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REVIEW

Effectiveness of fiscal federalism for poverty reduction in Nigeria: an analysis of federal and state governments' expenditures

Megbowon Ebenezer[1] · **Aderoju Samuel**[2] · **Gbenga Peter Sanusi**[3]

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Abstract

One of the sustained political and economic strategies that have been adopted by various countries over 3 decades to achieve the desired level of development is fiscal federalism. Through this economic development strategy, various levels of government within an economy have been involved in the pursuit of reducing poverty overtime. The purpose of this study is to examine the relationship between government expenditure on poverty reduction with respect to federal and state government expenditures, respectively. The study employed the auto-regressive distributed lag (ARDL) estimation technique to establish long-run relationship, and to examine the magnitude of the effect of federal and state government expenditures in both the short-run and long-run periods using time-series data for the period 1981–2018. Results obtained indicate that only state government expenditure has positive effect on poverty reduction in Nigeria. The findings of this study, therefore, support the need for greater decentralization and increase in fiscal expenditure responsibilities and strengthening revenue capability in favor of state governments, giving that achieving desired poverty reduction could be achieved through increased state government spending on developmental projects.

Keywords Poverty reduction · Government expenditure · Fiscal decentralization · ARDL · Nigeria

JEL Classification E62 · H50 · I30

✉ Megbowon Ebenezer
megbowontoyin@gmail.com

[1] Department of Economics, North-West University, Vanderbijlpark, South Africa

[2] Statistics and Mathematical Sciences, Kwara State University, Malete, Nigeria

[3] Department of Economics, Anchor University, Lagos, Nigeria

Abbreviations

UN	United Nation
HDI	Human Development Index
FCT	Federal Capital Territor
LGAs	Local Government Areas
GDP	Gross Domestic Product
DOLS	Dynamic ordinary least square
FMOLS	Fully modified ordinary least square
GMM	Generalized Methods of Moments (GMM)
FDI	Foreign Direct Investment
ECOWAS	Economic Community of West African States
OPEC	Organization of Petroleum Exporting Countries
VAR	Vector autoregression
FE	Federal Government Expenditure
SE	State Government Expenditure
ARDL	Autoregressive distributed lag
ECM	Error correction model
CBN	Central Bank of Nigeria
PP	Phillips–Perron
KPSS	Kwiatkowski–Phillips–Schmidt–Shin

Introduction

Theoretically, the Keynes School of thought argues that government's fiscal policy especially her expenditure is a tool for stabilizing the economy, improving economic performance and welfare. This argument is based on the premise that government spending has impact on output, employment, productivity, and income (Keho 2019). For example, government spending on infrastructure can increase employment through entrepreneurship and awarded projects. This will further increase disposable income, increase aggregate demand, increase private consumption, and eventually lead to an improved welfare or reduced poverty. Similarly, governments spending on health and education have the potential to increase efficiency and productivity which often translate to better income, private consumption, leading to a desirably improved welfare. In essence, the role of government in the economic growth and development process remain undisputable.

One of the sustained political and economic strategies that have been adopted by various governments over 3 decades to achieve the desired level of development is federalism. Federalism is a system of governance that comprises multi-ordered government levels (local government, state government, and central government) which make up the general government, with a certain degree of independence of the government units (Dziobek et al. 2011).

In this system of governance, power, duties, rights, privileges and decision-making responsibilities regarding generation, allocation and utilization of financial resources, and the provision and distribution of public goods according to Agyeman-Duah et al. (2018) are shared among each of the governance units. The argument for

federalism is on the logic that through its governance is brought closer to the people both spatially and institutionally, and government will be more knowledgeable about and responsive to the needs of the people (Crook 2003).

Globally, while there is a wide agreement regarding efficiency and benefits of fiscal federalism, the question in the Nigerian case remains about the effectiveness of expenditure responsibilities of each of the levels of government in the country. This is imperative because as of late governments fiscal in Nigeria has expanded greatly; however, social indicators especially employment, education, and health are not improving significantly; the poverty rate also has been on the increase. Nigeria is categorized as a lower-middle-income country, and it is one of the countries in the sub-Saharan Africa region that has been struggling with the serious problem of poverty. According to the National Bureau of Statistics (2020), about 40% (83 million people) are poor, because they live below the poverty line of $381.75 per year; this makes Nigeria to be considered as the poverty capital of the world. Collaborating this is the United Nations (UN) annual Human Development Index (HDI), which categorized Nigeria among countries with low human development index for more than a decade, and currently has low index of 0.534.

This extent of the poverty situation in the country is paradoxical in nature in that despite the abundant revenue from oil resource, a lot of people are considered deprived and poor, and this further puts a question on the relative impact of government fiscal efforts on the welfare on the citizens. The aim of this study, therefore, is to investigate the impact of government expenditure on poverty in Nigeria, by taking into consideration the federal system of governance operating in the country.

Specifically, the objective of the study is to estimate the long- and short-run impact of federal and state government expenditures responsibilities on poverty reduction. Rest of the paper is organized as follows; second section of the paper presents fiscal decentralization structure in Nigeria, relevant empirical literature is presented in section three, and section four describes data and analytical techniques used in the study. In the fifth section, empirical results and discussion are presented and the last section presents the conclusion and policy recommendations.

Federalism structure and government expenditure trend in Nigeria

The fiscal structure of Nigeria is influenced by the system of governance which is according to the Nigerian constitution. Specifically, Nigeria operates a federal system of governance, which is a system of governance that comprises multi-ordered tiers of governments (local government, state government, and central government) which make up the general government, with a certain degree of independence of the government units (Dziobek et al. 2011). Nigeria's federal system of governance grew from 3 regions during the period 1960–1966 to 12 states by 1967, and currently to 36 states and the federal capital territory (FCT). Equally, the number of Local Government Areas (LGAs) now 774 had risen from 301 between the years 1976 to 774.

In this system of governance, power, duties, rights, privileges, and decision-making responsibilities for the supply of public services are shared among each of the governance units (Khemani 2001). Like many African countries, Nigeria

Table 1 Expenditure Responsibilites of Different Government Units/Levels in Nigeria. Source: Khemani (2001)

Tier of government	Expenditure category
Federal (central)	Defense; Shipping; Federal trunk roads; Aviation; Railways; Posts, telegraph, and telephones; Police and other security services; Regulation of labor, interstate commerce, telecommunication; Mines and minerals; Social Security; Insurance; National statistical system; National Parks; Guidelines for minimum education standards at all levels; Water resources affecting more than one state;
Federal and state	Antiquities and monuments; Electricity; Industrial, commercial and agricultural development; Scientific and technological research; Statistics and surveys; University, technological and post-primary education; Health and social welfare
State and local	Primary, adult, and vocational education; Health services; Development of agriculture and non-mineral natural resources
Local	Economic planning and development; Cemeteries; Homes for the destitute and infirm; Markets; Sewage and refuse disposal; Roads, streets and street lighting, drains, other public facilities

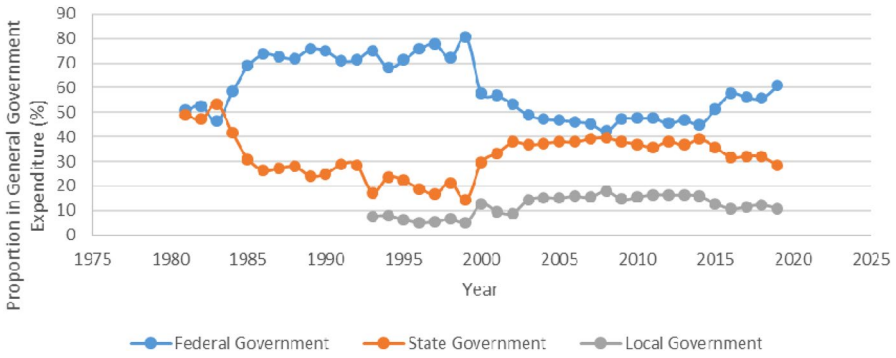


Fig. 1 Trend in Federal (Central), State, and Local Government Expenditure. Source: Authors' computation

has an astoundingly decentralized system of government and a significant part of the essential responsibilities of government such as education and health are decentralized to each levels of government (Dada 2015) (Table 1).

In terms of expenditure, the Nigeria government general expenditure has grown tremendiously over the past 20 years. The need to meet development demand arising from population dynamics and explosion, spatial expansion, and infrasturctural development are among several factors that have necessitated an increasing government expenditure. The general government expenditure grew from ₦254,8851 billion in the year 1993 to about ₦13,998,31 billion in 2019 (CBN 2020). However as seen in Fig. 1, the federal government accounts for about 75% of total expenditure in 1993 and 57% in 2018. The figure has clearly shown that the trend of share of central government spending in the general government expenditure has been higher than the state government share over the years under consideration.

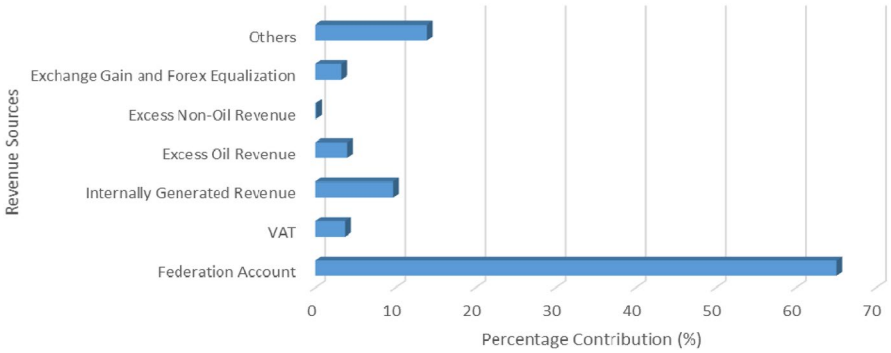


Fig. 2 Revenue structure of the federal government, 2015–2019. Source: Author

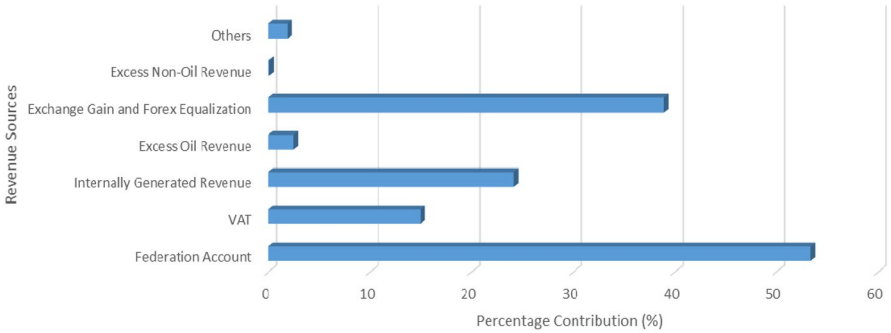


Fig. 3 Revenue structure of the state government, 2015–2019. Source: Author

In 2019, with respect to classification of government expenditure by function, both administration (general administration, defense, internal security, and national assembly) and transfer expenditures accounted for larger share of FG's recurrent and capital expenditure at 73.3% and capital 45%, respectively. In 2019, 72.9% of the total expenditure of state governments was recurrent expenditure, while capital expenditure accounted for the remaining. Furthermore, welfare sectors (education, health, agriculture, water supply, and housing) all together accounted for meager 19.2% of total state governments expenditure. Interestingly, local government tier spent 29.1% of her total expenditure on education in 2019.

In terms of revenue, the three tiers of government revenue profiles for the period 2015–2019 are shown in Figs. 2, 3 and 4, respectively. It can be seen from Fig. 2 that revenue from federation accounts for 65% of federal government revenue between 2015 and 2019. Other sources of federal government-generated revenue accounted for only about 14% between the period 2015 and 2019. Federal government internally generated revenue was the third-highest contributor to total federal government revenue, accounting for about 9.7% of FG revenue.

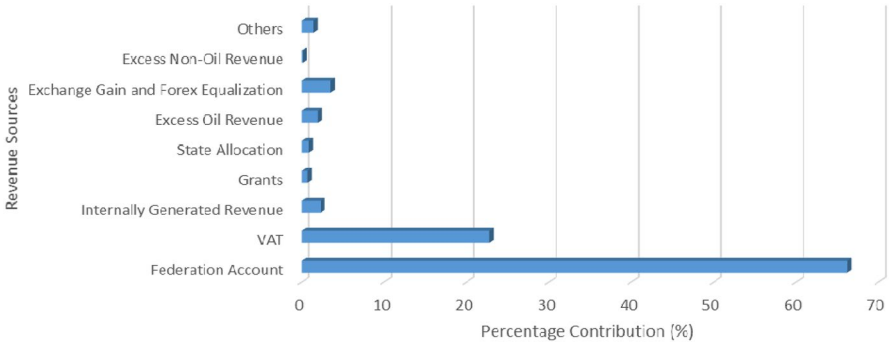


Fig. 4 Revenue structure of the local government, 2015–2019. Source: Author

Similarly, Fig. 3 shows that the bulk of the State government revenue comes from the federation account which represent 53.4% of the total States' revenue. This suggests that the State depends hugely on Federal allocation. This could account for the reason why a number of States were unable to pay thier workers emoluments whenever there is a delay in getting federal allocation. The internally generated revenue (IGR) by states stood at 24.2% in the same period. Value-Added Tax contributed 15% to the States' revenue.

Further, while States generated more internal revenue (24.2%) more than the local governments (2.3%), it is rather interesting to note that the local governments raised more value-added tax than both the States and the federal governments. Nevertheless, there is weak internally generated revenue by each of tiers of government in Nigeria.

Brief review of relevant literature

Empirically, several literatures have examined the link between or effect of government expenditure on economic development domains. These include income, income inequality, poverty, public service delivery, education outcomes, health outcomes, and human capital development among others. This literature review section focuses on poverty as a development outcome. In trying to fill a gap in the literature in this area, a structured but brief review of literature is conducted by focusing on three relevant areas that are extant in the literature, and this is categorized as follows: (i) studies focusing on aggregate government expenditure, (ii) studies focusing on disaggregated government expenditure by sector, and (iii) studies that capture fiscal federalism effect.

Under the first category, studies have mainly used aggregated government expenditure or government size which consider government expenditure as a percentage of gross domestic product (GDP). Using DOLS, FMOLS, and GMM techniques, Liu et al. (2020) demonstrated that increase in aggregate government expenditure reduces rural poverty incidence in Pakistan between 1980 and 2017. Milovich (2018) included government expenditure as a control variable while examining the

relationship between aid and poverty for a sample of 64 developing countries for the period 2000 and 2014. Result from the two-stage least-squares (2SLS) indicates that government consumption expenditure seems to be significantly associated with a decrease in both the income poverty gap and the multidimensional poverty index (MPI), respectively.

Moreover, a panel DOLS estimation by Kizilkaya et al. (2015) established an increase in human development as a result of increase in public expenditure. The study further argued that the extent of the effect of public expenditure on poverty reduction depends on the level of threshold reached and the component of such expenditures. Omar and Inaba (2020) also confirmed that government expenditure could lower poverty rates following a computed coefficient value from one-way error component fixed-effect model and robust standard errors that addressed heteroskedasticity estimation techniques.

Dhahri and Omri (2020) explored the relationship between FDI and poverty reduction for 50 developing countries using Tobit regression estimations, with government expenditure incorporated as a control variable. The coefficient of government expenditure was found to have a negative and statistically significant impact on the poverty headcount index. This implies that increasing government expenditure will significantly reduce the proportion of individual below the poverty line by about 7%. The findings of these five studies are however inconsistent with Huay et al. (2019) and Kaidi and Mensi (2019).

Applying the system generalized method of moment (Sys-GMM), Huay et al. (2019) investigated the impact of remittances on human development in 66 developing countries from 1980 to 2014 by incorporating government expenditure in the model. The significant but negative coefficient of government expenditure means that, when other variables are held constant, increased government expenditure rather than serve as a human development catalyst reduces it.

Again, a comparative analysis of democratic and autocratic governments by Kaidi and Mensi (2019) revealed that the relationship between government's final consumption expenditure and household final consumption expenditure (a proxy for poverty) was negative for both democratic and autocratic governments. This implies that a lowered household final consumption expenditure as a result of increase in government expenditure led to an increase in poverty level. In this case, government expenditure is not a stimulant for improved welfare.

Focusing on a regional bloc in African and applying Common Correlated Effect Mean Group (CCEMG) estimating technique, Keho (2019) in line with Huay et al. (2019), and Kaidi and Mensi (2019) found that growth in government consumption expenditure leads to decline in private consumption in examined ECOWAS countries. This is an indication of crowding-out effect against private consumption in the long-run and short-run periods. The study argued that this situation arises due to the crowding-out effect of private consumption, and a negative wealth effect induced by increased government expenditure.

In the second group of studies, government expenditure's effectiveness was accessed based on the expenditure component, where government expenditure was disaggregated into the sectoral component. This is in line with the argument that the effectiveness of government spending on welfare is dependent on sectoral and

component of the spending (Anderson et al. 2018). After applying an ARDL estimation technique, Ali et al. (2012) established that both government development expenditure and education expenditure have significant positive effects on HDI in Pakistan, whereas recurrent expenditure had negative and insignificant impact.

The estimated effect of education expenditure is slightly higher than that of development expenditure in the study. Olopade et al. (2019) explored the effect of human capital expenditure proxy by education and health expenditures for 12 OPEC member-countries using Fully Modified Ordinary Least Square (FMOLS) between the period 1980 and 2016. The study demonstrated that while public expenditure was shown to have a statistically significant trickling down effect on the poverty rate, public expenditure on health performed otherwise by not having a statistically significant impact.

Haque and Khan (2019) examined the effect of sectoral government spending (education, housing and community, social security, public service, health, defense, and economic services) on HDI in Saudi Arabia using multiple regression estimation techniques. Among these seven expenditure components, only three (education, housing and community, and social security) were found to have significant positive effect on HDI in the country. Education expenditure with the largest effect was identified as playing a key factor which contributes to the improvement in HDI.

Celikay and Gumus (2017) analyzed the relationship between social expenditure and poverty in Turkey using panel error correction models on data covering the period 2004–2011 and obtained from 26 regions in Turkey. The study found a negative relationship between social expenditure and poverty in the short run only. The study further obtained a negative relationship between education expenditure and poverty, both in the short run and in the long run. In the study of Matekenya et al. (2020), public health expenditure has a negative coefficient in the majority of the models estimated, which contradicts a priori expectations. The negative coefficient of public health expenditures may be indicative of inefficiencies in government spending which has been a problem for a number of African economies (Lawanson and Novignon 2016).

However, in an estimation conducted by Olugunde et al. (2020), government health expenditure was found to have a positive but insignificant relationship with HDI among a group of oil-producing countries in Africa. Adegboyo (2020) explored the relationship between the various components of government expenditure and national poverty index in Nigeria, and concluded that government recurrent expenditure on economic service, social and community, and transfer reduces poverty, while poverty is escalated as a result of increase in recurrent expenditure on administration and transfers' capital expenditure.

Ogbonnaya-Udo and Chukwu (2020) investigated the effect of defense, education, and health expenditures of government on HDI in a panel of five West African countries for the period 2000–2018. The random effect result shows that the effect of expenditure differs, while expenditure on defense was negative and insignificant, the effect was positive for both education and health, and it was only however significant for education.

Futhermore, the ordinary least-squares regression employed by Linhartová (2020), revealed that though HDI is positive and statistically significantly impacted

by Czech Republic government expenditures on public order and safety, housing, health, education, and recreation, culture, and religion, their contribution is however extremely minute. Omari and Muturi (2016) study on Kenya shows that government expenditure on agriculture and health has a positive and significant effect on private consumption per capita thereby leading to reduction of poverty level. Increase in government expenditure on agriculture and health led to increase in private consumption per capita. Whereas the impact of government expenditure on education was insignificant.

Ruch and Geyer (2017) study on South Africa concluded that regardless of the estimated models, additional investment in land, transportation infrastructure, and specialized vehicles slightly increase poverty; whereas expenditure on roads, sewerage, street lighting, community assets, and electricity consistently contribute to poverty reduction efforts though marginally. Following the very negligible effect on poverty reduction, the authors questions the effectiveness of service delivery as a significant poverty alleviation tool.

The third group of studies considered the effectiveness of government expenditure on welfare by examining the effect of fiscal federalism which could be captured by fiscal decentralization or a comparison of different governance units' expenditure. Fiscal decentralization is conceptualized as the transfer of administrative authority and responsibilities from the national government to other lower government in an economy (Martinez-Vazquez et al. 2017; Udoh et al. 2015). In a related study, Lledó et al. (2018) capture the share of own fiscal components (revenue, expenditure, and tax) of each of the levels of governments (central, state, province, region, and local) as a proportion of general government fiscal components.

Through a bivariate regression analysis conducted by Khanal (2018) in Nepal, it was concluded that fiscal expenditure decentralization cannot promote human poverty reduction which comprises deprivation in economic provisioning, life expectancy, and percentage of people without access safe water. Findings from a normalized equation obtained through Johansen cointegration in the study of Mehmood et al. (2010) suggest that both revenue and expenditure decentralization have a very significant positive effect on human development index in Pakistan. However, the findings show that the magnitude of impact of revenue decentralization is higher than that of expenditure decentralization.

Also, Liu et al. (2019) examined the effect of fiscal decentralization on social welfare in China. From the analysis, the effect of fiscal decentralization in the central and western areas is significant and negative, while it is significant and positive through the turning point detection in the eastern area of China. Following a fixed-effect estimation that was applied over panel data for the period 2009–2015 on 35 districts in Indonesia's central Java Province, Hadi and Nugroho (2018) find fiscal decentralization to be significantly but negatively related to poverty incidence. The study findings showed that, with a unit increase in fiscal decentralization, the count of poor persons in the Central Java province reduces by a very small percentage.

The study is however in contradiction with Nursini and Tawakkal (2019) who used three fiscal decentralization indicators to investigate the effect of fiscal decentralization on poverty alleviation in the same Indonesia. Fixed effect model was employed on data obtained from 33 provinces in the country for the period

2010–2016. Main finding of the study shows that, while regional government revenues and intergovernmental transfers had a statistically significant effect on reducing poverty, regional government expenditures did not. The study argued that the concentration of regional government expenditure on administration proceedings limits the extent of effect of expenditure on poverty reduction.

Tebogo et al. (2014) applied VAR and GMM to examine fiscal decentralization–poverty dynamic relationship using information from eight metropolitan municipalities in South Africa. The study found a negative short-run effect of fiscal decentralization on real household consumption per capita, which consequently implies that fiscal decentralization in South Africa only promotes poverty rather than reducing it. Francisco and Canare (2018) also observed that fiscal decentralization has a positive effect on poverty alleviation. Specifically, the study found that the share of locally sourced revenues is associated with less poverty. Further examination revealed that higher poverty incidence is recorded when fiscal decentralization level increases beyond its optimal point.

The result from Sepulveda and Maritinez-Vazquez (2011) is however contrary to Francisco and Canare (2018) in that it found the share of income of local governments which is proxy for fiscal decentralization to be having a significantly negative impact on poverty reduction of the 34 developing countries examined from 1970 to 2000.

Using GMM estimate over a data period from 1973 to 2013, Shahzad and Yasmin (2016) found fiscal decentralization (expenditure and revenue decentralization) to be having an increasing impact on poverty in Pakistan in the absence of better institutional quality. The study of Banwo (2012) conducted on Nigeria found different impacts of fiscal decentralization indicators on poverty incidence in Nigeria. Specifically, expenditure decentralization had an insignificant capability of increasing poverty.

From this brief empirical review, the varied dimensions, scope, and focus on poverty together with different conceptualization and computation of government expenditure assessment have contributed to mixed findings on effectiveness of government expenditure. Moreover, it is observed the extent of effect to which the central government retained fiscal power was not well-thought-out; and fiscal decentralization was narrowly focused on aggregating subnational governance tiers only, such that comparative and relative effects of each level of government fiscal responsibilities were not considered. Hence, this study attempts to fill this gap by analyzing the impact of fiscal federalism on poverty. This is carried out by comparatively investigating and analyzing the effectiveness of both central and state governments' expenditures on poverty in Nigeria.

Methodology

Model specification and variables

The study adopted a multivariate model specification following Ewetan et al. (2020) and Ugwuanyi et al. (2017) but incorporated different variables in the three

models specifying the relationship between the variables of interest. The mathematical expression of the relationships is as follows:

$$\ln\mathrm{Pov}_t = \alpha_0 + \alpha_1 \ln\mathrm{FE}_t + \alpha_2 \ln\mathrm{SE}_t + \alpha_3 \ln\mathrm{FDI}_t + e_t, \tag{1}$$

where $\ln\mathrm{Pov}_t$ is poverty indicator and it is represented by household consumption expenditure (Ugwuanyi et al. 2017). This study uses household final consumption expenditure per capita. This is because unlike income which is an indicator for potential in welfare improvement; consumption expenditure is a good proxy for achieved welfare for individuals and households. Besides, the documentation reliability and stability of consumption expenditure over time compare to income especially of poor people validate the use of consumption expenditure in this study. Is reliably documented and quite stable when compared with their income (Odhiambo 2010)? Furthermore, the household final consumption expenditure is consistent with the definition of poverty by the World Bank as "the inability to attain a minimal standard of living" gauged relative to their basic consumption needs (World Bank 1990). The proxy has been used in poverty-related studies (Ugwuanyi et al. 2017).

Fiscal federalism is represented by both federal and state government expenditures; while FE which is the proportion of federal or central government expenditure in total government expenditure and SE which is the proportion of the state government expenditure in total government expenditure. The control variable employed in the analysis is foreign direct investment inflow (FDI). All variables are in natural logarithm form. Foreign direct investment is posited to enhance poverty reduction based on the spillover effect theory. These spillover effects include employment creation and increase in capital investment (Magombeyi and Odhiambo 2018), development of local skills, and increase economic growth with an overall revenue transfer (Magombeyi and Odhiambo 2018; Ahmad et al. 2019). In short, the impact of FDI on poverty reduction can be both direct and indirect. From this study, a positive coefficient indicates an increase in expenditure and consequently a reduction in poverty and vice-versa.

Estimation techniques

An autoregressive distributed lag (ARDL) model estimation technique was used in this study. The ARDL specification of the general empirical model in Eq. (1) is expressed as follows:

$$\begin{aligned}\Delta\mathrm{Pov}_t =& \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta\ln\mathrm{pov}_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta\ln\mathrm{FE}_{t-i} + \sum_{i=1}^{n} \alpha_{3i} \Delta\ln\mathrm{SE}_{t-i} + \\ & \sum_{i=1}^{n} \alpha_{4i} \Delta\ln\mathrm{FDI}_{t-1} + \delta_1 \ln\mathrm{pov}_{t-1} + \delta_2 \ln\mathrm{FE}_{t-1} + \delta_3 \ln\mathrm{SE}_{t-1} + \delta_4 \ln\mathrm{FDI}_{t-1} + \varepsilon_{it}.\end{aligned} \tag{2}$$

Following the ARDL cointegration test which is based on Eq. (2), the ARDL-based error correction model of the general empirical model is also expressed as follows:

$$\Delta \mathrm{Pov}_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta \ln \mathrm{Pov}_{t-1} + \sum_{i=1}^{n} \alpha_{2i} \Delta \ln \mathrm{FE}_{t-1} + \sum_{i=1}^{n} \alpha_{3i} \Delta \ln \mathrm{SE}_{t-1} + \sum_{i=1}^{n} \alpha_{4i} \Delta \ln \mathrm{FDI}_{t-1} + \gamma_{1i} \mathrm{ECM}_{t-1} + \varepsilon_i, \quad (3)$$

where α_0 is the constant, $\alpha_{1i} - \alpha_{4i}$ are the respective short-run coefficients, ECM is the error correction term, and ε_i is the white noise error term.

ARDL technique was employed because of its advantages over other cointegration techniques. These advantages include applicability irrespective of the order of integration of series, though order of integration should not be beyond order 1, useability with relatively small samples, and possibility of simultaneously estimating long- and short-run dynamics (Pesaran et al. 2001; Ewetan et al. 2020; Demirhan 2020).

Data source

This study is based on annual time-series data that cover the period from 1981 to 2018. Data for the study are mainly secondary and they are obtained from the Central Bank of Nigeria and the World Bank Group websites, respectively. Total or general government, central (federal), and state government expenditures were obtained from the CBN website, and per capita household consumption expenditure and foreign direct investment inflow data were obtained from the World Bank Group website.

Results and discussion

Unit root stationarity and cointegration tests

Following the criteria that intended variables needed to be integrated in the order of $I(0)$ or $I(1)$ to so as to be able to apply the ARDL-Bound test cointegration technique, the integrated orders of the variables were examined using the Philips–Perron (PP) and KPSS unit root test measures, and results are presented in Table 2.

Table 2 Order of integration test. Source: computed by authors

Variable	PP				KPSS	
	Level		First difference		Level	First difference
lnPov	−1.0001	0.7429	−7.4084	0.0000	0.6086	0.2169
lnCGE	−1.1428	0.6883	−7.2233	0.0000	0.7179	0.2499
lnSGE	−0.4227	0.8948	−3.5861	0.0111	0.7049	0.1654
lnFDI	−2.9939	0.0447	−9.7637	0.0000	0.2557	3.8265

NB: KPSS significance level values are: 1% = 0.739000, 5% = 0.463000, and 10% = 0.347000

As shown in Table 2, there is a sufficient reason to conclude that the level form of the series is not stationary. Consequently, the tests were conducted at first difference for each of the variables. The results of both PP and KPSS tests indicate that the series are stationary at first difference at 1, 5, and 10% significance levels, respectively. This confirmed that none of the variables (lnPov, lnFE, lnSE, and lnFDI) are integrated at order above $I(1)$. This further confirms that the ARDL cointegration technique can be applied on the data.

As stated earlier, the bound test cointegration technique was carried out to ascertain the existence of cointegrating relationship among the variables or not in each of the model by comparing the computed F-statistic with the critical values. The AIC was employed to determine the optimal lag structure of the model of ARDL (1, 1, 1, 0).

The result of the bounds test for the model is presented in Table 3. The result shows that the F-statistic of 8.21 for the model is higher than upper bound $I(1)$ critical value at all levels of significance. This result therefore warrants the rejection of the null hypothesis that there is cointegration relationship existing among the regressands specified in Eq. 2 and concluding that there is an existence of long-run relationship among the variables in each of the model.

ARDL long-run and ECM estimation results

Table 4 presents the results of both long-run and short-run estimations following the establishment of the existence of cointegration relationship among variables in each of the model. As shown in Table 4, the error correction terms (ECT) for estimated short-run period are −0.818; this result indicates that each of the model will return to equilibrium with about 82% of adjustment taking place in the first year of the model after a shock.

The effect of federal government expenditure on poverty reduction varies across period, while the effect is insignificant in the short-run period; it is, however, found to be negative but significant ($\beta = -0.23$; $p < 0.01$) in a longer period. The result means that in the long run, there will be about 0.23% increase in poverty as a result of 1% increase in federal government expenditure when other variables are held constant. This suggests that the federal government budgetary spending has less positive impact on the citizen on a whole.

Table 3 Co-integration test-ARDL bound test. Source: computed by authors

Test statistic	Value	Significance (%)	$I(0)$	$I(1)$	Conclusion
F-statistic	8.21	10	2.37	3.2	Co-integration exist
K	3	5	2.79	3.67	
		2.5	3.15	4.08	
		1	3.65	4.66	

Table 4 Short-run and long-run coefficient estimates, ARDL (1, 1, 1, 0). Source: computed by authors

Variables	Coefficients	SE
Short-run estimate		
Δ(lnFE)	0.0855	0.0637
Δ(lnSE)	0.0995	0.0647
Ect	−0.8177*	0.1199
Long-run estimate		
LnFE	−0.2322*	0.0623
LnSE	0.3385*	0.0580
LnFDI	−0.0101	0.0323
C	0.4970*	0.0829
$R^2 = 0.62$		
Durbin Watson = 2.06		
Jarque–Bera's normality test: 3.6016; Prob = 0.1652		
Breusch–Godfrey serial correlation LM test: F-statistic = 0.2879; Prob. F (2,28) = 0.7521		
Heteroskedasticity–Breusch–Pagan–Godfrey: F-statistic = 0.6687; Prob. F (6,30) = 0.6755		

*$p < 0.01$

The coefficient of state government expenditure is positive and significant in the long run ($\beta = 0.339$; $p < 0.01$), but positive and insignificant in the short run. Specifically, in the long run, 1% increase in the state government expenditure will lead to about 0.34% increase in household expenditure, and by extension, a reduction in poverty is achieved at the same proportion. The positive effect of state government expenditure validates the assertion and argument in favor of fiscal federalism and decentralization that local government will be more knowledgeable about and responsive to the needs of the people (Crook 2003).

Since the state governments are closer to the masses and more knowledgeable of the need of the people than the federal government, they will as a result carry out expenditures that have positive impact on welfare in both the short and long term. This finding is also in consistent with Francisco and Canare (2018), though contrary to Banwo (2012) and Shahzad and Yasmin (2016). Besides, the fact that the federal government is not closer to the people, a further reason why increases in the proportion of federal government expenditures failed in poverty reduction, is the high level of corruption at the federal or central government and diversion of funds from welfare improving expenditures. In addition, the cost of maintaining the over bloated appointees at the federal government level can only enriched the few privileged individuals rather than the masses who a striving to survival at the state levels.

The control variable FDI is found to be negative and statistically insignificant in the long run; this is contrary to the a priori expectation of this study. It suggests that FDI inflow in the country does not have the potential of reducing poverty; rather, it increases it over the short and long period of time. This negative impact of FDI inflows though contrary to a priori expectation of study and the studies of Fowowe

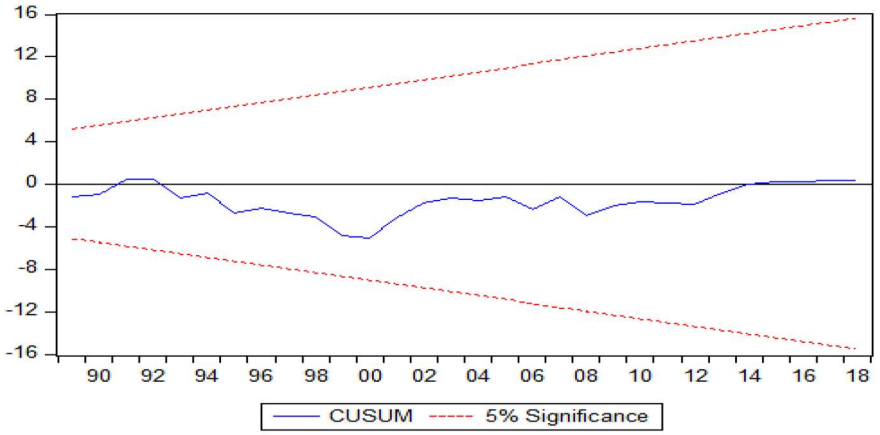
and Shuaibu (2014) and Ahmad et al. (2019), it is however consistent with the findings of Huang et al. (2010), Ali et al. (2010), and Anetor et al. (2020) that FDI inflows led to an increase in poverty levels, which in this study is through reduction in per capita expenditure. A possible explanation for this is the noncomplementary nature of FDI with domestic firm (De Mello 1999), near absolute crowding out of domestic investment by foreign investment and high level of advanced technology employed by foreign firms, such that employment generation that could stimulate consumption expenditure is impeded (Calvo and Hernandez 2006; Magomgeyi and Odhiambo 2018). Therefore, for FDI to really and fully impact positively on the citizens, its effect will first be by reducing the level of unemployment. Capital inflows which help individuals to be actively engaged in the process of economic activities in the country will not only empowered them, and improve their skills, but also act as a catalyst in boosting aggregate demand in the economy.

Table 4 further presents the results of relevant post-estimation tests that were conducted to affirm the soundness and reliability of the estimated models. The statistic report for the Jarque–Bera test for normality validates the rejection of the null hypotheses that the estimated residual series are not normally distributed. The serial correlation LM test statistics of 0.287 (0.75) suggests that there is no evidence of serial correlation in the model. The Breusch–Pagan–Godfrey test for heteroskedasticity 0.660 (0.67) indicates that residual do not suffer from heteroskedasticity. Additionally, Fig. 5a, b shows the CUSUM and CUSUM of squares test graphs validates the stability of each of the models at 5% significant level.

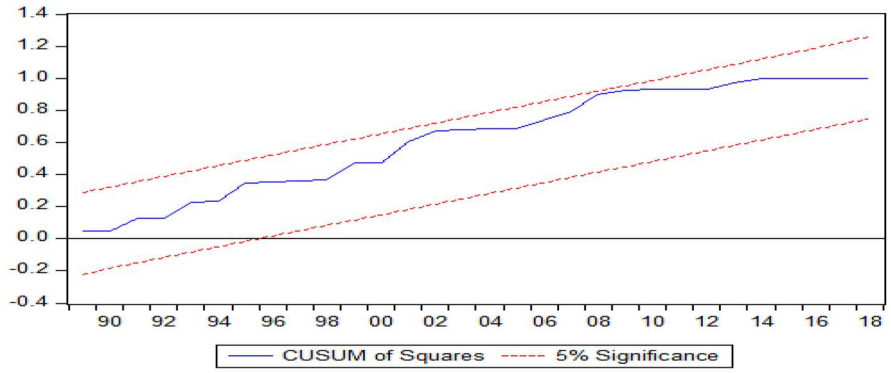
Conclusion and policy recommendation

The study analyzed the effect of extent of fiscal decentralization on the poverty reduction in Nigeria using time-series data from 1981 to 2018 and the auto-regressive distributed lag (ARDL) bounds testing and estimation technique was employed. Most of the previous studies examined the effect of different forms of fiscal decentralization within an economy on development using various indicators and analytical techniques at mainly subnational level only.

However, since fiscal decentralization is the distribution of responsibilities among different levels of governance in the economy, one of the contributions of this study is the government-level comparison of the effect of central and state government fiscal responsibilities on poverty reduction in the country. Results from the model consistently indicate that only the state government expenditure has a positive effect on poverty reduction in the long-run. Whereas the central government expenditure was found to increase poverty level in Nigeria, which, perhaps, is as a result of massive corruption in the central governance. The control variable (FDI) was found to be consistently statistically negative irrespective of time, suggesting that FDI inflow in the country does not have the potential of reducing poverty; rather, it increases it over the short-run and long-run period due to its crowding-out effect on some macroeconomic components of the economy and employment limiting technologies that is being used by foreign firms. Among other things, the results provide evidence that



a CUSUM test



b CUSUM of squares test

Fig. 5 **a** CUSUM test. **b** CUSUM of squares test

state governments' expenditures in the general government expenditure have positive effect on poverty reduction in the country.

In view of the importance of state government expenditure in enhancing poverty reduction, there is a need to strengthen state government revenue collection ability to meet development expenditure needs. In addition, a higher share of state governments' revenue in the monthly revenue allocations in total government revenue is necessary to increase the level of the state governments' poverty reduction projects and by implication reducing poverty level across the country.

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Availability of data The data for this present study are sourced from the database of the statistical bulletin of Nigeria CBN (https://www.cbn.gov.ng/) and World Development Indicators (https://data.worldbank.org/). Dataset analyzed in this study is available from the corresponding author on reasonable request.

Declarations

Conflict of interest The authors declare that they have no competing interests.

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