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Multidimensional Poverty Index Analysis of Nigeria: A Quantile Regression Approach

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ABSTRACT

This study presents a multidimensional analysis of poverty in Nigeria using quantile regression, based on data from the National Social Registry (NSR) of Poor and Vulnerable Households (PVHHs). Focusing on six high-poverty states which are Ebonyi, Cross River, Ekiti, Sokoto, Taraba, and Niger. It investigates the influence of education, employment, location, geographic zone, and household characteristics on poverty, measured through Proxy Means Test (PMT) scores at the 25th, 50th, and 75th quantiles. Unlike Ordinary Least Squares (OLS), which may misestimate effects across poverty levels, quantile regression captures heterogeneous impacts across the distribution.Findings reveal that higher education, urban residence, and waged employment significantly reduce poverty, with stronger effects observed at higher quantiles. In contrast, larger household size, female-headed households, and residence in the North-East and North-Central zones are associated with greater poverty. Regional disparities are pronounced, with southern zones exhibiting greater poverty resilience. These results highlight the need for targeted interventions, including vocational training, urban infrastructure development, agricultural support in northern zones, and social protection for female-headed households. This study adds depth to the poverty literature by analyzing NSR data through a distributional lens, yielding rich insights for policy interventions tailored to specific needs. In conclusion, we recommend that dynamic analyses using panel quantile regression and explore vulnerabilities among specific subgroups, such as rural female-headed households in high-poverty areas.

Keywords: Multidimensional Poverty, Quantile Regression, Proxy Means Test, Nigeria, Poverty Determinants, Social Registry.

INTRODUCTION

Poverty has remained a threat and challenge to humanity in all ramifications. It is complex, multidimensional, and multifaceted with manifestations in the economic, social, political, environmental, and every realm of human existence**.** It is no wonder thateradication of poverty is one of the greatest challenges bedevilling the international community and it is therefore an indispensable requirement for the attainment of sustainable development (United Nations, 2015). As a result, countries, as well as regional and international organizations, are committed to the eradication of chronic poverty and hunger such that resources and action plans are designed to curb poverty among others.

The incidence of poverty in Nigeria has increased since 1980. The Federal Office of Statistics now National Bureau of Statistic (2007) reported that while poverty incidence was 28.1% in 1980, it rose to 46.3% in 1985 and decreased to 42.7% in 1992 and later rose to 65.6% in 1996. In 2004 it decreased to 54.7 % and in 2010 the figure shot to 60.9% (NBS,2012). A decade later in 2020 the apex statistical Office reported that 40% or 83 million Nigerians live in poverty. Although Nigeria's poverty profile for 2021 has not yet been released, it is estimated that the number of poor people will increase to

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90 million, or 45% of the population, in 2022 (NBS,2020) If the World Bank's income poverty threshold of $3.20 per day is used, Nigeria's poverty rate is 71% compared to lower rates for some oil-producing developing countries like Brazil (9.1%), Mexico (6.5%), Ecuador (9.7%) and Iran (3.1%), this is grim.(World Bank,2022).

Poverty is a multidimensional phenomenon. The global Multidimensional Poverty Index (MPI) produced by the United Nations Development Programme (UNDP) and the Oxford Poverty and Human Development Initiative measures poverty by considering various deprivations experienced by people in their daily lives, including poor health insufficient education and a low standard of living.Nigeria fares poorly in multi-dimensional poverty measures, with high inequality across regions. Based on a 2022 multi-dimensional poverty survey report by the National Bureau of Statistics, 132.92 million Nigerians are categorized as multi-dimensionally poor.

Quantile regression is a key technique within the distributional regression framework that focuses on estimating conditional quantiles of the response variable. The technique was first introduced by Koenker and Bassett (1978), it empowers researchers to examine how covariates impact precise points of the response distribution, such as the 20th or 80th quantile. This method is particularly appropriate in multidimensional poverty analysis, where the lower quantiles represent the most deprived group of the population. By analysing these quantiles, quantile regression offers critical insights into the factors driving extreme poverty and informs targeted interventions (Olasupo & Efuwape,2024)

Quantile Regression complements and improves the traditional mean regression models, however, in a situation of homogeneity assumption is violated, the method quantifies the heterogeneous effects of covariates through conditional quantiles of the outcome variable and provides a comprehensive scan of the whole distribution of the outcome. QR is more robust to outliers and more flexible, because the distribution of the outcome does not need to be strictly specified as certain parametric assumptions. Additionally, QR can be viewed as a critical extension and complement when assumptions are violated. Thus, QR has become a subject of intense investigation and application in the past decades (Qi Huang et al. 2017)

Alabi et al (2023) in their study, investigated the significant role of economic and social services development on standard of living in Nigeria using quantile regression analysis to model various quantiles of the standard of living. They used dataset, which covered a period of 41 years and is obtained from Central Bank Statistical Bulletin, and they considered 0.1, 0.25, 0.5, 0.75 and 0.9 for the quantile values.The finding shows that only the compensation of employees (COE) has significant effect on the standard of living across all the quantiles distribution except the 0.25thquantile that is not significant, and also, the independent variables considered showed significant effect at 0.75thquantile. This suggests that economic and social services development only have significant effect on the higher class citizens' living standard.

Empirical evidence was provided to determine whether microfinance, measured through a country's gross loan portfolio per capita, has a heterogeneous effect on poverty reduction among countries with different levels of poverty. They utilized a panel-data quantile regression analysis, leveraging a dataset spanning 57 countries across three years (2005, 2008, and 2011) to investigate the distributional effects of microcredits on two poverty indices. The findings indicate that microfinance not only significantly reduces poverty incidence and depth but also exhibits varying impacts across different

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poverty levels (quantiles). Notably, the poverty reducing effect of microcredit is slightly more pronounced in countries with the highest poverty incidence and depth, suggesting that microcredit effectively reaches and benefits the most impoverished individuals (Maricruz et al, 2018).

Econometric studies on the determinants of poverty mostly rely on the traditional regression approach, which mainly gives attention to the mean or expected value of the response variables, while appreciating the helpful estimations this technique provides, it fails to provide the differences in how these determinants impacts the diverse levels of poverty within the target population. Explicitly, the method is unable to portray the disparities that is inherent among the different category of the poor, each having peculiar deprivation status (Wieser et al 2024).

A distributional regression framework is employed with particular attention on quantile regression. Distributional regression, with specific focus on quantile regression, transcends beyond investigating mean impacts, allowing for the discovery of how poverty determinants influence various quantiles of the poverty spectrum. Thus, it makes possible complete understanding of the relationships between variables across varying degrees of poverty. This technique gives a complete picture of patterns and dimensions of poverty that may have remained hidden in conventional regression techniques(Walti, 2019).

MATERIALS AND METHODS

The research utilised the National Social Registry (NSR) of the Poor and Vulnerable Households (PVHHs) in Nigeria which is obtained from the National Social Safety-Net Office (NASSCO). The NSR is the sum aggregate of all the State Social Registers (SSRs) of the 36 states of the Federation including the FCT. The building of the NSR spans between 2016 to date, however, the study will be based on data turned in from inception to March 2024 and will focus on six states of Ebonyi (South-East), Cross Rivers (South-South), Ekiti (South-West), Sokoto (North-west) Taraba (North-East) and Niger (North Central). The states are purposefully selected based on the National Living Standard Survey (NLSS 2018/2019) conducted by the National Bureau of Statistics which reported the six selected state as having the highest poverty headcount in their respective zones. The Quantile Regression Model will be employed to investigate the influence of Education, Employment, Location, Geographical Zone, Household Demographics (Sex, Age Household Size) in each group of the poor and vulnerable households. The Quantile regression which is a type of distributional regression model will investigate the influence of the identified dimensions on the 25th, 50th and 75th quantile of the Poverty Index

Data Presentation

The data used for this study is the National Social Register obtained from the National Social Safety-Net Coordinating Office (NASSCO) which is in STATA format with 139 variables. However, only 8 variables will be used for this research which includes educational qualification, sex, employment status, geographical zone, place of residence, age and sex. Furthermore, only data from the six purposefully selected states will be analysed and focus will be on households rather than individuals. The total number of Households for these six states is 1,953,802. However, this data is large and can come with some computational and analytical challenges. Sampling large data can overcome some of these challenges, hence Stratified Random sampling which ensures representation from the six selected is applied on the data. Randomly sampling 10% from each of the states significantly reduced the number of households to 195, 377 with each state proportionally represented. The response variable for the

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QR model is the PMT scores which is continuous in nature as obtained. The scores are calculated using the observable and verifiable household characteristics that serve as a proxy for household welfare

Theoretical Model: The broad model encompasses five dimension that hypothesize Poverty level as a function of Education, Place of Residence, Geographical Zone, Employment and Household Features

Techniques for Data Analysis

$$POV_{PMT} = F\ (\ ED_d, PR_d, GZ_d, EM_d, HF_d) \quad (1)$$

Where:

POV_{PMT} = *Poverty level represented by the PMT Scores*
ED_d = *Education dimension*
PR_d = *Place of Residence dimension*
EM_d = *Employment dimension*
HF_d= *Household Features Dimension*

Table 1: Poverty Dimensions Description.

		Predictor Variables
Dimensions	**Categories/Variables**	**Description**
Education	No Education =1	The Head of Household has no form of Education
	Primary Education =2	Household head that has completed only primary school education
	Secondary Education =3	Household head that has completed Secondary school education
	Tertiary Education=4	Household head that has completed Tertiary school education
Place of Residence	Rural =1	Household is located in rural area
	Urban=2	Household is located in urban area
Geographical Zone	North-West =1	Household reside in the North- West zone of the country
	South_West=2	Household reside in the North- Central zone of the country
	North_Central=3	Household reside in the North – East zone of the country
	North_East=4	Household reside in the South- East zone of the country
	South_East=5	Household reside in the South-South zone of the country
	South_South=6	The Household reside in the South-West zone of the country
Employment Status	Unemployed =1	Household Head is not employed
	Pensioner =2	Household Head is Self employed
	Waged_Employment=3	Household Head is in waged employment
	Self_Employed= 4	Household Head is an Unpaid Family Worker
	Unpaid_family_Worker=5	Household Head is a Pensioner
Household	Age	Age of the Household Head

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Features	Sex (male=1 female=2)	Sex of Household Head
	Household Size	Number of the Household Members
		Response Variable
Response Variable	**Model**	**Poverty level**
Poverty Index	Quantile Regression Model	25^{th} quantile, 50^{th} quantile, 75^{th} quantile

Source: Modified From Bikorimana and Sun (2020)

Quantile Regression Model

The quantile regression model (Koenker and Bassett 1978) is another approach used to understand the determinants of poverty. This model allows the analysis of the effect of poverty determinants in the different quantiles in the distribution of the dependent variable, thus showing the full picture of the relationships between variables, and also the quantile regression allows the study of the impact of predictive variables on different quantiles of the response distribution.

To explain the quantile regression model methodology, it will be contrasted with the OLS regression.The OLS regression model can be expressed as follows:

$$y_i = \beta_0 + \beta_i x_i + \varepsilon_i \quad (2)$$

for i = 1, . . . , n. Where y_i is the response variable which the poverty scores, x_i is a vector of poverty indicators (see Table 3.1 for the list of the characteristic explanatory variables), β_i is the vector of unknown coefficients to be estimated, and ε_i is a disturbance term. In this model, the method for obtaining the parameters is by using the minimization of squared errors:

$$min \sum_i (y_i - (\beta_0 + \beta_i x_i))^2. \quad (3)$$

The quantile regression model can be expressed as follows:

$$y_i = \beta_0^{(\tau)} + \beta_i^{(\tau)} x_i + \varepsilon_i^{(\tau)} \quad (4)$$

where τ represents the quantile and $0 < \tau < 1$, for $i = 1, \ldots, n$. The quantile regression model estimates the coefficients by minimizing the weighted sum of absolute residuals of the estimation, which can be expressed as follows:

$$min \sum_{i=1}^{n} d_\tau(y_i, \hat{y}_i) = \tau \sum_{y_i \geq \beta_0^{(\tau)} + \beta_i^{(\tau)} x_i} |y_i - \beta_0^{(\tau)} - \beta_i^{(\tau)} x_i| + (1-\tau) \sum_{y_i < \beta_0^{(\tau)} + \beta_i^{(\tau)} x_i} |y_i - \beta_0^{(\tau)} - \beta_i^{(\tau)} x_i| \quad (5)$$

The quantile regression is a natural extension of the linear regression model and is particularly useful when the researcher's interest resides in the full understanding of how the response distribution is affected by the predictor variables.

Given the explanatory variables captured in table 3.1, the Quantile Regression model for the study is presented below.

$$PMT_{(\tau)} = \beta_{0(\tau)} + \beta_{1(\tau)} PE + \beta_{2(\tau)} SE + \beta_{3(\tau)} TE + \beta_{4(\tau)} UR + \beta_{5(\tau)} NW + \beta_{6(\tau)} NC + \beta_{7(\tau)} NE + \beta_{8(\tau)} SE + \beta_{9(\tau)} SS + \beta \quad (6)$$

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where:
$PMT_{(\tau)}$ = *the* τ_{th} *quantile of the dependent variable which is the PMT scores*
PE = Primary Education
SE = Secondary Education
TE = Tertiary Education
UR= Urban
SW = South West Zone
NC = North Central Zone
NE = North East Zone
SE = South East Zone
SS= South South Zone
FE= Female
AG= Age
HS = Household Size
$\beta_{0(\tau)}$ = *intercept at the* τ_{th} *quantile*
τ = *represents the quantile level* (0.25, 0.50 *and* 0.75)

The model estimates the conditional quantiles of the dependent variable at specified quantile levels of 0.25, 0.50 and 0.75 as a function of the explanatory variables. The parameters in quantile regression are estimated by minimizing the sum of absolute weighted deviations as captured in equation 2.4. This is achieved using an optimization process where Stata iterates to find the coefficient values that minimize the quantile loss function

RESULTS AND DISCUSSION

Test for Heteroskedasticity

This test ascertains the existence or otherwise of constant variance for the residuals (errors). The result below is significant (Prob> chi2= 0.0000) indicating the presence of heteroskedasticity which further buttresses the justification for using quantile regression model

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: i.Education i.Location i.Geographical Zone i.Employment agehhsize i. Sex

Chi2(16) = 34196.16

Prob > chi2 = 0.00

Quantile Régression Model

In applying the quantile regression model (QR model), the STATA software was utilized to obtain the coefficients of the covariates at 25%, 50%, and 75% quantile. The Ordinary Least Square regression estimates are also obtained for comparative purposes. There are two types of coefficients; those that are significantly different from zero and the quantile coefficient that are significantly different from the OLS coefficient (outside of the OLS confidence interval). The result is captured in Table 2.

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Table 1: Result of Quantile Regression (QR)

PMT Scores Dimensions	Variables	QR at 0.25 (Extremely Poor)	QR at 0.50 (Poor)	QR at 0.75 (Moderately Poor)	OLS
Education	No Education *(reference)*				
	Primary Education	0.06076***	0.065786***	0.062618***	0.058408***
	Secondary Education	0.137118***	0.141344***	0.145362***	0.125893***
	Tertiary Education	0.208861***	0.229807***	0.245589***	0.213177***
Place of Residence	Rural*(reference)*				
	Urban	0.118505***	0.124362***	0.157538***	0.130589***
Geographical Zone	North-West*(reference)*				
	South_West	0.440173***	0.450062***	0.47318***	0.46885***
	North_Central	-0.08489***	-0.08697***	-0.06981***	-0.07589***
	North_East	-0.12167***	-0.11288***	-0.07642***	-0.09465***
	South_East	0.30943***	0.298920***	0.31536***	0.33754***
	South_South	0.55356***	0.550563***	0.58788***	0.59575***
Employment	Unemployed*(reference)*				
	Pensioner	0.002783***	0.002823***	0.011178***	0.01886***
	Waged_Employment	0.130416***	0.171075***	0.189895***	0.17087***
	Self_Employed	0.024709***	0.043698***	0.060472	0.04315***
	Unpaid_family_Worker	0.007106	0.021362***	0.061199***	0.06042***
Household Features	Age	0.002366***	0.001711***	0.00054***	0.001145***
	Household Size	-0.10565***	-0.09951***	-0.09374***	-0.09209***
	Male *(reference)*				
	Female	-0.04151***	-0.04629***	-0.05207***	-0.04686***

Source: Own estimates using Stata 15.1 software

Note: Significance level: *p ≤ 0.05, **p ≤ 0.01 and ***p ≤ 0.001.

Number of Observation: 194,261

Pseudo R2 = 0.5396 (25^{th}), 0.5208(50^{th}), 0.4983 (75^{th})

The result of quantile regression and OLS above in Table 4.3 shows that all the variables are significant at all quantiles (0.25, 0.50, 0.75) and all levels of significance (0.05,0.01,0.1) except for Unpaid Family Worker which is a category under the Employment dimension. The variable is not significant at the 25th quantile but it's significant at the median, 75th quantile, and the OLS at all levels of significance. The OLS's parameters are presented in the last column to compare them with the results of the quantile regression. Interpreting the result, any variable that is positively associated with household PMT scores decreases the poverty of the household, and conversely, any variable that is negatively associated with the household PMT scores increases the poverty of the household.

The level of education of the household head is significant for OLS and at all the studied quantiles and is all positively related to the response variable. Furthermore, the coefficient increases as the education level increases across all the quantiles and the

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OLS estimates. But for household heads with primary education, as the education of the head increases, the PMT scores of the household also increase across quantiles as compared to household heads with no education, it also concord with assertion that any educational level higher than unfinished primary school decreases the poverty of households (Garza-Rodriguez et al, 2021).

The OLS estimates for the education levels are not significantly different from the quantile regression estimate for households that are in the extremely poor category (0.25) but underestimated the coefficients for the poor (0.50) and moderately poor (0.75) households. In decreasing poverty, the households in the extremely poor group (0.06076) whose heads have a primary school education have the least potential as compared to households whose head has no primary Education.

There is a high tendency for households residing in urban areas to improve their standard of living compared to households residing in rural areas. The estimate for the 25th quantile is 0.118505, 0.124362 is for the Median while for the 75th quantile is 0.157538 indicating an upward movement, which align with narrative reflected in numerous in (Faustin et al 2015). There is no substantial difference in the OLS estimate (0.130589) with what is obtainable for the 50th quantile but there is an appreciable difference with the 25th and the 75th quantile as seen in the graphical presentation in Figure 1.

Households from the South-West, South-East and South-South were found to increase the PMT scores as compared to households in the North-West Zone, however households from the North-East and North-Central zone decrease the PMT scores as compared to households from the North-West zone. This is indicating that households from South-West, South-East and South-South have more tendency of moving out of poverty particularly the moderately poor group (0.75) while the North-East and North-Central households are seen to be more prone to poverty when compared to the households in the North-West Zone.

Households from North-East (-0.12167) are seen to most negatively affect the PMT scores at all quantiles. The sign of the OLS coefficients is same as that of the studied quantiles, however there is significant overestimation of the 25th quantile for South-West, North-East and North-Central while there is no connection with the coefficients of South-East and South-South zone as seen in Figure 1. Similar studies by Buba et al (2018) reported that households in all the six geo-political zones, exception of South-South in Nigeria have more tendencies of becoming poor.

The Employment dimension is found to positively affect the PMT scores where all the categories are significant at the three levels for all the studied quantiles with the exception of unpaid family worker that is significant at only two levels that is the 25th quantile (extremely poor). The likelihood to decrease poverty or increase PMT scores increase across quantiles for all employment categories as compared to households with no employment. The household heads in waged employment have the highest tendency of reducing poverty with households in the moderately poor group ahead (0.189895) as compared to the households with no employment.

Conversely, having a pensioner as the household head has the lowest likelihood of decreasing poverty with households in the extremely poor group mostly affected (0.002783). Figure 1 revealed that households head in Waged Employment and Unpaid family worker category have their 25th quantile coefficients underestimated by the OLS method while the self-employed have both 25th `and 75th quantile overestimated and underestimated respectively. There is no interaction between the estimates of the studied quantiles and

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OLS estimate for household heads in the pensioner category.

There is a positive relationship between age of the household head and PMT scores, however the likelihood of age reducing poverty is decreasing across the studied quantiles. The higher the PMT scores the less the impact of age. The age of the household has the least impact for moderately poor group (0.00054) and highest impact for households in the extremely poor group (0.002366). The result of the OLS is significant all levels and closely reflects the estimates of the 50th quantile (0.001711), however, it is seen that it underestimates the 25th quantile (0.002366) as displayed in the graphical representation.

Another household feature analysed is household size. The size of the household is negatively associated with PMT scores for all the studied quantiles, as the size of the household increases there is a higher likelihood of the household becoming poorer. The category of the poor that is greatly affected by increased household size is the moderately poor (75th quantile) with an estimate of -0.09374, The OLS overestimated all the studied quantiles where the 25th quantile is the most affected

The likelihood of the household getting poorer when the household is headed by a female is higher compared to when it is a male. This is due to the negative association between the female-headed household and the PMT scores. This tendency diminishes across the quantile's indicative that the extremely poor group (-0.04151) has the highest tendency of plunging further into poverty simply because the head of the household is a female compared to male-headed households. The direction of this relationship is in agreement with the OLS estimate (-0.04686) particularly when compared to the poor group (-0.04629). The estimates of the 25th and 75th quantile (-0.05207) was however underestimated and overestimated respectively.

Figure 1 visually displays the results of the estimated quantile regressions for each variable. The black line represents the coefficient values for each quantile regression, while the gray shaded area denotes the 95% confidence interval. On the other hand, the OLS estimate is represented by the thick line in between the two dotted black lines which serves as the 95% confidence interval for the method.

CONCLUSION

The quantile regression model was used to examine the correlates of poverty atdifferent points of the PMT Scores which depicts the welfare level of households. With the results obtained, it can be observedthat the OLS method cannot explain adequately the situation of households in the three levels of poverty; extremely poor, poor , moderately poor. Also, the level of education of the household head is significant for OLS and at all the studied quantiles and is all positively related to the response variable. Furthermore, the coefficient increases as the education level increases across all the quantiles and the OLS estimates. The research indicate that primary education is not sufficient to sustain poverty reduction across the quantiles hence the need to expand adult education programs to complement primary education, which alone is ineffective particularly for the extremely poor households (25th quantile). Additionally, regional disparities in poverty incident where households in the South-West, South-East, and South-South zones have a higher likelihood of escaping poverty compared to those in the North, with the North-East being the most vulnerable. It is on this premise; it is suggested that government should step up the implementation of agricultural subsidies and security stabilization programs to address extreme deprivation in North-East/North-Central Zones while in the southern zones entrepreneurship grants to consolidate poverty reduction gains should be strengthened. Nigeria's anti-poverty

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strategies need to be tailored to specific needs. By designing interventions that address the unique dynamics of different population segments, policymakers can allocate resources more effectively and promote inclusive development. Future research should use panel quantile regression to analyse how poverty triggers change over time and explore vulnerabilities, such as those faced by female-headed households in rural North-East Nigeria.

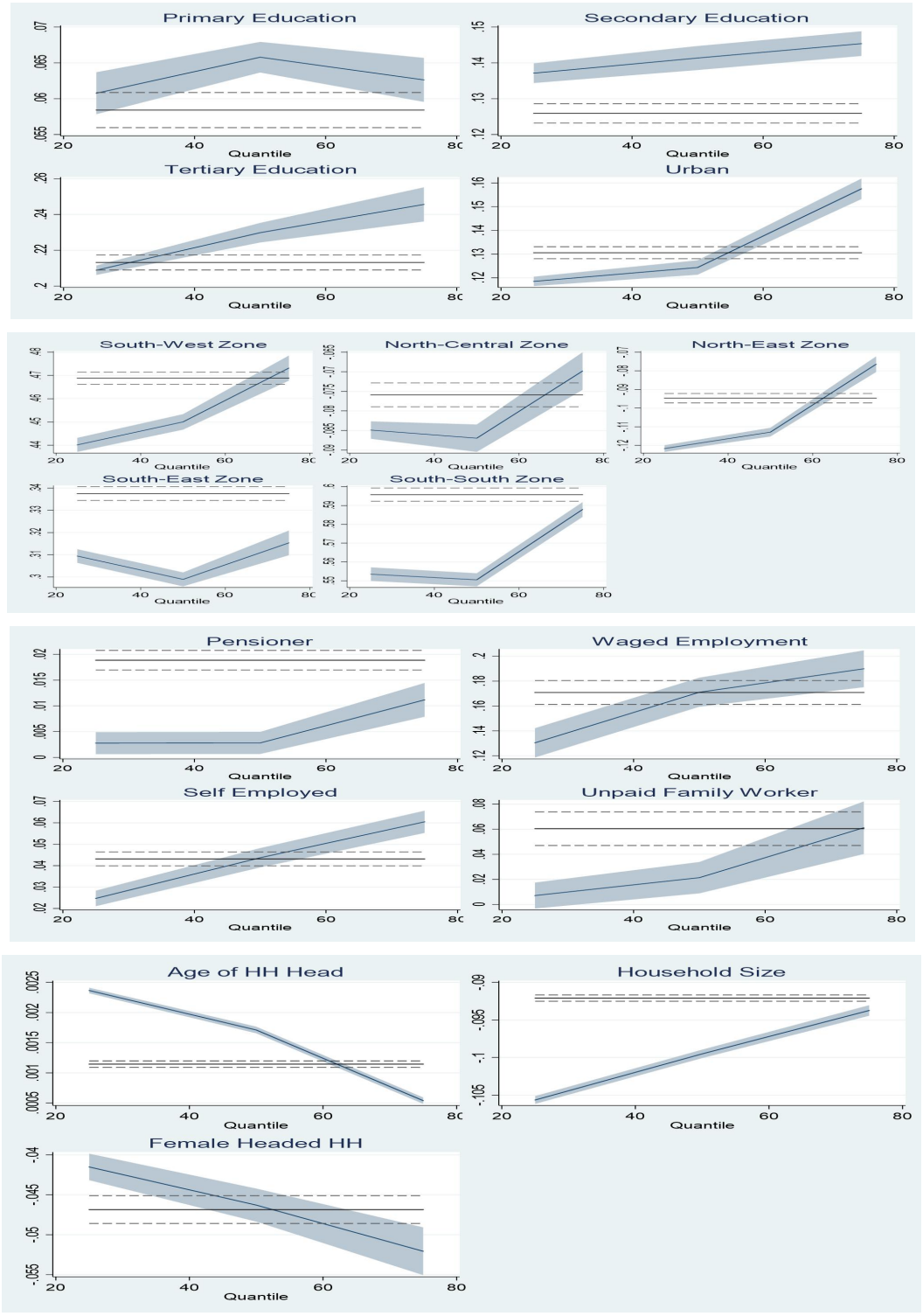

Figure 1: Graphical Presentation of Quantile Regression and OLS Estimates.

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REFERENCES

Alabi, O., Lawal, S., & Sanni, A. E. (2023). Application of quantile regression to the role of economic and social services on citizen's standard of living in Nigeria. *Asian Research Journal of Arts & Social Sciences, 20*(4), 12–23. https://doi.org/10.9734/arjass/2023/v20i4453.

Buba A., Musa A., Idi A., & Adamu J. (2018). Socio-Demographic Determinants of Poverty in Nigeria and its Gender Differentials. European Scientific Journal May 2018 edition Vol.14, No.14 ISSN: 1857 – 7881 (Print) e - ISSN 1857-7431. Doi: 10.19044/esj.2018.v14n14p236 URL:http://dx.doi.org/10.19044/esj.2018.v14n14p236

Garza-Rodríguez, J. (2015). The Determinants of Poverty in Mexico: 2002 MPRA paper 65995. München: University Library of Munich.

Jorge Garza-Rodriguez, J., Ayala-Diaz G A., Coronado-Saucedo G G., Garza-Garza E G & Ovando-Martinez O, (2021). Determinants of Poverty in Mexico: A Quantile Regression Analysis

Koenker, R., & Bassett, G. (1978). Regression quantiles. *Econometrica, 46*(1), 33-50. https://doi.org/10.2307/1913643

Maricruz .L., Manuel . P., & Isabel. N (2018).Does Microfinance Reduce Poverty Among The Poorest? A Macro Quantile Regression Approach. The Developing Economies 56, no. 1 (March 2018): 51–65

National Bureau of Statistics, Multidimensional Poverty Index (2022) https://nigerianstat.gov.ng/elibrary/read/1241254

National Bureau of Statistics. (2012). *Nigeria poverty profile 2010: Report of the National Bureau of Statistics*. Abuja, Nigeria: National Bureau of Statistics.

National Bureau of Statistics. (2020). *Poverty and inequality in Nigeria: Executive summary report*. Abuja, Nigeria: National Bureau of Statistics.

Qi Huang Q., Zhang H.,Chen J & He. M (2017) Quantile Regression Models and Their Applications: A Review. Journal of Biometrics & Biostatistics. DOI: 10.4172/2155-6180.1000354

Olasupo, O. F., & Efuwape, B. M. (2024). Macroeconomic variables and poverty reduction in Nigeria: A quantile regression approach. *Economic Change and Restructuring, 57*(2), 123–145. https://doi.org/10.1007/s10644-023-09456-1

Waltl, S. R. (2019). Inspecting the poverty-trap mechanism: A quantile regression approach. Review of Income and Wealth, 65(2), 293-318. https://doi.org/10.2202/1558-3708.1665

Wieser, C., Ambler, K., & de Hoop, J. (2024). How poverty is measured impacts who gets classified as impoverished. *Proceedings of the National Academy of Sciences, 121*(6), e2316730121. https://doi.org/10.1073/pnas.2316730121

World Bank. (2022). *A better future for all Nigerians: Nigeria poverty assessment 2022*. Washington, DC: World Bank Group.

World Bank. (1990). World Development Report 1990: Poverty. Oxford University Press.p. 26.