constant Lag Length: 2 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.988177	0.0082
Test critical values:	1% level	-3.886751	
	5% level	-3.052169	
	10% level	-2.666593	

Null Hypothesis: GEX_AD has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fu	ller test statistic	-0.518929	0.8669
Test critical values:	1% level	-3.831511	
	5% level	-3.029970	
	10% level	-2.655194	

Null Hypothesis: D(GEX_AD) has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.741689	0.0126
Test critical values:	1% level	-3.857386	
	5% level	-3.040391	
	10% level	-2.660551	

Null Hypothesis: GEX_D has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=4)

t-Statistic Prob.*

Augmented Dickey-Fuller test statistic		1.268051	0.9973
Test critical values:	1% level	-3.831511	
	5% level	-3.029970	
	10% level	-2.655194	

Null Hypothesis: D(GEX_D) has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.948641	0.0494
Test critical values:	1% level	-3.857386	
	5% level	-3.040391	
	10% level	-2.660551	

Null Hypothesis: GEX_ED has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic		0.878220	0.9927	
Test critical values:	1% level	-3.831511		
	5% level	-3.029970		
	10% level	-2.655194		

Null Hypothesis: D(GEX_ED) has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.064712	0.0478
Test critical values:	1% level	-3.857386	
	5% level	-3.040391	
	10% level	-2.660551	

Null Hypothesis: GEX_H has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.394197	0.9770
Test critical values:	1% level	-3.831511	
	5% level	-3.029970	
	10% level	-2.655194	

Null Hypothesis: D(GEX_H) has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.579474	0.0023
Test critical values:	1% level	-3.857386	
	5% level	-3.040391	
	10% level	-2.660551	

C GSJ