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A Disaggregated Impact Analysis of Public Capital Expenditure on Income Inequality in Nigeria

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ABSTRACT: The role of fiscal stimulus in achieving redistributive goal of equitable income distribution has remained a source of controversy in development literature and policy debates. This paper therefore, contributes to the ongoing debate by investigating the disaggregated impact of capital expenditure on income inequality in Nigeria between 1981 and 2019. Specifically, this paper applied autoregressive distributive lag (ARDL) model to examine the short and long term effects of capital expenditure on economic, social and community services as well as administration on income inequality measured by Gini index. The results of the unit root test show that the variables are mixed integrated. It was further observed from the bounds cointegration test result that long run relationship exists among the variables. The ARDL estimates reveal that capital spending on community and social services has significant negative effect on income inequality in both short and long run. This implies that investment in education and health are important for equitable distribution of income. At the same time, capital expenditure on economic services has significant negative impact on income inequality in the long run. The implication of this finding is that investment in agriculture, road, construction and telecommunication creates opportunity for reducing income inequality among the population. However, public expenditure on administration is not statistically significant run in explaining changes in income inequalityin both short and long. To this end, this paper recommends that that governments at all levels should prioritize investments in critical social and economic infrastructures to optimize their redistribution effects in flattening the curve of income inequality.

KEYWORDS: *Capital expenditure, economic services, community and social services, administration, income inequality and Nigeria*

I. INTRODUCTION

There has been growing recognition of the role public investment plays in sustainable reduction in poverty and income inequality. The proponents of public investment argue that government spending on infrastructure has one of the highest fiscal multipliers among all types of fiscal stimulus measures. Nagy, Nies& Plekhanov (2015) posit that high fiscal multiplier reflects both direct and indirect effects of infrastructure provision. This is consistent with Keynesian proposition that growth in public investment is an important policy tool for stimulating the level of economic prosperity and overcoming short-term cyclical fluctuations. It is also recognized that public finances are central to investment in Sustainable Development Goals (SDGs) in developing countries and other vulnerable economies [United Nations Conference on Trade and Development (UNCTD), 2014]. According to Zolfaghari, Kabiri&Saadatmanesh (2020), investment in economic and social infrastructures has the greatest impact on income inequality reduction. This follows the recognition that agriculture, education and health are key sources of human capital development which plays important role in reducing inequality in deprived areas.

As an integral factor of economic welfare, investment in education can improve human capital which in turn leads to increase in the productivity of the workforce, and consequently reduce income gap among the population. The endogenous growth theory linked to Lucas (1988) and Romer (1990) identifies the important role education plays in building the innovative capacities of an economy to stimulate growth and equitable distribution of income. On the other hand, healthcare infrastructure plays strategic role in influencing economic performance and income distribution levels. For instance, Currie &Madrian (1999) are of the view that healthier people usually have more productivity. Again, the ability to use technology-related tools for better production is closely linked to healthy condition of the users (Atashbar, Arani, Antoun, &Bossert, 2017). The promotion of broad-based economic growth and distributional efficiency is predicted on the quality of healthcare delivery.

This paradigm forms basis for huge allocation of public fund to the health sector to improve life expectancy of the citizenry with a view to increase their contribution to the overall growth and development of the economy. Like other developing countries worldwide, Nigeria has been making incremental budgetary allocations to critical infrastructures which define the capital expenditure. The World Bank (1994) classifies public capital expenditure as an important driver of economic activity. Although the pattern and dimensions of public investment vary overtime, successive governments in Nigeria, seem to reignite interest in financial commitment to economic, community and social services. Specifically, investment in economic services such as agriculture, construction; communication and transportation are considered as fundamental for infrastructural development. On the other hand, investments in community and social services such as education and health have been identified as important sources of human capital formation. In spite of the incremental capital expenditure approach practiced by successive governments in Nigeria, its effectiveness in driving pro-poor growth and equitable income distribution has remained a controversial issue in public debate.In view of the foregoing, this paper examines how capital expenditure on economic, community, social and administrative services affects income inequality in Nigeria.

II. LITERATURE REVIEW

2.1 Theoretical Framework

There has been evolving theoretical literature on capital expenditure-development nexus. Wagner (1890) theory outlines three reasons for increasing state activities to include growing demand for health and education services by the citizens, provision of enabling environment for business to thrive and the realities of market failure. The excess demand for services such as health and education over per capita income necessitates government intervention to help in meeting these needs. Magazzino, Giolli and Mele (2015) opine that Wagner's Law reveals that the share of government spending to the gross domestic product (GDP) tends to increase as the economy expands. This is concerned with the tendency for public expenditure to grow relative to national income. Thus, the cause of increase in public investments is assumed to be the level of progress in the overall economy. Additionally, Keynes (1936) theory of public investment assumes that changes in public expenditure can promote short-term stability. Keynes advocated for increased government expenditure and lower taxes to stimulate aggregate demand and pull the economy out of the depression. Thus, public investment is believed to contribute positively to economic and social services, and in so doing provides pathway for improved income distribution.

Further contribution to the theoretical debate of government expenditure growth was offered by Peacock & Wiseman (1961). They explained the pattern through which government expenditure evolve overtime. The Wiseman-Peacock hypothesis which builds on the political theory of public determination rather than the organic state as maintained by Wagner (1890) assumes that government expenditure evolves as an impulse to social unrest such as wars.The Wiseman-Peacock theory further disaggregated the effects of growth in public expenditure into displacement, inspection and concentration effects. The displacement effect is concerned with fluctuations in public expenditure between times of peace and social displacement while inspection effects involves efforts geared towards achieving fiscal balance. The concentration effect encompasses the stabilization of public revenue and expenditure to new level to bolster economic prosperity. The Wiseman-Peacock hypothesis holds sway when expansion in public expenditure compels government to increase revenue by raising taxes, borrowing or through seigniorage (Dada &Adesira, 2013).Additionally, Musgrave (1959) proposed the theory of public expenditure growth which assumes that increase in government expenditure tend to emerge from the expansion of the economy overtime. According to the theory, rising levels of per capita income causes public expenditure on public goods to increase following the increasing demand.Overall, the theoretical advancement in public investment growth and development intervention in providing infrastructural development is a reflection the growing public concern for improved economic and social well-being.

2.2 Stylized Facts on Disaggregated Capital Expenditure and Income Inequality in Nigeria

Capital expenditure in economic, administrative, community and social services in Nigeria has varied overtime as reported in figure 1.1
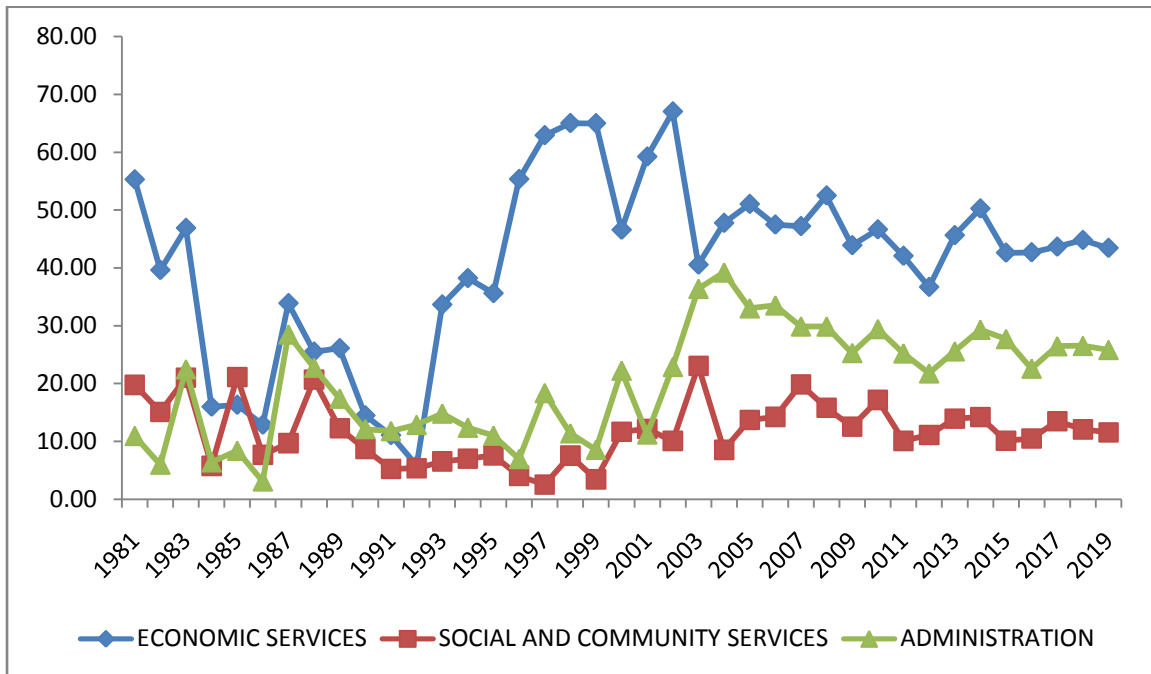
Figure 1.1: Percentage of capital expenditure on administration, economic services, social and community services to total capital expenditure, (1981-2019).
Source: CBN (2019) Statistical Bulletin

As observed from figure 1.1 capital expenditure on economic services comprising agriculture, road, construction, transportation, telecommunication and other economic services surpassed the other two components of capital expenditure in most of the periods sampled. It reached an all-time high value of 67 percent in 2002. This could be attributed to the efforts of the civilian administration in advancing economic services in Nigeria. Social and economic services which consist of investments in education, health and other social and economic services varied during the study period. It reached a minimum value of 2.56 percent in 1997 and a maximum value of 23.06 percent in 2003. However, capital expenditure on administrative services comprising general administration, defense, internal security and national assembly surpassed capital spending on social and community services in most of the sample periods. It reached a record high value of 39.22 percent in 2004. Overall, capital spending on community and social services are less than expenditures on economic and administration services. This reflects the poor commitment of successive governments to the human capital development in Nigeria.Furthermore, the income inequality measured by Gini index has continued to vary in Nigeria as presented in figure 1.2.
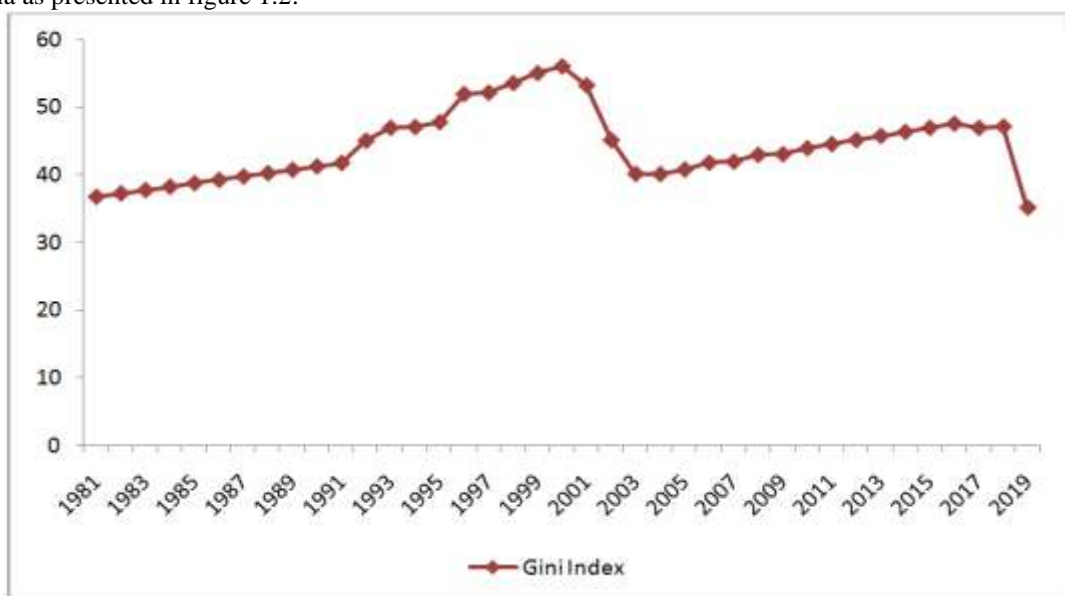

Figure 1.2: Nigeria's Gini Index, (1981-2019).
Source: World Bank World Development Indicators

Beginning from 1981, Gini index increased from 36.7 percent to a maximum level of 56 percent in 2000. The upward trend in the value of Gini index suggests that growth in the Nigerian economy is associated with growing inequality in the distribution of income. The value of Gini index declined to 40.1 percent in 2003. This could be linked to the efforts of the civilian administration in promoting the participation and share of the Nigerian population in the growth process. The Gini index witnessed a steady increase from 2004 to 2018. It however, declined to 35.1 percent in 2019. This equally portrays that there is a growing gap in income distribution among the Nigerian population. The possible explanations of the high Gini index in Nigeria include stagnant wage growth, joblessness triggered by low capacity utilization in productive sectors and growth in technology, globalization,labour market conditions, changes in personal skills and household structures.

2.3EMPIRICAL LITERATURE

In recent years, many empirical investigations have been conducted on the role of capital expenditure on economic growth and income distribution. The findings of these researches have been mixed in both country-case and regional dimensions. Thus, some of the related studies and their results are provided in this sub-section. Zolfaghari, Kabiri&Saadatmanesh (2020) investigated the effects of economic and social infrastructure expenditures on income inequality in the Iranian provinces for the period of 2007–2016. The panel corrected standard errors (PCSE) model formed basis for the analysis. The results show that social and economic infrastructures improvements reduce income inequality. However, the magnitude of these effects varies. Investment on education, healthcare, communication technology, energy, and water infrastructures has the greatest impact on income inequality reduction. To this end, the study recommended for the combination and optimal allocation of economic and social infrastructures as a tool for reducing inequality in deprived areas.

In a related study, Lee, Kim &Cin(2013) explored the trends and determinants of income inequality in Korea from 1980 to 2012. The study also examined the empirical validity of Kuznets' hypothesis of inverted U-shaped and Barro's hypothesis of U-shaped. The study found no evidence to support the Kuznets' hypothesis of inverted U-shaped relationship between income inequality and economic growth and Barro's hypothesis of U-shaped relationship. Macroeconomic index such as the government spending as a share of GNI was found to be statistically insignificant in affecting income inequality. The statistically significant negative estimate of the investment share in GDP shows that an increase in investment would decrease the income inequality. The statistically significant positive estimate of the variable for the share of the elderly in working population confirms the argument that the rise of aging population, which has been accelerating in Korea during the last two decades, is one of the important factors in widening the gap of income inequality.

Using Autoregressive Distributed Lag (ARDL) bounds approach, Guzaa, Ishakb, Banic&Madina (2020) empirically investigated the determinants of income inequality in Nigeria for the period 1990-2016. The findings show evidence of co-integration between income inequality and its determinants in Nigeria. It also showed that the Gini coefficient is relatively high in Nigeria, indicated a high level of income inequality in the country. Furthermore, the critical determinants of income inequality as revealed by the study are economic growth, education level and real GDP per capita in Nigeria. The study recommends that government should work towards revitalizing the economy to increase the national output and provide opportunities for equity and equality in income distribution. Additionally, Adigun (2017) employed the ARDL to evaluate the link between government expenditure and economic growth in Nigeria during 1981-2016. It is found that government expenditure on human capital development (education and health) positively influenced economic growth in the long run. The result further showed that government consumption expenditure and private sector investment are less significant in driving growth whereas government capital expenditure boost growth not in the short but in the long run. Based on the findings, the study recommended that government should place emphasis on capital expenditure with a view to fostering growth in the economy wide aggregate.

Ifeakachukwu (2020) examined the link between globalization, economic growth and income inequality in Nigeria using annual secondary data over the period 1981–2018. Specifically, the study used both vector error correction modelling (VECM) and ARDL techniques. The VECM results show a unidirectional causality from inequality and globalisation to economic growth in the long run, whereas a unidirectional causation was observed from inequality to economic growth in the short run. The ARDL estimate shows that globalisation and economic growth are significant determinants of inequality in Nigeria. Furthermore, it is observed that trade and financial globalisation influenced income inequality differently. Given the findings, the study recommends that foreign direct investment should be channeled towards empowering the poor, and the dividends of economic growth should be evenly distributed to reduce the income inequality gap.

Using the cointegration technique, Awe & Rufus (2012) empirically examines the relationship between the determinants and income distribution in Nigeria from 1977 to 2005. The empirical findings in the study revealed that Gini Coefficient is very high in Nigeria, indicating a high level of income inequality. Also, employment rate, inflation rate, Gross Domestic Product and social spending were true determinants of income distribution in the Nigerian economy during the period under review. The study also found that, both the growth rate of output and government health expenditure exhibited an inverse relationship with income distribution while

employment rate, inflation rate and government education expenditure had direct relationship with income distribution in the Nigerian economy. Moreso, the findings showed the existence of a long run relationship between income distribution and its determinants in Nigeria. Based on the findings, the study recommended that government should formulate and implement more pragmatic employment policies and ensure proper monitoring of its spending on education and health through appropriate policy measures and policies that bring about more equitable distribution of income.

Ewubare&Merenini (2018) examined the determinants of poverty and income inequality in Nigeria. The study specifically explored the impact of population growth and unemployment on poverty and income inequality in Nigeria. Secondary data from National Bureau of Statistics and CBN statistical bulletin were collected on poverty, income inequality, population growth and unemployment. The study relied on descriptive statistics and Generalized Method of Moments (GMM) test as the estimation techniques of data analysis. The GMM results show that the coefficient of population growth POP is positively related with poverty and statistically significant at 5 percent level. Similarly the coefficient of unemployment is negatively related with poverty but statistically not significant at 5 percent level. Moreover, the coefficient of population growth is positively related with income inequality and statistically significant at 5 percent level. Also, the coefficient of unemployment is negatively related with poverty and statistically significant at 5 percent level. To this end, the study recommended for the implementation of a sound government programme and welfare package in order to check growing rate of poverty and inequality in Nigeria.

Alimi(2020) investigated how government size affect economic development and determine the optimal government size that promotes economic development in ECOWAS countries. The study employed secondary data covering the period 1986 to 2018. Data on GDP per capita, government size, population growth rate, inflation rate, gross fixed capital formation and financial development variables were sourced from World Development indicator database. The study constructed social welfare function as development indicator. Data were analysed using Least Absolute Deviation (LAD) regression and quantile regression (QR). The findings showed that quantile regression estimates are negative and significant in low quantiles, thus suggesting that deleterious effect of government size is more pronounced among countries with low level of economic development. In a similar study, Ahuja&Pandit(2020) applied copious panel data set covering 59 countries between 1990 and 2019 to estimates the relationship between public expenditure and economic growth. The empirical results confirm the unidirectional causality between economic growth and government expenditure where the causation runs from public spending to GDP growth. The results at large support the Keynesian framework that asserts the importance of government expenditure in stimulating economic growth. With regards to control variables, it was found that investment has a significant and positive bearing on economic growth. Evidence from the regression estimates further displays that trade openness encourages evolution in developing countries. However, population growth and unemployment have a detrimental effect on economic growth.

III. RESEARCH METHODOLOGY

3.1 Research Design
In this paper, an ex post facto research design was adopted. The motivation for this research design was based on the fact that the data required for the empirical investigation was drawn from existing sources, and as such they are devoid of manipulations.

3.2 Model Specification
As a country-case study, this paper follows the works of Ifeakachukwu (2020) and Guzaa*et al.* (2020) with an improvement due to the disaggregation of capital expenditure into expenditures on economic services, social and community services as well as administration. The model set up for this paper is an ARDL which integrates short and long run relationship in a single equation set up. Thus, the model specification is provided as follows:

$$GiniIndex_t = \alpha_0 + \sum_{i=1}^{p} \beta_{1i}\Delta GiniIndex_{t-1} + \sum_{i=1}^{q} \beta_{2i}\Delta CECO_{t-1} + \sum_{i=1}^{q} \beta_{3i}\Delta cCESC_{t-1} + \sum_{i=1}^{q} \beta_{4i}\Delta CADM_{t-1} +$$

$\pi_{1i}GiniIndex_{t-1} + \pi_{2i}CECO_{t-1} + \pi_{3i}CESC_{t-1} + \pi_{4i}CADM_{t-1} + e_t(1)$

Where: GiniIndex = Gini index, proxy for income inequality, CECO = capital expenditure on economic services, CESC = capital expenditure on social and community services and CADM = capital expenditure on administration.

α_0 = constant parameter

$\beta_1 - \beta_4$ = short run dynamic coefficients

$\pi_1 - \pi_4$ = long run multipliers

e_t = white noise error process

Δ = first difference operator

p and q = lag order in each of the model

i and t = country of study and timeframe respectively

3.3 Nature and Source of Data

Time series data was used for the empirical analysis in this paper. The sources of the data include CBN Statistical Bulletin and World Bank World Development Indicators.

3.4 Data Analysis Techniques

This paper relies on Pesaran& Shin (1999) ARDL method for estimating the short and long coefficients of the dynamic regressors. The choice of this estimation technique was driven by the mixed integration of the variables for the investigation. Additionally, ARDL has been identified from extant empirical literature to produce robust estimates, especially for relatively small sample. More so, Phillips &Perron (1988) technique was applied to check for the stationary properties of the series while bounds cointegration test forms basis to determine if long run relationship exists among the variables in the model. More so, descriptive statistics and pairwise correlations were used for summary statistics and multicollinearity test respectively.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The summary statistics for each of the series are reported in table 1.

Table 1: Summary statistics

	GINIINDEX	CECO	CESC	CADM
Mean	44.20615	41.05897	11.73333	20.27128
Median	43.90000	43.64000	11.56000	22.48000
Maximum	56.00000	67.00000	23.06000	39.22000
Minimum	35.10000	5.880000	2.560000	3.110000
Std. Dev.	5.285541	15.49767	5.278886	9.487489
Jarque-Bera	2.002032	2.147817	1.466073	1.872348
Probability	0.367506	0.341671	0.480448	0.392125
Observations	39	39	39	39

Source: Author's computation using E-views

The descriptive statistics show that Gini index, proxy for income inequality averaged 44.206 percent. This suggests evidence of disparity in income distribution among the population. While capital expenditure on economic services averaged 41.06 percent, the mean value of capital spending on social and community services stood at 11.73 percent. Additionally, expenditure on administration has a mean value of 20.27 percent. It follows from the mean distribution of the variables that economic services more than double the share of social and community services, and administration of the total capital expenditure. The standard deviations for each of the variables reveal that their observations over the study sample converged around their respective mean values. It was further observed from the probability values of the JarqueBera statistics that all the variables are normally distributed over the study sample at 5 percent level.

4.2 Multicollinearity Test

This paper applied pairwise correlation for the multicolliearity test. The results are reported in table 2.

Table 2: Correlation matrix for multicolliearity test

	GINIINDEX	CECO	CESC	CADM
GINIINDEX	1			
CECO	0.4663	1		
CESC	-0.4854	0.0529	1	
CADM	-0.1481	0.3121	0.4166	1

Source: Author's computation using E-views

As observed from the correlation matrix, the correlation coefficient for each pair of the explanatory variables is low. This suggests that the explanatory variables can be regressed together without posing a problem of multicolinearity. In other words, the null hypothesis of multicolinearity is rejected.

4.3 Unit Root Test

The Phillips-Perron test for unit root is followed in this paper. The test results performed at 5 percent level are reported table 3.

Table 3: Phillips-Perron unit root test results

Levels test results		First difference test results		Order of Integration
Variable	**PP test statistic**	**Variable**	**PP test statistic**	
GiniIndex	-1.375 (0.852)	D(GiniIndex)	-4.654 (0.002)	I(1)
CECO	-2.984 (0.149)	D(CECO)	-7.515 (0.000)	I(1)

CESC	-4.996 (0.001)	NA	NA	I(0)
CADM	-3.808 (0.027)	NA	NA	I(0)

Source: Author's computation using E-views

NB: Figures in parenthesis are the corresponding probability values of PP statistics; NA denotes not available due to evidence of stationarity at the levels test result

The results of the unit root test reveal that the variables are mixed integrated. While Gini index and capital expenditure on economic services are stationary at first difference [I(1)], capital expenditure on social and community services, and administration were stationary at levels [I(1)]. The evidence of mixed integration in the series satisfies the empirical precondition for the application of bounds cointegration test.

4.4 Bounds Cointegration Test

The test for cointegration in this study follows ARDL bounds method. The result is presented in table 4.

Table 4: Bounds cointegration test result

Series: GiniIndex CECO CESC CADM		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	6.125	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
1%	4.29	5.61

Source: Author's computation using E-views

Note: K depicts number of explanatory variables in the model

As observed from the result, the computed F-statistic (6.125) is greater than the 5 percent critical value (4.35). This provides the empirical condition for rejecting the null hypothesis of no cointegration. It therefore, follows from the result that long run relationship exists among the variables. This finding corroborates with the results of Guzaa*et al.* (2020) which show that income inequality is cointegrated with its determinants in Nigeria.

4.5 Estimated ARDL Regressions

The estimated ARDL regression depicts the dynamic short and long run effects of disaggregated capital expenditure on income inequality. The results are reported in table 5.

Table 5: Estimated short and long run ARDL results

Dependent Variable: GINIINDEX				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GINIINDEX(-1))	0.589432	0.257949	2.285073	0.0304
D(CECO)	0.012249	0.049765	0.246126	0.8074
D(CECO(-1))	-0.079169	0.043420	-1.823303	0.0793
D(CESC)	-0.161497	0.104763	-1.541552	0.1348
D(CESC(-1))	-0.232430	0.106038	2.191951	0.0372
D(CADM)	0.011080	0.066653	0.166233	0.8692
CointEq(-1)	-0.595517	0.180989	-3.290343	0.0028
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CECO	-0.157017	0.059593	2.634817	0.0138
CESC	-1.043458	0.268859	-3.881057	0.0006
CADM	0.018606	0.112759	0.165003	0.8702
C	49.552698	3.534094	14.021331	0.0000

Source: Author's computation using E-views

The short run result shows that one period lag of Gini index is positively and significantly linked to current level of Gini index. The implication of this finding is that income inequality in the previous period can be relied upon in forecasting future level of income inequality. The result further indicates that capital spending on community and social services has significant negative effect on income inequality in both short and long run. This implies that investment in education and health are important for equitable distribution of income. This finding aligns with the result of Zolfaghari, Kabiri&Saadatmanesh (2020). Similarly, capital expenditure on economic services

has significant negative impact on income inequality in the long run. The implication of this finding is that investment in agriculture, road, construction and telecommunication creates opportunity for reducing income inequality among the population. This result is in accordance with the finding of Lee, Kim &Cin (2013). However, public expenditure on administration is not statistically significant in explaining changes in income inequality in both short and long run. This could be linked to the unproductive nature and concentrations of increasing administrative costs on few individuals in Nigeria which intensifies the disparities in income. The error correction coefficient (-0.596) is negative and statistically significant at 5 percent level. This implies that short run deviations in the system can be reconciled to achieve long term equilibrium position at a speed of 59.6 percent. This finding is also a corroboration of the fact that long run relationship exists among the variables.

V. CONCLUSION AND RECOMMENDATIONS

Enhancing income distribution has remained at the forefront of fiscal policy goals in Nigeria and most developing economies across the globe. This is driven by the sizeable growth in income disparities coupled with the growing challenges of global economic and financial crisis. Thus, this paper follows a disaggregated approach to deepen the understanding of how capital expenditure affects income inequality in Nigeria. The findings reveal that capital expenditure on economic services such as agriculture, transportation, telecommunication and other forms of economic services is significant in explaining changes in income inequality in the long run. Similarly, capital expenditure on community and social services are significantly linked to income inequality. This is a pointer that education and healthcare investments are important fiscal allocation options for reducing income inequality. Given the findings, this paper concludes that capital expenditure on economic, social and community services are redistributive fiscal stimulus measures for addressing growing income disparities among the Nigerian population. Therefore, it is recommended that governments at all levels should prioritize investments in critical social and economic infrastructures to optimize their redistribution effects in flattening the curve of income inequality.

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