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Connectedness of Industrial Subsectors towards Poverty Reduction Goal: Efforts to achieve Sustainable Development

Chidera Godson Eze [1*], Chukwuemeka Emmanuel Ugwuasogwa [2]
[1-2] Department of Economics, Enugu State University of Science and Technology, Enugu, Nigeria

* Corresponding Author: **Chidera Godson Eze**

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Abstract
This study is proposed to depict the relationship between industrial subsector growth and poverty mitigation with a view to achieving sustainable development goals in Nigeria within the period 1981–2023. Nigeria is considered a fragile economy with over 180 million Nigerians living in poverty. For valuable exploration into the aim of this study, the study builds on mechanism of the industrial subsector's outputs—mining and quarrying, manufacturing, information and communication technology, arts, entertainment and recreation, consumer price index and poverty reduction nexus with the aid of linear dynamics of Autoregressive distributed lag (ARDL), Multidimensional approaches—Quantile Regression (QREG), Fully Modified Ordinary Least Squares (FMOLS), Dynamic Ordinary Least Squares (DOLS) and Vector Error Correction Model (VECM) Granger causality methods. Empirical results from both approaches have given insight to the selected objectives of this study. According to the Multidimensional approaches: (i) the coefficients of linear of industry subsector are positively connected to the poverty reduction at 5% statistical significance level except entertainment. Also, findings from VECM Granger causality approach back the findings from the Multidimensional approaches through a nexus between the variables of interest (mining and quarrying, manufacturing, information and communication technology, arts, entertainment and recreation, consumer price index and poverty reduction).

Keywords: Industrial Subsectors, Poverty Reduction, ARDL bounds, QREG, FMOLS, DOLS, sustainable development, Nigeria

1. Introduction

The goal of any economy is to end all forms of poverty. Corroboratively, the United Nations' goal for poverty eradication, which is Sustainable Development Goal 1 (SDG 1), "end poverty in all its forms everywhere", is tailored towards eradicating extreme poverty by 2030, reduce at least half the proportion of people living in poverty, and build resilience among vulnerable populations, including those affected by climate change. Hence, eradication of poverty should be prioritized by every economy. It is no surprise however, that staggering poverty in the midst of plenty is one of the world's unsolved issues especially in the developing countries, particularly Nigeria. Poverty has a multi-dimensional nature and can be evident in different forms such as deficiency of material income adequate to guarantee good standard of living; unemployment, dependency on imports, inflation, hunger and under-nutrition; illness; limited education and fundamental services; persistent rise in mortality and morbidity due to sickness; homelessness and insufficient housing; insecure environments and social exclusion and discrimination (Ogbeide, Nwamaka and Agu, 2015) [27].

Many theorists including Georg Friedrich List have advocated for industrial protectionism where he emphasized that local industries should be developed and protected to discourage high imports, create employment for sustained economic development. Industrialization a deliberate, sustained application and combination of an appropriate technology, infrastructure, managerial expertise and other important resources has attracted considerable interest in research (Ogbeide, *et al*, 2005) [28]. According to Eneji, Tangka, Eneji, Haruna and Uzochukwu (2020) [10] industrialization is the process of building up a country's

capacity to produce varieties of goods and services– extraction of raw materials and manufacturing of semi-finished and finished goods. Anyanwu, *et al* (1997) [3], describe industrialization as the process of building up a nation's capacity to convert raw materials and other inputs to finished products and to manufacture goods for further production or for final consumption.

On the other hand, the United Nations fundamentally sees poverty as a denial of choices and opportunities, a violation of human dignity. It means lack of basic capacity to participate effectively in society. It also means not having enough to feed and clothe a family, not having a school or clinic to go, not having the land in which to grow food or job to earn one's living, not having access to credit. It means insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility to violence, and it often implies living in marginal or fragile environments, without access to clean water or sanitation.

In most areas of Nigeria, state capacity is low, service delivery is limited, and insecurity and violence are widespread. Infrastructure gaps constrain access to electricity and hinder the domestic economic integration that would allow the country to leverage its large market size, which is aggravated by trade protectionism. Emerging problems such as the increased severity and frequency of extreme weather events, especially in the northern parts of the country, add to these long-standing development challenges.

A lot of efforts have been put into the industrialization process. Plan after plan, investment policies have been renewed, fine-tuned and at times completely revamped; noteworthy of which are the Nigerian Economic Empowerment Development Strategy (NEEDS) Which Was Nigeria's Strategy and Plan to Bring about Development and Reduce Poverty among the Nigerian Poor, the Economic Recovery and Growth Plan (ERGP) is a medium term all-round developmental initiative that aims to restore economic growth, invest in Nigerians and build a globally competitive economy. Resources are abundant and investment opportunities are almost unlimited yet poverty rates have been on the increase in Nigeria.

To this end, Eneji, *et al* (2020) [9] noted that Nigeria has laid so much emphasis on industrialization since independence in 1960, yet the country is not industrialized till date, and may not be industrialized even by 2040. Various industrial development policies, perspective plans and medium–term economic plans, the fourth development plan acknowledged that manufacturing is capable of sustaining a minimum growth rate of 15% per annum, contributing over 7% to gross domestic product thereby reducing poverty, yet by 2019 Nigeria has the highest number of people living below the poverty line.

Additionally, numerous programmes (particularly agricultural development programmes aimed at plenty food production to meet the needs of the citizenry) geared towards mitigating the menace of poverty in the Nigerian economy have been executed by various past and present administrations. These programmes includes the River Basin Development Authority (RBDA), the Agricultural Credit Guarantee Scheme Fund (ACGSF), Agricultural Development Programme (ADP), Rural Electrification Scheme (RES), and Rural Banking Programme (RBP), Operation Feed the Nation (OFN), Green Revolution (GR), Low Cost Housing Scheme (LCHS), Directorate of Food, Road and Rural Infrastructure (DFRRI), National Directorate of Employment (NDE), Better Life Programme (BLP) later Family Support Programme (FSP), Peoples' Bank, Petroleum (Special) Trust Fund (PTF) etc (Eseyin, Toluyemi, & Oni, 2015) [11].The history of industrial development in Nigeria is a classic illustration of how a nation could neglect a vital sector through policy inconsistencies and distractions attributable to the discovery of oil (Adeoye, 2005; Ewubare and Okpanni, 2018) [12]. President Buhari in 2018 decried the pathetic state of the industrial sector, stating that Nigeria has become a marketer of other countries' merchandise; there is need for us to produce what we eat and use what we produce (local content policy). The more recent experiences of the East and Southeast Asian (especially the Asian Tigers; Taiwan, Singapore, Thailand, Indonesia, etc) economic transformations, demonstrate that diversification into industrial productions vis-à-vis manufacturing, mining and quarrying, electricity, gas, steam and air conditioner, water supply, sewage, waste management, and construction (CBN annual reports, various issues) are critical to poverty reduction deep-seated in sustainable economic growth and development, increasing per capita income and increasing employment openings. To crown it up, it could be held that Nigeria has championed very many industrialization policies and strategies, but in reality, these efforts remain futile; as they are not materializing.

Many studies such as Ughulu (2021) [33], Akpan and Eweke (2017) [2] all investigated the impact of aggregate industrial sector on economic growth which might make their research findings very ambiguous. The state of the industrial subsector of the Nigerian economy was, is, and remains deplorable and attention-seeking. This follows that despite being the giant of Africa, (although in principle) the country Nigeria, is grappling with a highly deplorable and demoralizing industrial revolution. Nigeria is yet to develop and record giant strides of progress in electricity supply, (notwithstanding her position in Africa in hydroelectricity generation) development in the mining and quarrying section, manufacturing activities, water supply, let alone construction subsector, despite her exquisite paper ranking.

Against this background, this research proposes to investigate the impact of industrial sub-sectors on poverty reduction in Nigeria from 1981 to 2022. The roles of industrial sector in reduction of poverty in Nigeria has been investigated by several scholars like Fashanu and Taofeek (2020) [13], Gylych and Enwerem (2016) [17], Mustapha, Said, and Sidique (2015) [23], however no study to the researchers best of knowledge has investigated the impact of industrial sub sector on poverty reduction in Nigeria. This present study intends to investigate the individual impact of disaggregated critical industrial subsectors such as Mining and quarrying, manufacturing sector, Information and communication (ICT), Arts and entertainment on poverty reduction/alleviation in the Nigerian economy.

Hence, the central objective of this study is to examine the impact of selected critical industrial sub-sectors on poverty reduction in Nigeria. Aside from the central objectives, the offshoot objectives of the studies are: 1. to evaluate the impact of mining and quarrying on poverty reduction in Nigeria. 2. To determine the impact of manufacturing sector on poverty reduction in Nigeria. 3. To determine the impact of information and communication on poverty reduction in Nigeria, 4. To evaluate the impact of arts and entertainment on poverty reduction in Nigeria. 5. To understand the causality relationship between poverty reduction and the sub

sectors of the selected industrial sector in Nigeria. The importance of this study is to understand the roles played by the various sub-sectors of the industrial sector in poverty reduction in Nigeria. For a clear insight on the objectives, this study applies the novel Pro-poor growth theory which captures the extent to which economic growth leads to increased welfare for the less well-off in a society and poverty reduction (Waas, T., Hugé, J., Verbruggen, A., & Wright, T. (2011) [36]. This will help us determine the components of poverty reduction. The novelty of this study is based on the following: 1. no study to the researchers best of knowledge has investigated the impact of industrial sub sector on poverty reduction in Nigeria. 2. Variable inclusion, No study to the best of the researcher's knowledge has estimated the impact of arts and entertainment on poverty reduction in Nigeria, 3. Methodological approach, the study uses three methodological approaches to estimate the impact of industrial sector on poverty reduction in Nigeria. These methods are Autoregressive distributed lag (ARDL), Quantile regression and Fully Modified Ordinary least squared (FMOLS) to have a better understanding of the relationship between the dependent and independent variables

The rest of the study is divided into; section 2- literature review, section 3- empirical methodology, 4- empirical results and discussion, 5-conclusion and recommendation.

2. Theoretical Framework

This study adopts the growth laws of Kaldor (1957) as a theoretical framework. The laws emphasized on the importance of manufacturing expansion to maintain a sustainable level of employment which is a drive into development and poverty reduction especially in underdeveloped economies. It established a high correlation between living standards (poverty) and the share of resources devoted to industrial activities.

Theoretically, Nurkse (1954) established the link between poverty- measured by low income and low investment, which he termed the vicious circle of poverty. The vicious circle represents forces that tends to act and react against each other so as to trap underdeveloped countries in a state of poverty. This is because underdeveloped countries like Nigeria characterized by low per capital income which translate into low savings and then to low capital formation for investment in the productive or industrial sector. This further worsens the problem poverty that has therefore kept Nigeria in a state of underdevelopment. In an industrialized society, workers are paid higher wages, productivity is higher and individual income increases as a result.

2.1. Classical theory of poverty

The classical theory of poverty is built on the assumption that markets operate efficiently, and individual productivity is directly correlated to the wages earned Davis and Sanchez-Martinez (2014) [8]. Poverty is, therefore, regarded as a sign of poor individual choices that emanate from poor productivity. However, according to the classical hypothesis, poverty can also result from people's genetic heterogeneity (Davis and Sanchez-Martinez (2014) [8]. The classical view also holds that when poverty levels rise, government involvement is required. According to studies, Nigeria's government was unable to combat poverty since ICT was not utilized in a variety of economic sectors Ochanja (2017) [26].

2.2. Empirical Review

Poverty reduction has attracted the attention in most developing countries. Recent studies such as Sigah, Donny Marclary Ayibazuomuno and Lubo Ebisine (2024) [31] investigated the link between real sector development and poverty reduction in Nigeria from 1981 to 2022. Independent Variables of real sector includes manufacturing, agricultural and service sectors while the dependent variable is poverty headcount. The data set was analysed using parsimonious error correction model. The result of the study shows that Agricultural and manufacturing sector has a positive impact in poverty reduction while manufacturing sector has a negative impact on poverty reduction. The study therefore recommends that policymakers prioritize investments in the agriculture and manufacturing sectors to deepen the level of development and create more opportunities for poverty reduction.

Omitogun, *et al* (2023) [29] investigated Poverty: Assessing Human Development in Nigeria. Data from 1990 to 2021 were estimated using fully modified least squares and bipartite Granger causality, respectively. The findings show that there is a negative correlation between value added and human capital development in Nigeria but it is not statistically significant. This indicates that contrary to apriori expectation, economic development in Nigeria has a weak capacity to reduce poverty. This may be due to the lack of economic activity in Nigeria. There is also no relationship between economic value added and human development. This means that Nigeria current level of economic development cannot reduce poverty in the country. Based on these findings, this study provides policies and recommendations for Nigerian policy makers.

Islam (2004) [20] further corroborates these results when he submits that employment in manufacturing sector has a negative and significant effect on poverty in some selected countries.

Freeman (2024) [16] examined how Nigeria can use information and communication technology to alleviate the enormous poverty levels. Data were sourced from the World Bank and International Telecommunication Union, for the period 1992–2020. In terms of the research methodology, the Autoregressive Distributed Lag model was employed in the research. The empirical findings showed that information and communication technology can have a projected 50% positive effect in reducing poverty. The study recommended that private domestic credit and foreign direct investment should be channeled to the information and communication technology sector to have a greater impact on poverty alleviation.

Charles Bertin *et al* (2024) analysed the effect of technological innovations on poverty reduction using a panel of 36 sub-Saharan African countries over the period 2008 to 2019. After applying several estimation techniques for panel data such as fixed effects, the result shows that technological innovations reduce poverty in countries with low urbanization rates and increase it in countries with high urbanization rates. These results imply that poverty reduction policies in sub-Saharan Africa need to refocus on capacity building in the use, adoption and adaptation of technological innovations, particularly in the agricultural and industrial sectors.

3. Data and methods

3.1. Data and variables

A time series data of 1981 to 2023 for Nigeria will be utilised to determine the impact of industrial sub-sectors on poverty reduction in Nigeria. As mentioned, the purpose of the study is to understand the roles some critical industrial sub-sectors play in poverty reduction in Nigeria. Aside from the central objectives, the offshoot objectives of the studies are: 1. to evaluate the impact of mining and quarrying on poverty reduction in Nigeria. 2. to determine the impact of manufacturing sector on poverty reduction in Nigeria. 3. to determine the impact of information and communication on poverty reduction in Nigeria, 4. to evaluate the impact of arts and entertainment on poverty reduction in Nigeria, 5. to understand the causality relationship between poverty reduction and the sub sectors of the selected industrial sector in Nigeria.

Following the objectives of this study, that is to understand the impact of industrial sub-sectors on poverty reduction, the study adopts final consumption expenditures of households as a proxy to the poverty level and the dependent variable, as envisaged by Akanksh, *et al* (2010), Edeh, *et al* (2023). The rationale for adopting final consumption expenditures of households as a proxy to poverty level is justified by its coverage of virtually all the private sector individuals; including the haves and haves-not and the ground that it takes care of the livelihood affordability amongst Nigerians as well as its all-year-round data availability other than several other measures of poverty vis-à-vis Gini coefficient and Poverty headcount. The data are extracted from the Central Bank of Nigeria (CBN) statistical bulletin, 2023. The explanatory variables which are utilized to better portray the level of economic development and livelihood affordability via the relations with poverty levels considering the objective of the study include:

1. Mining and Quarrying (symbolized as MQQ): This involves the output of all the four subgroups in the extraction of mineral resources including: a) crude petroleum and natural gas, b) coal mining, c) metal ores, and d) quarrying and other minerals.
2. Manufacturing (symbolized as MAQ): CBN (2023) categorizes manufacturing as one of the critical subsectors of the aggregate industrial sector of the Nigerian economy. This encompasses all the thirteen pertinent subsidiaries of the manufacturing subsector including: a) oil refining, b) cement, c) food, beverage and tobacco, d) textile, apparel and footwear, e) wood and wood products, f) pulp, paper, and paper products, g) chemical and pharmaceutical products, h) non-metallic products, i) plastic and rubber products, j) electrical and electronics, k) basic metal, iron and steel, l) motor vehicles and assembly, and m) other manufacturing.
3. Information and Communication Technology (symbolized as ICT): According the available data at the Central Bank of Nigeria (CBN) statistical bulletin (2023), the information and communication subsector of the aggregate industrial sector of the Nigerian economy encompasses the four broad subsidiaries of the services subsector of the industry. These subsidiaries include: a) telecommunications and information services, b) publishing, c) motion pictures, sound recording and music production, and d) broadcasting.
4. Arts, Entertainment and Recreation (symbolized as ENT): Nigeria has been well-known in Africa nay globally as one of the top entertainment hubs. The fast-rising artists, content creators, musicians, etc., emerging globally from the Nigerian origins are worthy commending
5. Consumer Price Index (symbolized as CPI): World Bank (2024) see literarily considers consumer price index as inflation. Consumer price index, therefore, shows the annual percentage change in the cost to the average consumer obtaining or procuring a basket of commodities which might be fixed or varied at given intervals, for instance, yearly.

The variables, final consumption expenditures of households, mining and quarrying, manufacturing, information and communication, and arts, entertainment and recreation are extracted from the 2023, Central Bank of Nigeria statistical bulletin, whereas consumer price index is obtained from the World Bank Development Indicators, 2023 edition. Elaborate explication of the variables and sources of data are indicated in the Table 1 below:

Table 1: Definition of Variables.

Variable name	Symbol	Variable measure	Expected sign	Sources
Poverty rate	POVT	(N'Billion)		CBN statistical bulletin, 2023
Mining & quarrying	MQ	(N'Billion)	±	CBN statistical bulletin, 2023
Manufacturing	MAQ	(N'Billion)	±	CBN statistical bulletin, 2023
Information and communication technology	ICT	(N'Billion)	±	CBN statistical bulletin, 2023
Arts, entertainment and recreation	ENT	(N'Billion)	±	CBN statistical bulletin, 2023
Consumer price index	CPI	(N'Billion)	±	World Bank Development Indicator 2023

Source: Authors' computation

3.2. Econometric approach and modelling

3.2.1. Econometric approach

The econometric approaches adopted for the data analysis of this study include:

1. Descriptive statistics and Stationarity (Unit Root) tests (the ADF Structural Breakpoint test) are employed as a pre-estimation test to ascertain the trend and behaviour of the time series data collected on the variables used in the empirical investigation. The outcome of the stationarity test will uncover the trend of the series as well as their order of integration. It will further help in shaping the authors' preference for other methods with precise understanding and explanation of the outcomes from the whole evaluations.
2. The next approach is to test the short-run and long-run relationships (cointegration) among the series. To this effect, this study employs the Autoregressive Distributive Lag (ARDL) bounds test technique of conitegration (Pesaran, *et al*., 2001). ARDL bounds method of cointegration possesses several benefits over

other methods, including; the ability to contain less sample size of data, and an array of integrating order among the series. Also, considering the standard for choosing the suitable lag order before evaluating ARDL, the method behooves the quality of lessening the multicollinearity and endogeneity issues. Further, ARDL permits the computation of the dynamic error correction model through its linear transformation specification (Udemba, *et al*., 2024) [34]. In addition, various diagnostic tests including autocorrelation (or more officially serial correlation), heteroskedasticity, and the stability of the model using Ramsey RESET and CUSUM test are carried out.

3. Moreover, the study estimates the causal direction among the chosen variables. Outcomes of the stationarity test will resolve whether the pairwise Granger causality test or the Block exogenous/VECM Granger causality will be applicable. This will make for the justification of the outcomes obtained in the short-run and long long-run estimations.

3.2.2. Econometric modelling

Based on the spotlight and chosen variables of this study to substantiate the objective, the technical model of this study is given in the equation below:

$$POVr_t = f(MQQ_t, MAQ_t, ICT_t, ENT_t, CPI_t) \quad (1)$$

The advanced econometric version of the Eq.1 is given below:

$$POVr_t = \beta_0 + \beta_1 MQQ_t + \beta_2 MAQ_t + \beta_3 ICT_t + \beta_4 ENT_t + \beta_5 CPI_t + \mu_t \quad (2)$$

One of the key objectives of this study is to embark on extensive evaluation of the industrial subsector performance implication on long-term and sustainable economic development. It is debatable that the industrial sectors of various developing economies do not provide for the welfare of the citizens via massive poverty reduction, especially at the pre-development era, however, improvement of the industrial sector makes for the advancement of the well-being of the citizens, if only and only if the economy matures in productivity usually at later periods (Rostow, 1960; Eneji, *et al*., 2020) [9]. Reposing on this, this study employs the monetary aspect of poverty measurement in relating with the industrial subsectors of the Nigerian economy which is akin to the Rostow's model development. The inspiration is to uncover the chronological development trend of industrial subsectors and their interconnectedness with final consumption expenditures of households (measure of poverty level). Similar to the novel Rostow's model, the nexus between the industrial subsectors and final consumption expenditures of households is expected to be either Ω-shape or U-shape. Thus, novelty of this study is the modelling of the industrial subsectors to analyzing this concept in the Nigerian economy as shown in Eq. 2 above.

From the Eq.(2) above, POVr stands for poverty rate proxy by the final consumption expenditures of households, MQQ is the mining and quarrying output, MAQ represents the manufacturing subsector output, ICT is the information and communication technology output, ENT represents the arts, entertainment and recreation output, and CPI stands for consumer price index proxy for inflation rate, while μ_t symbolizes the error term. β_1, β_2, β_3, β_4 symbolize the parameters that show the long-term elasticity effects or relationship between the dependent variable (POVr) and the independent variables (mining and quarrying output, manufacturing output, information and communication technology output, arts, entertainment and recreation output and consumer price index).

The evaluation of the cointegration, that is, the long run relationship among the series is carried out using the ARDL bounds testing approach which is also developed to contain both the short run and long run relations among the chosen variables. Further, the dynamic error correction model is modelled with the ARDL short run and long run model specifications. The equation for the ARDL bounds test model is expressed below:

$$\Delta POVr_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta POVr_{t-i} + \sum_{i=1}^{p} \alpha_2 \Delta MQQ_{t-i} + \sum_{i=1}^{p} \alpha_3 \Delta MAQ_{t-i} + \sum_{i=1}^{p} \alpha_4 \Delta ICT_{t-i} + \sum_{i=1}^{p} \alpha_5 \Delta ENT_{t-i} + \sum_{i=1}^{p} \alpha_5 \Delta CPI_{t-i} + \beta_1 MQQ_{t-1} + \beta_2 MAQ_{t-1} + \beta_3 ICT_{t-1} + \beta_4 ENT_{t-1} + \beta_5 CPI_{t-1} + ECM_{t-1} + \mu_t \quad (3)$$

From Eq. (3), α_1, α_2, α_3, α_4, α_5 and β_1, β_2, β_3, β_4, $\beta_5$represent the short run and long run parameters respectively, ECM_{t-1} stands for the error correction model that reveals the speed and capability of the model to correct its short path shocks in the long run and re-establish long run relationships among the variables. Δ and ρ symbolize the first difference operator and lag operator or limits of the variables. All the characteristics of the model have been explained in the Eq. 2 above.

In a bid to estimate and confirm whether there exists a cointegration with the ARDL bounds cointegration approach, a hypothetical statement of no cointegration is specified, that is, the null hypothesis, $H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$. The statement is affirmed if and only if the F-stats is less than the critical values of upper bounds at 1, 5 and 10 percentages. Conversely, this is rejected if the F-stats is greater than the critical values of upper bounds at 1, 5 and 10 percentages, and can be specified as $H_1 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 \neq 0$(Udemba, *et al*., 2024) [34].

4. Findings and discussions of the results

4.1. Pre-estimation tests and results

Beginning with the outcomes of the descriptive statistics and stationarity tests, in accordance with the outputs presented in Tables 2 and 3 for descriptive statistics and stationarity correspondingly, no normal distribution is confirmed with the significant probability values: 0.050327, 0.037761, 0.017035 and 0.000000 correspondingly, of Jarque-Bera for the variables: MAQ, ICT, ENT and CPI. Contrarily, a case of normal distribution is confirmed with the insignificant probability values: 0.110784 and 0.424690, of Jarque-Bera for the variables: POVr and MQQ.

Table 2: Descriptive statistics.

Variables	POVr	MQQ	MAQ	ICT	ENT	CPI
Mean	25.196	6.600.6	0.0	3.345	49.9	19.1
Median	24.052.8	6.415.4	0.0	953.9	15.4	13
Maximum	52.453	9.323.8	0.0	12.323	167.7	72.8
Minimum	8.326	4.097	0.0	209	3	5.4
SD	14.353.9	1.448	0.0	3.919	62.6	16.3
Skewness	0.3	0.2	0.7	0.9	1	1.9
Kurtosis	1.6	2.1	1.8	2.4	2.1	5.5
Jarque-Bera	4.4	1.7	6.0	6.6	8.1	35.9
Probability	0.1	0.4	0.05	0.03	0.02	0.00
Sum	1,083.428	283.817	0.00	143.836	2,144	820
Sum Sq. Dev	0.00	88,074.538	0.00	0.00	1,664.355	11,133
Observations	43	43	43	43	43	43

Source: Authors' analysis and compilation

The test of non-stationarity is conducted and the output established the alternative hypothesis of stationarity at level for most of the variables except for the case of entertainment, however, the null hypothesis is rejected at First difference with the whole series integrated at I(0) except entertainment that is integrated at I(1). Convincingly, the stationarity test result confirmed the series are integrated at mixed order. After the pretext of descriptive and stationary tests, and having arrived at the mixed order of integration of the series from the stationary test, the present study proceeds with the ARDL bound cointegration test. Except the ARDL bound method of cointegration test, any other cointegration approach demands some level of conditions such as uniformity in the stationarity result instead of mixed order of integration. Due to the importance of lag system in the application of ARDL approach (Lutkepohl 2006; Shabahz *et al*. 2013a) which is to provide efficient and consistent results to capture dynamic relation amongst the selected variables, the study applied Akaike criteria in lag length selection in identifying the appropriate lag for the application of the ARDL bound testing. The outcome of the lag length selection confirmed 4 as the most appropriate and optimal lag length order for this analysis. The result is available on request. After the process of lag order selection, the result of ARDL bounds testing approach to cointegration is shown in Table 4. From the result, the cointegration is confirmed with the computed F&T-statistics than the upper critical bound at 1% significance level for the POVr model. This shows that selected variables (MQQ, MAQ, ICT, ENT, CPI) are cointegrated for long run relationship in case of Nigeria.

Table 3: Stationarity analysis.

Variables	ADF (Trend and Intercept)	Vogelsang Critical Values	Prob.	Inference
POVT	-6.376	-5.719	<0.01	I(0)
MQQ	-6.276	-5.719	<0.01	I(0)
MAQ	-5.500	-5.176	0.021	I(0)
ENT	-30.292	-5.176	<0.01	I(1)
ICT	-5.902	-5.176	<0.01	I(0)
CPI	-7.812	-5.176	<0.01	I(0)

Source: Authors' analysis and compilation
Prob represent probability values

4.2. Linear dynamics using DOLS, QREG and FMOLS testing approaches

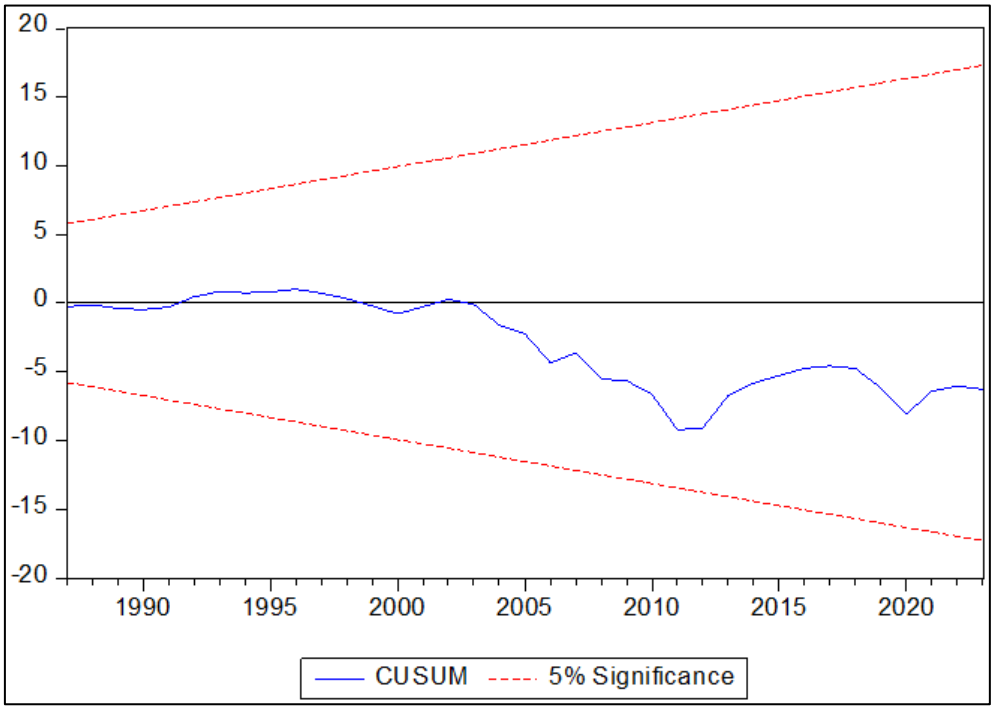
Table 4 Estimate of the linear dynamics using ARDL bound testing approach, Dynamic Ordinary Least Squares (DOLS), Quantile (QREG) and Fully Modified Ordinary Least Squares (FMOLS) regression estimates. Source: Authors' computation and compilation

Dependent variable = POVr							
Variables	**Coef**	**T-stats**	**Prob**	**Variables**	**Coef**	**T-stats**	**Prob**
Quantile Regression Estimates @25%				**Fully Modified Ordinary Least Squares Estimates**			
MQQ	1.984	3.202***	0.003	MQQ	3.317	8.468***	0.000
MAQ	0.000	1.121	0.269	MAQ	0.000	1.237	0.224
ICT	3.628	4.362***	0.000	ICT	3.097	6.752***	0.000
ENT	-37.407	-0.634	0.530	ENT	-2.843	-0.075	0.941
CPI	-13.049	-0.475	0.637	CPI	-44.523	-1.483	0.147
C	-4,168.651			C	-11,707.67		
Dynamic Ordinary Least Squares Estimates							
Variables		**Coef**		**T-stats**		**Prob**	
MQQ		3.919		5.814***		0.000	
MAQ		0.000		1.273		0.219	
ICT		3.998		2.475***		0.023	
ENT		-60.498		-0.687		0.501	
CPI		-92.644		-1.722		0.101	
C		-17,442.22					
Bounds testing of coint							
Significant level %		**Critical values**				**F-stats = 7.95**	
		Lower bounds I(0)		**Upper bounds I(1)**			
10		2.26		3.35			
5		2.62		3.79			
1		3.41		4.68			
Diagnostic tests							
		F-Stats				**Prob**	
χ2SERIAL		1.161				0.357	
χ2HETERO		1.285				0.292	
χ2RAMSEY		0.198				0.662	
JB NORMALITY		2.415				0.299	

The results of the Quantile (QREG), Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) regression analyses of the impacts of mining and quarrying, manufacturing, information and communication, entertainment, consumer price index and the interacting variables (MQQ, MAQ, ICT, ENT & CPI) on household consumption expenditure are shown in Table 4. The findings reveal a positive relationship (for both periods, short run and long run; MQQ presented with positive results of 1.45 and 2.06; MAQ revealed positive results of 0.00 and 0.00; ENT presented with negative (-139.89) and positive (538.80) results; ICT showed positive (5.04) and negative (-9.78), and finally, CPI indicated positive 19.67 and 27.95 in the short run and long run respectively)between MQQ, MAQ, ENT, ICT and CPI and the household consumption expenditure at 1% statistical significance level. The Cointeq coefficient (-0.703787) substantiates the long-run relationship among the variables and denotes that the speed of adjustment of the variables' convergence to equilibrium is approximately 70.38%. The probability value is statistically significant since the p-value is less than 1% (i.e. 0.0002<0.05). By implication, the coefficient of error correction mechanism (ECM) confirms that it takes the dependent variable approximately 1 year and 4 months to return to long equilibrium in the face of any economic shock involving the explanatory variables.

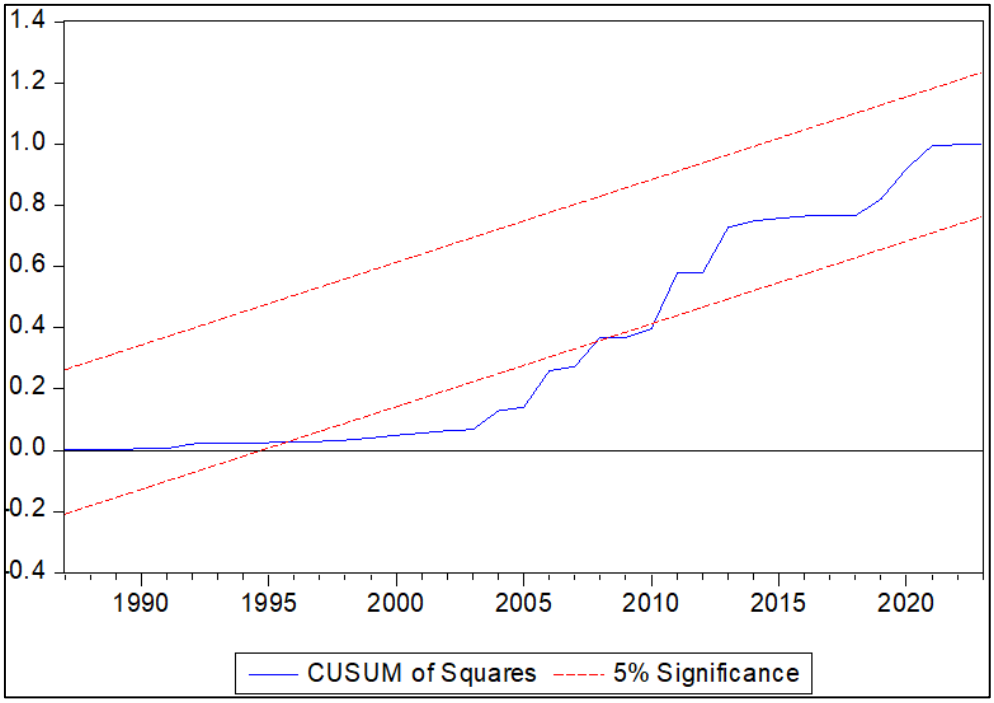
The coefficient of R-squared (0.856947) substantiates the goodness of fit among the variables and denotes that the rate at which the explanatory variables (MQQ, MAQ, ENT, ICT & CPI) influence the dependent variable (POVr) is approximately 85.69%. The result indicated that the explanatory powers of the independent variables employed in the study are relatively high. On the contrary, the result of the R-squared suggested that only approximately 14.31% of what happens to the dependent variable is being explained by the residuals. The results from the multidimensional approaches suggests that 1% increase in the mining and quarrying output significantly caused approximately 1.98%, 3.32% and 3.92% significant increase on the household consumption expenditure (measure of poverty level) for the long run, judging from the multidimensional regression estimates of the QREG, FMOLS and DOLS respectively. The above result shows by implication, that a 1% increase in mining and quarrying output decreases poverty level significantly by 1.98%, 3.32% and 3/92% as provided in the regression estimates. The result shows that the coefficient of manufacturing output is positively connected to the household consumption expenditure at 1% statistical significance level. This supposes that manufacturing output increases household consumption expenditure. That is, 1% increase in manufacturing output caused 0.00%, 0.00% and 0.00%insignificant increase in household consumption expenditure. This implies that with the above result, poverty level is decreased insignificantly by 0.00% in the long run following a 1% increasing manufacturing output. This result corroborates with the result of Sigah, *et al* (2024) [31] for Nigeria. The result further shows that information and communication technology exhibits a positive relationship with poverty rate in the short run, but a negative relationship in the long run. This implies that in the long run, 1% increase in information and communication technology output caused approximately 3.63%, 3.10% and 310% increase in household consumption expenditure from the QREG, FMOLS and DOLS estimates respectively. This result contradicts with the result from Freeman (2024) [16] for Nigeria. This result is significant at 1% level of significance. Further, with respect to entertainment, the result indicates that there is an indirect (negative) relationship between entertainment and household consumption expenditure in the long run. This indicates that a 1% increase in entertainment output decreases poverty rate by approximately 37.41%, 2.84% and 60.50%; hence, a 1% increase in entertainment output decreases poverty rate by 37.41%, 2.84% and 60.50%significantly. This result, by implication, indicates that entertainment is a poverty ameliorating factor in the Nigerian economy. Consumer price index exhibits a negative relationship with household consumption expenditure in the long run. The result means that a 1% increase in consumer price index decreases poverty rate by approximately 13.05%, 44.52% and 92.64%, although insignificantly. This result, by implication, indicates a certain tolerable level of inflation is ideal for sustaining the country's economy in the long run.

Diagnostic tests are also conducted with outputs of the tests displayed above in Table 4. From the results, the goodness of fit test shows the values of R^2 and Adjusted R^2 as 0.8021, 0.7753, 0.9647, 0.9598 and 0.9769, 0.9527 from the QREG, FMOLS and DOLS estimates respectively. These outputs show that the exogenous instruments (Mining and quarrying output, renewable manufacturing output, information and communication technology output, entertainment output and consumer price index) are able to explain the variations in the targeted variable (household consumption expenditure, the proxy for poverty level) at 80%, 97% and 97% respectively, while the remaining 20% and 3% are explained by residual. Among the tests conducted are serial correlation, heteroscedasticity, stability test of Ramsey RESET and normality test. The results of the highlighted tests show that the values of F-statistics of the tests are insignificant. These outcomes refute the null hypothetical statement of the existence of serial correlation, heteroscedasticity problems, unstable model problem and normality assumption. Further, the result of recursive test of cumulative sum (CUSUM) is shown in Fig. 1 with the blue lines well bounded inside the two red lines. This depicts the stability of the model; hence, the system is well built within the framework of 5% significant level. However, the sister CUSUM of Squares stability test result indicated a period of structural instability from the periods 1996 to 2010 (basically the pre-democracy years and the peak periods of global financial crisis). Except the result of CUSUM and CUSUM of Squares that are presented in Figs. 1 & 2, all the outputs of the diagnostic test are all presented below the Table 4.



Source: Authors' computation and compilation

Fig 1: Cumulative sum



Source: Authors' computation and compilation

Fig 1: Cumulative sum of squares.

4.3. VECM Granger causality test

Next test applied in this study is causality test. Following the mixed order of integration among the series from the stationarity test and the confirmation of long run relationship via bounds cointegration, this study considers Vector Error Correction Model (VECM)/Block exogenous test as the most appropriate method to examine the direction of causal relationship that exists among the series. Granger causality analysis act as a confirmatory test to the linear dynamic analysis, hence, it identifies the origin of any relationship between the variables which confirms where the impact or reaction started from. That is, it exposes which among the variables is causing the relational impact between the two variables. The empirical outputs of the VECM Granger causality are shown in Table 5, and reported as follows: a unidirectional causal transmission from manufacturing output to poverty reduction, from mining and quarrying to entertainment, from manufacturing output to entertainment. Apart from alignment of these findings with the findings from the linear dynamics of ARDL bounds testing, the intuition behind the results is the ability of achieving poverty reduction and sustainable development through the relevance of industrial subsectors (mining and quarrying, manufacturing, entertainment and information and communication

technology) highlighted in the objective of this study. Hence, juxtaposing the outcome with the highlighted objectives, the result has revealed the importance of industrial subsectors as among the macroeconomic variables capable of mitigating poverty problem through industrial subsectors performance. Thus, industrial subsector is transmitting one way to poverty reduction meaning significant impact on poverty reduction in Nigeria. The implications and ability of achieving sustainable development through industrial subsectors performance are revealed, with credence giving to both policies in poverty reduction.

Table 5: VECM Granger causality test

Dependent Variable	χ^2-Stats [Prob]					
	POVr	MQQ	MAQ	ENT	ICT	CPI
POVr	-	3.357 [0.187]	7.191 [0.027] ***	0.817 [0.665]	9.235 [0.010] ***	-
MQQ	0.705 [0.703]	-	0.895 [0.639]	1.463 [0.481]	1.898 [0.387]	0.572 [0.751]
MAQ	1.087 [0.581]	0.075 [0.963]	-	0.243 [0.885]	1.678 [0.432]	4.449 [0.108]
ENT	3.727 [0.155]	3.210 [0.201] ***	-	-	6.916 [0.031] ***	1.145 [0.564]
ICT	0.484 [0.785]	1.878 [0.391]	4.234 [0.120]	0.358 [0.836]	-	0.071 [0.965]
CPI	1.536 [0.464]	3.548 [0.170]	0.077 [0.962]	0.677 [0.713]	1.560 [0.459]	-

Source: Authors' analysis and compilation
Prob represent probability values, *** represent significant. Numbers inside bracket are the probability values

5. Conclusion and policy implication

This study is a novel scientific research into the connectedness between industry subsector and poverty reduction towards Nigeria's sustainable economic development. By extension and based on the objectives of this study, nexus among mining and quarrying, manufacturing, information and communication technology, entertainment and consumer price index is also investigated. Nigeria has been ranked as the fourth largest economy in Africa. Building on this, the authors undertake to pursue the following objectives: (a) to analyze the impact of industry subsector on poverty reduction in Nigeria. (b) to determine the causality relationship between industry subsector and poverty reduction in Nigeria. For effective research into the highlighted objectives, the study builds on the nexus among the selected variables with the help of linear dynamics of ARDL bounds, QREG, FMOLS, DOLS and VECM Granger causality tests to investigate the connectedness among the selected variables to the achievement of the objectives of the study. Findings from all the approaches have given insight to the selected objectives of this research. Hence, findings from linear dynamics of ARDL bounds testing approach report that there exists a long-term relationship amongst the variables of interest in the study. The QREG, FMOLS and DOLS, on the other hand, report the following: (i) the outcome indicates that the coefficients of linear of industry subsector are positively connected to the poverty reduction at 5% statistical significance level except entertainment. Following the underlining Kaldor's growth hypothesis, the findings confirmed the presence of correlation between the industrial subsectors output and poverty reduction (captured by household final consumption expenditure). This exposes the historical developmental pattern of industrial subsector and its relationship with the sustainable developments through poverty reduction responses. This infers the positive link of industrial subsectors to poverty reduction at the initial stage of industrial sector growth, however, this pattern was later upturned to negative relationship between the two variables (i.e. industrial subsectors and poverty reduction; specifically entertainment and POVr), (ii) the relationship between mining and quarrying, manufacturing, information and communication and POVr is positive and significant at 1% level in the long run. This results shows that the coefficients of mining and quarrying, manufacturing, information and communication, are approximately 1.98, 3.92, 3.32; 0.00, 0.00, 0.00; 3.63, 3.99 and 3.10 judging from the multidimensional approaches, depicting that 1% increase in mining and quarrying, manufacturing, information and communication outputs leads to an increase in spendable available resources of the households, and by extension, a decline in poverty level by 1.98, 3.92, 3.32; 0.00, 0.00, 0.00; 3.63, 3.99 and 3.10, (iii) also, the result reveals adverse link between entertainment, consumer price index and POVR. This results shows that the coefficients of entertainment and consumer price index, are approximately -37.41, -13.05; -60.50, -92.64; -17.44, -2.84 and -44.52 judging from the multidimensional approaches, depicting that 1% increase in entertainment and consumer price index leads to a decline in spendable available resources of the households, and by extension, a decline in poverty level by -37.41, -13.05; -60.50, -92.64; -17.44, -2.84 and -44.52. Also, findings from VECM Granger causality approach report as follows: a unidirectional causal transmission from manufacturing output to poverty reduction, from mining and quarrying to entertainment, from manufacturing output to entertainment. The findings connect very well with and support the findings from the multidimensional approaches, and this has been effectively discussed in the VECM Granger causality section. Following the findings from both ARDL bounds, Multidimensional approaches and VECM Granger causality tests, application of the following policies are suggested: (i) making funds available to the private investors at relatively affordable costs so as to develop new and efficient technologies in the manufacturing of commodities, (ii) granting financial subsidies to the captains of the industries and investors who are the active players in the industrial sectors, (iii) granting financial access in form of subsidies to the investors (both private and public) for specific investments into manufacturing, mining and quarrying, and information and communication technology subsectors for greater expansion and productivity purposes.

The pattern of development and relationship that is traced to the industrial subsectors and its relationship with poverty alleviation depicts a success pattern (particularly manufacturing, mining and quarrying, and information and communication technology) capable of engineering a sustainable development via poverty reduction if industrialization policies are utilized effectively in regulating disposable incomes of the private individuals as well as poverty level in Nigeria. For this reason, it is suggested that

industrial sector should be considered and prioritized as a tool in achieving sustainable development in Nigeria through financing industrial subsectors' efficient technology. Hence, from our findings, manufacturing is confirmed impacting favorably on the poverty level. The industrialization agenda through adequate financing and monitoring can be achieved through a significant spillover and driving effects on the development trend of any given country, infrastructural advancement and substantial poverty reduction through the adoption of new technologies for efficient productive engagements and productivity. Also, availability of finance through the instrument of government subsidies and other programmes that will guarantee access to loans with less interest rate will impact positively on the structural change of industrial sector. The players in the industrial sector will have access to finance for capital projects and manufacturing which involves switching to industrial practices with less carbon intensive through adoption of renewable based machineries. Again, Nigeria's position in Africa's economic growth strengths is remarkable and an advantage to build policies to curtail the rising of poverty in the country. This is exposed as part of our findings which shows the increase in manufacturing, mining and quarrying, and information and communication technology caused the increase in disposable available resources to the private individuals, hence the decline in poverty level at 1% significant level. This is a pointer that policies that will favor the development of industrial sector (particularly manufacturing) through increased capital investment expansion are essential in mitigating the rising poverty level and achieving sustainable development for Nigeria. Apart from manufacturing subsector, other subsectors including mining and quarrying, information and communication technology, entertainment should be activated and promoted through subsidies and favorable rules that will permit easy entrance and investment into the industrial subsector and market. This will fashion a reasonable level playing ground for both private and public agencies to participate and compete favorably in the market. This will inevitably make the end-products of these subsectors available at affordable prices and permit easy and swift transition from imported products to locally produced ones and promote a clean and sustainable milieu. Additionally, sustainable policies geared towards engineering a single-digit and sustainable inflationary pressures should be upheld and prioritized. Conclusively, the findings and policies identified in this study will aid in the achievement of the objective of the study which is to expose the best practice to achieve poverty reduction and sustainable development through the application of the identified policies. However, the study is not without limitations which could be the missing of some important variables related to Nigeria's economic development. Variables such as government or institutional quality, foreign direct investment, economic growth and fuel pump prices may be essential in this study but they are missing. It is counseled that succeeding studies should consider these variables in future research.

6. Appendix

Dependent Variable: POVR				
Method: Fully Modified Least Squares (FMOLS)				
Date: 10/01/24 Time: 12:49				
Sample (adjusted): 1982 2023				
Included observations: 42 after adjustments				
Cointegrating equation deterministics: C				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
MQQ	3.317404	0.391751	8.468135	0.0000
MAQ	1.85E-07	1.49E-07	1.236946	0.2241
ICT	3.097467	0.458755	6.751905	0.0000
ENT	-2.843127	37.88705	-0.075042	0.9406
CPI	-44.52264	30.01354	-1.483418	0.1467
C	-11707.67	5344.378	-2.190651	0.0350
R-squared	0.964695	Mean dependent var		25504.79
Adjusted R-squared	0.959791	SD dependent var		14382.58
S.E. of regression	2884.010	Sum squared resid		2.99E+08
Long-run variance	8751761.			

Dependent Variable: POVR				
Method: Dynamic Least Squares (DOLS)				
Date: 10/01/24 Time: 12:50				
Sample (adjusted): 1983 2022				
Included observations: 40 after adjustments				
Cointegrating equation deterministics: C				
Fixed leads and lags specification (lead=1, lag=1)				
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
MQQ	3.919734	0.674245	5.813518	0.0000
MAQ	3.46E-07	2.72E-07	1.272724	0.2185
ICT	3.998452	1.615854	2.474513	0.0229
ENT	-60.49813	88.07756	-0.686873	0.5005
CPI	-92.64437	53.81414	-1.721562	0.1014

C	-17442.22	9283.493	-1.878842	0.0757
R-squared	0.976933	Mean dependent var		25305.77
Adjusted R-squared	0.952653	SD dependent var		14096.31
S.E. of regression	3067.281	Sum squared resid		1.79E+08
Long-run variance	9470848.			

Dependent Variable: POVR				
Method: Quantile Regression (tau = 0.25)				
Date: 10/01/24 Time: 12:52				
Sample: 1981 2023				
Included observations: 43				
Huber Sandwich Standard Errors & Covariance				
Sparsity method: Kernel (Epanechnikov) using residuals				
Bandwidth method: Hall-Sheather, bw=0.19207				
Estimation successfully identifies unique optimal solution				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
MQQ	1.983578	0.619399	3.202421	0.0028
MAQ	1.42E-07	1.27E-07	1.121198	0.2694
ICT	3.627591	0.831726	4.361523	0.0001
ENT	-37.40660	58.96013	-0.634439	0.5297
CPI	-13.04851	27.44856	-0.475380	0.6373
C	-4168.651	5917.251	-0.704491	0.4855
Pseudo R-squared	0.802071	Mean dependent var		25196.00
Adjusted R-squared	0.775324	S.D. dependent var		14353.87
S.E. of regression	3821.869	Objective		32050.94
Quantile dependent var	12015.61	Restr. objective		161931.2
Sparsity	9193.543	Quasi-LR statistic		150.6916
Prob(Quasi-LR stat)	0.000000			

ARDL Bounds Test				
Date: 04/09/25 Time: 12:40				
Sample: 1985 2023				
Included observations: 39				
Null Hypothesis: No long-run relationships exist				
Test Statistic	**Value**	**k**		
F-statistic	7.954655	5		
Critical Value Bounds				
Significance	**I0 Bound**	**I1 Bound**		
10%	2.26	3.35		
5%	2.62	3.79		
2.5%	2.96	4.18		
1%	3.41	4.68		
Test Equation:				
Dependent Variable: D(POVR)				
Method: Least Squares				
Date: 04/09/25 Time: 12:40				
Sample: 1985 2023				
Included observations: 39				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(POVR(-1))	-0.115321	0.174327	-0.661525	0.5167
D(POVR(-2))	0.345489	0.205417	1.681889	0.1099
D(POVR(-3))	-0.203680	0.205240	-0.992398	0.3342
D(MAQ)	2.93E-07	1.92E-07	1.527192	0.1441
D(MAQ(-1))	2.93E-07	2.07E-07	1.413008	0.1747
D(MAQ(-2))	-2.20E-07	1.46E-07	-1.508306	0.1488
D(ENT)	-113.8574	67.64200	-1.683235	0.1096
D(ENT(-1))	-127.9472	86.16471	-1.484914	0.1549
D(ENT(-2))	-186.7927	87.53045	-2.134030	0.0469
D(ENT(-3))	325.7914	76.11462	4.280273	0.0005
D(ICT)	5.062212	1.304285	3.881216	0.0011
D(ICT(-1))	15.21630	3.949920	3.852306	0.0012
D(ICT(-2))	4.726052	2.759995	1.712341	0.1040
D(ICT(-3))	23.14017	4.188461	5.524743	0.0000
C	-56.89759	5657.478	-0.010057	0.9921
MQQ(-1)	0.869618	0.677088	1.284349	0.2153
MAQ(-1)	4.18E-08	1.72E-07	0.243100	0.8107
ENT(-1)	395.3511	86.36023	4.577930	0.0002

ICT(-1)	-7.331960	2.157025	-3.399108	0.0032
CPI(-1)	38.02565	28.21962	1.347490	0.1945
POVR(-1)	-0.602048	0.186429	-3.229372	0.0047
R-squared	0.856947	Mean dependent var		1008.955
Adjusted R-squared	0.698000	S.D. dependent var		3415.045
S.E. of regression	1876.722	Akaike info criterion		18.21617
Sum squared resid	63397531	Schwarz criterion		19.11194
Log likelihood	-334.2154	Hannan-Quinn criter.		18.53757
F-statistic	5.391391	Durbin-Watson stat		2.647629
Prob(F-statistic)	0.000356			

ARDL Cointegrating And Long Run Form				
Dependent Variable: POVR				
Selected Model: ARDL(4, 0, 3, 4, 4, 0)				
Date: 04/09/25 Time: 12:39				
Sample: 1981 2023				
Included observations: 39				
Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(POVR(-1))	-0.008653	0.152998	-0.056556	0.9555
D(POVR(-2))	0.273938	0.184315	1.486251	0.1545
D(POVR(-3))	-0.319194	0.177775	-1.795496	0.0894
D(MQQ)	1.451076	0.500621	2.898553	0.0096
D(MAQ)	0.000000	0.000000	1.637232	0.1189
D(MAQ(-1))	0.000000	0.000000	1.874548	0.0772
D(MAQ(-2))	-0.000000	0.000000	-1.694901	0.1073
D(ENT)	-139.894841	59.674644	-2.344293	0.0307
D(ENT(-1))	56.687862	119.522832	0.474285	0.6410
D(ENT(-2))	-478.676264	125.283608	-3.820741	0.0013
D(ENT(-3))	326.594682	68.116639	4.794639	0.0001
D(ICT)	5.040338	1.139586	4.422955	0.0003
D(ICT(-1))	9.529689	3.561905	2.675447	0.0154
D(ICT(-2))	-17.686481	4.071308	-4.344177	0.0004
D(ICT(-3))	22.992359	3.703067	6.209004	0.0000
D(CPI)	19.675672	23.150412	0.849906	0.4065
CointEq(-1)	-0.703787	0.149929	-4.694150	0.0002
Cointeq = POVR - (2.0618*MQQ + 0.0000*MAQ + 538.8058*ENT -9.7865				
*ICT + 27.9569*CPI -6539.7479)				
Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
MQQ	2.061811	0.576082	3.579023	0.0021
MAQ	0.000000	0.000000	0.805959	0.4308
ENT	538.805816	155.119886	3.473480	0.0027
ICT	-9.786451	3.682396	-2.657631	0.0160
CPI	27.956851	34.015582	0.821884	0.4219
C	-6539.747876	7639.930255	-0.855996	0.4033

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