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Essays on Income Inequality, Financial Inclusion, and Economic Growth: Evidence from Nigeria

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Dedication

My pursuit of academic aspirations came with sacrifices, which my family gladly embraced. Driven by our shared commitment to contribute to the quest for answers to fundamental questions and to collaborate with individuals and groups to facilitate growth. We can and we will! On this note, I dedicate this research to my beloved wife, Corina, and our children, Lisa, David, and Lucy. Their love and support have been priceless in enabling me to undertake this endeavour.

I also wish to convey my sincere gratitude to my parents for their unwavering support and love. They have imparted the values of diligence and selflessness to me. Their altruistic deeds undoubtedly contribute to making the world a better place.

In honour of a brilliant mind whose legacy endures and will continue to resonate for generations. The late Idowu Amore, a multifaceted talent who excelled as an author, actor, and poet. Through his professional network, provided me with the academic reference necessary to secure admission to the polytechnic in 2002. His kind gestures leave me eternally grateful. Although he departed from this world, his memory endures.

Finally, this research is also dedicated to unrecognised champions who strive to make the world a better place. It honours those individuals and organisations that are altruistically serving, participating in community and countrywide development projects, going the extra mile to aid those in distress, lending a hand to strangers in challenging situations, and protecting the interests of upcoming generations. These unsung heroes may not receive national or international recognition; yet their compassionate deeds leave a lasting impact on the lives they touch.

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Publication and Conferences

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Declarations

Chapter 1 was modified from the original term paper submitted by the author to the University of Hull in April 2020. Modifications were made to the empirical analysis and results, while the introduction and literature review were largely preserved.

Chapter 3 is an adapted version of the original term paper submitted by the author to the University of Hull in 2021. Extensive modifications have been applied to the entire document. In addition, the study incorporates the data and the empirical analysis section from Chapter 3.

Abstract

Studies on the relationship between income inequality and economic growth, especially in low-income nations like Nigeria, have garnered significant interest. Some scholars argue that income inequality stimulate economic growth, while others contend it exacerbates poverty. This study explores the empirical relationship between income inequality and economic growth in Nigeria, investigating whether an inverted U-shaped connection, as suggested by the Kuznets hypothesis, exists. Using an Autoregressive Distributed Lag (ARDL) model, the results show an inverted U-shaped relationship in the short run. Therefore, it is strongly recommended that Nigeria implement relative pro-poor policies, such as improving economic opportunities for the poor, targeting subsidies more effectively, and continuing to promote financial inclusion strategies.

This study examines the economic conditions of households in terrorism-affected areas. It employs inequality measures such as the Gini coefficient and Lorenz curve and tests hypotheses using analysis of variance. The study also evaluates the poverty headcount, poverty gap, and poverty severity. Findings indicate that income inequality in Northeast and Northwest Nigeria is lower than the national average, as shown by the Gini coefficient and Lorenz curve. Although the Gini coefficient (0.27) in these regions suggests a relatively equal society, the poverty headcount ratio is 73%, much higher than the national average of 33% in 2021. Therefore, it is recommended that Nigeria implement effective redistribution policies to reduce poverty, address gender income inequality, promote equitable educational policies, and tackle the challenges of terrorism in the northern region.

The present study aims to evaluate the economic effect of Covid-19 on income inequality in northeast and northwest Nigeria. This study uses 2021 dataset from the Food and Agricultural Organization (FAO) and inequality measures, such as the Gini coefficient and Lorenz curve. The study finds that although income inequality grew among individuals who adhered to Covid-19 restrictions, among those whose household heads became unwell or passed away, and among those who suffered other forms of economic shocks, the rise appears to be marginal. This highlights the necessity for tailored interventions and policy measures to mitigate the impact of the pandemic on income inequality and the Nigerian economy as a whole, given that those who faced other forms of economic shocks were more affected than others.

This research examines the effects of financial inclusion on income inequality among 999 Nigerians surveyed in 2021. Using an ordered logistic regression model and inequality measures such as the Gini coefficient and Lorenz curve. Results show that having a financial institution account or a mobile money account positively influences income equality. Those with such accounts typically experience lower income inequality than those without. The Gini coefficient and Lorenz curve analysis indicate that financial inclusion promotes greater income equality. Thus, it is recommended that the government maintain policies promoting financial inclusion among the general population.

This study aims to thoroughly examine Nigerian perceptions of institutional quality and inequality across all regions. Using descriptive statistics and Pearson's chi^2 test, the study reveals regional differences in perceptions. Results show widespread dissatisfaction with government handling of corruption and a prevalent fear of retaliation for reporting it. Despite this, most Nigerians still support democracy. Additionally, there is significant dissatisfaction with the government's handling of income inequality, with many experiencing cash shortages. Furthermore, many believe the government has not done enough to improve living standards nationwide. Therefore, it is strongly recommended that Nigerian leaders adhere to democratic principles and take necessary measures to address these issues.

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List of Abbreviations

ARDL	Autoregressive Distributed Lag
ADF	Augmented Dickey Fuller
CPIB	Corrupt Practices Investigation Bureau
DRG	Development Research Group
DW	Durbin Watson
EFCC	Economic and Financial Crime Commission
FAO	Food and Agricultural Organization
FGT	Foster-Greer-Thorbecke Poverty
FMOLS	Fully Modified Ordinary Least Squares
GDPC	Gross Domestic Product per capita
GFD	Global Findex Database
GMM	Generalised Method of Moments
IFI	Index of Financial Inclusion
MENA	Middle East and North Africa
MIF	Multidimensional Inequality Framework
NBS	National Bureau of Statistics
OECD	Organisation for Economic Co-operation and Development
OLM	Ordered Logistic Model
OLS	Ordinary Least Squares
PP	Phillips-Perron
Resp	Respondents
SARS	Severe Acute Respiratory Syndrome
SDG	Sustainable Development Goals

WB   World Bank

WDI   World Development Indicator

Chapter 1 Introduction

"The test of our progress is not whether we add more to the abundance of those who have much; it is whether we provide enough for those who have too little"
Franklin Roosevelt[1]

Rising inequality is not a predetermined or unavoidable state of affairs. It is a result of various factors, including policies, laws, institutions, cultural and social norms, governance deficiencies, and the unequal distribution of wealth and power. Inequality can lead to societies becoming polarised, making it difficult to find common ground and posing a significant challenge to the peace, security, and social contracts of nations. In extreme cases, inequality can become an existential threat (Dieye, 2019). Furthermore, the issue of income inequality is not only of interest to academic researchers but has also been acknowledged by global leaders as a pressing concern that requires immediate attention. Additionally, the global community has recognised that a fairer distribution of income contributes to greater economic stability, sustained economic growth, and more resilient societies characterised by stronger cohesion and trust (Atkinson, 2013).

This thesis consists of five essays that focus on income inequality. Furthermore, the study aims to illuminate the problem of inequality in Nigeria, contribute to the existing body of knowledge on the subject, and provide valuable policy recommendations. In addition, this study is guided by the desire to improve the current state of affairs in the country and provide insights that can inform future policy decisions.

The subsequent sections include 1.1, research questions, 1.2, a brief profile of Nigeria, 1.3, presenting a chapter-by-chapter summary and 1.4 highlighting contributions to academic literature.

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[1] FDR, (1937) Franklin D. Roosevelt Presidential Library and Museum.

1.1 Research Question

To what extent is income inequality a pressing issue in Nigeria, and how effective are the proposed measures in addressing this issue?

1.1.1 Sub-Research Questions

Chapter 1

How does income inequality influence the rate of economic growth?

Does Kuznets' (1955) hypothesis apply to Nigeria?

Chapter 2

How does the level of income inequality in northeast and northwest Nigeria compare with the overall income inequality in the country?

What impact does terrorism have on income inequality of both victims and non-victims?

What insights does the poverty headcount ratio provide for households in northeast and northwest Nigeria, relative to the overall poverty headcount ratio in the country?

Chapter 3

To what extent did Covid-19 exacerbate income inequality in Nigeria?

Chapter 4

To what extent does financial inclusion mitigate or intensify income inequality in Nigeria?

Chapter 5

To what extent does the perception of institutional quality and inequality vary across different regions of Nigeria?

Research was undertaken to seek answers to the questions posed above.

1.2 Brief Profile of Nigeria

Nigeria, located in West Africa, is the most populous country in Africa and ranks seventh globally in the list of countries by population. In 2022, the estimated population of Nigeria was approximately 219 million individuals. Demographic projections suggest that the population will continue to grow at a steady pace in coming decades. According to projections, by the year 2050, the population is expected to surpass 377 million (Sasu, 2023; Yeboua et al., 2022).

Nigeria operates a three-tier federal system of government comprising the federal government, 36 states, the Federal Capital Territory in Abuja, and 774 local government areas. Additionally, the country is divided into six geopolitical zones for administrative and political purposes (Hassan, 2014). Nigeria has a tumultuous political history. Generally, the nation seems to have overcome its previous difficulties, as there has been a smooth change in the government since it returned to democracy in 1999. Following its independence in 1960, no civilian government had successfully transferred power to other civilian governments until 2003. Nonetheless, the Nigerian population hoped for political benefits in the form of human development, improved governance, and economic prosperity. Unfortunately, this expected political benefit has not come to fruition (Lewis, 2003; Oche & Attah, 2024).

Although recent years have witnessed some socioeconomic progress in Nigeria, the country still faces significant social, economic, and security challenges. Notably, Nigeria has one of the highest populations living in extreme poverty globally, with over 80 million individuals surviving on less than US$1.90 per day, which is the international benchmark for extreme poverty (Yeboua et al., 2022). Nigeria faces a range of challenges as it looks towards the year 2050, including slow and unstable economic growth, high population growth, widespread insecurity, and a lack of economic diversification and transformation. Additionally, the following issues also pose challenges: lack of a favourable business environment, limited external competitiveness, de-industrialisation, inadequate infrastructure, governance difficulties, impacts of climate change, scarcity of financial resources, and high levels of poverty, unemployment, and inequality (Yeboua et al., 2022; National Planning, 2023).

1.3 Summary of Findings by Chapters

The first paper "Exploring the Relationship between Inequality and Economic Growth", (joint with Keshab Bhattarai) attempts to explore the relationship between Inequality and Economic Growth. This study investigates the relationship between income inequality and economic growth in Nigeria using an Autoregressive Distributed Lag (ARDL) model. The relationship between economic growth and inequality has been a topic of interest since Kuznets' seminal work in 1955. As Kuznets (1955) shows, the relationship between income inequality and economic growth is characterised by an inverted U-shaped pattern. Initially, income inequality increased during the early phases of economic growth. However, as the economy continued to expand, it began to decrease. Nevertheless, previous research has yielded mixed results on the relationship between income inequality and economic growth (Awe & Rufus, 2012; Adinde & Stephannie, 2017; Royuela et al. 2019; Igwegbe & Amaka, 2021). The central inquiry we pose is whether Kuznets' hypothesis applies to Nigeria.

Two equations were adapted from the work of Kim et al. (2011) to assess the linear and non-linear connections between economic growth and income inequality in the context of Nigeria. The primary estimation technique utilised for this analysis is the Autoregressive Distributed Lag (ARDL) error-correction model, which is a widely used technique that investigates both short- and long-term relationships. Its popularity has increased in empirical research owing to its ability to determine co-integration relationships in small sample sizes while avoiding the endogeneity issue. In addition, the method can be used for regressors of order one [I(1)], order zero [I(0)], or a combination of both. The ARDL approach also provides unbiased and efficient estimators of the model (Pesaran et al., 2001; Nayaran, 2004).

The first step in the ARDL cointegration model involves performing a hypothesis test for the cointegration bounds established by Pesaran et al. (2001). The test uses the upper and lower critical bounds to determine whether cointegration exists among variables. The lower bound examines whether all variables are stationary at a level, while the upper bound evaluates whether they are stationary at the first difference. The ARDL method employs a maximum of two lags to estimate the parameters of the equations, thereby preventing a reduction in degrees of freedom. The F-statistics from the Pesaran Shin Smith (2001) ARDL cointegration bounds test for the linear equation is higher than the upper bound at the 5%

significance level, this suggests cointegration among the variables. However, quadratic and cubic equations do not exhibit cointegration. Therefore, the ARDL model is utilised to estimate short-run effects with the short- and long-run equations derived from the linear equation.

The study finds an inverted U-shaped relationship between the two variables in the short run and that inflation and real exchange rates have a negative correlation with income inequality in the long run. Political stability has a positive long-term correlation with income inequality, while in the short term it seems to improve income inequality in Nigeria. The research also reveals that real exchange rates exacerbate income inequality in the short term. Furthermore, the findings suggest that the S-curve hypothesis put forth by List and Gallet (1999) does not hold true for Nigeria. This hypothesis is generally acknowledged to be an extension of Kuznets' theory. In conclusion, this study presents a significant contribution, demonstrating that the Kuznets hypothesis is valid in the context of Nigeria, contrary to the existing literature on the subject. This study's main findings shed light on the relationship between economic growth and income inequality in Nigeria.

In the second paper titled 'Income Inequality, Terrorism, and Poverty: The Economic Perspective of the Terrorised' (joint with Keshab Bhattarai), we investigated the economic situation of households living in areas affected by terrorism using inequality measures, such as the Gini coefficient and Lorenz curve. Furthermore, the study used poverty measures and analysis of variance. The economic consequences of terrorism have been widely studied, revealing its significant costs. However, there is limited research on the microeconomic level, particularly in regions where insurgency is prevalent. This study focuses on the impact of terrorist activities on the economic stability of households in northeast and northwest Nigeria, where sustained violence has had a significant impact on income and expenditure.

Although research indicates that poverty and inequality are the primary causes of terrorism in some countries, they cannot be extended to Northern Nigeria. In this region, terrorism is primarily driven by Islamic insurgency rather than economic factors. Terrorism poses a significant problem in Africa, leading to substantial loss of life, property, and damage to African economies (Iheonu & Ichoku, 2021). The reviewed literature failed to provide insight into the economic circumstances of individuals or households residing in regions where

terrorism is prevalent. The research questions to be assessed are as follows: How does the level of income inequality in northeast and northwest Nigeria compare with overall income inequality in the country? To what extent do disparities in income exist between men and women, and how does income inequality differ based on the level of educational attainment? What impact does terrorism have on income inequality of both victims and non-victims? What insights does the poverty headcount ratio provide for households in northeast and northwest Nigeria relative to the overall poverty headcount ratio in the country?

Various theories have been proposed to explain different types of inequalities, one of which is the Multidimensional Inequality Framework (MIF). Prominent sociologist Goran Therborn delved deeply into the concept of multidimensionality from a theoretical perspective and argued that social inequalities are imbalances that are perceived as unjust. According to Therborn, inequality, which refers to the absence of equality, constitutes a breach of equality and is perceived as unjust (Carmo, 2021). The MIF serves as a systematic and theoretically grounded tool for quantifying and examining inequalities while also identifying causes and potential remedies. Although there is variation in the understanding of income inequality trends, studies indicate that different measures can be used to paint a particular picture in certain countries over specific time periods, or globally. Despite these variations, individuals express discontent with and disapproval of inequality in all forms. It is increasingly being recognised that inequality and poverty are more comprehensively understood as multidimensional phenomena (McKnight et al., 2017).

To consistently evaluate growth and inequality, we utilised the year 2021 household survey data from Food and Agriculture Organization of the United Nations (FAO). The FAO conducted a household survey in Nigeria, covering five states: Yobe, Borno, and Adamawa in the northeast and Zamfara and Katsina in the northwest (FAO, 2022). To understand the extent of inequality between the two groups, we computed estimates for the entire population in the dataset, as well as for households that had experienced violence and those that had not. Furthermore, we used measures of inequality, such as the Gini coefficient, Lorenz curve, and the poverty headcount ratio. In addition, we used one-way analysis of variance to test hypotheses.

The findings indicate that income inequality in the northeast and northwest regions of Nigeria is lower than the national average. However, the poverty headcount ratio is notably higher. It is recommended that Nigeria should prioritise effective redistribution policies to reduce poverty, address gender income inequality, implement educational policies that promote equity, and resolve the challenges posed by terrorism in the northeast region. This study makes three principal contributions to the literature: First, it investigates income inequality in five northern states where terrorism is common. Secondly, it explores the disparity in income between individuals who have experienced violence and those who have not. Lastly, it demonstrates that low-income inequality does not provide a comprehensive understanding of existing inequalities in society, although it serves as a suitable starting point.

In the third paper titled "Economic Effect of Covid-19 on Income Inequality" I seek to evaluate the economic effect of Covid-19 on income inequality in northeast and northwest Nigeria. In December 2019, severe respiratory illness was detected in Wuhan, China. This disease swiftly disseminated from China to other regions around the world. Soon after, scientists established that the disease was caused by a new coronavirus (Yuki et al., 2020). The coronavirus has had a profound impact on various aspects of life, resulting in the death of more than 7 million individuals and the sickening of over 675 million others (Worldometer, 2024). Furthermore, its effects are being felt in the global economy. It is widely believed that the Covid-19 pandemic exacerbated global income inequality, as poorer countries experienced a more significant decline in per capita income than richer nations. This concern stemmed from the economic consequences of the pandemic, which had a disproportionately negative impact on individuals with lower levels of education and income, exacerbating disparities within and between nations (Deaton, 2021).

Usman et al. (2024) suggests that Covid-19's economic impact in Nigeria outweighed its health impact. The pandemic led to severe economic disruptions, including fiscal deficits, negative economic indicators, and health and economic challenges (Usman et al., 2024). The lockdown measures implemented in Nigeria to curb the spread of the virus faced challenges such as government distrust, service failures, and multidimensional poverty, as suggested by Ezechi et al. (2024). The extent to which Covid-19 has influenced income inequality has not been widely investigated. Furthermore, despite the significance of this topic, there is a dearth of literature exploring the effects of the pandemic on income inequality in low-income

countries. Therefore, this study aims to contribute to the existing body of knowledge by analysing the economic impact of the pandemic on income inequality.

This research explores the multidimensional theory of inequalities, briefly introduced in the second chapter of this study. Specifically, this investigation assesses the impact of Covid-19 measures on income inequality in northeast and northwest Nigeria by utilising both the Gini coefficient and the Lorenz curve. The study finds that although income inequality grew among individuals who adhered to Covid-19 restrictions, among those who suffered other forms of economic shocks, and among those whose household heads became unwell or passed away, the rise appears to be marginal. This study enhances the existing body of knowledge on the economic consequences of Covid-19 on income inequality by utilising micro-level data from a low-income country and examining its impact at the household level. Therefore, the findings of this study provide valuable insights into the impact of the pandemic on household income in this context. Furthermore, this research highlights the need for tailored interventions and policy measures to mitigate the impact of the pandemic on income inequality and the Nigerian economy as a whole.

In the fourth paper titled "Effect of Financial Inclusion on Income Inequality ", I investigated the effect of financial inclusion on income inequality using an ordinal logistic model and inequality measures such as the Gini coefficient and Lorenz curve. Several proposals have been made to address income inequality. For instance, some strategies have been suggested, including redistribution measures (Bhattarai, 2010), imposing taxes on higher-income brackets (Joumard et al., 2013), and implementing market regulations (Murinde, 2012).

Recently, financial inclusion has been considered as a means of tackling income inequality. Financial inclusion is important, because providing access to financial services for the underprivileged is widely regarded as a powerful means of combating poverty and reducing income inequality (Park & Mercado, 2015). This elevated interest underscores a heightened awareness of the significance of financial inclusion in economic and social progress. It demonstrates an increasing understanding that access to financial services is critical in alleviating extreme poverty, fostering shared prosperity, and promoting inclusive and sustainable development (World Bank, 2013). Despite the importance of financial

inclusion, Nigeria still struggles to improve its financial inclusion rate. In 2020, according to the National Bureau of Statistics (NBS, 2022), only approximately 45% of adults had access to a bank account.

Based on the reviewed literature, the current empirical evidence regarding the connection between financial inclusion and income inequality remains ambiguous. The majority of the studies examined employed either macro-level data or cross-country micro-level data, which included data from Nigeria. The central query in this study pertains to the extent to which financial inclusion serves to mitigate or intensify income disparities in Nigeria.

The results indicate that possessing a financial institution account and mobile money account has a positive effect on income levels and reduces income inequality. The study also found that income inequality exists based on educational attainment, gender, and location of residence. This study recommends policies that promote financial inclusion to address income inequality. Furthermore, this study adds to the literature by showing the positive effect of financial inclusion on income inequality at the micro level.

The final paper, titled "Institutional Quality and Inequality: A Regional Perspective," examines the views of the Nigerian population regarding institutional quality and inequality across the country using descriptive statistics and the Pearson's chi^2 test. Several scholars argue that the quality of institutions in emerging economies significantly influences their growth and development (La Porta et al., 1999; Haq et al., 2006; Alexiou et al., 2014; Iheonu et al., 2017). Additionally, countries with robust institutional frameworks, characterised by high capacity and integrity, are more likely to develop and implement effective policies and programs that can overcome the persistent challenges of widespread poverty, significant inequality, and high unemployment, which affect many developing economies globally (Olanrewaju et al., 2019).

The existing body of literature has explored the connection between institutions and inequality by providing an overview or conducting an analysis using panel data. This study aims to make a contributes to the literature by providing a regional perspective using microdata from a single country. Specifically, it seeks to fill a gap in the current literature by thoroughly examining perceptions of institutional quality and inequality in various regions of

Nigeria. The research question to be investigated is: To what extent does the perception of institutional and inequality quality vary across different regions of Nigeria?

The evaluation commences with descriptive statistics, presenting the data as percentages for categorical variables and averages for the age variable. Furthermore, Pearson's chi^2 test was used to investigate regional disparities. A descriptive survey is typically conducted to study contemporary phenomena, such as practices, beliefs, processes, or trends. Furthermore, descriptive research focuses on collecting and analysing information on current circumstances. This type of research involves more than just data collection and organisation; it also entails a thorough analysis, interpretation, comparison, identification of trends, and examination of relationships (Salaria, 2012).

The study finds that institutional quality, as measured by levels of corruption and preference for democracy, varies across regions, while the freedom to report corruption appears to be the same across regions. This perception is consistent with the news and existing research at the national level. Across regions, citizens are dissatisfied with the government's handling of corruption and fear retaliation from reporting it. Additionally, most Nigerians prefer a democratic form of government. When it comes to inequality, the government's management of income inequality, poverty, and standard of living in various regions was measured. The results indicate that many are unhappy with the government's handling of income inequality, a significant portion of the population has experienced a lack of cash at some point, and a substantial majority, excluding the northwest, believe that the government has not done enough to improve their standard of living. The primary contribution of this study is revealing the regional perspective of these vital issues.

1.4 Contribution

In summary, this thesis comprises five essays that focus on income inequality and makes six noteworthy contributions to academic literature. First, it scrutinises the extent of income inequality in Nigeria, providing perspectives on this pressing concern. This study further reveals that the Kuznets inverted U-curve is applicable to Nigeria. Second, a low-income inequality score (the Gini Coefficient) does not necessarily guarantee a high standard of living. Third, it examines the economic burden of terrorism on residents by analysing income inequality and poverty rates and finds that income inequality, as measured by the Gini coefficient, is low, but the poverty rate is high. Fourth, the impact of Covid-19 on income inequality is minimal. Fifth, this study indicates that financial inclusion can reduce income inequality. Finally, a substantial proportion of Nigerians, irrespective of their regional affiliations, are dissatisfied with the government's handling of corruption and inequality. However, a substantial segment of the population expresses preference for democracy as the most suitable form of governance. These contributions are based on detailed empirical analyses of time series data and household survey data of Nigeria.

Chapter 2 Exploring the Relationship Between Inequality and Economic Growth[2]

Abstract

Studies on the relationship between income inequality and economic growth, especially in low-income nations like Nigeria, have garnered significant interest. Some scholars argue that income inequality stimulate economic growth, while others contend it exacerbates poverty. This study explores the empirical relationship between income inequality and economic growth in Nigeria, investigating whether an inverted U-shaped connection, as suggested by the Kuznets hypothesis, exists. Using an Autoregressive Distributed Lag (ARDL) model, the results show an inverted U-shaped relationship in the short run. Therefore, it is strongly recommended that Nigeria implement relative pro-poor policies, such as improving economic opportunities for the poor, targeting subsidies more effectively, and continuing to promote financial inclusion strategies.

Keywords: Inequality, economic growth, gini coefficient, Kuznets curve

2.1   Introduction

Bridging the gap between rich and poor has been a major concern in Nigeria and the world. For the past five decades, the gap between the rich and the poor has widened, and global

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GDP per capita has continued to grow (WID, 2017). Inequality often reflects poverty in rural and urban areas. The concept of inequality refers to inequitable circumstances which manifest in terms of unequal distribution of resources within a society. In economic terms, inequality is an outcome of a skewed distribution of income. If inequality exists in a country, a group often referred to as capitalist gets a bigger share of the total income, while other groups of society get less share (Nurudeen & Ibrahim, 2014).

While factors such as unequal access to education, disparity between urban and rural areas, and corruption by public officials are alleged to fuel within-inequality in a country, some other factors such as capital mobility between countries also cause inequality, as investors and firms would move their investment to other countries where they can access cheap labour to reduce production costs (Nurudeen & Ibrahim, 2014). Some of the consequences of income inequality are reflected in how the poor are tempted to engage in crime and other disruptive activities (Alesina & Perotti, 1994). Higher inequality tends to reduce economic productivity. Countries practising democracy or even dictatorships will maintain income-equalising transfers if they decrease the chances of political instability or civil unrest (Barro, 2000).

Evaluating the relationship between income inequality and economic growth is a challenging and highly debated topic in the literature. While theoretically the effect can be either positive or negative, some argue that increased income inequality, resulting from substantial rewards for risky entrepreneurship and innovation, can stimulate economic growth. However, others suggest that higher inequality may hinder growth if low-income households experience reduced productivity, owing to slower human capital accumulation and greater financial exclusion (Berg et al., 2012; Piketty & Goldhammer, 2014). Furthermore, there is currently a lack of agreement among empirical studies on the impact of income inequality on economic growth and sustainability. While some studies have demonstrated a strong and detrimental association between these two variables, others have failed to find a statistically significant relationship. (Berg et al., 2012; Cingano, 2014).

In the global arena, various studies have yielded contrasting results on the correlation between economic growth and income inequality. While some studies have demonstrated a positive association, others have indicated a different relationship (Barro, 2000; Forbes, 2000).

As it relates to Nigeria, the extant literature attempts to triangulate the relationship between income inequality and economic growth by including another measure: the poverty rate (Aigbokhan, 2000; Nurudeen & Ibrahim, 2014; Kolawole et al., 2015). A rise or reduction in income inequality and economic growth can lead to a rise or reduction in poverty (Goudie & Ladd, 1999).

However, this study examines the relationship between income inequality and economic growth in Nigeria between 1992 and 2022. Understanding the interaction between economic growth and income inequality will equip Nigerian policymakers with the knowledge and necessary policy tools to address Nigerian challenges. Nigeria faces issues such as high poverty, frequent labour union agitations, poor standards of living, and social and political disturbances. (Nurudeen & Ibrahim, 2014). Other significant challenges that merit attention include inflation, high exchange rates, and security issues, all of which are pressing and critical concerns. With inflation alarmingly high, surpassing two-decade records, and Nigerian currency losing considerable value, coupled with the prevalence of security issues (World Bank, 2023), the situation is dire and requires attention.

It is in light of a sense of high-income inequality Nigerians face and coupled with the fact that the country has experienced some economic growth in recent years, which makes it appealing to examine the relationship between economic growth and income inequality. The Study examines theories pertinent to inequality and economic growth, tests Kuznet's (1955) inverted U-curve theory and adopts the Autoregressive Distributed Lag (ARDL) error-correction model to analyse and answer the research questions. This research is structured into seven distinct sections. The first section, denoted as Section 2.1, serves as an introduction, followed by a literature review in Section 2.2. The data sources and description are outlined in section 2.3, and the empirical approach is presented in section 2.4. The empirical results and discussion are detailed in Section 2.5, policy recommendations in Section 2.6, and conclusions in Section 2.7.

2.2 Literature Review

The relationship between income inequality and economic growth has been widely studied; however, there is no clear agreement on its impact. Some research suggests that it is difficult to determine whether income inequality has a significant effect on growth, whether it has a positive or negative impact, or if it has any impact (Klasen et al., 2016), while other economists argue that inequality has adverse effects on economic growth (Aghion et al., 1999; Stigliz, 2012).

The extant literature analyses the effects of income inequality on macroeconomic performance, as shown by economic growth rates. This relationship between economic growth and inequality has been a subject of interest since the seminal work of Kuznets (1955), which established a foundation for examining the connection between income inequality and economic growth. Kuznets argued that there is a trade-off between economic growth and inequality, particularly during the early stages of modernisation. He posits that during the transition from an agricultural, subsistence-based economy to a modernised, growth-oriented economy, income inequality increases but eventually stabilises before declining again. Kuznet's (1955) study on the relationship between income inequality and economic growth described it as an inverted U-shape, where income inequality increases during the early stage of economic growth and then decreases as the economy continues to expand.

As an extension of Kuznets' theory, List and Gallet (1999) demonstrated a significant correlation between income inequality and per capita income. In their seminal work, "The Kuznets curve: What happens after the inverted U?", they find that for lower- to middle-income countries, the Kuznets curve takes an inverted-U shape. Although the relationship between income inequality and per capita income again becomes positive for higher-income countries. This phenomenon is commonly referred to as the S-curve. This finding implies that income equality continues to be a crucial objective for policymakers (List & Gallet, 1999).

To date, many theories have been proposed to analyse this macroeconomic relationship. One of these is Keynes' General Theory. It is a popular belief among many scholars influenced by Keynes's General Theory that saving rates rise with the level of income. If this is true, it implies that the redistribution of resources from rich to poor tends to reduce the aggregate savings rate in an economy. Therefore, an increase in inequality tends to

increase the investment level in an economy. The result is that greater inequality enhances economic growth. This is sometimes perceived as a complementary reason for the positive effect of inequality on economic growth (Barro, 2000).

According to political economy theory, if the average income in an economy exceeds the median income, the general voting preference tends to favour the redistribution of resources from rich to poor. Redistribution can take the form of regulatory policies and public expenditure programs, such as childcare and education, or explicit transfer payments (Alesina & Perotti, 1994). Political economy theorists justified their position by sighting the consequences of income inequality in a country which could include social unrest, increase in poverty, rent seeking, market imperfection, etc. (Delbianco et al., 2014). However, in situations where political decisions determine economic policies, inequality is harmful to economic growth (Torsten & Tabellini, 1994).

Chong and Grandstein (2007) investigated the interactive relationship between institutional quality and income inequality using dynamic panel and linear feedback analysis. Their findings revealed that these two factors are interconnected and can reciprocally impact each other during the economic development process. The quality of institutions plays a crucial role in determining distribution and growth outcomes. Income inequality when high can foster poor institutions, which in turn exacerbates inequality and reduces efficiency, ultimately leading to low long-term growth rates. When income inequality is high, political decisions tend to favour wealthy minorities, resulting in unfairness towards the less fortunate (Mdingi & Ho, 2021).

In the context of credit markets that are less than perfect, there exists a restricted capacity to obtain loans, leading to a state of affairs in which the returns on investment opportunities are not necessarily equal at the margins (Piketty, 1997). Thus, the imperfection in this market is the result of asymmetric information and the limitations of legal institutions. An example is reflected in cases where creditors find it difficult to recoup defaulted loans because of imperfections in law enforcement. With limited access to credit, individuals' income and asset levels determine the exploitation of investment opportunities. In this case, the redistribution of income and assets from rich to poor is a viable mechanism that leads to a reduction in inequality and increases economic growth (Barro, 2000).

Forbes (2000) also shares the belief that income inequality has a positive relationship with economic growth. Forbes posits that the improved dataset and panel data estimation of income inequality led to a reduction in measurement errors and the elimination of omitted variable biases witnessed in earlier literature that income inequality has a negative relationship with economic growth. This finding suggests that, in the short and medium terms, income inequality has a statistically positive relationship with economic growth (Forbes, 2000).

Royuela et al. (2019) conducted a study to investigate the connection between income inequality and economic growth in more than 200 comparable regions across 15 OECD countries between 2003 and 2013, using a panel framework. The authors found a generally negative correlation between income inequality and economic growth in the OECD regions. Breunig and Majeed (2020) examined the connection between economic growth and inequality in 152 countries over a period of 55 years from 1956 to 2011. The results indicate that high levels of inequality hinder growth, and countries with higher poverty rates are more severely affected by the negative impact of inequality on economic growth.

Some inconsistent estimates of the variables have also been used to assess the relationship between income inequality and economic growth. Adinde and Stephannie (2017) investigate the effects of income inequality on economic growth in Nigeria between 1984 and 2005. Their research aimed to determine the form of the Kuznets curve in Nigeria by employing multiple linear regression and econometric modelling. The study finds that the Kuznets curve does not hold true for the country but that the relationship is linear. However, the data for the Gini coefficient were sourced from an article (Awe & Rufus, 2012) that calculated income distribution in Nigeria based on employment rates and average income levels. The estimates obtained in this study were found to be significantly higher than the validated open-source data available, such as those provided by the World Development Indicator.

Similarly, Igwegbe and Amaka (2021) investigated the various factors that impact income inequality in Nigeria by employing the fully modified ordinary least squares (FMOLS) method to analyse annual time-series data from 1981 to 2018. Their study assessed both traditional and emerging determinants of income inequality, including education, inflation,

poverty, economic growth, technology, globalisation, labour market policies, and rural-urban drift. The results show that the graph of income inequality in Nigeria is linear rather than an inverted U-shaped Kuznets curve. However, the study did not demonstrate how the Gini coefficient was calculated. Based on the WDI (2024), the available open-source data for the Gini coefficient are incomplete.

This relationship between income inequality and economic growth has been a subject of much debate and research, as evidenced by Mdingi and Ho (2021). According to Forbes (2000), the relationship between income inequality and economic growth in the short and medium term is statistically positive. Conversely, Royuela et al. (2019) contended that high levels of inequality hinder growth, with countries experiencing higher poverty rates being more severely impacted by the negative effects of inequality on economic growth. Adinde and Stephannie (2017) found that the Kuznets curve does not hold true for the country, but the relationship between the two remains linear. However, the reliability of the source used to determine the Gini coefficient is questionable. Ultimately, Igwegbe and Amaka (2021) show that the graph of income inequality in Nigeria is linear, rather than following an inverted U-shaped Kuznets curve.

Despite various studies, the existing literature on the relationship between income inequality and economic growth is characterised by a lack of consensus, which underscores the importance of conducting additional research and employing dependable data sources. This study intends to fill this knowledge gap by assessing the relationship between income inequality and the economic growth of Nigeria for the period 1992-2022. The primary objective of this research is to determine whether the Kuznets hypothesis is applicable in the context of Nigeria. Furthermore, to evaluate the hypothesis that suggests there is no meaningful connection between income inequality and economic growth. The hypotheses to be tested are as follows:

H_0: *There is no significant relationship between income inequality and economic growth.*

H_1: *There is significant relationship between income inequality and economic growth.*

H_0: *Kuznets (1955) hypothesis is not applicable to Nigeria.*

H_1: Kuznets (1955) hypothesis is applicable to Nigeria.

2.3 Data Sources and Description

To conduct an extensive analysis of Nigeria's inequality and economic growth, we utilised data spanning the period from 1992 to 2022 sourced from the World Development Indicator (WDI). The World Development Indicators (WDI) serve as the primary repository of development indicators derived from the World Bank, which is sourced from reputable international organisations. It provides the most recent and accurate global development data, including national, regional, and international estimates (WDI, 2024). The selected variables, including growth rates of Gross Domestic Product per capita (GDPC), the Gini coefficient, inflation rates, real effective exchange rates, and political stability, were chosen to investigate the relationship between national income inequality and economic growth.

This research adopts a unique approach in examining the connection between income inequality and economic growth. Although literature employ GDP per capita as a variable to evaluate this relationship, this research utilises the growth rates of GDP per capita to capture the changes in income inequality in relations to Kuznets hypothesis. According to Blakemore and Herrendorf (2009), economic growth is a crucial determinant of individual well-being and income. In particular, modest variations in growth rates across extended periods yield substantial variations in living standards. The concept is often referred to as the "Rule of 70", a simplified method for calculating the time it takes for an investment or economy to double in value. This approach involves dividing 70 by the annual growth rate percentage. The rule operates on the assumption of a steady exponential growth rate (Bermingham, 2003). The intuition is such that a 1% growth rate results in income doubling in 70 years, whilst a 2% growth rate leads to income doubling in 35 years. Moreover, a growth rate of 10% will result in income doubling in 7 years.

Furthermore, due to missing data, the Gini coefficient and political stability variables were extrapolated using the last known values for the missing year's data point, as suggested in extant literature (Bennett, 2001; Rue et al., 2008). In addition, we recognise that the objective of data analysis is to deliver unbiased estimates of population parameters, as well as to conduct accurate hypothesis testing, as suggested by Newman (2014). These issues are addressed in the post-estimation examination of the empirical results in Section 2.5.1.

Table 2.1 provides a concise overview of the abbreviated variables, along with their summary statistics, while Table 2.2 contains all variables and their respective definitions.

Table 2.1 Variable Summary Statistics and Description

Variable	Variable Desc.	Obs	Mean	Std. dev.	Min	Max
gdpcgrt	Gdpc growth rate	31	1.499416	3.615641	-4.50715	12.27614
gini	Gini coefficient	31	41.45484	6.567437	35.1	51.9
infl	Inflation	31	18.59428	16.48649	5.388008	72.8355
realexch	Real effective exchange rates	31	112.1357	49.03658	49.77629	273.0093
polstab	Political stability	31	8.755808	6.575697	2.415459	26.59575

(data from: WDI, 2024)

Table 2.2 Variable Definition

Variables	Definition
GDPCGRT	The annual growth rate of GDP per capita, measured in local currency and adjusted for inflation, is calculated by dividing the country's gross domestic product by its mid-year population.
INFL	Inflation as measured by the consumer price index represents the yearly percentage change in the average cost of a set of goods and services, which may be adjusted periodically, such as annually.
REALEXCH	The real effective exchange rate is calculated by dividing the nominal effective exchange rate (which assesses the value of a currency against a group of foreign currencies) by a price deflator or cost index.
POLSTAB	The concept of Political Stability and Absence of Violence/Terrorism gauges the likelihood of political instability and/or politically motivated violence, including terrorism. The percentile rank signifies the country's standing among all countries that are part of the aggregate indicator, with (0) being the lowest and (100) the highest.
Gini	The Gini index is a measure of the extent to which the distribution of income or consumption among individuals or households within an economy deviates from perfect equality. It has a scale ranging from 0 to 100, where 0 signifies perfect equality, and 100 denotes perfect inequality.

(WDI, 2024)

With respect to GDP per capita growth rates, inflation, and political stability variables, as illustrated in Figures 2.1, 2.2, and 2.3, all exhibit variations over time. However, inflation, political stability, and exchange rates, depicted by Figure 2.4, display a rising trend. Furthermore, real effective exchange rates have increased remarkably since the early 2000s, presenting a significant challenge for Nigeria. Notably, the Gini index, also known as the Gini coefficient, as shown in Figure 2.5, has witnessed a decline in recent years.
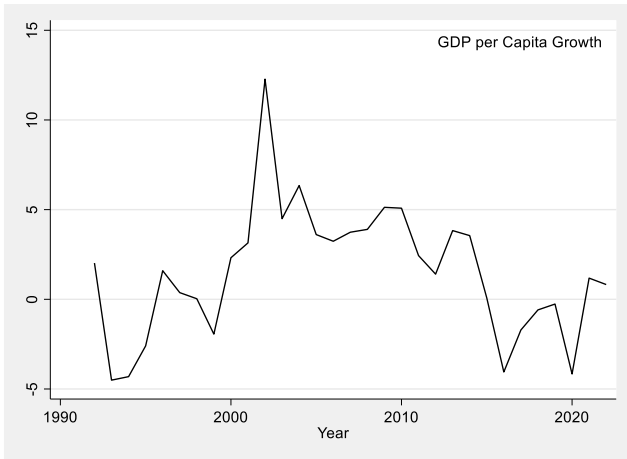
Figure 2.1 GDP per Capita Growth
(Created with Stata, data from WDI (2024))
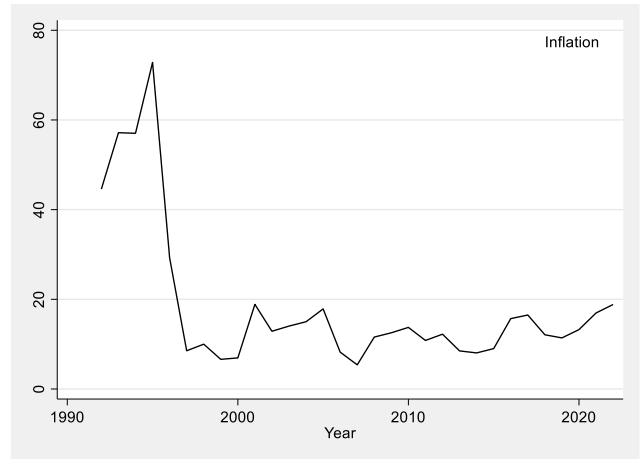
Figure 2.2 Inflation
(Created with Stata, data from WDI (2024))
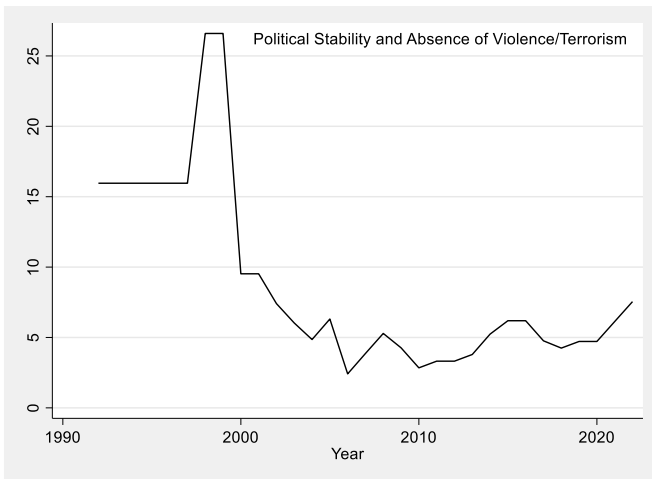
Figure 2.3 Political Stability and Absence of
Violence/Terrorism
(Created with Stata, data from WDI (2024))
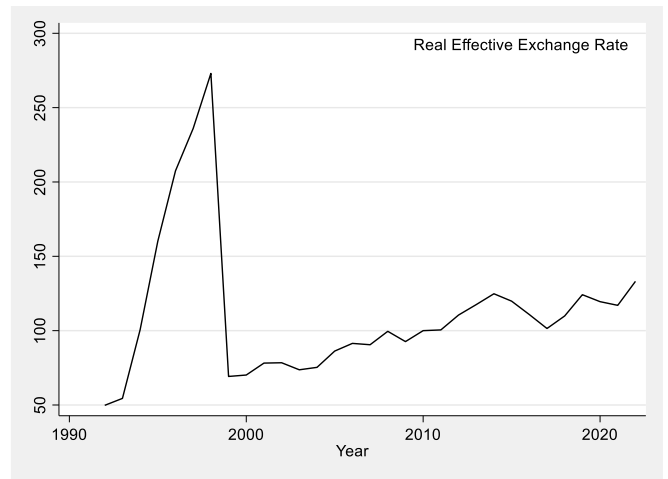
Figure 2.4 Real Effective Exchange Rates
(Created with Stata, data from WDI (2024))
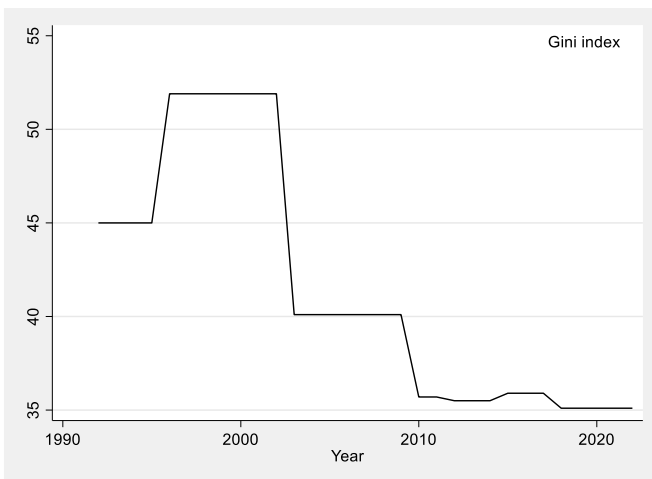
Figure 2.5 Gini Index
(Created with Stata, data from WDI (2024))

2.4 Empirical Analysis

2.4.1 Simon Kuznets' hypothesis

Simon Kuznets' hypothesis, which was presented in his 1955 work, suggests that economic growth may initially worsen income inequality before eventually improving it during the later stages of development (Kuznets, 1955). In order to test this hypothesis as it relates to Nigeria, two equations were adapted from the work of Kim et al. (2011) to assess the linear and non-linear connections between economic growth and income inequality. In their study, "Kuznets Hypothesis in a Panel of States," Kim et al. (2011) presented Kuznets equations, which have been utilised as inspiration in the present study to formulate the following equations.

Equation 2.1

$$GINI_t = \beta_{01} + \beta_{11}GDPCGRT_t + \beta_{21,}Z' + \varepsilon_t$$

Equation 2.2

$$GINI_t = \beta_{02} + \beta_{12}GDPCGRT_t + \beta_{22}GDPCGRT_t^2 + \beta_{32,}Z' + \varepsilon_t$$

Equation 2.1 represents a linear equation that is subsequently extended in Equation 2.2 through the incorporation of the squared estimate of GDP per capita growth rates. To demonstrate the Kuznets inverted U-curve, the following parameters are expected in Equation 2.2: $\beta_{12} > 0\ and\ \beta_{22} < 0(|\beta_{12}| > |\beta_{22}|)$. The use of quadratic equations corresponds with Kuznets' original concept of an inverted U-shaped curve, providing a comprehensive framework for understanding the relationships between income inequality, economic growth, and other explanatory factors. The quadratic component provides insight into the inclination of the curve, revealing its steepness and orientation. Nonetheless, according to empirical literature, the S-curve is an extension of Kuznets' inverted U-shaped curve (List & Gallet, 1999). Although the relationship between income inequality and per capita income becomes positive again for higher-income countries, it is imperative to examine this phenomenon, particularly in relation to Nigeria, as the nation's economy is projected to rank among the world's top 15 economies by 2050 (Galloway, 2020). Therefore, the cubic term of the GDP per capita growth rates is included in Equation 2.3.

Equation 2.3

$$GINI_t = \beta_{03} + \beta_{13}GDPCGRT_t + \beta_{23}GDPCGRT^2 + \beta_{33}GDPCGRT_t^3 + \beta_{43}Z' + \varepsilon_t$$

The Gini coefficient ($GINI_t$) is employed as a proxy for measuring income inequality in year *t*, while the GDP per capita growth rates (GDPCGRT) is used to measure economic growth in year t. Vector Z' contains four economic and institutional variables that may affect Inequality. $\beta_{01}, \beta_{02}, and\ \beta_{03}$ are the intercept. $\beta_{11}, \beta_{21}, \beta_{12}, \beta_{22}, \beta_{32}, \beta_{13}, \beta_{23}, \beta_{33}, and\ \beta_{43}$ are the slope of the coefficients to be estimated while ε_t's are normally distributed error terms.

2.4.2   Autoregressive Distributed Lag (ARDL) Error-Correction model

The main estimation technique used for the analysis was the Autoregressive Distributed Lag (ARDL) error-correction model. This method has gained significant popularity and is well-suited for examining short- and long-term relationships, which has led to its extensive use in empirical research over the past few years. Furthermore, the ARDL model is a more statistically significant approach for determining cointegration relationships in small sample sizes (Pesaran et al., 2001; Nayaran, 2004). In addition, the ARDL method is free of endogeneity issues. Moreover, this approach can be used regardless of whether the regressors are purely order one [I(1)], purely order zero [I(0)], or a combination of both. Finally, by using the ARDL method, the researcher can obtain unbiased and efficient estimators for the model (Nayaran, 2004).

The generalised ARDL *(p,q)* model based on the work of Pesaran and Shin (1995) and Adeleye (2018) is specified as

Equation 2.4

$$Y_t = \gamma_{0i} + \sum_{i=1}^{p}\delta_i\ Y_{t-i} + \sum_{i=0}^{q}\beta_i'\ X_{t-i} + \varepsilon_{it}$$

Where Y_t is the dependent variable and the variables in $(X_t')'$ can be I(0) or I(1) or cointegrated. $\beta\ and\ \delta$ are coefficients. γ is the constant while *i = 1,… k. p,q* are the optimal lag orders for the dependent variable and independent variables respectively. ε_{it} is a vector of the error terms. The unobserved *zero* is a white noise vector process. These can be either serially correlated or independent.

2.4.3 Pesaran Shin Smith (2001) ARDL Cointegration Bounds Test

The initial stage in the ARDL model entails conducting a hypothesis test for the bounds test of cointegration. Pesaran et al. (2001) established two sets of critical values, referred to as upper and lower critical bounds, for the cointegration test. The lower critical bound assesses whether all variables are stationary at a level, indicating that there is no cointegration among them. Conversely, the upper bound considers all variables that are stationary only at the first difference, indicating the presence of cointegration. The hypotheses tested were as follows:

$H_0: b_{1i} = b_{2i} = b_{3i} = b_{4i} = b_{5i} = 0,$ (where i = 1, 2, 3, 4, 5)

$H_1: b_{1i} \neq b_{2i} \neq b_{3i} \neq b_{4i} \neq b_{5i} \neq 0,$

The linear cointegration-bound test equation is as follows:

Equation 2.5

$$\Delta gini_t = a_{01} + b_{1i}gini_{t-i} + b_{2i}gdpcgrt_{t-i} + b_{3i}infl_{t-i} + b_{4i}realexch_{t-i} +$$

$$b_{5i}polstab_{t-i} + \sum_{i=1}^{p} a_{l1} \Delta gini_{t-i} + \sum_{i=1}^{q} a_{2i} \Delta gdpcgrt_{t-i} + \sum_{i=1}^{q} a_{3i} \Delta infl_{t-i} +$$

$$\sum_{i=1}^{q} a_{4i} \Delta realexch_{t-i} + \sum_{i=1}^{q} a_{5i} \Delta polstab_{t-i} + \varepsilon_{1t}$$

followed by quadratic Cointegration Bounds Test

Equation 2.6

$$\Delta gini_t = a_{02} + b_{12}gini_{t-i} + b_{22}gdpcgrt_{t-i} + b_{32}gdpcgrt^2_{t-i} +$$

$$b_{42}infl_{t-i} + b_{52}realexch_{t-i} + b_{62}polstab_{t-i} + \sum_{i=1}^{p} a_{l1} \Delta gini_{t-i} +$$

$$\sum_{i=1}^{q} a_{2i} \Delta gdpcgrt_{t-i} + \sum_{i=1}^{q} a_{3i} \Delta gdpcgrt^2_{t-i} + \sum_{i=1}^{q} a_{4i} \Delta infl_{t-i} +$$

$$\sum_{i=1}^{q} a_{5i} \Delta realexch_{t-i} + \sum_{i=1}^{q} a_{6i} \Delta polstab_{t-i} + \varepsilon_{2t}$$

and the cubic Cointegration Bounds Test

Equation 2.7

$$\Delta gini_t = a_{03} + b_{13}gini_{t-i} + b_{23}gdpcgrt_{t-i} + b_{33}gdpcgrt^2_{t-i} +$$

$$b_{43}gdpcgrt^3_{t-i} + b_{53}infl_{t-i} + b_{63}realexch_{t-1i} + b_{73}polstab_{t-i} +$$

$$\sum_{i=1}^{p} a_{l1} \Delta gini_{t-i} + \sum_{i=1}^{q} a_{2i} \Delta gdpcgrt_{t-i} + \sum_{i=1}^{q} a_{3i} \Delta gdpcgrt^2_{t-i} +$$

$$\sum_{i=1}^{q} a_{4i} \Delta gdpcgrt^3_{t-i} + \sum_{i=1}^{q} a_{5i} \Delta infl_{t-i} + \sum_{i=1}^{q} a_{6i} \Delta realexch_{t-i} +$$

$$\sum_{i=1}^{q} a_{7i} \Delta polstab_{t-i} + \varepsilon_{3t}$$

The ARDL cointegration method was used to estimate the parameters of the equations using a maximum of two lags to prevent a reduction in the degrees of freedom. The result indicates that the F-statistics from the Pesaran Shin Smith (2001) ARDL cointegration bounds test for the linear equation is higher than the [I(0)] series (upper bound) at the 5% significant levels. This implies that there is cointegration among the variables. See Appendix 2.A. However, cointegration does not exist for variables in the quadratic and cubic equations. Consequently, the ARDL model was employed to estimate short-run effects. The short- and long-run equations were adapted from Pesaran and Shin (1995) and Adeleye (2018).

2.4.4   The ARDL Model

The ARDL model for the quadratic equation is specified as:

Equation 2.8

$$\Delta gini_t = a_{02} + \sum_{i=1}^{p} a_{l1} \Delta gini_{t-i} + \sum_{i=1}^{q} a_{2i} \Delta gdpcgrt_{t-i} + \sum_{i=1}^{q} a_{3i} \Delta gdpcgrt^2_{t-i} +$$

$$\sum_{i=1}^{q} a_{4i} \Delta infl_{t-i} + \sum_{i=1}^{q} a_{5i} \Delta realexch_{t-i} + \sum_{i=1}^{q} a_{6i} \Delta polstab_{t-i} + \varepsilon_t$$

While the ARDL model for the cubic equation is:

Equation 2.9

$$\Delta gini_t = a_{03} + \sum_{i=1}^{p} a_{l1} \Delta gini_{t-i} + \sum_{i=1}^{q} a_{2i} \Delta gdpcgrt_{t-i} + \sum_{i=1}^{q} a_{3i} \Delta gdpcgrt^2_{t-i} +$$

$$\sum_{i=1}^{q} a_{4i} \Delta gdpcgrt^3_{t-i} + \sum_{i=1}^{q} a_{5i} \Delta infl_{t-i} + \sum_{i=1}^{q} a_{6i} \Delta realexch_{t-i} +$$

$$\sum_{i=1}^{q} a_{7i} \Delta polstab_{t-i} + \varepsilon_t$$

Since there is cointegration for the linear equation, the model is thus specified as:

Equation 2.10

$$\Delta gini_t = a_{01} + \sum_{i=1}^{p} a_{l1} \Delta gini_{t-i} + \sum_{i=1}^{q} a_{2i} \Delta gdpcgrt_{t-i} + \sum_{i=1}^{q} a_{3i} \Delta infl_{t-i} +$$
$$\sum_{i=1}^{q} a_{4i} \Delta realexch_{t-i} + \sum_{i=1}^{q} a_{5i} \Delta polstab_{t-i} + \lambda ECT_{t-1} + \varepsilon_t$$

$\lambda = 1 - \sum_{i=1}^{p} \delta_i$, This represents the speed of adjustment parameter with a negative sign.

$ECT = (gini_{t-1} - \theta X_t)$ This represents the error correction term.

$\theta = \frac{\sum_{i=0}^{q} \beta_i}{\alpha}$, this is the long-run parameter.

$a_{1i}, a_{2i}, a_{3i}, a_{4i}, a_{5i}, a_{6i}, a_{7i}$ are the short-run dynamic coefficients of the model's adjustment long-run equilibrium.

2.4.5   Stationarity

To evaluate the stationarity of the variables in the study, Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests were carried out to investigate the stationary properties of the time series, with particular attention paid to identifying unit roots. The objective of the unit root test is to ensure that the order of integration does not exceed [I(1)], as this is a prerequisite for applying the ARDL cointegration bound test. Furthermore, ADF and PP tests were administered to guarantee that no variable was integrated at level [I(2)] and to prevent spurious outcomes. The results of the unit root tests are presented in Table 1.3. Based on Table 1.3, the study confirms that all variables are stationary at the 1% or 5% level of significance. Using ADF, GDPCGRT, INFL, REALEXCH, and POLSTAB are significant in levels form which is denoted by [*I(0)]* whereas GINI is stationary after first differencing, also indicated by [*I(1)].* Furthermore, when using PP, only GDPCGRT was stationary in level forms. The other variables became stationary after first differencing.

The selection of the appropriate lag length was established using the Bayesian Information Criterion (BIC), which was determined through automatic selection using the Stata software. In accordance with Nayaran's (2004) suggestion, we chose two lags in the model to limit the selection to a maximum of two lags for the annual data series.

Table 2.3 Stationarity results of the variables

	Augmented-Dicky Fuller (ADF) Test		Phillips-Perron (PP) test	
Variable	ADF Statistics	Order of Integration	PP Statistics	Order of Integration
GDPCGRT	-2.260**	*I(0)*	-2.555**	*I(0)*
INFL	-3.419 ***	*I(0)*	-5.258***	*I(1)*
REALEXCH	-3.082***	*I(0)*	-5.220***	*I(1)*
POLSTAB	-1.882 **	*I(0)*	-5.383***	*I(1)*
GINI	-3.613*	*I(1)*	-5.292***	*I(1)*

Notes: Significance at: ***1% and **5%. *I(0)* refers to stationarity in levels, whereas *I(1)* refers to stationarity after the first differencing. ADF and PP test statistic results for 1992-2022.

(data from: WDI, 2024)

2.5   Empirical Result and Discussion

The coefficient for the ARDL-EC model's ADJ is shown to be (-0.74) in Table 2.4, and it is utilised to determine the rate at which adjustments are made towards the long-term equilibrium. This suggests that any errors from the previous period will be rectified in the current period. Therefore, the results suggest that approximately 74% of the difference between the long and short runs is rectified within a year. The ECT-ADJ coefficient is statistically significant at the 1% level, with t-statistics (-5.08) and coefficients displaying negative signs.

The outcomes of the long-run analyses of equation (2.1), as per BIC, are presented in Table 2.4. The findings indicate that the growth rates of GDP per capita exhibit a positive trend, although this is not statistically significant. Similarly, political stability has a statistically significant positive association with income inequality. The findings further indicate that political stability and the absence of violence/terrorism have negative impacts on income inequality. This suggests that in the long term, the political stability variable has a negative effect on income inequality, further exacerbating it. Nigeria returned to a democratic form of governance in 1999 and implemented various policies to improve the country; it is unfortunate that the issue of insecurity in the form of terrorism and kidnapping has had a devastating effect on certain sectors of the economy (Onuoha and Oyewole, 2018; Ajide & Alimi, 2021). Although the political stability score has improved slightly in Nigeria, this study suggests that this improvement is unlikely to lead to a reduction in income inequality in the long run. As of 2022, the political stability and absence of violence/terrorism score for Nigeria was approximately (8%) (WDI, 2024). This value is similar to that of countries such as Burkina Faso (8%), Cameroon (11%), and Chad (9%). In comparison, developed countries, such as the Netherlands (71%) and Germany (67%), had significantly higher scores (WDI, 2024). Nigeria must take further steps to enhance its security apparatus and institutions.

On the contrary, inflation and exchange rates exhibit a negative association with inequality and are both statistically significant in the long run. Previous research has yielded mixed results regarding the relationship between income inequality and inflation (Cassette et al. 2012; Siami-Namini and Hudson, 2019; Berisha et al. 2023). Berisha et al. (2023) discovered that the effect of inflation on inequality is negative, significant, and greater for higher

quantiles of income inequality. Over the course of a year, it has been observed that the inflation rate increases income inequality more at the initial level (Berisha et al., 2023). Nevertheless, a more precise understanding of the relationship among inflation, exchange rates, and income inequality in Nigeria requires controlling for monetary and fiscal policy indicators, which is beyond the scope of this study. Future studies should investigate this relationship and the underlying mechanisms that enable these circumstances.

Furthermore, in the short run, the growth rate of GDP per capita demonstrated a positive and statistically significant relationship with income inequality, as presented in Table 2.4. This suggests that, in the short term, the growth rate of GDP per capita is positively and significantly associated with income inequality. Additionally, real exchange rates seem to exacerbate income inequality in Nigeria as it exhibits statistical significance. Finally, political stability appears to enhance income equality in Nigeria. This suggests that an improvement in political stability in Nigeria, whether due to a decrease in violence or terrorism or a more favourable perspective of government policies, could result in declining income inequality at the national level in Nigeria. However, political stability has both positive and negative effects on income inequality. On the one hand, in the short term, it can lead to a reduction in income inequality. On the other hand, in the long term, it can result in an increase in income inequality.

The literature has explored the mechanism through which political instability can give rise to both short-term and long-term impacts on economic growth. Aisen and Veiga (2013) emphasise that political instability often results in policymakers adopting a shorter-term perspective, which can lead to the implementation of inadequate short-term macroeconomic policies. Furthermore, it may result in increased policy switching, thereby contributing to volatility and ultimately having a negative impact on macroeconomic performance. Similarly, Alesina and Perotti (1996) argue that socio-political instability creates an uncertain politico-economic environment, which in turn increases risks and reduces investment. The current research indicates that Kuznets' hypothesis is applicable to Nigeria, as economic growth is expected to result in a decrease in income inequality. Nevertheless, political instability may have a detrimental effect on economic growth, which could potentially disrupt the long-term and short-term paradigms of income inequality reduction. Additional studies are required to empirically examine this phenomenon.

Table 2.4 ARDL-EC – Linear Equation

Dependent variable: GINI				ADJ -0.7394*** | t-stat (-5.08)	
	Long-run		Short-run		
Variables	Coefficients	P-value		Coefficients	P-value
GDPCGRT	0.0847	0.730		0.3275	0.021
INFL	-0.2811	0.004		- - -	- - -
REALEXCH	-0.0779	0.024	D1	0.0788	0.009
			LD	0.0689	0.001
POLSTAB	1.5636	0.000	D1	-0.8666	0.000
			LD	-0.2427	0.051
Constant	30.0566	0.000			

Number of obs = 29

F(12, 7) = 58.23

Prob > F = 0.000

R-squared = 0.9700

Adj R-squared =   0.9534

Durbin–W   atson = 1.8989

Breusch–Godfrey LM = 0.8966

White's test (Homoskedasticity) | Prob > chi2 = 0.4125

Jarque-Bera test for Ho: normality| 1 Chi(2) = .6813

Note: ARDL (1,1,0,2,2) selected based on Schwarz Bayesian Information criterion

To evaluate the nonlinear connection between income inequality and economic growth, specifically in relation to the Kuznets hypothesis, this study incorporates the squared term of the growth rate of GDP per capita into the linear model, thus making it a quadratic model, as shown in equation (2.2). Table 2.5 presents the findings of the quadratic estimation. The coefficients for the growth rates of GDP per capita with a positive sign (+) and the squared term of the growth rates of GDP per capita with a negative sign (-) reveal an inverted U-shaped relationship. Additionally, both coefficients are statistically significant at the 10% and 1% levels.

This result provides validation for the existence of the Kuznets inverted U-shaped curve in the context of Nigeria. Additionally, the outcome is in line with the prevailing literature (Kuznets, 1955) which posits that economic expansion initially exacerbates inequality; however, as the economy expands further, inequality begins to decrease. However, this study acknowledges that certain scholars perceive the relationship between income inequality and economic growth differently. Cingano (2014) suggests that increased inequality might impede growth by diminishing the productivity of low-income households and exacerbating financial exclusion. Similarly, some scholars argue that inequality can have negative consequences for economic growth (Aghion et al., 1999; Stiglitz, 2012; Royuela et al., 2019). However, these perspectives were not substantiated by the findings of this study.

Furthermore, the results in Table 2.5 indicate that S-curve theory is not applicable to Nigeria. Neither the GDP per capita growth rates nor the squared terms of GDP per capita growth rates were statistically significant. Although the cubic term of the GDP per capita growth rate is significant, it displays a negative association with income inequality. List and Gallet (1999) posited that the Kuznets inverted U-curve constitutes an S-Curve. This contention is validated through the incorporation of the cubic term of the growth rates of GDP per capita in the nonlinear model, as shown in equation (2.3). List and Gallet (1999) found that as per capita income increases, it initially contributes to greater income inequality. However, after reaching a specific level, further increases in per capita income result in lower income inequality. Furthermore, they reveal that for high per capita income levels, beyond the second quartile in all three estimated versions, the association between income inequality and per capita income reverts to positive.

Table 2.5 ARDL Model – Inverted U-curve and S-curve

Dependent variable: GINI

Variables	Quadratic equation (∩-curve)		Cubic equation (S-curve)	
	Coefficients	P-value	Coefficients	P-value
GDPCGRT	0.2144	0.070	0.0861	0.484
GDPCGRT^2 (L1)	-0.0754	0.000	-0.0126	0.726
GDPCGRT^3 (L1)	- - -	- - -	-0.0060	0.000
INFL (L1)	0.1068	0.000	0.1465	0.001
REALEXCH	-0.0061	0.340	0.0072	0.468
POLSTAB	0.0918	0.244	0.0236	0.787
Constant	3.8263	0.126	-1.100	0.741

	Number of obs = 30	Number of obs = 29
	F(12, 7) = 109.82	F(12, 7) = 86.58
	Prob > F = 0.000	Prob > F = 0.000
	R-squared = 0.9767	R-squared = 0.9796
	Adj R-squared = 0.9678	Adj R-squared = 0.9683
	Durbin–W atson = 2.2270	Durbin–W atson = 2.0111
	Breusch–Godfrey LM = 0.4128	Breusch–Godfrey LM = 0.8527
	White's test (Homoskedasticity) = 0.4140	White's test (Homoskedasticity) = 0.4125
	Jarque-Bera test for Ho: normality = .0517	Jarque-Bera test for Ho: normality = 1.7
	ARDL(*1,0,1,1,0,0*) regression	ARDL(1,0,0,1,2,0,0) regression

Note: ARDL were selected based on Schwarz Bayesian Information criterion

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2.5.1   Postestimation Diagnostic

For diagnostics of the linear equation, as shown in Table 2.4, the Durbin–Watson (DW) test yields a value of (2.9), which indicates no evidence of autocorrelation. The Durbin-Watson statistic is specifically designed to detect the presence of autocorrelation in the residuals of a regression analysis. It is an important tool for ensuring the accuracy of the standard errors in a regression model, which can have a significant impact on the validity of the results. By using the Durbin-Watson statistic, researchers can ensure that their results are based on accurate data and that they are not making incorrect assumptions about the relationship between the variables in their model (Durbin & Watson, 1971; Baum, 2006). This finding is corroborated by the Breusch-Godfrey LM test, with a p-value stands at (0.8966). Furthermore, the White test indicated the absence of heteroskedasticity, as the p-value (0.4125) is not statistically significant. The Jarque-Bera test for normality also revealed that the errors were normally distributed, as the chi-square value (0.6813) is not statistically significant. Finally, the model stability falls within the 5% bound, as depicted in Figure 2.3, which confirms its stability.

In relation to the quadratic equation shown in Table 2.5, the result of the Durbin-Watson test is (2.23), signifying the absence of serial correlation. This conclusion is reinforced by the Breusch-Godfrey LM test, as its p-value of (0.4128) is not statistically significant. Furthermore, the White test demonstrates that there is no presence of heteroskedasticity, as its p-value (0.4140) is not statistically significant. The Jarque-Bera test for normality also indicates that the errors are normally distributed, as its chi-square value of (0.0517) is not statistically significant at the 5% level. Finally, the model stability lies within the 5% bound, as shown in Figure 2.4, which confirms the stability of the model.

Finally, for the cubic equation presented in Table 2.5, the outcome of the Durbin-Watson test is (2.01), signifying the absence of serial correlation. This conclusion is reinforced by the Breusch-Godfrey LM test, as its p-value of (0.8527) is not statistically significant. Furthermore, the White test demonstrates that there is no presence of heteroskedasticity, as its p-value (0.4125) is not statistically significant. The Jarque-Bera test for normality also indicated that the errors were normally distributed, as its chi-square value of (2.7) is not statistically significant. Finally, the model stability lies within the 5% bound, as shown in Figure 2.5, which confirms the stability of the model.

The diagnostic results address the concern regarding Gini coefficient and political stability variables mentioned in the data and description section.
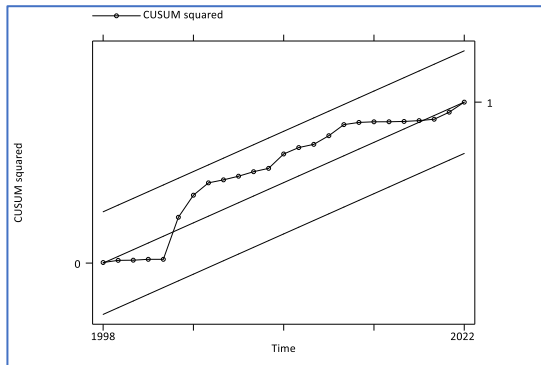
Figure 2.6 : Cusum Stability – Linear
(Created with Stata, data from WDI (2024))
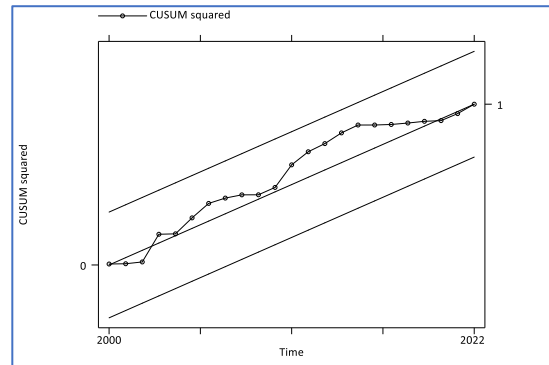
Figure 2.7 : Cusum Stability – Quadratic
(Created with Stata, data from WDI (2024))
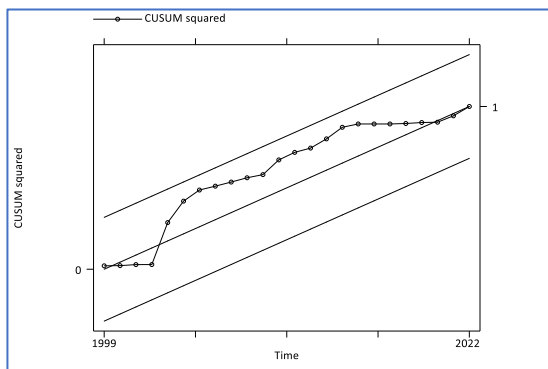
Figure 2.8 Cusum Stability – Cubic

(Created with Stata, data from WDI (2024))

2.6   Policy Recommendation

It is understandable that a single solution may not be effective in all circumstances. The question arises whether a greater emphasis should be placed on redistribution or promoting growth. Different countries have varying institutions and cultures, as well as varying endowments of labour, capital, and natural resources. Therefore, policies should be tailored to suit the economic and social institutions of a particular country (Bhattarai, 2018). Attempts to address inequality with a poorly designed policy may result in distorted incentives, ultimately undermining growth and harming even the poor (Berg et al., 2012). Given that this

research concludes that the Kuznets hypothesis is applicable to Nigeria, and thus recommends that Nigeria implement relative pro-poor policies, such as enhancing economic prospects for impoverished, targeted subsidies, and financial inclusion strategies. In addition, efficient public investment in fundamental social services such as healthcare, education, and infrastructure that benefit the impoverished is crucial for fostering economic growth that is favourable to the poor. The concept of pro-poor growth is characterised by the notion that economic development results in a proportionately greater benefit for the poor than for the non-poor. This implies that although growth minimises poverty, it also has the potential to exacerbate relative inequality. This concept is referred to as a relative approach, as it implies a reduction in relative inequality. On the other hand, a measure of pro-poor growth is considered absolute when the poor receive the same or greater absolute benefits from growth as compared to the non-poor (Kakwani et al. 2003).

2.7 Conclusion

This study aimed to investigate the relationship between income inequality and economic growth in Nigeria. To achieve this, we conducted short- and long-run estimations, which yielded the following findings. First, from the linear equation result, the research demonstrated that economic growth has no significant influence on income inequality in the long run. The results further suggest that political stability intensifies income disparities in the long run. In addition, inflation and exchange rates were found to be negatively associated with income inequality and were statistically significant. However, in the short term, exchange rates appear to exacerbate income inequality.

Furthermore, in the ARDL short-run model, economic growth is statistically significant and displays a positive association with income inequality. Secondly, the study suggests that, in the short term, Kuznets theory is applicable to Nigeria, as indicated by the inverted U-shaped relationship between economic growth and income inequality. This notion is based on the idea that economic growth can initially worsen income inequality before ultimately improving it in later stages of development. Therefore, we reject the null hypothesis that

states that there is no correlation between income inequality and economic growth and that Kuznets hypothesis is not applicable to Nigeria. Additionally, the results indicate that List and Gallet's (1999) S-curve theory is not applicable to Nigeria. The implication is that Nigeria will not face the same level of concern as high-income economies, which, after reaching the inverted U-curve of Kuznets, will witness a rise in income inequality once again, resulting in an S-shaped curve.

Chapter 3 Income Inequality, Terrorism, and Poverty: The Economic Perspective of the Terrorised[3]

Abstract

This study examines the economic conditions of households in terrorism-affected areas. It employs inequality measures such as the Gini coefficient and Lorenz curve and tests hypotheses using analysis of variance. The study also evaluates the poverty headcount, poverty gap, and poverty severity. Findings indicate that income inequality in Northeast and Northwest Nigeria is lower than the national average, as shown by the Gini coefficient and Lorenz curve. Although the Gini coefficient (0.27) in these regions suggests a relatively equal society, the poverty headcount ratio is 73%, much higher than the national average of 33% in 2021. Therefore, it is recommended that Nigeria implement effective redistribution policies to reduce poverty, address gender income inequality, promote equitable educational policies, and tackle the challenges of terrorism in the northern region.

Keywords: Income inequality, terrorism, poverty, Gini coefficient

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3.1 Introduction

Research on the economic consequences of terrorism has revealed its substantial costs. Nevertheless, there has been limited focus on examining these costs at the microeconomic level, particularly on the residents of regions where insurgency is prevalent. The sustained impact of terrorist activities on household income and expenditures can have significant implications for economic stability. This study sheds light on the economic conditions of households residing in regions affected by terrorism in northeast and northwest Nigeria.

Since 2009, Nigeria has been plagued by a persistent and violent Islamic insurgency spearheaded by the extremist group, Boko Haram. The terrorist organisation has wreaked havoc in Nigeria's northern region, perpetrating a slew of heinous acts such as assassinations, assaults, bombings, hostage-takings, attacks on public and private properties, invasions of border communities, and territorial seizures and control in Nigeria and neighbouring countries such as Cameroon, Chad, and Niger Republic in the Lake Chad region. As a result of these actions, Boko Haram has caused widespread destruction and disruption, resulting in the deaths, maiming, and kidnapping of tens of thousands of people, a displacement of over two million, and the destruction of properties worth $5.2 billion, including one million houses and 5,000 classrooms in Borno state, which serves as the group's primary theatre of operations (Onuoha & Oyewole, 2018).

The extant literature posits that terrorism and other forms of political violence are rooted in poverty and inadequate resource distribution, which has become a fundamental assumption for both national and international policymakers. This connection between material deprivation and terrorist activity has been endorsed by political figures across the political spectrum and integrated into mainstream discussions on economic development and international security. Poor countries with high levels of poverty, low education, unemployment, and a growing divide between the wealthy and poor, in conjunction with low literacy rates, create fertile grounds for the emergence of violent and dangerous extremist groups. Furthermore, the underdeveloped state of the economy and society exacerbates the allure of political extremism and fosters political violence and instability (Piazza, 2006; Krieger & Meierrieks, 2019).

Terrorism poses a significant problem in Africa, resulting in a substantial loss of life and property, as well as damage to African economies (Iheonu & Ichoku, 2021). The examined literature failed to provide any insight into the economic circumstances of individuals or households residing in regions where terrorism is prevalent. Consequently, the primary objective of this study is to gain a deeper understanding of the economic circumstances experienced by households located in areas affected by terrorism. Thus, the research questions to be assessed are as follows: How does the level of income inequality in northeast and northwest Nigeria compare with overall income inequality in the country? How does terrorism affect income inequality in both victims and non-victims? What insights does the poverty headcount ratio provide regarding households in northeast and northwest Nigeria, relative to the overall poverty headcount ratio in the country?

The subsequent sections of this paper are organised as follows: Section 3.2 provides a summary of the literature, followed by Section 3.3, which delves into the description of the data sources. Section 3.4 details the empirical approach utilised for the empirical analyses presented in this study. Section 3.5 presents the empirical results and Section 3.6 critically examines these results. In Section 3.7, the study presents policy recommendations, while in Section 3.8, it concludes.

3.2 Literature Review

Several theories have been proposed for evaluating the relationship between inequality and terrorism. Among these are relative deprivation theory and rational choice theory. Relative deprivation theory suggests that individuals in society assess their economic standing relative to a reference group. According to this theory, individuals experience feelings of dissatisfaction and frustration when their economic status is inferior to that of the reference group, which leads to relative deprivation. This theory asserts that these sentiments significantly contribute to the emergence of political violence (Muller & Weede, 1994). As per the principles of rational choice theory, it has been expanded to incorporate the relationship between inequality and terrorism. Sandler and Enders (2007) advocate for this perspective, in which terrorists are viewed as rational agents who optimise expected utility or net returns, subject to constraints. Increased income inequality is expected to affect rational terrorists' decision-making process, making terrorism more probable.

Krieger and Meierrieks (2019) examine the connection between income inequality and terrorism in a sample of 113 countries between 1984 and 2012. They presented robust evidence even after accounting for various methodological changes, such as the use of instrumental-variable approaches. Their findings suggest that higher levels of income inequality are linked to an increase in domestic terrorism. This study further investigates the underlying causes and finds that the negative effects of income inequality on institutional outcomes, such as corruption, contribute to the motivation for domestic terrorism. Additionally, the researchers examined the efficacy of redistribution in decreasing terrorist activity and found that nations with higher levels of redistribution experience less domestic terrorism, partly because redistribution enhances institutional conditions.

Iheonu and Ichoku (2021) investigate the association between poverty and terrorism in Africa between 2000 and 2017. They utilised a panel two-stage least squares model and instrumental variable quantile regression with fixed effects to examine the effect of poverty on terrorism in 26 African countries. This study indicates that poverty has a direct impact on the number of terrorism incidents. Nevertheless, once other factors, such as unobserved heterogeneity, are considered, the connection between poverty and terrorism becomes insignificant. Additional findings reveal that the level of terrorism incidents plays a crucial role

in determining the impact of poverty on terrorism. Moreover, research underscores that poverty alone is not a determining factor for terrorism in Africa when compared to economic growth, political stability, and unemployment (Iheonu & Ichoku, 2021).

Piazza (2006) explored the relationship between poverty, terrorism, and economic development, challenging the notion that poverty is the primary driver of terrorism. This study examined the connection between socioeconomic factors, particularly poverty, and the frequency and severity of interstate terrorism in the current context. To achieve this, the study conducted multiple regression analyses on terrorist incidents and fatalities in 96 countries between 1986 and 2002. This research revealed that the widely accepted notion regarding the relationship between economic growth and terrorism is not supported by evidence. Instead, factors such as population, ethno-religious diversity, state repression, and the structure of political parties emerge as significant indicators of terrorism (Piazza, 2006).

In a similar study conducted by Ajide and Alimi (2021) titled "Income Inequality, Human Capital, and Terrorism in Africa: Beyond Exploratory Analytics," the authors examined the relationship between income inequality and terrorism in a panel of 34 African countries over the period–1980-2012. This study used a zero-inflated negative binomial regression estimator to analyse the data. The results suggest that income inequality plays a significant role in predicting terrorism, except for transnational terrorism. In addition, the impact of the human capital variables on both domestic and total terrorism is positive and significant. Furthermore, their research revealed that the influence of interactions between human capital measures and income inequality indicators is negative, especially at higher levels of educational attainment.

Evans and Kelikume (2019) investigate how poverty, unemployment, inequality, corruption, and poor governance influence Niger Delta militancy, Boko Haram terrorism, and Fulani herdsmen attacks in Nigeria. This study examines the socio-economic factors that contribute to the emergence of violence in Nigeria and uses the Fully Modified OLS (FMOLS) method of estimation to analyse trends from 1980 to 2017. Their findings suggest that poverty, unemployment, inequality, corruption, and poor governance are significant factors in the prevalence of violence in the country and that there is a strong association between

these socioeconomic factors and the occurrence of Niger Delta militancy, Boko Haram terrorism, and Fulani herdsmen attacks (Evans & Kelikume, 2019).

Coccia (2018) examined the root causes of terrorism with a focus on demographic factors, such as high population growth, income inequality, and relative deprivation. The author further opined that to better understand the occurrence of terrorism, it is crucial to have precise information about the environmental determinants in which it takes place, such as demographic, economic, geographic, and social factors. Without this knowledge, it is not possible to explain the reasons behind terrorism effectively. Coccia assessed the relationship between these demographic elements and the consequences of terrorist incidents on society while also identifying potential socioeconomic and psychosocial risk factors. To this end, Coccia (2018) employed bivariate, partial, and linear regression analyses. Their research indicated that regions with high population growth rates are more likely to experience terrorism. This is because high population growth rates can lead to income inequality, subsistence stress, and relative deprivation among the population. Additionally, studies show that countries in Africa and the Middle East have a strong correlation between fatalities from terrorist incidents and population growth (Coccia, 2018).

Coccia (2018) posed a few inquiries, one of which was: How can the differences between terrorist attacks in various contexts be accounted for? The existing body of literature generally focuses on the causal link between terrorism, income inequality, and poverty (Piazza 2006; Evans & Kelikume, 2019; Krieger & Meierrieks, 2019; Iheonu & Ichoku, 2021), with some exceptions, such as Coccia (2018), who, in part, explored the effects of terrorism on society. Existing literature lacks clarity on the precise impact of terrorism on victims' income inequality and poverty levels. This study aims to fill this gap by assessing the economic impact of terrorism and insurgency on the inhabitants of northeast and northwest Nigeria. The primary objective of this study is to gain a more comprehensive understanding of the economic circumstances faced by households located in areas impacted by terrorism. Furthermore, previous research has utilised macro data to scrutinise the relationship between terrorism, income inequality, and poverty. However, this study aims to investigate this relationship using microdata, with a particular focus on the income of households residing in the northeast and northwest region of Nigeria. The hypotheses to be examined are stated below.

Hypotheses

H0: Income inequality in the northeast and northwest is higher than the national average.

H1: Income inequality in the northeast and northwest is lower than the national average.

H0: Income inequality does not exist across gender and education level of household head.

H1: Income inequality exist across gender and education level of household head.

H0: Violence made no significant difference to income inequality.

H1: Violence increased or reduced income inequality significantly.

H0: Majority of households residing in northeast and northwest Nigeria live above poverty line.

H1: Majority of households residing in northeast and northwest Nigeria live below poverty line.

3.3   Data Sources and Description

To analyse income inequality in a consistent manner, we utilised the year 2021 household survey data from the Food and Agriculture Organization of the United Nations (FAO). The FAO conducted a household survey in Nigeria, covering five states: Yobe, Borno, and Adamawa in the northeast and Zamfara and Katsina in the northwest. The survey comprised 2739 household interviews administered across five states. The data were further divided and compared between Local Government Areas that were directly impacted by armed conflict and those that were not (FAO, 2022). Estimates were computed for the entire population in the dataset, as well as for households that had experienced violence and those that had not, to understand the extent of inequality that exists between the two groups.

The variables of interest are the gender of the respondents, educational level of household heads, experiences of violence and insecurity/conflict (victim and non-victim), total income, and the income quintile derived from total income (See Table 3.1 for the income quintile distribution). Furthermore, education, gender, and violence are categorical variables, with categorisation for education comprising university, secondary, primary, religious education, and no education. Education was ranked from 1 (highest qualification) to 5 (lowest qualification). Gender was categorised into female (1) or male (2), while the violence variable was categorised into non-victims (1) and victims of violence (2) – See Table 3.2.   The individuals referred to as "victims" are those who have experienced violence or insecurity within their household or community, which has consequently hindered their ability to earn a livelihood. On the other hand, those referred to as "non-victims" are those who have not encountered such challenges. Furthermore, due to the fact that some of the extremist campaigns by terrorists were targeted towards formal education and the redefinition of female gender roles within society (Onuoha & Oyewole, 2018), we chose education and gender as variables of interest to evaluate the extent of income inequality. It is also intriguing to explore the relationship between these variables, as both quality education and gender equality are part of the United Nations Sustainable Development Goals 4 and 5, respectively (UN, 2015).

The source of income for households in the dataset varies, ranging from agricultural to public employment (FAO, 2022). The diverse nature of income sources makes it an ideal dataset for

understanding and estimating income inequality, poverty, and attendant effects. The summary statistics are presented in Table 3.2.

Table 3.1 Income Quintile

inc_q	N	Mean	Min	Max	SD	p50
1	370	14331.02	0	40021.99	14184.15	12013.33
2	369	65174.41	40023.15	90024.93	15343.20	60071.53
3	369	124860	90030.71	169980.20	22737.28	120039.20
4	369	247243.90	169985.80	349973.50	51746.48	240042.70
5	369	886356.30	350006	8700005	900324.50	599999
Total	1846	267455.90	0	8700005	513994.80	120035.20

Table 3.2 Variable definitions and descriptive statistics

Variable	Name	Obs.	Mean	Std. Dev.	Min.	Max.	Definition
Total Income	Tot_income	2689	278755.6	537057.7	0	8700005	Total Income
Education	educ	2689	1.737	1.233	1	5	Educational level attained by head of household
Gender	gender	2689	1.846	.361	1	2	Gender of respondents
Violence	violence	2689	1.313	.464	1	2	Violence indicator
Income Quintile	Inc_q	2689	2.999	1.414	1	5	Income quantile computed from total income

(data from: FAO, 2022)

3.4 Empirical Approach

Many theories have been proposed to explain inequalities in various forms, one of which is the Multidimensional Inequality Framework (MIF). Goran Therborn, a prominent sociologist who has delved deeply into the concept of multidimensionality from a theoretical standpoint, contends that social inequalities are imbalances that are deemed unjust. Inequality, which refers to the absence of equality, is perceived as unjust and constitutes a breach of equality (Carmo, 2021). The MIF serves as a systematic and theoretically grounded tool for quantifying and examining inequalities, while also pinpointing causes and potential remedies. Although the understanding of income inequality trends varies, studies indicate that different measures can be used to paint a particular picture in certain countries, over specific periods, or globally. Despite these variations, individuals express discontent with and disapproval of inequality in all forms. There is an increasing awareness that inequality and poverty are more comprehensively understood as multidimensional phenomena (McKnight et al., 2017).

Drawing on the multidimensional theory of inequalities, this study comprehensively investigates income inequality and poverty estimation in northeast and northwest Nigeria using the Gini coefficient, Lorenz curve, poverty headcount ratio, and one-way analysis of variance. The intention of the aforementioned analyses is to show associations rather than to draw conclusions about causation.

3.4.1 Inequality Measures

A plethora of indicators have been proposed in the literature to determine income inequalities. These indicators encompass a range of statistical measures, such as the Lorenz curve, Gini coefficients, lognormal distribution, coefficient of variations, relative mean deviation, kakwani, inter-quartile range, and ratios of income received by the highest and lowest income groups. Furthermore, these measures also encompass normative aspects that take into account the values of society towards the well-being of various population segments. This includes Theil's entropy measure, Atkinson's Index, and Sen's Index (Whitehouse, 1995; Cowell, 2011). However, the Lorenz curve and Gini coefficient are among the most widely used methods for evaluating changes in income inequality. An effective measure of income inequality ought to fulfill the following conditions:

(i) Pigou-Dalton transfer sensitivity: Transfers of income from poorer individuals to wealthier ones contribute to the growth of income inequality.

(ii) Symmetry: Income inequality remains consistent when two individuals merely swap their positions in the distribution.

(iii) Independence: If all individuals' incomes rise by the same proportion, income inequality will remain unchanged.

(iv) Population homogeneity: If the relative increase or decrease in the population of each income group is the same, then there would be no alteration in income inequality.

(Cowell, 2011).

It is essential to acknowledge that not all measures of inequality meet the criteria for a suitable inequality measure. Shorrocks and Foster (1987) proposed an alternative to the Pigou-Dalton condition, which prioritises income transfers among individuals with low incomes over those between high-income earners. The coefficient of variation, for instance, is heavily influenced by those with high incomes. They proposed using the standard deviation of logarithms (SDL) as an alternative, although this measure does not satisfy the Pigou-Dalton condition.

3.4.2 Gini Coefficient and Lorenz Curve

The Gini coefficient is a straightforward concept that is derived from the Lorenz curve, and it satisfies all four properties in previous section. It measures the ratio of the area between the Lorenz curve and the 45-degree line to the total area of the box. See Figure 3.1 for example of Lorenz curve. The 45-degree line is referred to as the egalitarian line, signifying a completely equal society in terms of income distribution (Whitehouse, 1995; Deaton, 2018). Furthermore, the Gini coefficient illustrates the distribution of income across a population in a cumulative manner, starting with the poorest 20% and progressing to the 40%, 60%, 80%, and 100% brackets. By plotting this distribution on a graph and comparing it to the 'line of equality,' the distance from this line represents the extent of inequality in a given country. The Gini coefficient is expressed as a value between 0 and 1 or as a percentage between 1 and 100. A lower Gini coefficient is desirable, and an increase in the coefficient indicates a rise in income inequality within a country (Oxfam,2017).

The GINI coefficient equation was adapted from Whitehouse (1995). The equation is presented as follows:

$$I_{GINI} = \frac{2}{n^2 \bar{y}} \sum_{i=1}^{n} i(y_i - \bar{y})$$

Where I_{GINI} is the Gini income, $\bar{y}$ denotes the mean of the distribution, 'n' is the sample size (total number of observations), y_i is the naira value of the ith household income and are arranged in ascending order. Gini-coefficient used was for the estimation and comparison of the degree of income inequality in the sample, between both genders (male and female), level of education attained, and violence (victims and non-victims).
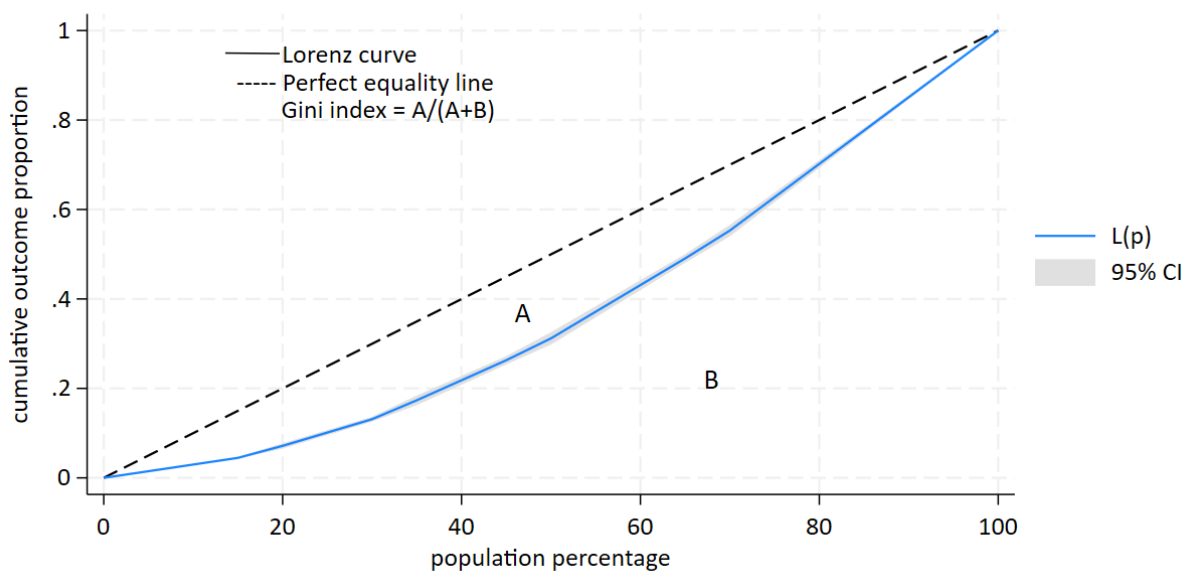
Figure 3.1 Lorenz Curve
Created with Stata, data from FAO (2022)

3.4.3   Poverty Measures

The social sciences have encountered challenges in arriving at a unified definition of poverty due to its intricate and multi-dimensional nature. The conventional viewpoint posits that individuals who fail to generate sufficient income or expenditure to attain a minimum acceptable level are deemed poor. The poverty line is often used to denote this threshold. From this standpoint, poverty is predominantly conceived in financial terms. Another viable way to define poverty is as the absence of a particular commodity or service, such as housing, education, food, or healthcare. The focus of well-being and poverty lies in an individual's ability to thrive in society. Unfortunately, those struggling with poverty often lack essential skills, such as insufficient financial resources and education, poor health, a sense of helplessness, and the absence of political freedoms (World Bank, 2005).

To evaluate and establish poverty levels, we apply Foster, Greer, and Thorbecke's (1984) poverty classification. The poverty line plays a crucial role in gauging poverty levels. It divides the population into two categories: those who are considered poor and those who are above the poverty line. By utilising the poverty line, the number of individuals experiencing poverty and the severity of their circumstances can be determined (Leibbrandt & Woolard, 1999).

3.4.3.1   Poverty Headcount Ratio
A key measure of poverty is the poverty headcount ratio, which assesses a nation's poverty levels by considering the number or proportion of impoverished individuals in the country. The headcount ratio is a useful method for quantifying poverty (Foster et al., 1984; Castleman et al., 2016). We used World Bank poverty lines to compute the poverty indices for the population in the dataset. The World Bank's international poverty line is regularly revised to account for fluctuations in prices worldwide. As of 2021, the World Bank poverty line is \$1.90 (World Bank, 2022). In addition, we used the average USD to naira rates since my dataset is in local currency. In 2021, the average exchange rate for the US Dollar (USD) to the Nigerian Naira (NGN) was 403.58 naira. This covers 365 days of USD in NGN historical data (Exchange Rates, 2021). The FGT poverty indices were adapted from Jaiyeola and Choga (2021).

Equation 3.2

$$P\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\left(z-y_i\right)\Big/z\right]^{\alpha} for\ \alpha \geq 0$$

z is the poverty line, y_i is the household income of the ith household, α is the parameter that shows poverty aversion, while q is the number of households who are adjudged to be poor using the poverty line z.

P_0 is the headcount ratio ($\alpha = 0$)

$$P_0 = \frac{1}{n} \sum_{i=1}^{q} 1 = \frac{q}{n}$$

Poverty Gap Ratio

P_1 is the poverty gap ratio ($\alpha = 1$)

where $\alpha = 1$, the poverty gap ratio is obtained. This is a normalised gap function averaged across the population. It is calculated by summing all the shortfalls ($z - y_i$) and dividing the result by the population (n), which is then expressed as a ratio relative to the population line itself ($/z$). By setting poverty aversion parameter to 1, it indicates uniform concern about the depth of poverty. Furthermore, the poverty gap ratio is a measure that calculates the average disparity between the living standards of impoverished individuals and the poverty line, represented as a proportion of the poverty line. It encompasses all people, and it quantifies the cost of eradicating poverty through perfectly targeted transfers to the poor (World Bank, 2005).

$$P_1 = \frac{1}{n} \sum_{i=1}^{q} \left[\left(z - y_i \right) \big/ z \right]$$

3.4.3.2 Squared Poverty Gap Ratio

P_2 is the poverty gap squared ($\alpha = 2$)

When $\alpha = 2$, the squared poverty gap measure is obtained. This measure evaluates each individual's normalised gap function by raising it to a power of two and weighing it separately. When the poverty aversion parameter is set to 2, the poverty-gap index shows heightened

sensitivity to the plight of the poorest of the poor. The measure's lack of intuitive appeal is due to its complexity and lack of ease in interpretation, which has resulted in limited widespread use. It can be considered as one of the family of measures introduced by Foster, Greer, and Thorbecke in 1984 (World Bank, 2005).

Equation 3.5

$$P_2 = \frac{1}{n} \sum_{i=1}^{q} \left[\left(z - y_i \right) \Big/ z \right]^2$$

P_2 is often referred to as a measure of the 'severity' of poverty because of its frequent usage. However, interpreting P_2 can be challenging. Nonetheless, P_2 provides limited information when considered on its own. Nevertheless, P_2 is highly beneficial in making poverty comparisons over time or space, as well as in evaluating the poverty impacts of different policy options (Leibbrandt & Woolard, 1999).

3.4.4   Analysis of Variance (ANOVA)

One-way analysis of variance (ANOVA), which is a statistical technique used to test for differences in the means of two or more groups, was used to examine the data. ANOVA is a straightforward method for implementing a statistical testing procedure. This strategy was used to determine if there were any significant variations in the variable of interest across gender, education, and violence (victims and non-victims). The hypotheses to be tested are outlined in Section 3.2. If at least one of the means is significantly different, the null hypothesis will be rejected.

The dependent variable is the log of total household income. The independent variables assessed were the educational attainment of the household head, gender of the respondent, and the violence indicator. To ensure that the household income data were normally distributed, the log of the variable was computed. Therefore, the sample data met the ANOVA assumption that the data must be normally distributed, have equal variances, and contain independent groups (Park, 2009). This assumption has been empirically confirmed by Bartlett's equal-variances test, which has a significance level greater than 10% for all one-way ANOVA tests.

The one-way ANOVA model is hereby presented below:

Equation 3.6

$$y = \bar{x} + \alpha + \varepsilon$$

where y is the dependent variable representing total household income. The overall sample mean $\bar{x}$ serves as the central aspect that has a uniform impact on all values, and it could be considered as the starting point from which the dependent variable diverges due to the influences of multiple factors and random error. In this study, the factors α correspond to circumstances (gender or experience of violence), efforts (level of education attained), and other unobservable factors. The random component ε represents the random influence associated with sampling each individual subject within a group.

3.5   Empirical Results

3.5.1   Income Inequality - Gini Coefficient and Lorenz Curve

The Gini coefficient for the entire population in the dataset is 0.27. The level of income inequality in this region is considerably lower than the national average, which is 0.35 as of 2018. The Lorenz curve for the distribution of total income among the population, which is a commonly used tool for analysing income inequality, is illustrated in Figure 3.2. The graph clearly indicates that income inequality is present, as the Lorenz curve is notably distant from the line of equality, as shown in the figure below (See Appendix 3.A for Lorenz estimates).
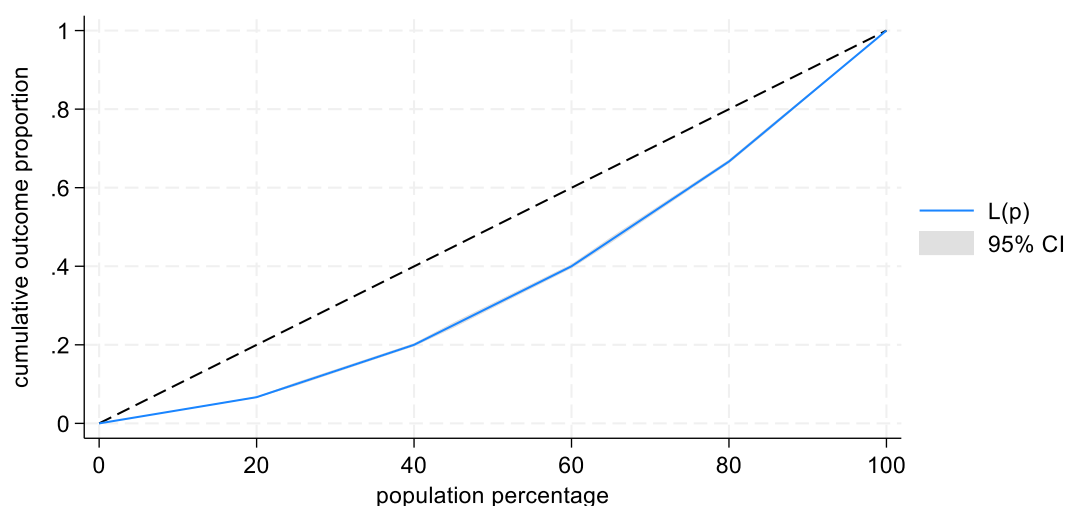
Figure 3.2 Total income Quintile Lorenz Curve

(data from: FAO, 2022)

3.5.1.1   Income Inequality by Education

The subgroup Gini coefficient results presented in Table 3.3 indicate that household heads with the least education experience greater inequality than those with higher education. Similarly, the graphs in Figures 3.3 and 3.4 show that the Lorenz curve for those with the lowest level of education appears further from the equality line than for those with higher education, highlighting the disproportionate impact of inequality on this group. By contrast, individuals with secondary education fare better than those with little to no education, as indicated by the Lorenz estimation. Additionally, the Lorenz curve for individuals with tertiary or university education is closer to the equality line than that for those with lower education.

The graphs depicted in Figures 3.4 illustrate the estimates of the Lorenz curve for income quintiles based on educational attainment (See Appendix 3.B for Lorenz estimates).

Table 3.3 Income Inequality by Education

Education Level Attained	Resp.	Gini
University	1878	0.24
Secondary	70	0.29
Primary	495	0.30
Religious Education	63	0.31
No Education	183	0.31

(data from: FAO, 2022)
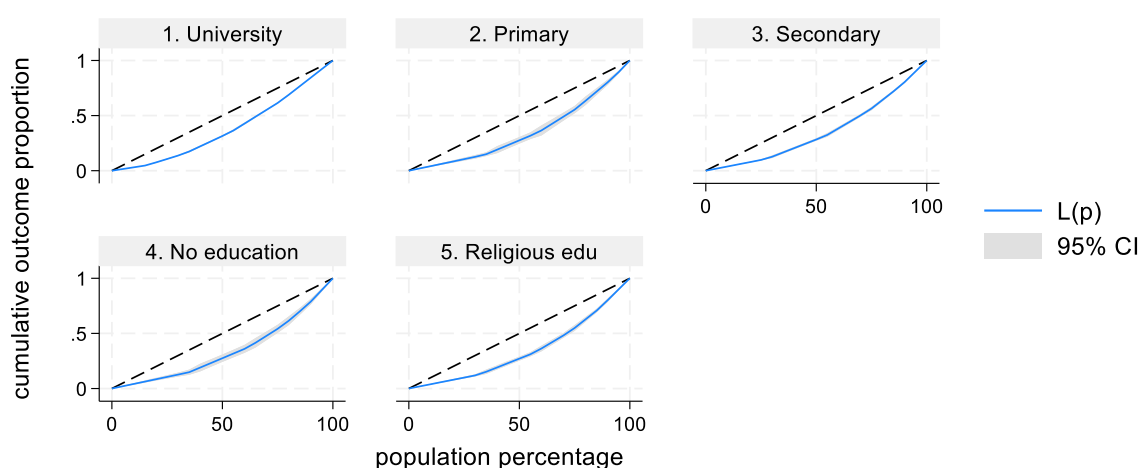
Figure 3.3 Lorenz curve - Education
(Created with Stata, data from FAO (2022))
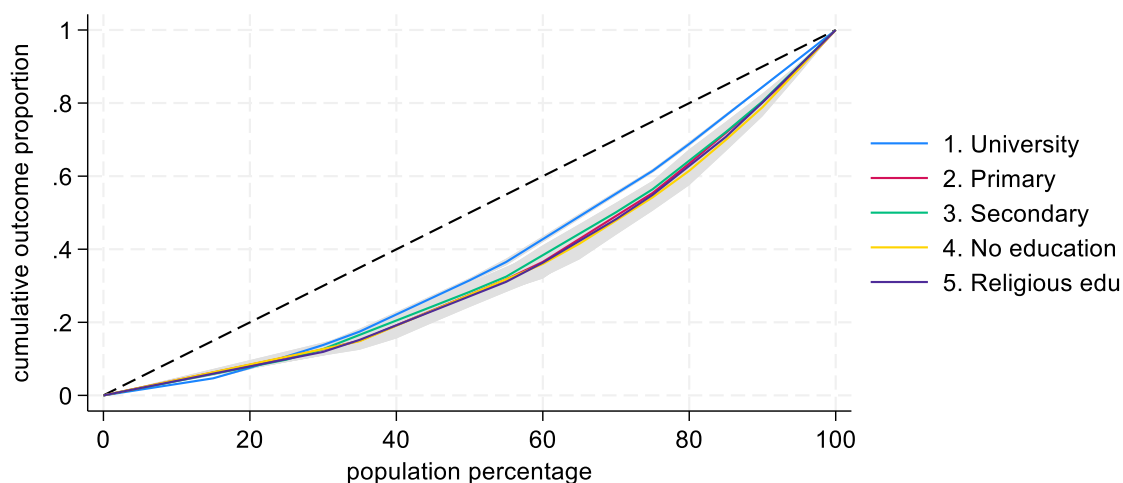
Figure 3.4 Combined Lorenz curve - Education
(Created with Stata, data from FAO (2022))

3.5.1.2 Income Inequality by Gender

The Gini coefficient for female respondents has been determined to be 0.31, which is notably higher than the Gini coefficient for male respondents, which is 0.25. The findings indicate a significant difference in the distribution of income between male and female respondents. See Table 3.4 below. The distribution of income between male and female individuals is primarily similar up to the bottom 30% as depicted in Figure 3.6, and thereafter, it diverges further. The consequence of unequal income distribution is that women experience greater effects than men. The Lorenz curve graphs presented in Figures 3.5 and 3.6 indicate that female respondents are slightly farther from the line of equality than male respondents. This is more obvious in Figure 3.6 (See Appendix 3.C for Lorenz estimates).

Table 3.4 Income Inequality by Gender

Gender	Resp.	Gini
Female	413	0.31
Male	2276	0.25

(data from: FAO, 2022)
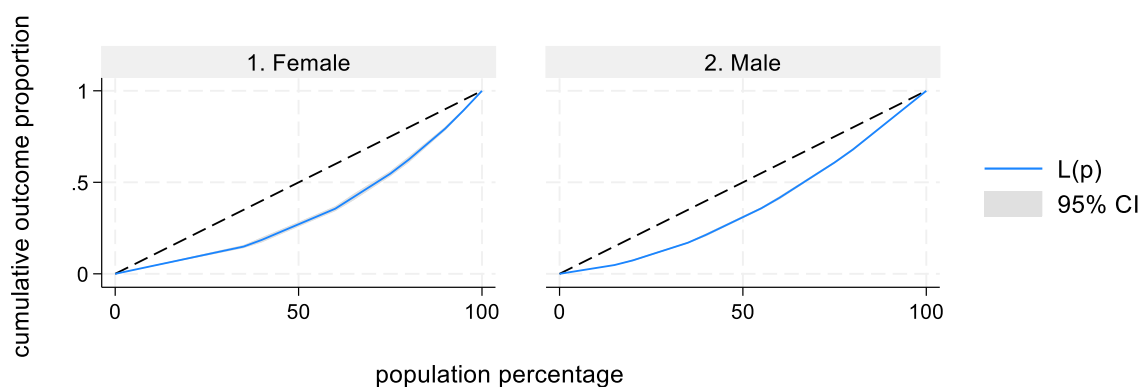
Figure 3.5 Lorenz curve - Gender
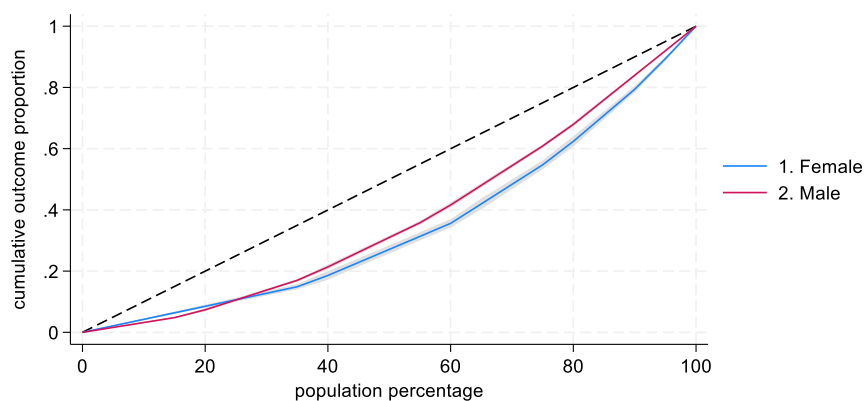
Figure 3.6 Combined Lorenz curve - Gender
(Created with Stata, data from FAO (2022))

3.5.1.3 Income Inequality by Victims and Non-Victims of Violence

The dataset was further disaggregated, and an estimation was performed on both terrorism victims (those who experienced violence) and non-victims. The results in Table 3.5 indicate that the Gini coefficient for the group that did not encounter violence or terrorism is 0.27, while for the terrorism victims, it is 0.26.

Table 3.5 Gini Coefficient of Victims and Non-Victims

Population	Resp.	Gini
Non-victims	1846	0.27
Victims	843	0.26

(data from: FAO, 2022)

3.5.1.3.1 Income Inequality by Education

Based on the results from the subgroup estimates presented in Table 3.5, income inequality by education between individuals who have experienced violence and those who have not is relatively minimal. This conclusion was drawn from the subgroup estimation results.

Table 3.6 Income Inequality by Education

Education Level Attained	Resp.	Non-Victims	Victims
University	1878	0.25	0.23
Secondary	70	0.29	0.29
Primary	495	0.30	0.29
Religious Education	63	0.30	0.31
No Education	183	0.31	0.32

(data from: FAO, 2022)

3.5.1.3.2 Income Inequality by Gender

Based on the results from the subgroup estimation presented in Table 3.7, the income inequality by gender between individuals who have experienced violence and those who have not is also relatively minimal. The Gini coefficient for females, who have experienced violence, is 0.32, while for those who have not experienced violence, it is 0.31. Similarly, the Gini coefficient for the male gender is the same for those who have experienced violence and those who have not.

Table 3.7 Income Inequality by Gender

Gender	Resp.	No Violence	Expr Violence
Female	413	0.31	0.32
Male	2276	0.25	0.25

(data from: FAO, 2022)

3.5.2 Poverty Analysis

3.5.2.1 FGT Poverty Estimates (Total population)

The Foster-Greer-Thorbecke Poverty (FGT) indices show that the poverty headcount ratio of the population is 73%. This implies that approximately three-quarters of the population lives below the World Bank poverty line, while the remaining 27% live above it. According to data available for 2013, the poverty headcount in the northeast and northwest region stood at 40% (Jaiyeola and Choga, 2021). This further suggests that poverty increased significantly over the years. In a similar vein, the poverty gap at 48% signifies the cost of entirely eliminating poverty via perfectly targeted transfers to the impoverished. By definition, the poverty gap ratio measures the average disparity between the living standards of impoverished individuals and the poverty line, represented as a proportion of the poverty line. Furthermore, the squared poverty gap, is 36%.

The presentation of the Pen's Parade in Figure 3.7 serves to complement the poverty headcount result previously presented in Section 3.5.2.1. The Pen's parade comprises a lineup of individuals in the economy, arranged in ascending order of income, with the height of each person proportionate to their earnings. Thus, those with average income would occupy a position of average height, while those with greater income would tower above the rest, and the observers would be the shortest (Haughton & Khandker, 2009). These figures effectively illustrate the visual representation of the distribution of income within the sample.
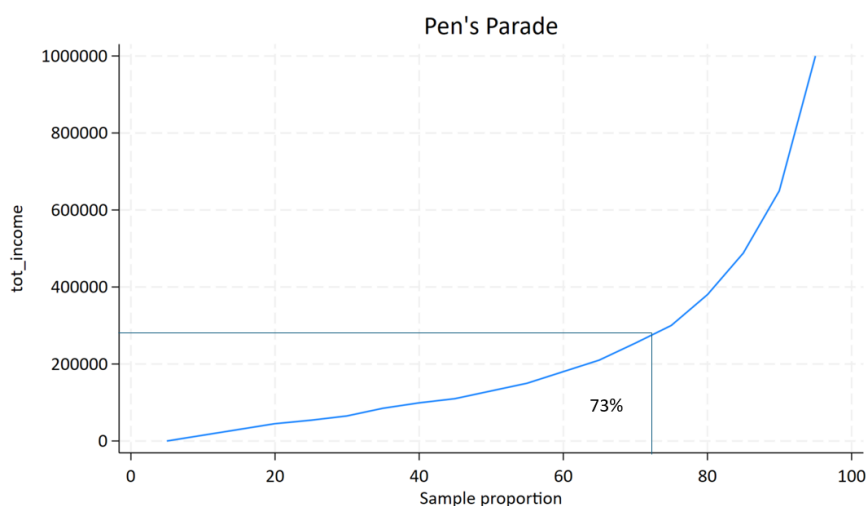
Figure 3.7 Pen's Parade
(Created with Stata, data from FAO (2022))

3.5.2.2 FGT Poverty Estimates – Education

The results presented in Table 3.8 of the subgroup poverty headcount indicate that individuals with the least education experience higher levels of poverty than those with more education. It is noteworthy that, with the exception of household heads with university education, all other household heads accounted for more than 80% of those living below the poverty line within their subgroup. Although individuals with university education fare better than those with lower levels of education, it is crucial to acknowledge that a significant proportion of this group (approximately 63 %) live below the poverty line. This finding suggests that educational attainment does not guarantee financial stability. Still on Table 3.8, it is evident that those who lack formal education are disproportionately affected by poverty, as they exhibit the highest poverty gap (65%) and poverty severity (54%). Conversely, individuals with university education experience better outcomes, as they display the lowest poverty gap (43%) and poverty severity (32%) in the table.

Table 3.8 FGT Poverty Estimates – Education

Household Poverty Line (N279,882.73)

Education Level Attained	Resp.	Poverty Headcount	Poverty Gap	Squared Poverty Gap
University	1878	0.63	0.43	0.32
Secondary	70	0.84	0.59	0.47
Primary	495	0.83	0.62	0.51
Religious Education	63	0.81	0.59	0.47
No Education	183	0.86	0.65	0.54

(data from: FAO, 2022)

3.5.2.3 FGT Poverty Estimates – Gender

The proportion of female respondents living in poverty was found to be considerably higher than that of male respondents, at 87% and 71%, respectively. This difference is notably significant. This is presented in Table 3.9. The consequence of this finding is that a greater proportion of women are living below the poverty line when compared to the number of men living below the poverty line. Only 13% of females in the dataset surpassed the poverty line, whereas 29% of males have exceeded the poverty line. Given that a majority of the population (approximately 70 %) lives beneath the poverty line, it can be reasonably inferred that a considerable portion of the population is poor. Similarly, it is clear that women are disproportionately impacted by poverty, as they exhibit a higher poverty gap of 65% and

poverty severity of 54%, while men experience better outcomes, with a lower poverty gap of 45% and poverty severity of 34% according to the table.

Table 3.9 FGT Poverty Estimates – Gender

Household Poverty Line (N279,882.73)				
Gender	Resp.	Poverty Headcount	Poverty Gap	Squared Poverty Gap
Female	413	0.87	0.65	0.54
Male	2276	0.71	0.45	0.34

(data from: FAO, 2022)

3.5.2.4   FGT Poverty Estimates – Victim and Non-victim

The dataset was subsequently divided, and an estimation was carried out for both terrorism victims (those who experienced violence) and non-victims. The findings in Table 3.10 indicate that the poverty headcount for the group that did not encounter violence or terrorism is 73%, while for the terrorism victims, it is 71%. This follows a pattern similar to that observed in the Gini coefficient results. Those who suffered violence had lower poverty headcounts than those who did not. The same pattern is evident in the poverty gap and poverty severity indicators. It is observed that individuals who have experienced violence tend to have lower poverty gap and poverty severity ratios. The reason for this could not be determined in the present study. Therefore, future research should assess why this could occur or the cause of this phenomenon.

Table 3.10 FGT Poverty Estimates - Victim and Non-victim

	Household Poverty Line (N279,882.73)			
	Resp.	Poverty Headcount	Poverty Gap	Squared Poverty Gap
Non-victim	1846	0.73	0.48	0.37
Victim	843	0.71	0.46	0.34

3.5.2.5   FGT Poverty Estimates – Victim and Non-victim (Education)

Based on the subgroup estimates presented in Table 3.11, there are differences in the poverty headcount based on education between individuals who have experienced violence and

those who have not. When comparing the poverty headcount rates of the population sample, it appears that individuals who have experienced violence and have university education, as well as those with no education, have lower poverty headcount rates than those who did not experience violence in their respective groups. However, as might be anticipated, individuals who have experienced violence and possess secondary, primary, or religious education have higher poverty headcount rates than those who have not experienced violence in their corresponding groups. The same pattern is evident across poverty gap and poverty severity indicators. It is recommended that future studies examine these observed dynamics.

Table 3.11 FGT Poverty Estimates – Victim and Non-victim (Education)

	Household Poverty Line (N279,882.73)						
	Non-victim				Victim		
Educational Level Attained	Resp.	Poverty Headcount	Poverty Gap	Squared Poverty Gap	Poverty Headcount	Poverty Gap	Squared Poverty Gap
University	1878	0.69	0.43	0.32	0.65	0.40	0.29
Secondary	70	0.84	0.59	0.47	0.86	0.60	0.46
Primary	495	0.83	0.62	0.51	0.92	0.64	0.51
Religious Education	63	0.81	0.59	0.47	0.86	0.63	0.51
No Education	183	0.86	0.65	0.54	0.79	0.66	0.57

3.5.2.6   FGT Poverty Estimates – Victim and Non-victim (Gender)

In accordance with the findings from the subgroup estimation shown in Table 3.12, the poverty headcount based on gender for individuals who have experienced violence and those who have not is comparable to the result obtained in Section 3.5.2.4 Those who have experienced violence have a lower poverty headcount ratio than those who have not. The same pattern is evident across poverty gap and poverty severity indicators. As previously proposed, future studies should delve more deeply into the reasons for this outcome. Nevertheless, in both samples, women seem to have a higher poverty headcount ratio than men do, implying that women are disproportionately affected by poverty.

Table 3.12 FGT Poverty Estimates – Victim and Non-victim (Gender)

| | | Household Poverty Line (N279,882.73) | | | | | |
| | | Non-victim | | | Victim | | |
Gender	Resp.	Poverty Headcount	Poverty Gap	Squared Poverty Gap	Poverty Headcount	Poverty Gap	Squared Poverty Gap
Female	413	0.87	0.65	0.54	0.84	0.64	0.53
Male	2276	0.71	0.45	0.34	0.69	0.43	0.32

3.5.3 One-way Analysis of Variance (ANOVA)

3.5.3.1 One-way ANOVA: Total Income by Household head Educational Level

The ANOVA model starts with the education level of the household head, which is a categorical variable that separates the sample into five groups. As shown in Table 3.13, this variable contributes significantly to income inequality among households, making it one of the factors shaping income inequality in northern Nigeria. The F-statistic of the model is statistically significant at the 1% level, with a degree of freedom of 4 for between-groups and 2472 for within-groups. The Bonferroni test was conducted to perform multiple comparisons for each of the one-way layouts of education levels. The results as shown in Table 3.14 demonstrate a significant relationship between the level of education among household heads and household income. In particular, there is a discernible negative difference between the mean income of households with low or no education and those with higher education.

Table 3.13 One-way ANOVA: Total Income by Household head Educational Level

Source	SS	df	Ms	F	Prob > F
Between groups	180.113	4	45.028	35.34	0.0000
Within groups	3149.472	2472	1.274		
Total	3329.585	2476	1.345		

Table 3.14 Bonferroni Multiple comparison test: Levels of Education

Education Comparison	Difference in mean
Primary Education – University Education	-.652[***]
Secondary - University Education	-.559[***]
No Education - University Education	-.667[***]
Religious Education - University Education	-.624[***]

3.5.3.2 One-way ANOVA: Total Income by Gender

The second variable examined was gender, which was divided into male and female categories. The objective is to determine the level of income inequality based on gender. The results in Table 3.15 suggest that gender is a significant contributor to income inequality between households and is therefore one of the determinants of income inequality. The F-statistic of the model is statistically significant at the 1% level, with a degree of freedom of 1 between groups and 2475 within groups. This finding suggests that gender has a significant impact on income inequality. Similar to the household head's education level, the Bonferroni test, as shown in Table 3.16, is employed to evaluate the gender of respondents, and the results indicate a substantial positive distinction in income levels between male and female individuals. The average income of the male respondents was found to be greater than that of their female counterparts. There is a positive difference between the mean income of the male and female respondents.

Table 3.15 One-way ANOVA: Total Income by Gender

Source	SS	df	Ms	F	Prob > F
Between groups	90.534	1	90.534	69.18	0.0000
Within groups	3239.051	2475	1.309		
Total	3329.585	2476	1.345		

Table 3.16 Bonferroni Multiple comparison test: Gender

Gender Comparison	Difference in mean
Male – Female	0.558[***]

3.5.3.3 One-way ANOVA: Total Income by Violence

The results in Table 3.17 indicate no distinction in income levels between terrorism victims and non-victims. This implies that terrorism did not significantly influence income inequality between victims and nonvictims. The results of the F test are not statistically significant, as validated by the Bonferroni test presented in Table 3.18.

Table 3.17 One-way ANOVA: Total Income by Violence

Source	SS	df	Ms	F	Prob > F
Between groups	1.836	1	1.836	1.37	0.2427
Within groups	3327.749	2475	1.345		
Total	3329.585	2476	1.345		

Table 3.18 Bonferroni Multiple comparison test: Violence

Violence Comparison	Difference in mean
Nonvictim – Victim	0.058

3.6 Discussion

The Income inequality of the household in the dataset, as measured by the Gini coefficient, is low (0.27). Income inequality in the northeast and northwest region of Nigeria is notably lower in comparison to the national average which is 0.35 as at 2018 (WDI, 2020). Thus, the null hypothesis stating that Income inequality in the northeast and northwest is higher than the national average is hereby rejected. It is often assumed that areas with ongoing insurgency are characterised by high levels of inequality (Sandler & Enders, 2007). However, the available data indicate low levels of inequality in this region, necessitating the use of alternative measures such as the poverty headcount ratio to better comprehend the economic circumstances of the local population.

As this study indicates, northeast and northwest Nigeria exhibit a relatively low level of income inequality among their residents, which implies that resources are distributed in a relatively even manner in the region. The extant literature, as outlined by Krieger and Meierrieks (2019) and Ajide and Alimi (2021), posits that high levels of income inequality can act as catalysts for terrorism. However, this hypothesis does not appear to be applicable in northeastern and northwestern Nigeria.

Income Inequality by Education

According to the Gini sub-estimates, individuals with lower education levels have a higher Gini coefficient than those with tertiary or university education. Specifically, those with university education had a Gini coefficient of 0.24, those with secondary education had a coefficient of 0.29, those with primary education had a coefficient of 0.30, and those with no education had a coefficient of 0.31. These findings suggest that individuals with lower education levels are more likely to experience higher income inequality than those with higher education levels. This observation is also visibly evident from the Lorenz curve subgroup graphs presented in Figure 3.3 and 3.4. Furthermore, the result of the one-way ANOVA analysis validates the findings of the Gini coefficient and Lorenze curve analysis. The one-way ANOVA indicates that the level of education attained by the household head have a significant impact on income inequality. The findings suggest that as the level of education attained by household heads increases, so does the household income. Thus, the hypothesis suggesting that income inequality does not exist across the educational level of household heads is rejected. These

results align with the existing literature (Checchi, 2001; Negara, 2018; Vu, 2020). The relationship between income inequality and educational levels has been well established, and it is widely believed that this correlation is due to the fact that educational choices influence earning potential.

Studies have consistently demonstrated a positive relationship between the educational level of household heads and household income. In particular, research conducted in Vietnam has revealed that higher qualifications or vocational education of household heads is associated with increased income levels (Vu, 2020). Similarly, Negara (2018) investigated the effect of higher education on income and economic growth across various countries and found that tertiary education has a substantial and positive impact on both income and economic growth. Furthermore, an exploratory study conducted in Ghana emphasised the importance of education in financial management practices and income levels, showing a significant relationship between household budgeting, level of saving, educational level, income level, and age of the household (Krah et al., 2014). Collectively, these findings support the notion that the higher education levels of household heads are linked to higher household income levels.

Income Inequality by Gender

The Gini coefficient results indicate that male respondents had a lower Gini coefficient (0.25) than female respondents (0.31). Thus, the hypothesis that income inequality does not exist across gender is hereby rejected. This suggests that female respondents bear a greater burden of income inequality than their male counterparts. This finding is also supported by the Lorenz curve of income by gender. Moreover, the findings of the one-way ANOVA analysis corroborate the results of the Gini coefficient and Lorenze curve analysis, indicating that gender type has a substantial influence on income inequality. Specifically, the one-way ANOVA demonstrates that there is a significant difference in the mean income between male and female individuals, with the latter mean income lower than their male counterparts. Therefore, the hypothesis that income inequality is not present between genders is not supported. It is worth noting that these results align with Nigeria's perception as a masculine society. Traditionally, society has conditioned men to assume leadership, decision-making, and primary domestic responsibilities, while women are often relegated to unpaid domestic

labour and low-wage jobs. As a result, the development and education of women has received limited attention, which partially contributes to the lack of female empowerment. In Nigeria, the concepts of masculinity and femininity are shaped by a combination of cultural, social, and psychological factors (Jaiyeola, 2020; Okongwu, 2021).

Income Inequality between victims and non-victims

The Lorenz curve and Gini coefficient for the group that did not encounter violence or terrorism (0.27) and those who experienced violence or terrorism (0.26) appeared similar, with a one percentage point difference. The results of the one-way ANOVA also indicate no distinction in mean income levels between terrorism victims and non-victims. The F-statistics of the model are not statistically significant. This implies that violence and terrorism did not significantly influence income inequality between victims and non-victims. Therefore, this study failed to reject the null hypothesis that violence or terrorism has no significant effect on income inequality.

FGT Poverty Estimates (Total population)

The existing body of literature has primarily focused on the root causes of terrorism and the causal links between poverty, terrorism, and income inequality (Piazza, 2006; Coccia, 2018; Iheonu & Ichoku, 2021). However, this study adopts a distinct approach by assessing the poverty rate in a region severely impacted by terrorism. The poverty headcount ratio of the population under observation is 73%. The poverty gap and poverty severity are also quite high. According to the latest publicly available data from a survey conducted in 2021, 33% of Nigeria's population is living below the World Bank poverty line, while an additional 16.6% is considered vulnerable to it (UNDP, 2023).

These results suggest that the poverty rates in northeast and northwest Nigeria are high. Thus, the null hypothesis stating that the majority of households residing in northeast and northwest Nigeria live above the poverty line is hereby rejected. This finding is supported by Jaiyeola and Bayat (2020), who noted that poverty is most prevalent in the northern region of the country. Based on their findings, the poverty rates in the northeast and northwest zones of Nigeria were 77.7% and 76.3%, respectively (Jaiyeola & Bayat, 2020).

It is important to note that while northeast and northwest Nigeria exhibit a low level of income inequality, their high poverty rate suggests a different reality. In other words, although the region appears relatively equal, its largely impoverished population suggests otherwise. Only 27% of the population live above the World Bank poverty line. The findings of this study underscore the importance of the economic devastation caused by terrorism in the northern region. Due to terrorism, the infrastructure sector in the northern region has suffered significant damage. Many foreign and local contractors working on projects such as road construction, bridge building, housing estate development, dam construction, National Integrated Power projects, and railway track rehabilitation have either abandoned their sites or moved them to other states. This has caused a major setback in the region's economy (Chibuike & Eme, 2019). In addition, Jaiyeola and Bayat (2020) opined that insurgency in the region has led to a significant increase in the poverty headcount, and it has also resulted in the region mainly depending on agriculture and a subsistence way of life.

FGT Poverty Estimate - Education

This research indicates that the FGT subgroup poverty estimates for education demonstrate a clear correlation between educational attainment and economic well-being. Specifically, the data shows that individuals with higher levels of education are less likely to live in poverty than those with lower levels of education. Notably, over 80% of household heads with an education lower than a university degree fall below the poverty line in their respective subgroups. In terms of poverty gap and poverty severity, individuals with higher levels of education tend to have lower values compared to those without education. These findings underscore the crucial role that education plays in alleviating poverty, with an emphasis on the significance of university education. Existing literature (Afzal et al., 2012; Ukwueze & Nwosu, 2014) corroborates this conclusion.

FGT Poverty Estimate - Gender

Finally, the data indicate that female respondents exhibit a higher poverty headcount rate than male respondents do. Specifically, 87% of the female respondents were below the poverty line, which is higher than the 71% of the male respondents in their respective subgroups. Similarly, men exhibit lower levels of poverty gap and poverty severity in contrast

to their female counterparts. These findings have significant implication, as a larger proportion of women live in poverty than men. This disparity further accentuates gender inequality in northeast and northwest Nigeria. Extant literature suggests that women and girls are more frequently subjected to higher levels of poverty than are men and boys. This unfortunate reality is demonstrated by the United Nations' Sustainable Development Goals (SDGs) projection for 2022. According to these projections, an alarming 83.7% of the world's extremely impoverished women and girls will reside in only two regions: Sub-Saharan Africa (accounting for 62.8%) and Central and Southern Asia (20.9%) (UN, 2022).

Poverty Headcount – Victim and Non-victim

The poverty headcount among individuals who have not encountered violence or terrorism appears to be greater than among those who have experienced terrorism across all samples, genders, and educational backgrounds, both with university education and no education. The same pattern is evident across poverty gap and poverty severity indicators. The cause of this phenomenon remains unclear according to the findings of the present study. Future research should therefore investigate the factors that contribute to this phenomenon or the reasons for this occurrence.

3.7 Policy Recommendation

This study successfully achieved its intended objectives by answering the stated questions. These findings indicate that income inequality in northeast and northwest Nigeria is lower than the national average. However, low-income inequality alone does not offer a complete picture, as poverty rates in the northeast and northwest are higher than the national average. This study revealed that a substantial portion of the population in northeast and northwest Nigeria live below the World Bank poverty line, suggesting that they struggle to meet their basic needs. Therefore, it is crucial that steps are taken to address this issue and work towards reducing poverty levels in northeast Nigeria.

To attain this goal of reducing poverty, it is imperative for Nigeria to adopt the strategies suggested by Bhattarai (2010), which emphasises the need for a mechanism that is both growth-promoting and redistributive, and that is compatible with incentives for all three parties–the wealthy, the poor, and the government. Bhattarai suggested that alleviating poverty requires collaboration from the rich who are willing to pay their fair share of taxes, the poor engaging in skill enhancement, and the government being able to implement policies geared towards reducing poverty. Thus, redistribution policies are crucial for reducing poverty and Nigeria should implement effective measures to achieve this goal. In addition, it is necessary to prioritise addressing terrorism challenges in the north and in the country at large. Krieger and Meierrieks' (2019) findings reinforce the notion of redistribution. Their study investigated the impact of redistribution on reducing terrorist activity, revealing that countries with higher levels of redistribution experience less domestic terrorism, partly because redistribution bolsters institutional conditions.

Furthermore, the study also found that household heads with higher education fare better than those with lower education, as it relates to income inequality. Policymakers in Nigeria must carefully consider incorporating educational inequality policies into their policy agenda in a more deliberate manner to address income inequality and poverty. Similarly, our analysis reveals that female residents in the northeast and northwest regions experience greater income inequality than their male counterparts do. It is recommended that priority be given to the promotion of gender equality in terms of earnings. This can be achieved by implementing policies that encourage women to participate in wage-paying jobs rather than

confining them to traditional domestic roles that have been historically assigned to them. This will lead to further reduction in poverty among women.

3.8 Conclusion

The present study aimed to assess the economic state of households within a region that has been impacted by terrorism, and it effectively fulfilled its objectives by addressing previously stated research questions. These findings indicate that income inequality in northeast and northwest Nigeria is lower than the national average. However, low-income inequality alone does not offer a complete picture, as poverty rates in the northeast and northwest are higher than the national average. Furthermore, this study indicates that approximately a quarter of households in the northeast and northwest regions of Nigeria live above the poverty line, as defined by the World Bank. This suggests that a substantial portion of the population in northeast and northwest Nigeria lives below the poverty line, meaning that they struggle to meet their basic needs. The study also found that household heads with higher education fared better than those with lower education, as it relates to income inequality and poverty estimates. Similarly, our analysis reveals that female residents in the northeast and northwest regions experience greater income inequality than their male counterparts do. Therefore, policy recommendations have been proposed to address these issues.

Our approach is not without its limitations. Specifically, we do not have access to longitudinal data, which restricts our ability to determine whether current income inequality and poverty headcounts will expand or contract. It is important to note that our analysis was based on a snapshot of history and further research may be necessary to draw more conclusive findings using longitudinal data.

Chapter 4 Economic Effect of Covid-19 on Income Inequality

Abstract

The present study aims to evaluate the economic effect of Covid-19 on income inequality in northeast and northwest Nigeria. This study uses 2021 dataset from the Food and Agricultural Organization (FAO) and inequality measures, such as the Gini coefficient and Lorenz curve. The study finds that although income inequality grew among individuals who adhered to Covid-19 restrictions, among those whose household heads became unwell or passed away, and among those who suffered other forms of economic shocks, the rise appears to be marginal. This highlights the necessity for tailored interventions and policy measures to mitigate the impact of the pandemic on income inequality and the Nigerian economy as a whole, given that those who faced other forms of economic shocks were more affected than others.

4.1 Introduction

In December 2019, an acute respiratory disease was first identified in Wuhan, China. The disease has spread swiftly from China to other regions of the world. Shortly thereafter, scientists discovered that the disease was caused by a novel coronavirus. This newly identified coronavirus was named severe acute respiratory syndrome Coronavirus-2. It was initially believed that the outbreak began through zoonotic transmission associated with the seafood market in Wuhan, China. However, subsequent observations have revealed that human-to-human transmission plays a significant role in the outbreak (Yuki et al., 2020).

The virus has had a profound impact on numerous aspects of life. In addition to causing the deaths of over 7 million individuals and sickening over 675 million others, its ramifications are felt in the global economy (Worldometer, 2024). Previous outbreaks of coronaviruses have not led to a global pandemic on the scale of Covid-19. These earlier coronaviruses typically caused mild infections and were not considered highly pathogenic until a large number of cases were reported in the Guangdong province of China between 2002 and 2003, during the severe acute respiratory syndrome (SARS) outbreak (Zhong et al., 2003). In total, 8422 people were infected during this period, and 916 of them lost their lives, while 7506 recovered (Meo et al., 2019). Similar to the rest of the world, Nigeria was not spared from the negative effects of Covid-19. Nigeria was among the first countries in Sub-Saharan Africa to identify Covid-19 cases and, therefore, implemented measures to contain the fallout (CRS, 2021). To date, the country has recorded over 267,000 cases and more than 3,100 deaths (Worldometer, 2024).

There was a widespread believe that the Covid-19 pandemic aggravated global income inequality, as poorer countries have experienced a more significant decline in per capita income than richer nations. This concern stems from how the economic consequences of the pandemic have had a disproportionately negative impact on individuals with lower levels of education and income, exacerbating disparities within and between nations (Deaton, 2021). The Covid-19 pandemic has had a profound impact on both developed and developing nations. As the pandemic began, economists agreed that the global economy would experience a recession. During the last week of February 2020, the global stock market suffered a loss of US$6 trillion. Additionally, the S&P 500 index experienced a decline of over US$5 trillion. This

significant decrease in stock value can be attributed to the uncertainty among investors regarding the potential consequences of the pandemic on corporate profits (Ozili, 2020).

Global GDP decreased by 5.2% in 2020, and advanced economies were expected to experience a contraction of 7%, whereas developing countries would see a decrease of 2.5% (World Bank, 2020a). These figures indicate the most severe global recession over several decades, despite governments implementing fiscal and monetary policy measures to mitigate the impact. The pandemic's lingering effects are projected to lead to long-term consequences such as reduced investment, lower levels of human capital due to job and education losses and disrupted global trade. The Covid-19 situation necessitated immediate action to alleviate health and economic consequences, protect vulnerable populations, and facilitate lasting recovery (World Bank, 2020a).

Nonetheless, the global economic downturn in 2020 was not as severe as anticipated, owning to the fiscal and monetary policies implemented by governments that year. The world economy experienced a two-tier recovery, with advanced economies showing signs of improvement and developing economies lagging behind. However, the surge in infection rates in countries such as India, Brazil, Europe, the United States, and several low-income nations has led to renewed calls for lockdowns, which could inadvertently jeopardise potential economic recovery in 2021 (CRS, 2021).

As the virus wreaked havoc on the global economy, oil prices tumbled by 60 percent. The Nigerian oil sector contributes significantly to government revenue; thus, the decline in global oil prices has far-reaching implications for the economy (World Bank, 2021). Nigeria has a substantial population of over 200 million people. Unfortunately, it is estimated that approximately eighty-three million individuals in Nigeria live below the poverty line, with an additional fifty-three million vulnerable (World Bank, 2020b). The impact of Covid-19 may result in many vulnerable individuals to fall below the poverty line.

In the area of development, Nigeria has made advancements in socioeconomic matters in recent times, however, its human capital remains lacking due to insufficient investment. Despite this progress, Nigeria still faces significant developmental challenges, such as reducing its dependence on oil and diversifying its economy, addressing inequality,

improving its infrastructure, enhancing its institutions, and addressing governance and public financial management issues. These challenges make the Nigerian economy susceptible to the impact of Covid-19 (World Bank, 2020b).

Furthermore, Nigeria has a greater economic impact than health impact as a result of Covid-19. The pandemic has caused severe economic disruptions, resulting in fiscal deficits, negative economic indicators, and health and economic challenges. The impact of the pandemic on businesses in Nigeria was particularly notable, as they faced difficulties such as changes in customer patronage, supply disruptions, and inflation of goods prices (Usman et al., 2024). The lockdown measures implemented in Nigeria during the Covid-19 pandemic faced challenges due to various factors, such as government distrust, service failures, and multidimensional poverty (Ezechi et al., 2024). However, the extent to which Covid-19 has influenced income inequality remains largely unexplored. Consequently, this study aims to add to the existing body of knowledge by examining the economic effects of the pandemic on income inequality. This study is comprised of eight sections. The first section, Section 4.1, serves as the introduction. Section, 4.2, presents a comprehensive literature review. Section, 4.3, delves into the data sources and offers a detailed description. Section, 4.4, concentrates on the empirical analysis. Section, 4.5, presents the empirical results. The sixth section, 4.6, offers a discussion, while Section 4.7, the study presents policy recommendations, and section, 4.8, concludes the paper.

4.2   Literature Review

The first case of Covid-19 in Nigeria was reported on the 27th of February 2020. This led to a chain of events crippling the Nigerian economy. The pandemic's widespread outbreak prompted the restriction of movement aimed at curbing the spread of the virus while infected individuals received treatment. In light of the index case reported in Lagos, Nigeria's commercial capital (Ebenso & Otu, 2020; Garba et al., 2020; Bassey & Bassey, 2021), it became essential to follow the World Health Organization (WHO) guidelines on increased testing, contact tracing, isolation, patient care, social distancing, and necessary preventive hygiene. Furthermore, the lockdown policy was implemented to curb physical interaction and the spread of the disease, despite the absence of social support for citizens facing hardships due to these measures (Adebowale-Tambe, 2022; Shodunke, 2024).

The difficulties faced by many Nigerians owing to multidimensional poverty made it challenging for them to comply with government-declared lockdown measures. For those living in poverty, following the restrictions would have meant facing the risks of malnutrition and starvation. The combination of multidimensional poverty and distrust in government institutions led to the disregard for stay-at-home orders, social distancing guidelines, and personal hygiene directives. Despite assurances of assistance to alleviate the consequences of lockdowns, there was minimal faith in the government's 'ability to deliver these promises (Ezechi et al., 2024).

The Covid-19 pandemic has gained widespread attention as a result of the havoc it has wreaked around the world. As a result, numerous studies have been conducted to evaluate its effects on various aspects of life. Some studies have examined the impact of Covid-19 on economic growth (Baldwin & Tomiura, 2020; Maliszewska et al., 2020), whereas others have assessed its impact of Covid-19 induced lockdown on economic activities (Liang et al., 2020). At a global level, Maliszewska et al. (2020) conducted a preliminary assessment of potential impact of Covid-19 on GDP and Trade using standard computable general equilibrium (CGE) model and finds a significant decline in GDP in both high-income and low-income countries. Notably, the decline was approximately 4 percent below the global benchmark.

The study conducted by Elgar et al. (2020) titled "Social Capital, Income Inequality, and COVID-19 Mortality in 84 Countries" explored the relationship between social capital, income

inequality, and COVID-19 mortality rates in 84 nations. This study utilised data from the World Values Survey and implemented Poisson regression with population-averaged estimators to conduct time-series analysis on nations which had experienced at least 10 COVID-19 fatalities. The study found that income inequality and particular aspects of social capital were connected to COVID-19 fatality rates, even after adjusting for factors such as wealth, population size, and age. Meanwhile, civic participation and faith in state institutions demonstrated a lower mortality rate correlation, whereas social trust and group affiliations showed a higher mortality rate association during the initial stages of the pandemic.

The effects of COVID-19 on global income inequality were explored in Angus Deaton's work. Deaton (2021) suggest that the per capita income losses were generally more pronounced for countries that were better off in 2019, as they experienced more deaths per capita and suffered other pandemic-related harms. Despite this, the trend towards greater global inequality actually slowed down, and in fact, it fell at an even faster rate in 2020. This suggests that the pandemic has not led to further disparities between countries but has rather highlighted existing inequalities. While the Deaton (2021) conclusion may be temporal at the time, the findings are relevant to a long-standing issue of income inequality (Atkinson, 2013) and are likely to be compounded by pandemics such as Covid-19. However, according to Lapinova (2024), it was challenging to detect a noticeable pattern in the rise of inequalities among European nations during the COVID-19 pandemic. The researcher's comparative study of the data revealed neither a clear upward trend in income inequality nor a downward trend in income levels during the pandemic period.

The research conducted by Clark et al. (2021) examine the effect of the COVID-19 pandemic on income inequality in France, Germany, Italy, and Spain. Using a cross-country survey dataset, this study tracks the changes in equivalent disposable household income from January 2020 (pre-COVID-19) to January 2021. The study employed Lorenz curves and evaluated four relative measures of inequality, which comprised Gini, as well as three additional members of the generalised entropy family. The study's findings reveal a decrease in income inequality during the pandemic. The authors attribute this unexpected trend to government compensation schemes such as furlough payments and direct support targeted at vulnerable populations.

Lapinova (2024) conducted a comparative analysis of the pandemic's impact on income inequality across European countries. This study investigated the effects on income distribution, regional differences in income inequality, and the role of public sector activity and social security systems. It utilised data from European surveys on income and living conditions to analyse income levels and trends in inequality from 2019 to 2021. The study found that the effects of the pandemic on income inequality varied across European countries, but common factors could be identified. Furthermore, the study indicated that the pandemic did not significantly alter the order of nations, based on their Gini coefficient values or income levels.

Angelov and Waldenström (2023) evaluated the effect of COVID-19 on income inequality in Sweden by utilising a monthly payroll register and a comprehensive tax-return register to measure earnings and earnings inequality from January 2019 to March 2021. This study evaluates the distributional impact of government policies on earnings during the pandemic by employing descriptive before-and-after analysis and difference-in-differences regressions. Specifically, this study examines the effects of short-term work allowance and reorientation support programs, as well as the overall impact of the pandemic on earnings distribution. The study finds that the pandemic exacerbated income inequality, particularly among lower-earning individuals who experienced a substantial decline in earnings. Government intervention helped alleviate the escalation of inequality but did not completely eliminate it.

Similarly, Usman et al. (2024) assessed the impact of the COVID-19 pandemic on Nigeria's socio-economic development between 2019 and 2022. The study employed qualitative techniques and analysed secondary data from Nigeria's bureau of Statistics, the Central Bank of Nigeria, international organisations' reports, and academic publications. It highlights the difficulties experienced by the nation, including economic turmoil, budget shortfalls, unfavourable economic indicators, and health and financial hurdles. Research indicates that Nigeria, being a revenue-driven economy, was significantly impacted by Covid-19. This was due to the pandemic's influence on the country's economic development, diaspora remittances, and overall health status. The decline in oil prices, closure of businesses, and rise in the cost of goods and services all contributed to the nation's hardship.

Inegbedion (2021) employed least-squares methods and t-tests to evaluate the effects of Covid-19 on Nigeria's economic growth. The findings of the study revealed that the Covid-19-induced lockdown and subsequent constraints on economic activities led to a loss of income for individuals, which ultimately had a negative impact on the country's economic growth.

Existing literature on the effect of Covid-19 on income inequality is characterised by a lack of consensus. According to Clark et al. (2021), it was discovered that there was a decrease in income inequality during the pandemic. On the other hand, Lapinova (2024) found that the effects of the pandemic on income inequality varied across European countries. Angelov and Waldenström (2023) discovered that the pandemic exacerbated income inequality, while Inegbedion (2021) suggests that Covid-19 led to a loss of income for individuals, which ultimately had a negative impact on the country's economic growth. The lack of consensus in literature highlights the need for further research to assess the impact of Covid-19 on income inequality. Therefore, this study aims to fill this gap and contribute to the body of knowledge by evaluating the economic effect of Covid-19 on income inequality.

4.3 Data Sources and Description

To consistently assess the impact of Covid-19 measures on income inequality, I utilised data from a 2021 household survey data from the Food and Agriculture Organization of the United Nations (FAO). The Food and Agriculture Organization of the United Nations carried out a household survey in Nigeria, encompassing five states: Yobe, Borno, and Adamawa in the northeast, as well as Zamfara and Katsina in the northwest The 2739 household interviews for the survey were conducted across the five states (FAO, 2022). The global measures put in place to curb the spread of Covid-19, including in Nigeria (Ezechi et al., 2024), were in effect when FAO data were collected. It is therefore essential to evaluate the impact of these measures on income inequality.

The variables that are of core importance include the measures taken in response to COVID-19, the illness or passing of household heads, economic shocks, total income, and the income quintile derived from total income (Refer to Table 4.1 for income quintile distribution). Households that have endured some forms of economic shock are those who have experienced any disaster or crisis that has impacted their ability to earn an income, whether it be at the community or household level. I have consequently selected Covid-19 measures, the sickness or death of household heads, and economic shock as the variables of interest to assess the extent of income inequality present. These variables were representative of the prevailing global conditions at the time the data were collected. It is also important to note that I have a limitation in that certain variable, such as anonymised data on individuals who have experienced Covid-19 related health issues, were not included in the FAO dataset (2022) dataset.

The sources of income for households in the dataset vary and range from agricultural to public employment, as reported by the Food and Agriculture Organization (FAO, 2022). This diverse range of income sources makes this dataset an ideal tool for estimating income inequality and its associated consequences. The summary statistics are presented in Table 4.2. The Covid-19 variable was divided into two categories: those who did not follow Covid-19 measures (1) and those who did (2). The sickness and death variable classified individuals based on whether their household head was not sick or did not die during the pandemic (1)

or was sick or died (2). The shock variable was categorised into those who did not experience an economic shock (1) and those who did (2).

Table 4.1 Income Quintile

inc_q	N	Mean	Min	Max	SD	p50
1	370	14331.02	0	40021.99	14184.15	12013.33
2	369	65174.41	40023.15	90024.93	15343.20	60071.53
3	369	124860	90030.71	169980.20	22737.28	120039.20
4	369	247243.90	169985.80	349973.50	51746.48	240042.70
5	369	886356.30	350006	8700005	900324.50	599999
Total	1846	267455.90	0	8700005	513994.80	120035.20

Table 4.2 Variable definitions and descriptive statistics

Variable	Variable Name	Obs.	Mean	Std. Dev.	Min.	Max.	Definition
Total Income	Tot_income	2689	278755.6	537057.7	0	8700005	Total Income
Covid	Covid19	2689	1.6742	0.4687	1	2	Covid-19 measures
Sickness and death	sickdhh	2689	1.1636	0.37000	1	2	Sickness or death of household head
Shock	econshock	2689	1.0417	0.1998	1	2	Economic shock
Income Quintile	Inc_q	2689	2.999	1.414	1	5	Income quintile computed from total income

(data from: FAO, 2022)

4.4   Empirical Approach

A vast array of theories has been proposed to account for inequalities in different forms, one of which is the Multidimensional Inequality Framework (MIF). The MIF is a structured and well-founded instrument for assessing and evaluating disparities with the added benefit of identifying contributing factors and potential solutions. Although the understanding of income inequality trends varies, studies suggest that various measures can be used to depict a particular picture in certain countries, over specific periods, or globally. Despite the varying expressions of dissatisfaction and disapproval of inequality in all its forms, there is growing recognition that inequality and poverty are more holistically understood as multidimensional issues (McKnight et al., 2017).

Employing the multidimensional theory of inequalities, this study comprehensively examined the effect of Covid-19 measures on income inequality in northeast and northwest Nigeria using the Gini coefficient and Lorenz curve. The analyses in question will be used to demonstrate associations rather than establish causation.

4.4.1   Income Inequality Measures

A wealth of indicators has been suggested in the literature to assess income inequalities. These indicators comprise a variety of statistical measures, including the Lorenz curve, Gini coefficient, lognormal distribution, coefficient of variations, relative mean deviation, Kakwani, inter-quartile range, and ratios of income received by the highest and lowest income groups. In addition, these measures also incorporate normative elements that consider the societal values towards the welfare of different population groups. This comprises Theil's entropy measure, Atkinson's Index, and Sen's Index (Whitehouse, 1995; Cowell, 2011). An effective measure of income inequality ought to fulfill the following conditions: (1) Pigou-Dalton transfer sensitivity: Transfers of income from poorer individuals to wealthier ones contribute to the growth of income in equality; (2) Symmetry: Income inequality remains consistent when two individuals merely swap their positions in the distribution; (3) Independence: If all individuals' incomes rise by the same proportion, income inequality will remain unchanged; and (4) Population homogeneity: If the relative increase or decrease in the population of each income group is the same, then there would be no alteration in income inequality (Cowell, 2011).

Although the Gini coefficient satisfies all four properties mentioned above, it is crucial to recognise that not all measures of inequality meet the standards for a suitable inequality measure. In 1987, Shorrocks and Foster put forward an alternative to the Pigou-Dalton criterion, which prioritises income transfers among those with low incomes over those between high-income earners. For instance, the coefficient of variation is greatly influenced by individuals with high incomes. They recommended using the standard deviation of logarithms as an alternative, even though this measure does not fulfill the Pigou-Dalton condition.

4.4.2 Gini Coefficient and Lorenz Curve

The Gini coefficient demonstrates the distribution of income across a population cumulatively, starting with the poorest 20% and progressing to the 40%, 60%, 80%, and 100% brackets. This distribution is plotted on a graph and compared to the 'line of equality.' The distance from this line represents the extent of inequality in a given country. The Gini coefficient is expressed as a value between 0 and 1 or as a percentage between 1 and 100. A lower Gini coefficient is desirable, and an increase in the coefficient indicates a rise in income inequality within a country (Oxfam, 2017). Furthermore, the Gini coefficient assesses the ratio of the area between the Lorenz curve and the 45-degree line to the entire area of the box. To illustrate this concept, refer to Figure 4.1, which displays an example of a Lorenz curve. The 45-degree line is known as the egalitarian line, symbolising a completely equal society in terms of income distribution (Whitehouse, 1995; Deaton, 2018).

The GINI coefficient equation was adapted from Whitehouse (1995). The equation is presented as follows:

Equation 4.1

$$I_{GINI} \; = \; \frac{2}{n^2 \bar{y}} \Sigma_{i=1}^{n} \, i(y_i \; - \; \bar{y})$$

Where I_{GINI} is the Gini income, $\bar{y}$ denotes the mean of the distribution, 'n' is the sample size (total number of observations), y_i is the naira value of the ith household income and are arranged in ascending order. Gini-coefficient used was for the estimation and comparison of

the degree of income inequality in the sample, between those who observed covid-19 measures, experienced sickness or death of household heads, and economic shock.
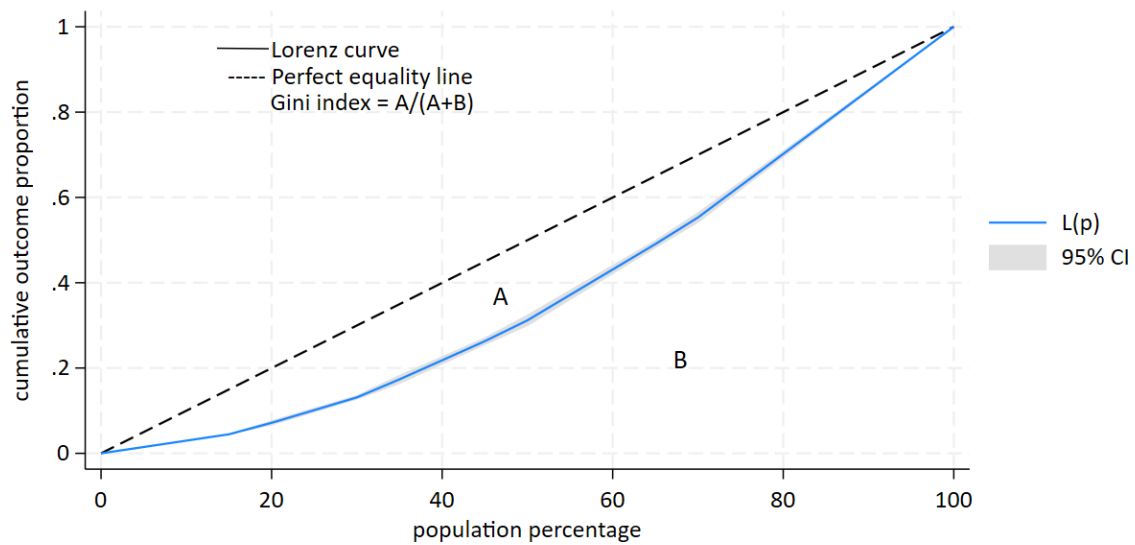
Figure 4.1 Income Quintile Lorenz Curve

(Created with Stata, data from FAO (2022))

4.5 Empirical Results

4.5.1 Income Inequality - Gini Coefficient and Lorenz Curve

The income inequality in northeast and northwest Nigeria, as indicated by the Gini coefficient for the entire population in the dataset, which is 0.27. The income inequality level in this region is significantly lower than the national average, which stood at 0.35 in 2018. The Lorenz curve, a widely used tool for evaluating income inequality, is depicted in Figure 4.2 and shows the distribution of total income among the population. The graph demonstrates that income inequality is evident as the Lorenz curve is significantly far from the equality line (see Appendix 4.A for the Lorenz estimates).
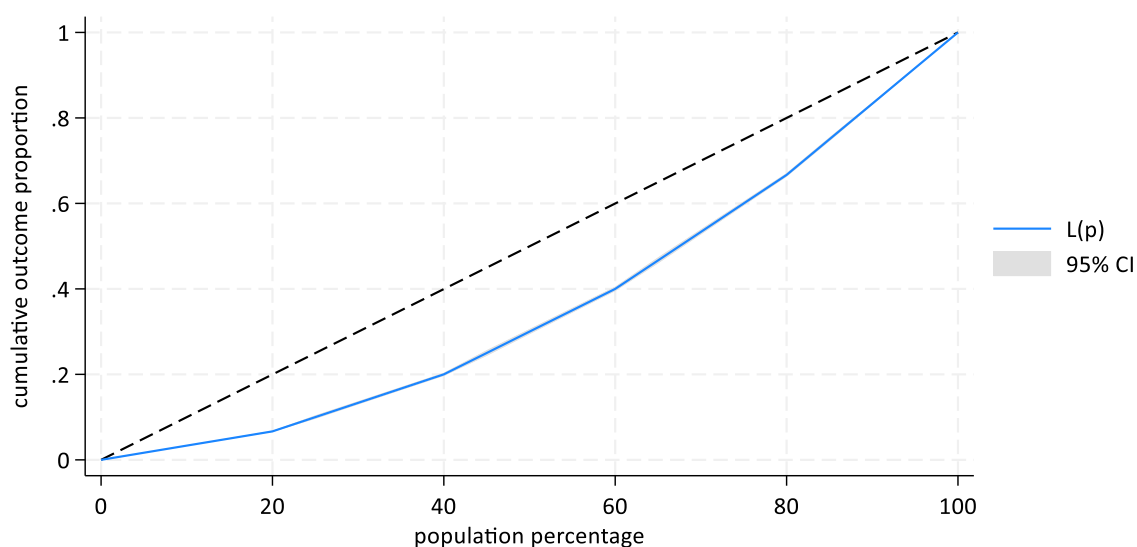
Figure 4.2 Total income Quintile Lorenz Curve
(Created with Stata, data from FAO (2022))

4.5.2 Income Inequality by Covid-19 Measures

The Gini coefficient for respondents who did not adhere to Covid-19 "Stay at home" restriction is 0.26, while those who adhere to the restriction is 0.27. The findings indicate a slight difference in the distribution of income between the two groups. See Table 4.3 below. The Lorenz curve graph presented in Figures 4.3 and 4.4 also indicates that the Lorenz curve of respondents that adhered to the Covid 19 restriction is slightly further from the line of equality than those who did not follow the Covid-19 recommendation by the government. This is more obvious in Figure 4.3 below (see Appendix 4.B for the Lorenz estimates).

Table 4.3 Income inequality by Covid-19 Measures

Covid-19 Measures	Resp.	Gini
No Lockdown	885	0.26
On Lockdown	1824	0.27

(data from: FAO, 2022)
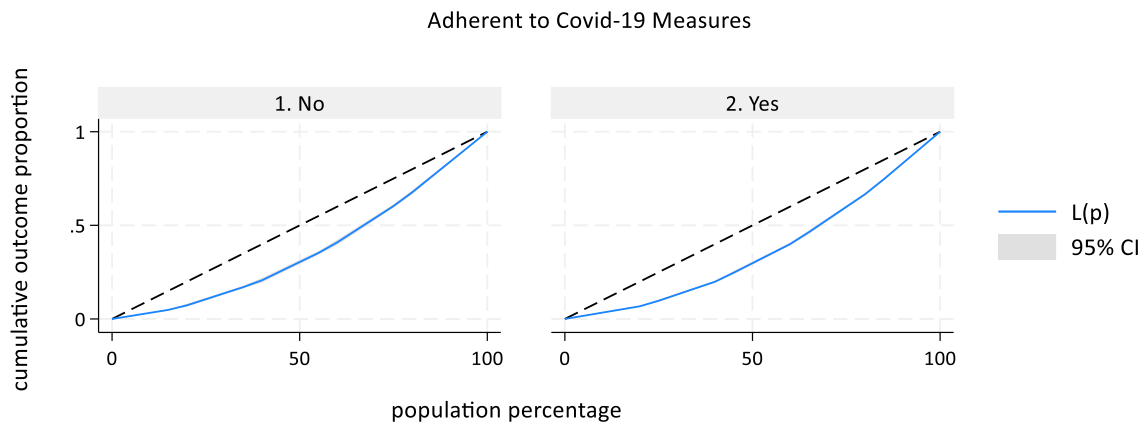
Figure 4.3 Lorenz Curve - Covid-19 Measures
(Created with Stata, data from FAO (2022))
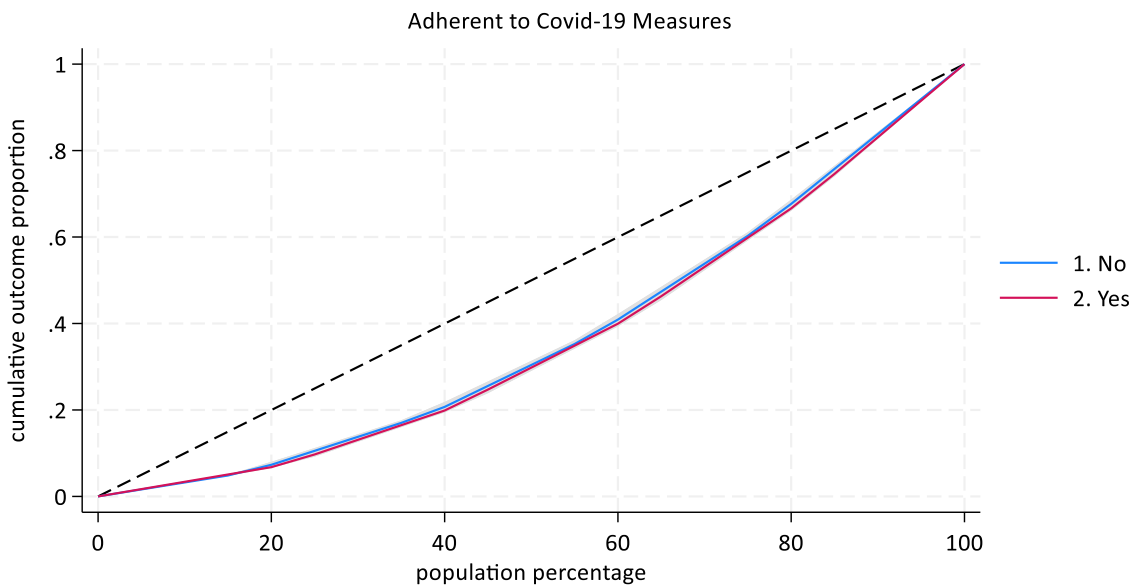
Figure 4.4 Lorenz Curve - Covid-19 Measures
(Created with Stata, data from FAO (2022))

4.5.3 Income Inequality by Sickness and Death of Household Head

The Gini coefficient for respondents whose household head was neither sick or dead has been determined to be 0.26, which is somewhat lower than the Gini coefficient for respondents whose household head either fell sick or passed, which is 0.28. The findings indicate a difference in the distribution of income between those whose household heads either fell sick or died, although the margin appears minimal. See Table 4.4 below. The Lorenz curve graph presented in Figures 4.5 and 4.6 also shows that respondents who lost their household head or were sick were slightly farther from the line of equality than those who stayed healthy. This is more obvious in Figure 4.6 below (see Appendix 4.C for the Lorenz estimates).

Table 4.4 Income Inequality by Sickness or Death of Household Head (HH)

Sickness or Death of HH	Resp.	Gini
No	2265	0.26
Yes	444	0.28

(data from: FAO, 2022)
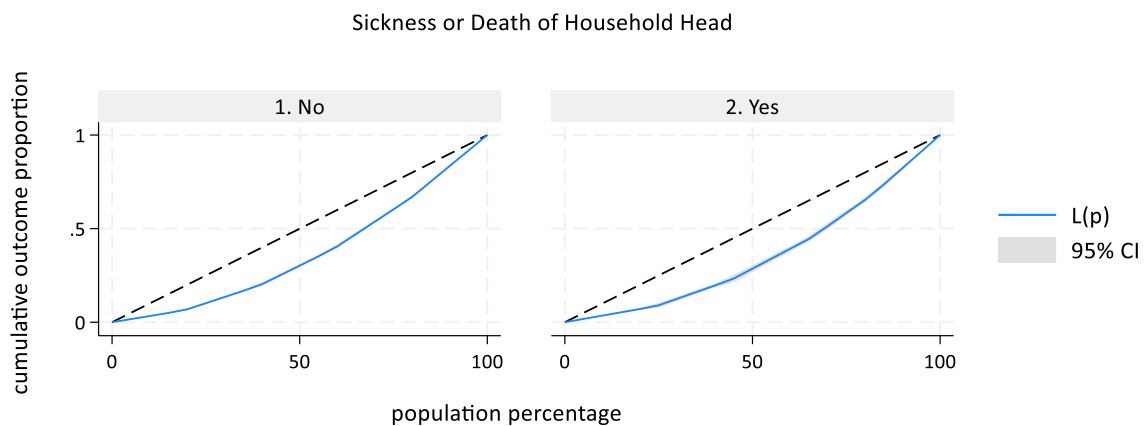
Figure 4.5 Lorenz Curve - Sickness or Death of HH
(Created with Stata, data from FAO (2022))
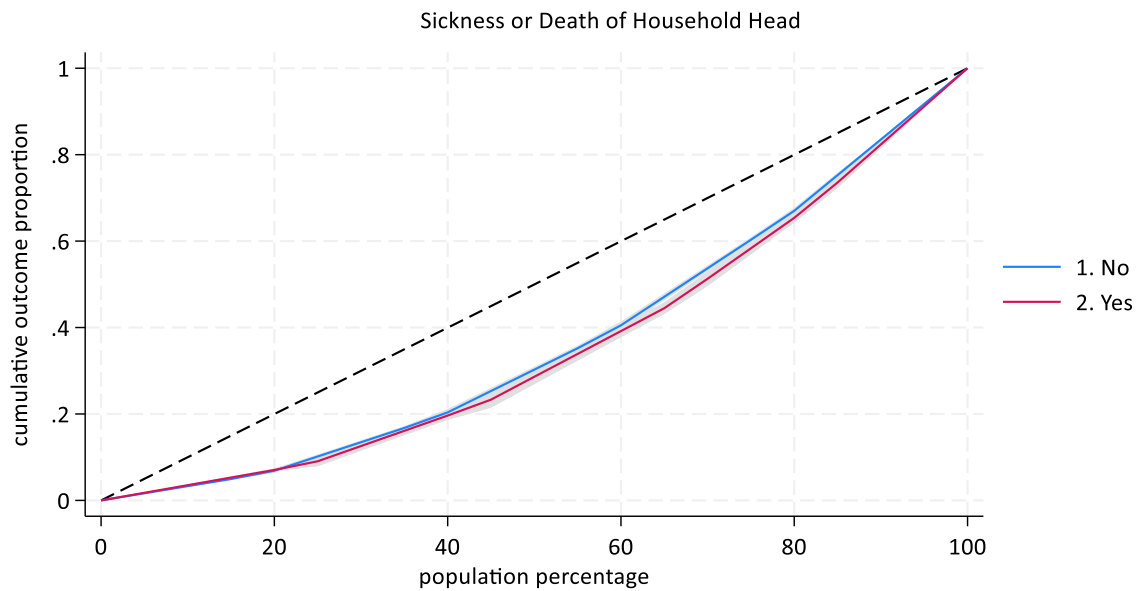
Figure 4.6 Lorenz Curve -Sickness or Death of HH
(Created with Stata, data from FAO (2022))

4.5.4 Income Inequality by Economic Shock

As already mentioned, there were various economic shocks caused by Covid-19 and other global factors, as the time data for the current study were collected; hence, there is a need to assess the economic shock resulting from any of these. The Gini coefficient for respondents whose income was not impacted by any kind of economic shock is 0.27, while that for those who were impacted is 0.29. The findings indicate a slight difference in the distribution of income between the two groups. See Table 4.5 below. The Lorenz curve graph presented in Figures 4.7 and 4.8 also indicates that the Lorenz curve of respondents who suffered an economic shock is slightly further from the line of equality than those who were not impacted. This is more obvious in Figure 4.8 below (see Appendix 4.D for the Lorenz estimates).

Table 4.5 Income Inequality by Economic Shock

Economic Shock	Resp.	Gini
No	2597	0.27
Yes	112	0.29

(data from: FAO, 2022)
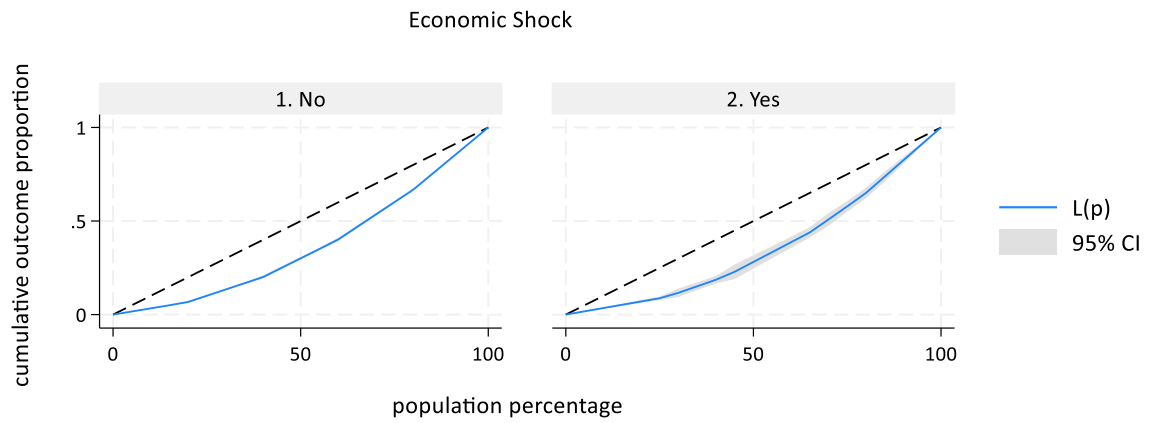
Economic Shock

Figure 4.7 Lorenz Curve - Economic Shock
(Created with Stata, data from FAO (2022))
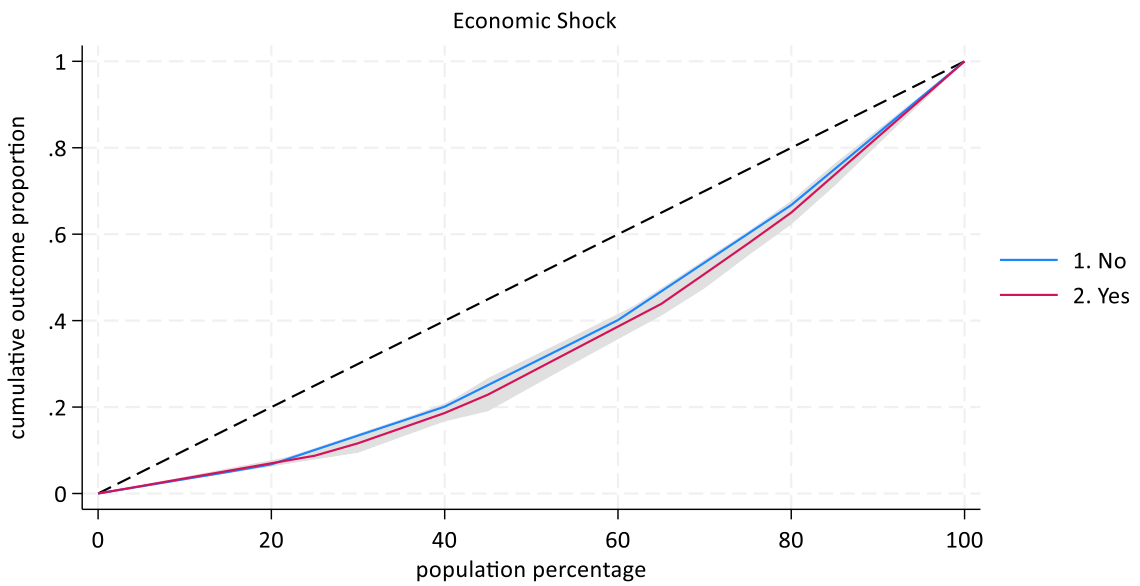
Economic Shock

Figure 4.8 Lorenz Curve - Economic Shock
(Created with Stata, data from FAO (2022))

4.6   Discussion

The Gini coefficient, which is an indicator of income inequality, appears to be relatively low in northeastern and northwestern Nigeria, as indicated by this dataset, with a coefficient of 0.27. In a separate study by Ossai and Bhattarai (2024), employing the 2021 Financial Inclusion dataset (DRG, 2022), the Gini coefficient for the nation was determined to be 0.26. It is akin to countries that exhibit low-income inequality and extensive welfare provisions, such as Denmark (0.28), Finland (0.28), and Sweden (0.30), in the year 2021 (Pedersen & Kuhnle, 2017; WDI, 2024).

This study found that adhering to Covid-19 restrictions, such as staying at home or lockdowns, had only a minimal negative impact on the income of those who followed the guidelines, compared to those who did not. Similarly, the minimal negative impact of Covid-19 on income was observed to be the same for respondents whose household heads either became ill or passed, as opposed to those whose household heads remained healthy. The existing body of research has established a relationship between income inequality, certain aspects of social capital, and COVID-19 fatality rates, as reported by Elgar et al. (2020). However, the present study was unable to confirm this finding, as the sickness and death variables did not allow for determination of whether these factors were related to COVID-19. The difference between the two groups was only two percentage points. Finally, the research demonstrates that other types of economic shocks exert a slightly more detrimental influence on the income of those who experienced such shocks compared to those who were not affected. The Gini coefficient values remained largely unchanged despite the COVID-19 pandemic, as demonstrated in the graphs in the analysis.

The study's results are in line with Deaton's (2022) findings, which showed that global inequality's trend diminished and declined at an accelerated pace in an intercountry study. It appears that the pandemic has not resulted in increased disparities between countries but has instead brought to light pre-existing inequalities. Similarly, Lapinova's (2024) comparative analysis did not reveal a clear upward or downward trend in income inequality or significantly rearrange the ranking of countries according to their Gini coefficient values or income levels.

Research conducted by Clark et al. (2021) in France, Germany, Italy, and Spain revealed that the relative inequality in equivalent household disposable income among

individuals exhibited a hump-shaped pattern between January 2020 and January 2021. Initially, there was a surge in inequality from January to May 2020, which was subsequently reversed by September 2020 as per the study. According to the research, it was found that there was a decrease in absolute inequality during the same period. It is also suggested that the pandemic has had a disparate impact on households, with some experiencing greater losses than others. However, according to Angelov and Waldenström (2023), the pandemic worsened income inequality, particularly affecting lower-earning individuals in Sweden who experienced a significant decrease in earnings. Nonetheless, the current study results did not align with the conclusion drawn by Angelov and Waldenström (2023).

Furthermore, the results of this study do not support the argument put forth by Usman et al. (2024) regarding the effects of Covid-19. Usman et al. (2024) argued that Covid-19 had a devastating impact on the economy of Nigeria. The researchers highlighted the challenges faced by the nation, such as economic instability, health, and financial obstacles. According to their findings, Nigeria, as a revenue-dependent economy, has been significantly affected by the Covid-19 pandemic. However, it is worth stating that Usman et al. (2024) relied on reports from international institutions and academic journals for its assertion. Nonetheless, it is possible that the impact of Covid-19 on income inequality was not fully reflected in the data collected in this study. The effect of Covid-19 on income inequality will become more precise when data from 2022 become available. The examination of Covid-19's impact is still in its preliminary stages owing to the limited availability of data from 2022, when restrictions were finally lifted globally. Therefore, it is strongly recommended that future research thoroughly reassesses the influence of Covid-19, incorporating data for the year 2022.

4.7 Policy Recommendation

This research indicates that income inequality grew among individuals who adhered to Covid-19 restrictions, those whose household heads became ill or passed away, and those facing other forms of economic shock. Nevertheless, this rise was relatively small. In the light of these findings, Nigeria needs to implement tailored interventions and policy measures to mitigate the impact of the pandemic on income inequality and the Nigerian economy as a whole, given that those who face other forms of economic shocks are more affected than others.

4.8 Conclusion

The present study evaluated the economic effect of Covid-19 on income inequality and found that although income inequality grew among individuals who adhered to Covid-19 restrictions, among those whose household heads became unwell or passed away, and among those who suffered other forms of economic shock, the rise appears to be marginal. However, inequalities continue to exist within the northeastern and northwestern population, just as the existing literature has suggested at global level (Deaton, 2018). It is also essential to mention that the impact of Covid-19 may not be entirely evident until data for the year 2022 are accessible. Thus, it is recommended that future research endeavours assess this impact by incorporating data from the years 2022 and potentially 2023.

Chapter 5 Effect of Financial Inclusion on Income Inequality

Abstract

This research examines the effects of financial inclusion on income inequality among 999 Nigerians surveyed in 2021. Using an ordered logistic regression model and inequality measures such as the Gini coefficient and Lorenz curve. Results show that having a financial institution account or a mobile money account positively influences income equality. Those with such accounts typically experience lower income inequality than those without. The Gini coefficient and Lorenz curve analysis indicate that financial inclusion promotes greater income equality. Thus, it is recommended that the government maintain policies promoting financial inclusion among the general population.

Keywords: Financial inclusion, income inequality, Gini coefficient, internet banking

5.1 Introduction

The problem of income inequality is not only a concern for academic researchers but has also been recognised by global leaders as a pressing issue that demands attention. Even the global community has come to appreciate that fairer allocation of income fosters greater economic stability, sustained economic expansion, and more resilient societies marked by stronger cohesion and trust. Extant literature echoes this insight. However, it remains uncertain how these outcomes can be achieved in practical terms. Nonetheless, there is reason to be optimistic, as it has been proposed that mankind can derive valuable lessons from past instances in which substantial reductions in inequality have taken place (Atkinson, 2013).

Several proposals have been proposed to address income inequality. Among these are redistribution strategies (Bhattarai, 2010), levying taxes on higher-income groups (Joumard et al.,2013), and implementing market regulations (Murinde, 2012), among others. A key principle in finance theory is that financial institutions and markets are vital in ensuring the efficient distribution of capital resources given the absence of uneven information, transaction expenses, and other market inadequacies. The flow of funds theoretical framework is built on this idea, and it offers an explanation for how capital resources are allocated between households and companies, which, in turn, fuels economic expansion. The relationship between financial flows, interest rates, and asset prices is closely linked to income and expenditure, as demonstrated by a substantial body of evidence from both developed and developing economies (Murinde, 2012).

Recently, financial inclusion has come to be viewed as a means of addressing income inequality. Financial inclusion is crucial because expanding access to financial services for the poor is commonly regarded as a powerful means of alleviating poverty and reducing income inequality (Park & Mercado, 2015). This increased interest highlights a heightened appreciation of the significance of financial inclusion for economic and social advancement. It demonstrates a growing recognition that access to financial services plays a crucial role in alleviating extreme poverty, fostering shared prosperity, and promoting inclusive and sustainable development (World Bank, 2013).

Financial inclusion is a process that ensures ease of access, availability, and usage of formal financial systems for all members of an economy. This concept encompasses various

elements, such as accessibility to, accessibility of, and efficient use of the financial system. When taken collectively, these aspects contribute to the development of inclusive financial systems (Sarma, 2008). Nevertheless, it is crucial to differentiate between voluntary and involuntary exclusion. Voluntary exclusion refers to a situation in which individuals or businesses opt not to utilise financial services for various reasons, such as a lack of need or cultural or religious beliefs. By contrast, involuntary exclusion is caused by a lack of income and a high-risk profile, or it can arise from discrimination, market failures, and imperfections (World Bank, 2013). Theory suggests that financial market inefficiencies, including information imbalances and transaction expenses, impede the ability of economically disadvantaged individuals to improve their financial situation by limiting their access to formal financial services (Lindert & Williamson, 1985; Banerjee & Newman, 1993; Galor & Zeira, 1993; World Bank, 2013).

Despite the considerable progress made in recent years, the Global Findex database suggests that approximately two billion adults worldwide still lack access to formal financial services. Furthermore, among those with access, approximately 800,000 do not utilise them (Demirgüç-Kunt et al., 2018). Frequently cited reasons for the lack of financial institution accounts or their underutilisation include high costs, distance, and rigorous documentation requirements (Demirgüç-Kunt et al., 2018). Similarly, despite the significance of financial inclusion, Nigeria continues to face challenges in increasing its financial inclusion rate. As of 2020, only 45% of the adult population has access to bank accounts (NBS, 2022).

Furthermore, the outcomes of studies on a single country's potential to diminish inequality through financial inclusion are varied and indecisive. This study contributes to the existing body of research by investigating the effect of financial inclusion indicators on income inequality using Gini and Lorenz measurements as well as an Ordered Logit Regression Model and micro-level data. In addition, it investigates the extent of income inequality within the population.

The remainder of this paper is organised as follows. Section 5.2 presents a summary of the literature, followed by section 5.3, which provides an in-depth description of the data sources and summary statistics. Section 5.4 explains the approach used for the empirical analyses presented in this study. Section 5.5 presents the empirical results and Section 5.6 critically

evaluates these results. Section 5.7, the study presents policy recommendations, and section, 5.8, concludes the paper.

5.2   Literature Review

Alsan et al. (2017) evaluated the connection between income inequality, gender disparities, and financial inclusion using a cross-country micro-dataset encompassing 146,000 individuals. They utilised ordinary least square regression and covariance-based expressions for the generalised Gini to conduct the analysis. Cross-country regressions revealed a connection between inequality in financial access and income inequality, emphasising the need for policies that promote financial inclusion to reduce overall economic disparities. Moreover, this study found that a substantial portion of inequality is driven by gender differences in financial access. One of the findings of Alsan (2017) is corroborated by that of Demir et al. (2022). According to Demir et al. (2022), financial inclusion significantly reduces income inequality, particularly in the upper percentiles.

Neaime and Gaysset (2018) investigated the effects of financial inclusion on income inequality, poverty, and financial stability in the MENA region during the period 2002–2015 by employing the generalised method of moments (GMM) and generalised least squares (GLS) econometric models. Their findings show that while financial inclusion decreases income inequality, other factors such as population size and inflation are found to increase income inequality. Furthermore, empirical evidence reveals that financial inclusion has no discernible impact on poverty levels, while population growth, inflation, and trade openness are all shown to exacerbate poverty. Finally, the results suggest that although financial integration contributes to financial instability in the Middle East and North Africa (MENA) region, financial inclusion plays a positive role in fostering financial stability.

Park and Mercado (2015) investigated the factors that affect financial inclusion in 37 developing Asian economies using the Index of Financial Inclusion (IFI) to compare the level of financial inclusion across different economies and monitor the progress of these economies in terms of financial inclusion over time. Additionally, they employ panel data regression to determine the impact of financial inclusion in the region. The study analysed data from 2004 to 2012, and the findings indicate that variables such as per capita income, rule of law, and population size have a favourable impact on financial inclusion, whereas the age dependency ratio demonstrates a negative impact. Notably, this study suggests that

financial inclusion may serve as a means of reducing poverty and income inequality within the region.

Foueyjeu et al. (2020) investigate the relationship between financial inclusion, access to financial services, and economic inequality using a comprehensive dataset of both developed and developing countries from 2004 to 2015. The research utilised ordinary least squares (OLS) panel fixed effects, generalised least squares (GLS) with panel-wide, and dynamic panel GMM to analyse the data. This study explored the impact of financial inclusion on income inequality through various channels. It further examines the effects of macroeconomic and financial circumstances, as well as the gender gap in financial inclusion. Their findings indicate that expanding access to financial services can alleviate inequality. The researchers also highlight that this effect is not disconnected from the broader economic circumstances and prevailing financial conditions. Their findings also highlight the significance of gender disparity in financial inclusion. They indicated that women's financial inclusion has a more substantial negative effect on inequality.

Agyemang-Badu et al. (2018) examined the relationship between financial inclusion, poverty, and inequality by employing a fixed effect panel regression estimator and a macro dataset extending from 2004 to 2015 for 48 chosen African nations. This study investigated the impact of financial inclusion on macroeconomic indicators, discovering that it exhibits an inverse relationship with poverty and income inequality in Africa. The findings show that GNI per capita, population size, and education have a positive influence on the financial inclusion levels of the selected African countries. The outcomes also indicate that credit, education, and the rule of law have minimal influence in determining the poverty levels of the chosen countries in Africa. Instead, financial inclusion and economic growth are the primary factors predicting poverty in these countries.

Adeleke and Olomola (2023) investigated the relationship between financial inclusion, poverty, and inequality in Nigeria by analysing quarterly data from 2004 to 2018. Their study employed the Vector Autoregressive model (VAR) as the estimation method and found no significant relationship between any of the financial inclusion measures and poverty reduction. According to the authors, various initiatives designed to promote financial inclusion, particularly in terms of access, depth, and utilisation of financial services, have not

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resulted in a significant reduction in poverty levels in Nigeria. The study highlighted that the bank-based credit provided to the private sector in Nigeria displays a statistically significant long-term relationship with inequality.

Similarly, Sakanko et al. (2020) conducted a study on the connection between financial inclusion and inclusive growth in Nigeria using the ARDL bounds testing technique and quarterly data from 2007 to 2018. Their research demonstrated the existence of a cointegrating relationship between the indicators of financial inclusion, such as deposit account ownership, access to banks and ATMs, credit, loans to SMEs, and Internet usage, and the dimensions of inclusive growth, including poverty, household consumption expenditure, employment, and per capita income. Their study further revealed that expanding financial inclusion by providing easier access to credit and banking services may lead to a decline in poverty, inequality, and unemployment rates, ultimately fostering economic growth and development in the nation.

Drawing upon the literature review, empirical evidence regarding the relationship between financial inclusion and income inequality remains inconclusive. According to Demir et al. (2022) highlight that financial inclusion significantly reduces income inequality. Neaime and Gaysset (2018) also emphasised that financial inclusion plays a positive role in fostering financial stability. However, Agyemang-Badu et al. (2018) suggested that financial inclusion exacerbates poverty in Africa. Park and Mercado (2015) suggested that financial inclusion may serve as a means of reducing poverty and income inequality within the Asian region. Foueyjeu et al. (2020) indicate that expanding access to financial services can alleviate inequality.

Furthermore, Adeleke and Olomola (2023) found that various initiatives designed to promote financial inclusion, particularly in terms of access, depth, and utilisation of financial services, have not resulted in a significant reduction in poverty levels in Nigeria. Similarly, Sakanko et al. (2020) find that expanding financial inclusion by providing easier access to credit and banking services may lead to a decline in poverty, inequality, and unemployment rates. The reviewed studies predominantly utilised either macro-level data or cross-country micro-level data, including those from Nigeria. This study seeks to fill this gap by examining

the effect of financial inclusion on income inequality using a micro-level dataset derived from Nigeria. The hypotheses to be examined are as follows:

Hypotheses

H_0: Income inequality based on education, gender, or residence is not present in Nigeria.

H_1 Income inequality based on education, gender, or residence is present in Nigeria.

H_0: There is no significant relationship between financial inclusion indicators and income inequality.

H_1: There is a significant relationship between financial inclusion indicators and income inequality.

5.3   Data Source and Description

This study uses data from the Global Findex Database (GFD), 2021 edition. The GFD is a primary resource for global financial inclusion initiatives and offers a comprehensive, multidimensional perspective on how adults manage their finances, including saving, borrowing, making payments, and handling financial risks (Development Research Group (DRG), 2022). Global Findex 2021 data were collected from national representative surveys of nearly 145,000 adults across 139 economies. To narrow the focus of this study, I selected only data from 1,000 Nigerian adults surveyed by the GFD. See Appendix 5.A for the survey methodology. In addition, I eliminated one observation from the dataset concerning educational attainment, as it distorted the estimates. Consequently, the remaining population consisted of 999 individuals. The variable description and summary statistics are presented in Table 5.1. Education, gender, residence, possession of a financial account (account_fin), and ownership of a mobile money account (account_mob) are categorical variables. The categorisation of education included tertiary, secondary, and primary levels, with education coded as 3 being the highest qualification and 1 being the lowest. Gender was coded as female (1) or male (2), whereas residence was categorised as rural (1) or urban (2). Account_fin is coded as (0) for no financial account and (1) for having a financial account. Finally, Account_mob was coded as (0) for those without a mobile money account and (1) for those who possess a mobile money account.

Table 5.1 Variable description and summary statistics

Variable	Description	Obs	Mean	Std. dev.	Min	Max
Gender	Gender	999	1.563564	0.496192	1	2
educ	Education	999	1.826827	0.472745	1	3
inc_q	Income Quintile	999	3.353353	1.450681	1	5
residence	Urban/Rural	999	1.65966	0.474061	1	2
account_fin	Financial Account	999	0.614615	0.48693	0	1
account_mob	Mobile Account	999	0.152152	0.359348	0	1

(data from: DRG, 2022)

Table 5.2 shows the income quintile, which is the dependent variable.

Table 5.2 Within-economy Household Income Quintile

Income Quintile			Freq.	Percent	Cum.
1	Poorest	20%	156	16.13	16.13
2	Second	20%	139	14.37	30.51
3	Middle	20%	176	18.2	48.71
4	Fourth	20%	200	20.68	69.39
5	Richest	20%	296	30.61	100
	Total		967	100	

(data from: DRG, 2022)

5.4 Empirical Approach

The Multidimensional Inequality Framework (MIF) is a comprehensive and well-founded means for quantifying and studying inequalities as well as identifying their sources and possible solutions. Although perspectives on income inequality trends differ, research indicates that various measures can provide a particular picture in certain nations, during specific timeframes, or worldwide. The MIF, developed to gauge inequality in well-being, recognises that our lives are multifaceted, encompassing key aspects such as health, physical and legal safety, education, financial stability, respectable employment, secure living, and family and social life (McKnight et al., 2017).

Financial security and independence are essential components of well-being. Furthermore, economic inequalities also impact other aspects of life. Indicators such as income and wealth inequality, poverty rates, material deprivation, income insecurity, and financial resilience, including measures that capture both advantages and disadvantages, are key factors in understanding economic inequalities (McKnight et al., 2017). Drawing on the multidimensional theory of inequalities, this study examines the relationship between financial inclusion and income inequality using an ordered logistic regression model as well as the Gini coefficient and Lorenz curve. The analyses referred to herein are intended to reveal associations rather than establish causation.

5.4.1 Ordered Logistic Regression Model

I employed an ordered logistic regression model, also referred to as an ordinal logistic model, to evaluate the effect of two crucial financial inclusion indicators: having an account with a financial institution and possessing a mobile money account. The model incorporates additional variables, including the personal attributes of the individual, such as gender, educational attainment, place of residence, and income distribution, with the latter serving as the dependent variable.

Ordered logistic regression models were used to determine the relationships between an ordered dependent variable and a set of independent variables. An ordered variable is categorical and possesses an inherent ranking system. In ordered logistics, a hidden score is estimated as a linear combination of the independent variables and a series of predetermined thresholds. The likelihood of observing outcome i is proportional to the probability that the

estimated linear function, together with random error, falls within the range of the cut points determined for the outcome (StataCorp, 2021).

Ordered regression models are typically illustrated as latent variable models that are commonly applied in various contexts. The model discussed below was adapted from Long and Freese (2006) and Katchova (2013), and the structural model is thus specified as

$$y_i^* = \beta'X'_i + \varepsilon_i$$

where,

$$y_i = j \text{ if } \alpha_{j-1} < y_i^* \leq \alpha_j$$

Such that,

$$y_i = 1 \Rightarrow \textit{Poorest } 20\% \quad \text{if } \alpha_0 = -\infty \leq y_i^* < \alpha_1$$
$$y_i = 2 \Rightarrow \textit{Second } 20\% \quad \text{if } \alpha_1 \leq y_i^* < \alpha_2$$
$$y_i = 3 \Rightarrow \textit{Middle } 20\% \quad \text{if } \alpha_2 \leq y_i^* < \alpha_3$$
$$y_i = 4 \Rightarrow \textit{Fourth } 20\% \quad \text{if } \alpha_3 \leq y_i^* < \alpha_4$$
$$y_i = 5 \Rightarrow \textit{Richest } 20\% \quad \text{if } \alpha_4 \leq y_i^* < \alpha_5$$

where y_i is the income level of individual in the population. α is some thresholds point where, when crossed by the latent variable y^*, the income level changes; and X', β', and ε_i are a vector of independent variables, a set of coefficients to be estimated, and an error term.

The probability that observation i will select alternative j is:

$$p_{ij} = p(y_i = j) = p(\alpha_{j-1} \leq \alpha_j) = F(\alpha_j - x'_i\beta) - F(\alpha_j - x'_i\beta)$$

F is the logistic cumulative distribution function $F(z) = e^z / (1 + e^z)$

The ordered logit model with *j* alternatives has one set of coefficients with *(j-1) and j* sets of marginal effects.

The final ordered logistic model is as depicted below:

$$y_i^* = \alpha_j + (\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon_i)$$

where, the coefficients for each variable are as follow:

Cut-point (intercept), Education, Gender, Residence, Account_fin, and Account_mob coefficient are represented by α_j, β_1, β_2, β_3, β_4, and β_5, respectively.

The marginal effects of an increase in a regressor x_r on the probability of selecting alternative j is:

$$\partial p_{ij} / \partial X_{ri} = \left\{ F'\left(\alpha_{j-1} - X_i'\beta \right) - F'\left(\alpha_j - X_i'\beta \right) \right\} \beta_r$$

The marginal effects of each variable on the alternatives sum to zero.

5.4.2 Inequality Measures

A variety of indicators have been recommended in the literature to measure income inequality. These indicators encompass a wide range of statistical measures, including the Lorenz curve, Gini coefficients, lognormal distribution, coefficient of variations, relative mean deviation, Kakwani, inter-quartile range, and ratios of income received by the highest and lowest income groups. Additionally, these measures also incorporate normative elements that consider society's values and the well-being of different population segments. This includes Theil's entropy measure, Atkinson's Index, and Sen's Index (Whitehouse, 1995; Cowell, 2011). However, the Lorenz curve and Gini coefficient are among the most commonly utilised methods for assessing changes in income inequality.

An effective measure of income inequality ought to fulfill the following conditions: Pigou-Dalton transfer sensitivity, which involves transfers of income from poorer individuals to wealthier ones contributing to the growth of income equality; symmetry, where income inequality remains consistent when two individuals merely swap their positions in the distribution; independence, where if all individuals' incomes rise by the same proportion, income inequality will remain unchanged; and population homogeneity, where if the relative increase or decrease in the population of each income group is the same, then there would be no alteration in income inequality (Cowell, 2011).

Acknowledging the fact that not all measures of inequality are suitable, Shorrocks and Foster (1987) suggested an alternative to the Pigou-Dalton condition. This alternative prioritises income transfers among individuals with low incomes over those between high-income earners. The coefficient of variation, for instance, is heavily influenced by those with high incomes. However, this measure does not satisfy the Pigou-Dalton condition. Instead, Shorrocks and Foster proposed using the standard deviation of logarithms (SDL) as an alternative, although it does not meet the Pigou-Dalton condition.

5.4.3 Gini Coefficient and Lorenz Curve

The Gini coefficient is a simple concept that is derived from the Lorenz curve, and it satisfies all four properties in previous section. It measures the ratio of the area between the Lorenz curve and the 45-degree line to the total area of the box. The 45-degree line is referred to as the egalitarian line, which signifies a completely equal society in terms of income distribution

(Whitehouse, 1995; Deaton, 2018). An example of a Lorenz curve is illustrated in Figure 5.1. Furthermore, the Gini coefficient provides a comprehensive representation of the income distribution within a population, starting with the poorest 20% and moving progressively to the 40%, 60%, 80%, and 100% brackets. Graphing this distribution and comparing it to the 'line of equality' allows for the measurement of the disparity between the two, with the distance from the line reflecting the extent of inequality in a given country. The Gini coefficient is expressed as a value ranging between 0 and 1 or as a percentage between 1 and 100. A lower coefficient is ideal, and a rise in the coefficient signifies an increase in income inequality within a country (Oxfam, 2017).

The GINI coefficient equation was adapted from Whitehouse (1995). The equation is presented as follows:

Equation 5.6

$$I_{GINI} = \frac{2}{n^2 \bar{y}} \sum_{i=1}^{n} i(y_i - \bar{y})$$

Where I_{GINI} is the Gini income, $\bar{y}$ denotes the mean of the distribution, 'n' is the sample size (total number of observations), y_i is the naira value of the ith household income and are arranged in ascending order. The Gini coefficient was employed for the evaluation and comparison of the extent of income disparity in the sample across various dimensions, including gender, education, residence, account_fin, account_mob, debitcard, use_dcard, mob_acc_bal, mob_stor_pur, online_pay, Save_fin, internetaccess, anydigpayment, and deposit.
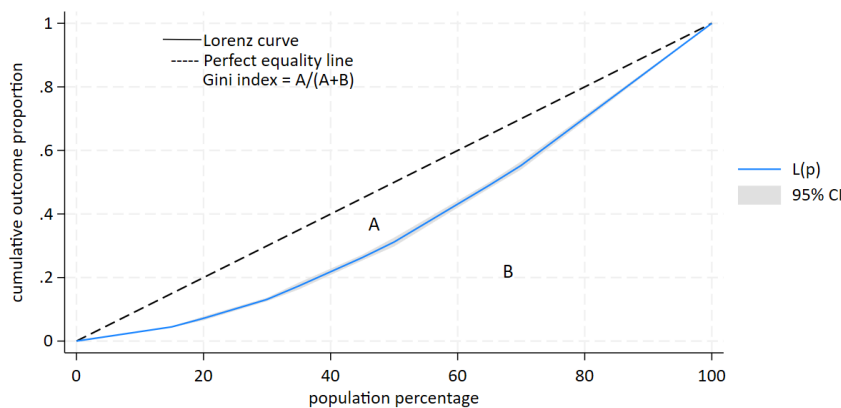
Figure 5.1 Lorenz Curve
(Created with Stata, data from FAO, 2022)

5.5 Empirical Results

5.5.1 Ordered Logistic Regression Model

Table 5.3 contains the results of the ordered logistic model. According to Table 5.3, the model demonstrates a statistically significant result at the 1% level, with an F-statistic of 12.32. The 'P>|t|' statistics for the independent variables also show statistical significance at the 5% level, with the exception of 'residence', which is significant at the 10% level. The second, third, and fourth thresholds were significantly different from one another and should not be combined.

The Adjusted Wald test is statistically significant at the 1% level. Based on the adjusted Wald test result, the null hypothesis (misspecification) is hereby rejected. A null hypothesis in this context implies that an ordered logistic regression model is incorrectly specified. Similarly, the 'Linktest', the 'hat (0.222)' and 'hatsq (0.329)' do not demonstrate explanatory power. If a model is correctly specified, then regressing inc_q on the prediction and the prediction squared demonstrates that the prediction squared has no explanatory power (StataCorp, 2023). The predicted mean values align with the initial percentages of each income quintile, as illustrated in Appendix 5.B.

The results from the ordered logistic model, as presented in Table 5.3, reveal that education (0.414**), account_fin (0.491**), and account_mob (0.524**) are statistically significant at the 5% level, while gender (0.284*) and residence (0.279*) are statistically significant at the 10% level. Individuals with a higher level of education are more likely to be part of the higher-income quintile, while those with lower levels of education are less likely to be part of this group. Moreover, the model suggests that males are more likely to be represented in the higher income category than females. Furthermore, the outcomes indicate that individuals residing in urban areas are more likely to belong to the higher-income quintile than those living in rural areas. In addition, the findings of the two financial inclusion indicators suggest that individuals who possess accounts at financial institutions and mobile money accounts are more likely to belong to the higher-income quintile than those who do not have either of these accounts.

Table 5.3 Ordered Logistic Regression Result

VARIABLES	(1) inc_q
Education	0.414**
	(0.173)
Gender	0.284*
	(0.158)
Residence	0.279*
	(0.167)
Account_fin	0.492**
	(0.193)
Account_mob	0.524**
	(0.215)
/cut1	0.249
	(0.390)
/cut2	1.287***
	(0.394)
/cut3	2.162***
	(0.400)
/cut4	3.215***
	(0.418)
Observations	999

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
F-stat 12.32***
Linktest: hat (-0.222), hatsq (0.329)

(data from: DRG, 2022)

5.5.2 Ordered Logistic Marginal Effects on Income Quintiles

- Based on the results in Table 5.4, an additional year of education is associated with a 6% decrease in the likelihood of being in the lowest 20% income bracket, 4% less likely to be in the second quintile, 4% more likely to be in the fourth quintile, and 6% more likely to be in the fifth quintile.

- Regarding gender, male individuals exhibited a 4% lower chance of being in the lowest 20% income category, 3% less likely to be in the second income quintile, 3% more likely to be in the fourth income quintile, and 4% more likely to be in the top 20% income quintile.

- Individuals residing in urban areas were 4% less likely to be in the bottom 20% of the income quintile, 2% more likely to be in the fourth income quintile, and 4% more likely to be in the fifth income quintile.

- Individuals with an account in a financial institution are 7% less likely to be in the bottom 20% income quintile, 4% less likely to be in the second income quintile, 4% more likely to be in the fourth income quintile, and 8% more likely to be in the top 20% income quintile.

- Finally, individuals with a mobile money account are 7% less likely to be in the bottom 20% income quintile, 5% less likely to be in the second income quintile, 4% more likely to be in the fourth income quintile, and 9% more likely to be in the top 20% income quintile.

Table 5.4 Marginal Effects on Income Quintiles

Variables	Bottom 20%	2nd Quintile	3rd Quintile	4th Quintile	Top 20%
Education	-0.061**	-0.037**	-0.003	0.036**	0.064**
Gender	-0.042*	-0.025*	-0.002	0.025*	0.044*
Residence	-0.041*	-0.015	-0.001	0.024*	0.043*
Account_fin	-0.072**	-0.043**	-0.003	0.042**	0.076**
Account_mob	-0.067**	-0.049**	-0.013	0.038***	0.091**

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

(data from: DRG, 2022)

5.5.3 Income inequality by Account at Financial Institution

The data in Table 5.5 indicate the existence of income inequality based on whether an individual has an account with a financial institution. The Gini coefficient for individuals with an account is 0.21, whereas that for those without an account is 0.27. Figure 5.1 shows that individuals with an account are closer to the line of equality than those without an account in a financial institution. Similarly, the Lorenz contrast curve for the income distribution of individuals without a financial institution account is lower than that of individuals with an account, as illustrated in Figure 5.2. Refer to Appendix 5.C for the Lorenze estimates pertaining to Figures 5.2 and 5.3, respectively.
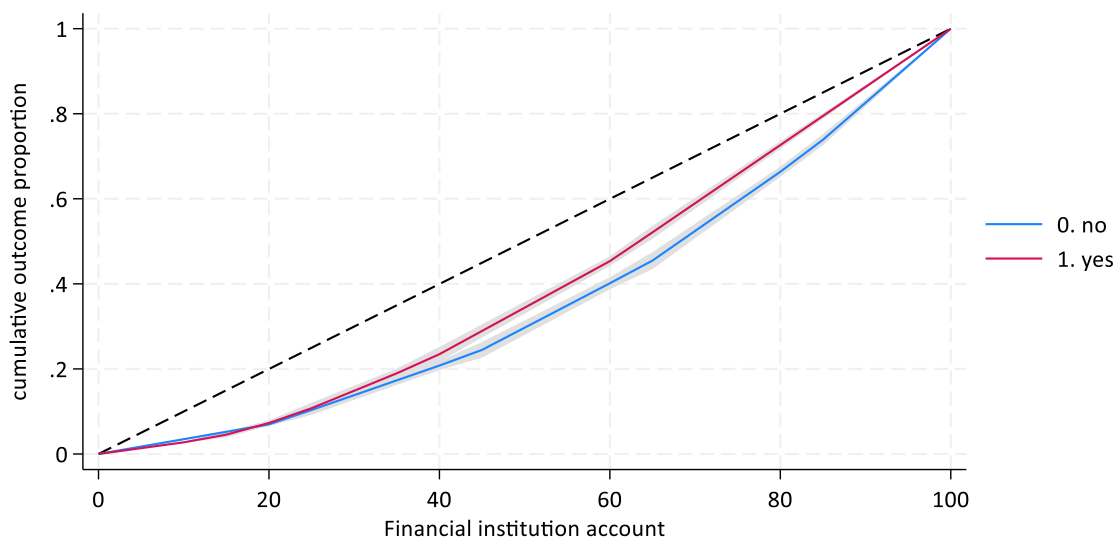
Figure 5.2 Combined Lorenz curve - Financial Institution Account
(Created with Stata, data from DRG (2022))
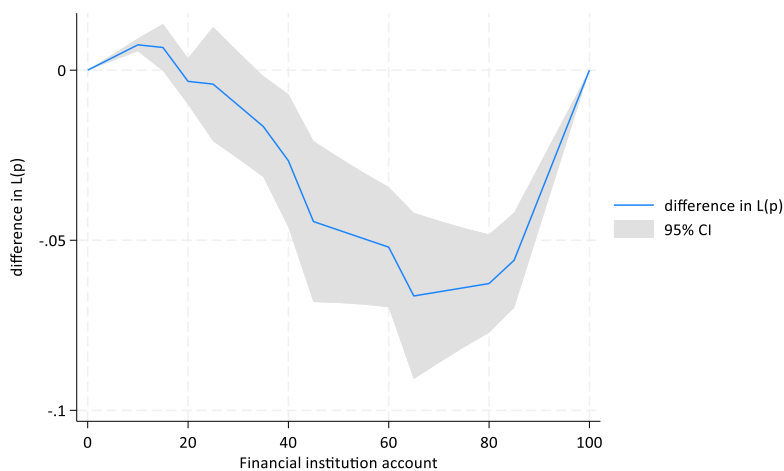
Figure 5.3 Lorenz contrast curve - Financial Institution Account
(Created with Stata, data from DRG (2022))

5.5.4 Income inequality by Mobile Money Account

The data in Table 5.5 suggest the presence of income inequality, which is influenced by the possession of a mobile money account. The Gini coefficient for individuals with a mobile money account stands at 0.16, while it is 0.25 for those without one. As illustrated in Figure 5.3, individuals who have a mobile money account are significantly closer to the line of equality than those who do not. Similarly, the Lorenz curve depicting income distribution for individuals without a mobile money account is notably lower than that for individuals with a mobile money account, as illustrated in Figure 5.4. Refer to Appendix 5.D for the Lorenze estimates pertaining to Figures 5.4 and 5.5, respectively.

Figure 5.4 Combined Lorenz curve - Mobile Money Account
(Created with Stata, data from DRG (2022))
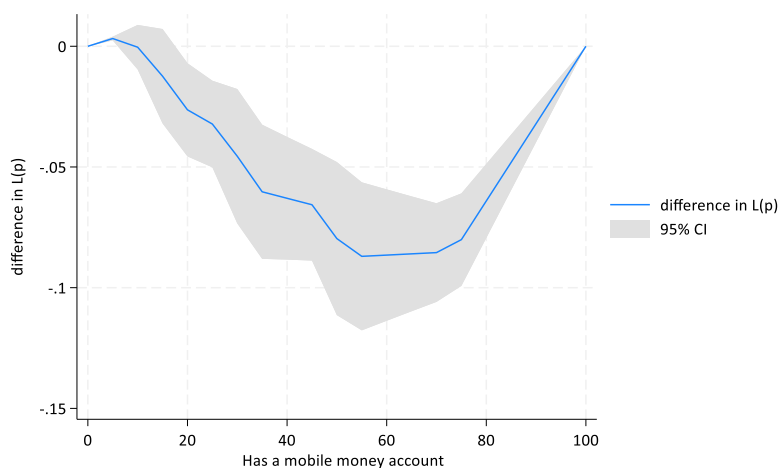
Figure 5.5 Lorenz contrast curve - Mobile Money Account
(Created with Stata, data from DRG (2022))

Table 5.5 Financial Inclusion Indicators

Variable	Description	Gini (Resp.-Yes)	Gini (Resp.-No)
account_fin	Has an account at a financial institution	0.21 (614)	0.27 (385)
account_mob	Has a mobile money account	0.16 (152)	0.25 (847)

(data from: DRG, 2022)

5.5.5 Gini Coefficient (Total Population)

The Gini coefficient for the entire population in the dataset is 0.24. This is relatively low. Figure 5.6 shows the Lorenz curve for the distribution of the total income among the population. The Lorenz curve is a widely recognised method for evaluating income inequality. This graph clearly indicates the presence of income inequality, as the Lorenz curve is significantly distant from the line of equality. Refer to Appendices 5.E for Lorenze estimates pertaining to Figures 5.6.
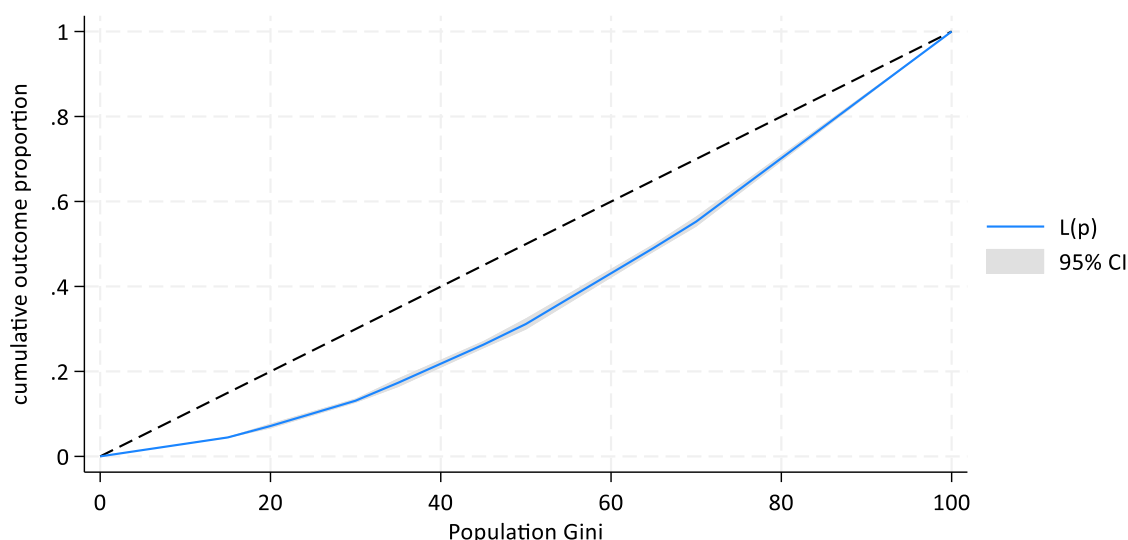
Figure 5.6 Lorenz Curve Income Quintile

(Created with Stata, data from DRG (2022))

5.5.6 Income inequality by Education

The data presented in Table 5.6 indicate that individuals with the least education are disproportionately affected by inequality compared to those with higher levels of education. The Gini coefficient for those with primary education or lower is 0.28, for those with secondary education it is 0.23, and for those with a tertiary education or higher, it is 0.13.

The Lorenz curve in Figure 5.7 further supports the Gini coefficient results. The curve clearly demonstrates that individuals with lower education levels are more distant from the equality line than those with higher education levels. Notably, those with secondary education fare better than those with primary education or no education, as indicated by the Lorenz estimation output. By contrast, the Lorenz curve for individuals with tertiary education is closer to the equality line than that for individuals with lower education. Similarly, the Lorenz curve for individuals with secondary (2) or tertiary (3) education income lies above the Lorenz curve for those with lower education levels, as depicted in Figure 5.8 (refer to Appendix 5.F for the Lorenze estimates pertaining to Figures 5.7 and 5.8, respectively). Therefore, it is possible to infer that the income distribution among individuals with lower education is less equal when compared to those who have attained secondary or higher education.

Table 5.6 Income inequality by Education

| Education Level Attained	Resp.	Gini
Primary	213	0.28
Secondary	746	0.23
Tertiary	40	0.13

(data from: DRG, 2022)

Figure 5.7 Combined Lorenz curve - Education
(Created with Stata, data from DRG (2022))

Figure 5.8 Lorenz contrast curve - Education
(Created with Stata, data from DRG (2022))

5.5.7 Income inequality by Gender

The results presented in Table 5.7 reveal the presence of gender-based income inequality. The Gini coefficient for females is 0.26, while that for males is 0.22. Figure 5.9 shows that female respondents were slightly farther away from the line of equality than male respondents. The significance of this finding is that women are more affected by the unequal distribution of income than men are. Similarly, the Lorenz curve for the male income distribution is noticeably higher than that of the female income distribution (see Figure 5.10). Although this difference may not be apparent between points zero and 18, it is reasonable to infer that the distribution of income among women is less equitable than that of men. Refer to Appendix 5.G for the Lorenz estimates pertaining to Figures 5.9 and 5.10, respectively.

Table 5.7 Income inequality by Gender

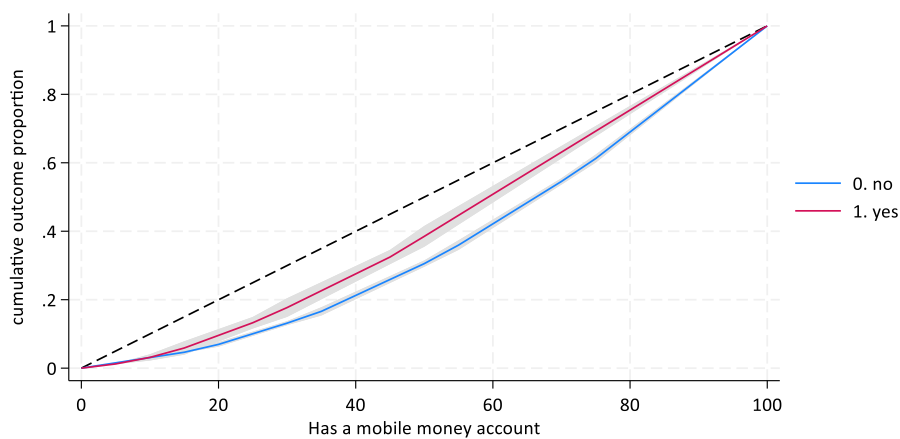| Gender	Resp.	Gini
Female	436	0.26
Male	563	0.22

(data from: DRG, 2022)
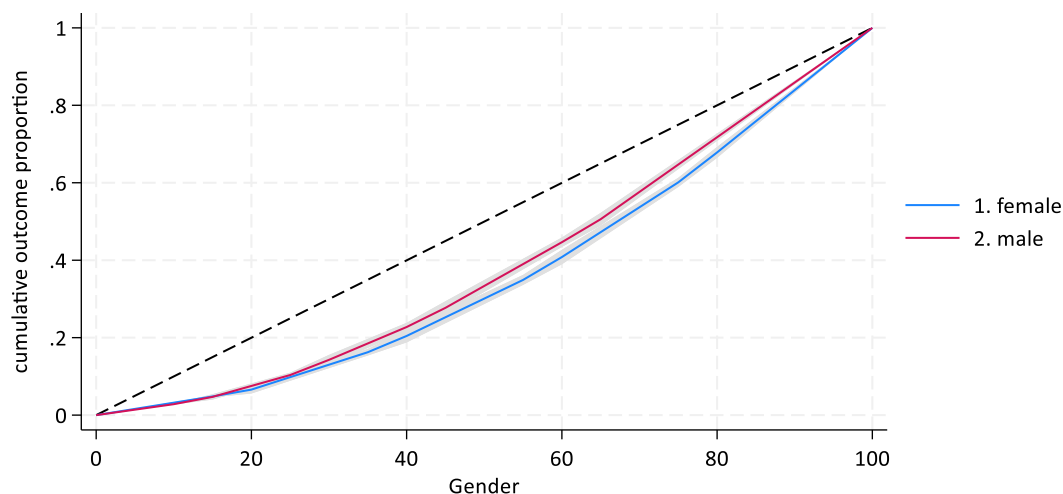
Figure 5.9 Combined Lorenz curve - Gender
(Created with Stata, data from DRG (2022))
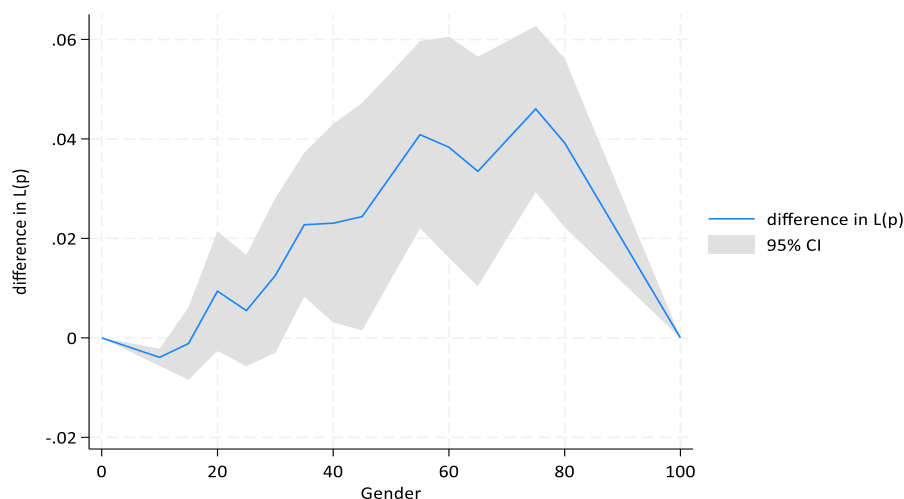
Figure 5.10 Lorenz contrast curve - Gender
(Created with Stata, data from DRG (2022))

5.5.8 Income inequality by Place of Residence

The data presented in Table 5.8 indicate the existence of income disparity based on place of residence. The Gini coefficient for rural residents is 0.26, whereas that for urban residents is 0.23. This difference is illustrated by the Lorenz curve in Figure 5.11. Additionally, the Lorenz curve for urban residents is conspicuously above that of the rural residents' income distribution, as shown in Figure 5.12. This suggests that urban residents are more equal to their rural counterparts. Refer to Appendix 5.H for the Lorenze estimates pertaining to Figures 5.12 and 5.13, respectively.

Table 5.8 Income inequality by Place of Residence

Residence	Resp.	Gini
Rural	340	0.26
Urban	659	0.23

(data from: DRG, 2022)
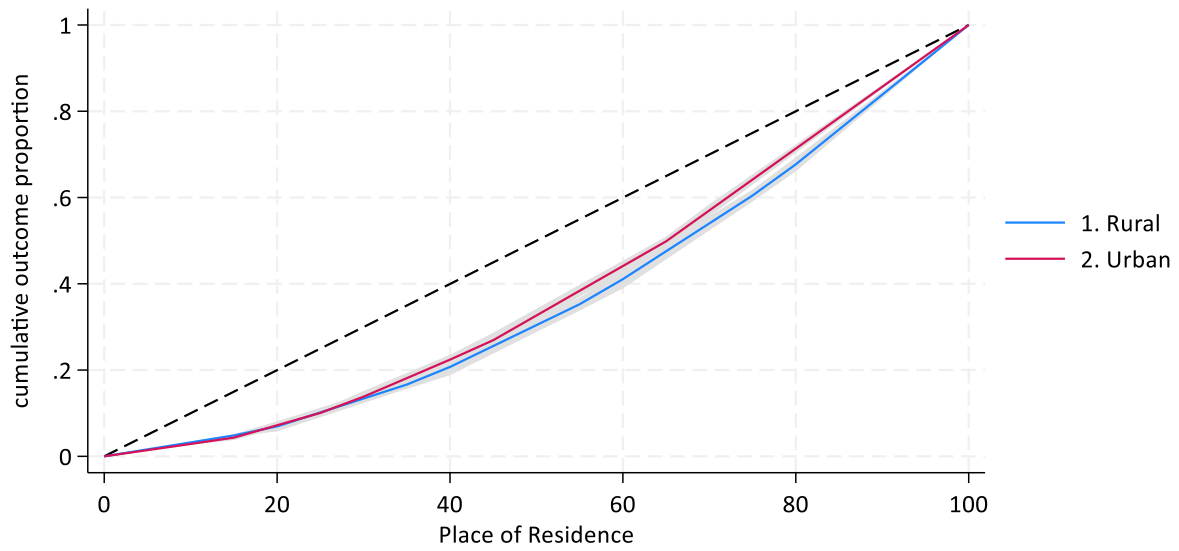
Figure 5.11 : Combined Lorenz curve - Residence
(Created with Stata, data from DRG (2022))

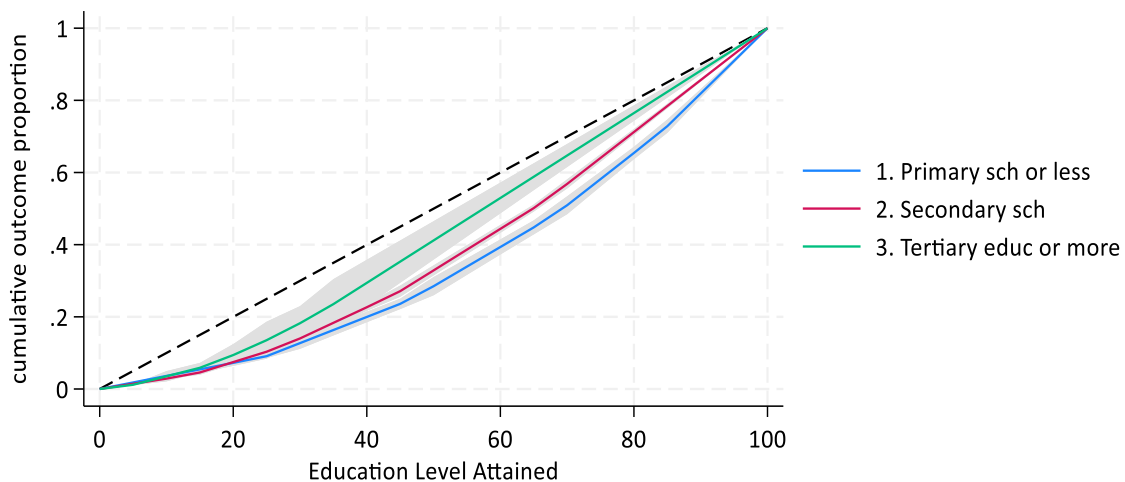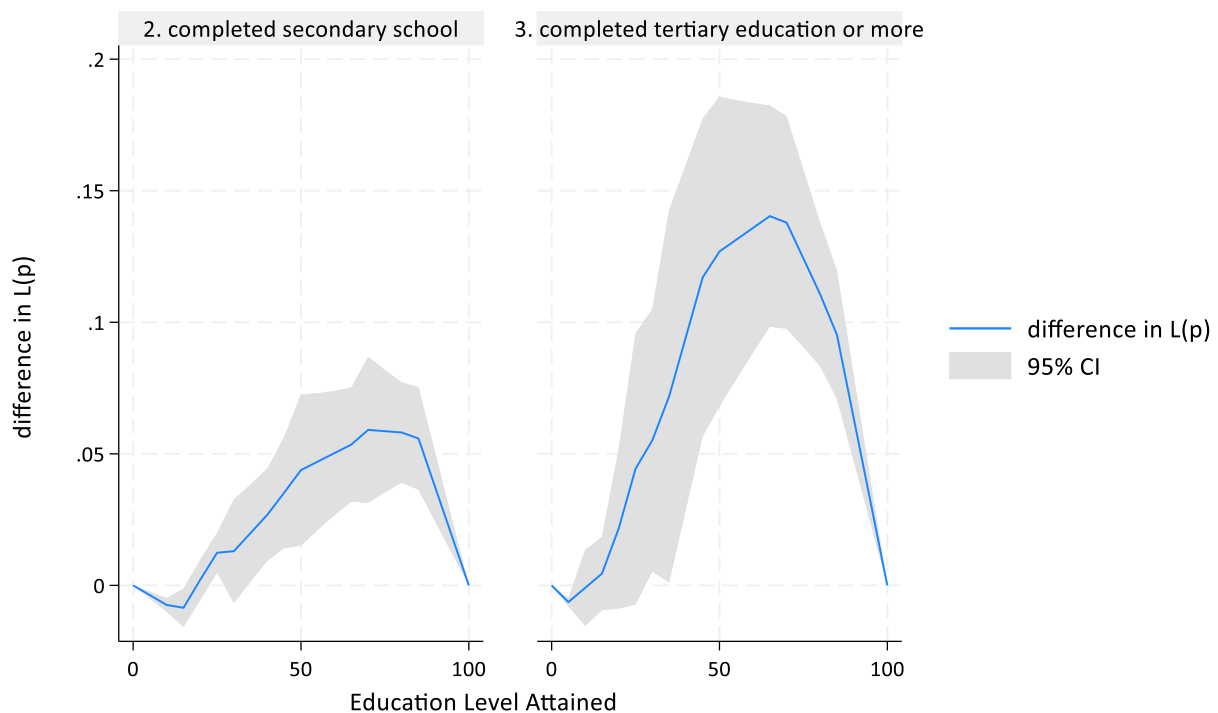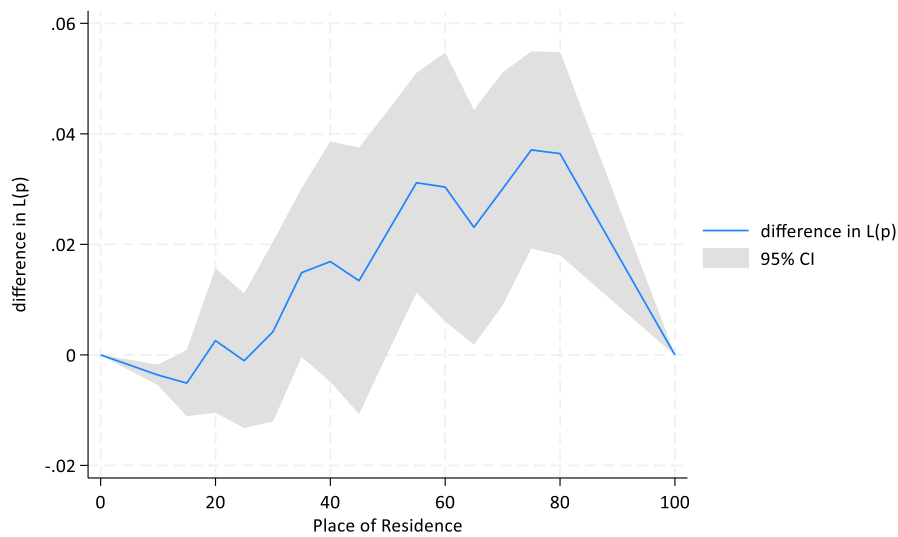Figure 5.12 Lorenz contrast curve - Residence
(Created with Stata, data from DRG (2022))

5.6 Discussion

According to the main hypothesis examined in this study, financial inclusion indicators, including possessing an account at a financial institution and having a mobile money account, significantly contribute to diminishing income inequality. The outcomes of the Gini and Lorenz estimates as well as the ordered logit regression model align with this conclusion. Other indicators of financial inclusion drew the same conclusion, demonstrating that individuals who utilise financial services are more likely to be in higher-income groups and are more equal than those who do not use these services. This finding is consistent with the results obtained in a previous study from Nigeria (Sakanko et al., 2020), and Foueyjeu et al. (2020) reached a similar conclusion. They argue that expanding access to financial services can help alleviate inequality.

Furthermore, this research evaluated the perspectives of academics, including Fields (2007), who highlighted the significance of placing a priority on poverty reduction. According to Fields (2007), "I do not see a compelling economic case for reducing inequality per se. I do see a compelling ethical reason to lower poverty...it is all right for inequality to rise if the increase in inequality causes poverty to fall. I know this is a personal value judgement". However, according to existing research, economic growth appears to have an impact on poverty levels, with the extent of its effect being influenced by the distribution of income within a society. Specifically, evidence suggests that more equitable distribution of income leads to a greater reduction in absolute poverty as a result of economic growth (Goudie & Ladd, 1999). Given that this study has demonstrated that financial inclusion appears to diminish income inequality, and consequently, the author holds the view that financial inclusion could potentially lessen poverty, as suggested by Goudie & Ladd (1999), who identified a relationship between income inequality and poverty.

The current study did not find any evidence to support the existing literature (Agyemang-Badu et al., 2018; Adeleke & Olomola, 2023) which asserts that financial inclusion does not affect income inequality. Rather, this study revealed the opposite. Thus, the null hypothesis suggesting there is no significant relationship between financial inclusion indicators and income inequality is rejected. It is also worth noting that, in a prior study, Demir et al. (2022) argued that financial inclusion has a more significant impact on inequality in high-

income countries. Furthermore, the research revealed that, although Scandinavian countries are more inclusive in terms of financial services, African countries are not as inclusive.

The Gini coefficient, which is a measure of income inequality within the dataset, is (0.24). This value is comparable to the Gini score reported by Ossai and Bhattarai (2024), which is currently being reviewed for publication. In their examination of income inequality in the northeast and northwest of Nigeria, Ossai and Bhattarai utilised the Food and Agriculture Organisation (FAO) 2021 dataset containing household information and found a Gini coefficient of (0.27). The current study revealed a low Gini coefficient score; however, it is suggested that future research should examine the connection between financial inclusion indicators and poverty rates when appropriate data become available. This study only has access to the income quintile data of the respondent and not the actual income figures.

Furthermore, the findings derived from the calculations of the Gini coefficient, Lorenz curve, and ordered logit regression indicate that those with a higher level of education are more likely to fall within the higher-income quintile, as opposed to those with lower levels of education, such as those with primary education. This conclusion is supported by existing literature (Checchi, 2001; Negara, 2018; Vu, 2020). To mitigate income disparities through education, it is recommended that the Nigerian government at various levels implement targeted policies that can be monitored for effectiveness.

In addition, the results of this research suggest that women generally encounter more significant disparities in income than men. This finding is also supported by the literature (Jaiyeola, 2020; Okongwu, 2021). The findings of Alsan et al. (2017) offer a similar, yet distinct viewpoint. According to Alsan et al. (2017), a substantial portion of inequality can be attributed to disparities in financial access between sexes. The current researcher believes that the world should not become desensitised to the issue of gender inequality, and that further measures are necessary to address this problem. Similarly, the socioeconomic status of individuals appears to be influenced by their place of residence. Urban dwellers are more likely to belong to higher-income groups than their rural counterparts are. It is crucial to persistently implement development policies that aim to reduce geographical disparities, as this could have positive ramifications for the environment. Thus, the null hypothesis stating that income inequality is not present in education, gender, or residence in Nigeria is rejected.

5.7 Policy Recommendation

This study highlights the crucial role of financial inclusion in minimising income inequality in Nigeria, considering that only 45% of the country's adult population has access to financial services (NBS, 2022). Therefore, it is imperative to stress the need for Nigeria to persist in implementing financial inclusion strategies to alleviate income inequality. Additionally, it is essential to focus on expanding financial services for women, rural residents, and those with low levels of education.

Furthermore, research indicates that individuals with higher levels of education are more likely to be in the higher income quintile than those with lower levels of education, and thus more equal. Consequently, policies aimed at reducing income inequality through education should be implemented and monitored. Additionally, the study reveals that women are less equal to men in terms of income inequality, and thus policies that foster gender equality should be pursued with determination. Finally, the research revealed that individuals residing in rural areas experience less equality than those living in urban areas. To mitigate disparities in income levels between rural and urban populations, it is recommended to introduce targeted development policies such as ensuring access to similar social amenities that are available in urban areas.

5.8 Conclusion

This study aims to evaluate the impact of financial economic indicators on income inequality in Nigeria and concludes that these indicators indeed have a significant influence on reducing income inequality in the country. Furthermore, this study indicates that income inequality, measured by the Gini coefficient, is relatively low in the surveyed population. Nevertheless, low-income inequality alone does not provide a comprehensive picture as the poverty rate may present a different perspective. Thus, it is recommended that future studies explore this connection as more data becomes available. Furthermore, research indicates that individuals with higher levels of education are more likely to be in the higher income quintile than those with lower levels of education, and thus more equal. Additionally, the study reveals that women are less equal to men in terms of income inequality. Finally, the research revealed that individuals residing in rural areas experience less equality than those living in urban areas. Various policy recommendations have been proposed to address these challenges.

Chapter 6 Institutional Quality and Inequality: A Regional Perspective

Abstract

This study aims to thoroughly examine Nigerian perceptions of institutional quality and inequality across all regions. Using descriptive statistics and Pearson's chi^2 test, the study reveals regional differences in perceptions. Results show widespread dissatisfaction with government handling of corruption and a prevalent fear of retaliation for reporting it. Despite this, most Nigerians still support democracy. Additionally, there is significant dissatisfaction with the government's handling of income inequality, with many experiencing cash shortages. Furthermore, many believe the government has not done enough to improve living standards nationwide. Therefore, it is strongly recommended that Nigerian leaders adhere to democratic principles and take necessary measures to address these issues.

Keywords: Institution, Inequality, Governance, Corruption

6.1   Introduction

Several scholars have argued that the extent to which emerging economies experience growth and development is largely influenced by the calibre of their institutions (La Porta et al., 1999; Haq et al., 2006; Alexiou et al., 2014; Iheonu et al., 2017). In addition, countries with a strong institutional framework, characterised by high capacity and integrity, are more likely to develop and implement policies and programs that can swiftly overcome the persistent challenges of widespread poverty, significant inequality, and high unemployment that plague many developing economies worldwide (Olanrenwaju et al., 2019). Understanding the role of institutions in enabling economic inequality can help devise targeted interventions to address systemic issues and achieve more equitable outcomes for individuals and society (Amis et al., 2017).

Furthermore, effective governance and institutional quality have been a primary theme in development policy debates for several years. Although their inherent worth as development goals is now widely acknowledged, their usefulness as a means to achieve improved economic growth and more equitable income distribution, and how this applies to policy priorities for countries with weak institutions and low income, is not yet fully understood despite a substantial and expanding body of literature (Zhuang et al., 2010). Existing literature (Chong & Calderon, 2000; Josifidis et al., 2017; Kaufmann & Kraay, 2023) utilised various indicators to assess the relationship between institutional quality and inequality. In addition, the pervasive challenges of corruption, inequality, and poverty in Nigeria have long been a concern (Adebayo, 2013; Ajisafe, 2016), necessitating further examination of these issues. This study explored this connection by employing the perception of corruption, preference for democracy, income inequality, and standard of living as indicators.

The literature examined either provided a general overview of the relationship between institutions and inequality or conducted a detailed analysis using panel data. This study aims to contribute to the existing body of knowledge by offering a single-country regional perspective using microdata. Furthermore, to provide a concise overview of the public's perception of institutional quality and inequality in Nigeria, with a focus on regional perspectives. To achieve this objective, the following research questions are evaluated: How does the perception of institutional quality, as measured by the level of corruption, differ

across Nigeria's regions? Additionally, how does inequality, as measured by income and standard of living, vary across Nigeria's regions? The analysis will draw on a comprehensive dataset to ensure that the findings are robust and reliable.

The remainder of this paper is organised as follows. Section 6.2 presents a summary of the literature, followed by Section 6.3, which provides a detailed description of the data sources. Section 6.4 explains the approach used for the empirical analyses presented in this study. Section 6.5 presents the empirical results and discussion. Section 6.6 presents policy recommendations, and section, 6.7, concludes the paper.

6.2   Literature Review

In the aftermath of World War II, the United States witnessed considerable influence from institutions on the distribution of income. These institutions were established to effectively distribute the gains from economic growth. The institutions include unions, progressive taxation, and minimum wage policy (Levy & Temin, 2007). Levy and Temin (2007) assert that institutions such as unions, tax policies, and minimum wage regulations have significantly influenced the distribution of income in America over the past century, emphasising the significance of institutional frameworks in shaping economic outcomes.

During the early postwar period in the United States, trade unions held a significant position, striving to defend workers' rights and bargain for improved wages and perks on their behalf. Simultaneously, the government implemented progressive taxation policies, which required high-income individuals to contribute a larger portion of their income in taxes. This policy aimed to redistribute wealth to a certain extent. Furthermore, a substantial minimum wage was implemented to set a foundation for reasonable income for employees, thereby guaranteeing that even those in low-paying jobs could earn a living wage. These institutional elements collaborated to produce a fair distribution of income during the early postwar period. Nevertheless, in recent times, there have been setbacks in these institutional aspects, resulting in growing income inequality (Levy & Temin, 2007).

Hurrell (2001) examined the relationship between global inequality and international institutions in discourse. Hurrell posits that, although there is a more extensive network of common institutions and practices, global distributive justice is still a marginal concern due to significant power disparities. He also discussed the difficulties in tackling economic inequality by attributing these challenges to political decisions and the interests of influential individuals. This essay emphasises the intricate nature of addressing global economic disparities using international institutions and the power dynamics they entail.

Acemoglu et al. (2003) emphasised the intricate relationship between institutions and macroeconomic policies in their paper titled Institutional causes, macroeconomic symptoms: volatility, crises, and growth. Whilst macroeconomic policies are crucial, they are shaped by the institutional framework, which dictates how these policies are carried out and their subsequent economic consequences. The authors highlighted that institutional factors rather than macroeconomic policies alone are the primary cause of significant differences in

economic volatility and growth performance across countries. Robust institutions contribute to more stable economic conditions, while feeble institutions exacerbate volatility and crises.

According to Amis et. (2017), institutions wield a substantial influence over the persistence or alleviation of economic disparities. The authors suggest that these influences stem from power dynamics, policy control, financialisaton, institutional arrangements, organisational practices, institutional work, and the institutionalisation of practices. The role of these mechanisms can either exacerbate existing inequalities or help alleviate them, emphasising the need to comprehend and address institutional factors to advance more equitable economic outcomes.

Similarly, a study conducted by North (1991) titled "Institutions, Ideology, and Economic Performance" indicates that institutions and ideologies play a crucial role in shaping economic outcomes. North additionally emphasises that successful economic growth is not solely dependent on technological advancements but also hinges on societies' ability to adapt their institutional frameworks to new realities. Furthermore, North suggest that institutional framework is determined by the quality of the institutions, both inclusive and extractive. Inclusive economic institutions create inclusive markets, whereas extractive economic institutions are designed to extract income and wealth from a subset of society to benefit a different subset. In conclusion, the paper asserts that understanding the dynamics of institutions and ideology is critical for assessing the performance of different economies, particularly in the context of historical change and development.

Easaw and Savoia (2009) examined the relationship between economic institutions, political equality, and income inequality in sixty-three developing countries using both cross-sectional and panel data methods. This study investigates the role of property rights systems and political institutions in shaping income distribution in low-income and middle-income countries. It emphasises the significance of establishing inclusive political frameworks and fair property rights systems to address income inequality. This study reveals that property rights play a crucial role in boosting income inequality in most developing nations, particularly in countries with low levels of democracy. This suggests that the institutions in these economies often cater to the needs of a select few rather than the general population. In addition, they found that only political systems capable of creating inclusive institutions can effectively offset the negative impact of inequality.

Kotschy and Sunde (2017) examined the interplay between democracy, inequality, and institutional quality in their study. They utilised cross-country panel data from 96 countries spanning the period 1970-2010 to demonstrate the non-linear impact of democracy on institutional quality, which was moderated by inequality. The study's empirical approach is centred on capturing variations in democratic quality and income equality within countries over time, while accounting for unobserved country-specific and time-specific heterogeneity. This research additionally considers prior institutional achievements and the indirect consequences of economic institutions. The results show that equality holds significant importance in determining whether democratic institutions contribute positively to institutional quality. The findings endorse the notion that highly unequal societies may have a detrimental impact on institutional quality under democracy.

Josifidis et al. (2017) investigates the impact of shifts in economic, legal, and political institutions on income inequality in developed countries by employing a balanced panel data model on a dataset comprising 21 OECD nations spanning the period between 1990 and 2010. The investigation identified variables including income inequality; institutional quality indices covering legal, economic, and political aspects; elitisation of society; and trade union density. This study stresses the significance of institutional changes in comprehending distributional consequences, underlining the influence of the elitisation of society, unionisation, and institutional inertia on income redistribution. Research results indicate that changes to institutions have a greater impact on the redistribution of income than elitisation and unionisation. The analysis emphasises the necessity of tackling institutional inertia in the face of technological and business transformations brought about by globalisation.

Kouadio and Gakpa (2022) examined the connection between economic growth, institutional quality, poverty, and inequality in West Africa by employing a pooled Mean Group estimation and annual data spanning 1984 to 2015. Their findings indicate that economic growth is associated with decreased poverty levels. Additionally, the research reveals that economic growth can play a substantial role in diminishing income inequality in the West African region, provided that countries in the region have an effective judicial and regulatory system, a robust mechanism for combating corruption, and fewer bureaucratic impediments. Furthermore, according to studies, the quality of institutions, particularly democracy, the efficiency of bureaucracy, law and order, the control of corruption, and

government stability, have been established as significant factors contributing to the reduction of income inequality and poverty in West Africa.

The existing literature has examined the relationship between institutions and inequality by expressing an opinion or conducting analysis using panel data (Hurrell, 2001; Easaw & Savoia, 2009; Amis et. 2017; Kotschy & Sunde, 2017; Josifidis et al. 2017; Kouadio & Gakpa 2022). This research aims to address the existing gap in the literature and contribute to the existing body of knowledge by thoroughly examining the perceptions of institutional quality and inequality through the use of a micro dataset. Rather than simply expressing an opinion, this study seeks to provide a comprehensive analysis of these issues in different regions of Nigeria. This study is expected to provide valuable insights for policymakers and researchers. In light of the fact that this research is centred on the perception of institutional quality and inequality at the regional level, it is essential to formulate hypotheses that encompass the entire regions in the nation rather than just a specific subset of society. It is crucial to adopt an inclusive approach to gain a comprehensive understanding of these issues as alluded to by North (1991). Previous studies have conducted comparable analyses of Nigeria's geopolitical regions (Akpoilih & Farayibi, 2012; Eze et al., 2014; Usman et al., 2016; Dauda, 2017).

The hypotheses to be tested are stated below.

Hypotheses

H0: The perception of institutional quality is the same across various regions of Nigeria.

H1: Perception of institutional quality differs significantly across various regions of Nigeria.

H0: The perception of inequality is the same across various regions in Nigeria.

H1: The perception of inequality differs significantly across the various regions of Nigeria.

6.3 Data Source and Description

This study uses data obtained from the Afrobarometer via the World Bank microdata platform (World Bank, 2024). Afrobarometer is a non-partisan, non-profit survey research network that offers dependable data on African perceptions and evaluations of democracy, governance, and quality of life. NOIPolls, Afrobarometer's national partner in Nigeria, conducted a survey using a random stratified probability sample of 1,599 adult Nigerians between 20 January and 13 February 2020. This sample size provided accurate country-level results with a margin of error of +/-2.5 percentage points at a confidence level of 95% (Afrobarometer, 2021). The institutional factors of interest in this context are the regional perception of corruption, freedom to report corruption, and level of confidence in democracy. Additionally, the analysis considers inequality indicators, such as the regional perception of income gaps, poverty, and standard of living. The dataset comprises additional variables including location (urban or rural), state, age, and region. The regional variable was created by grouping the states in Nigeria into official regions. The states and regions of Nigeria are shown in Figure 6.1 while the definitions of the variables are presented in Table 6.1. The analysis will be conducted on a regional level.
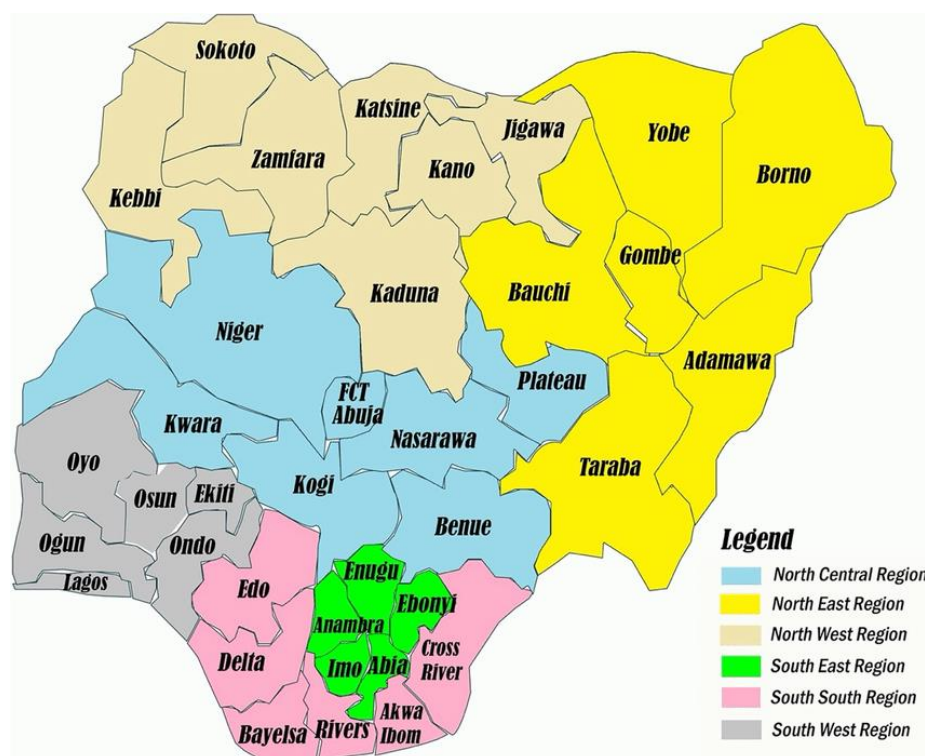
Figure 6.1 Map of Nigeria
(Kalu & Chukwurah, 2022)

Table 6.1 Variable Definition

Variables	Definition
Region	The "region" variable is comprised of states within Nigeria and serves as a collective representation of the official regions.
State	36 states and Federal Capital territory
Location	Location – Urban and Rural
Age	Age of respondents
corrup	Level of corruption
corruprt	Freedom to report corruption without fear of reprisal attacks.
democracy	Preference for democratic governance over any alternative form of governance
Inq_gaps	Handling narrowing income gaps
hd	Handling improving living standards of the poor
inc	The degree to which individuals have encountered financial difficulties (Poverty)

(Afrobarometer, 2021).

6.4 Empirical Approach

This study used a descriptive survey method to assess the perception of institutional quality and inequality across regions in Nigeria. The term "descriptive survey study" is typically used to describe research methods that focus on current phenomena, such as conditions, practices, beliefs, processes, relationships, or trends. In accordance with Dr. Y. P. Aggarwal's work from 2008, descriptive research, is focused on the collection and analysis of information pertaining to current circumstances or situations, with the aim of providing a detailed description and interpretation of these findings. This type of research involves more than just collecting and organising data; it also involves thorough analysis, interpretation, comparison, identification of trends, and examination of relationships (Salaria, 2012).

The assessment began with descriptive statistics, presenting the data as percentages for categorical variables and averages for the age variable. Additionally, Pearson's chi^2 homogeneity test was used to investigate regional differences. The Pearson's chi^2 test of homogeneity is a statistical tool designed to assess whether multiple independent samples vary in their distribution across a single variable of interest. This test is particularly useful in comparing two or more groups or conditions on a categorical outcome. A significant test statistic suggests that the groups differ in their distribution of the variable of interest, but it does not pinpoint which specific groups are different or where these differences occur. The Pearson's chi^2 test of homogeneity is widely used in research to evaluate the uniformity of categorical data across multiple groups (Franke et al. 2012).

Furthermore, this research utilises a newly introduced feature in Stata 18 known as the Stata code "dtable", which employs p-values for statistical inference. However, Stata 18 does not offer support for critical values, an additional method of statistical inference. In hypothesis testing, both the p-value and the critical value play crucial roles, albeit with distinct functions in the statistical process. The p-value, a probabilistic measure, quantifies the robustness of evidence challenging the null hypothesis, and has been a fundamental element of statistical inference. It indicates the probability of observing the given data under the assumption that the null hypothesis holds true (Verdam et al., 2014; Gagnier & Morgenstern, 2017). The chi-square critical value serves as a benchmark for evaluating the calculated chi-square statistic to determine whether to dismiss the null hypothesis. In addition, it is employed to assess if a meaningful relationship exists between categorical variables

(Buckalew & Pearson, 1982). Nonetheless, a statistically significant p-value suggests that there are discrepancies in the estimates across regions, whereas a non-significant p-value indicates the opposite. The test was conducted at a significance level of 5%, with the aim of determining the relationships between regions. The aforementioned analyses are intended to demonstrate relationships rather than to establish causation.

The Pearson's *chi²* equation is as follows:

$$\chi^2 \ = \ \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

Where *n* is the number of cells in the table. O_i represents the Observed frequency of type *i*, while E_i signifies the Expected frequency of type *i*. The chi-square distribution with *(r-1)(c-1)* degrees of freedom is used to compare the obtained test statistic against a critical value. The hypotheses that are to be tested are provided in Section 6.2. The Stata software was used for data editing and descriptive analyses.

6.5 Empirical Results and Discussion

6.5.1 Demographic Information

The results of the Pearson's *chi*^{2} test suggest that the ratio of males to females in the sample is not statistically different within the regions. Nonetheless, the distribution of respondents based on place of residence is statistically significant at the 1% level (see Table 6.2). This implies that where people live, either urban or rural, differs across regions. For example, 69% of respondents in the North Central region dwell in rural areas, whereas 72% of respondents in the southwest dwell in urban areas. Similarly, the age of the respondents differs across regions, as the Pearson's *chi*^{2} test is statistically significant at the 5% level. The representation of the respondents appears to capture the diverse nature of Nigeria, particularly their place of residence and the age group to which they belong.

Table 6.2 Demography by Region

	1. NC (N=231)	2. NE (N=272)	3. NW (N=392)	4. SE (N=168)	5. SS (N=224)	6. SW (N=312)	P-value
Gender of respondent							
Male	116 (50.2%)	136 (50.0%)	196 (50.0%)	84 (50.0%)	112 (50.0%)	157 (50.3%)	1.000
Female	115 (49.8%)	136 (50.0%)	196 (50.0%)	84 (50.0%)	112 (50.0%)	155 (49.7%)	
Location							
Urban	71 (30.7%)	96 (35.3%)	128 (32.7%)	96 (57.1%)	80 (35.7%)	224 (71.8%)	<0.001
Rural	160 (69.3%)	176 (64.7%)	264 (67.3%)	72 (42.9%)	144 (64.3%)	88 (28.2%)	
Age	35.26 (15.01)	34.81 (59.78)	31.18 (10.75)	38.77 (15.16)	35.50 (13.43)	36.20 (12.67)	0.044

Total sample: N = 1,599 | *Note: using Pearson chi^2 test across levels of region for gender, location, and age.*

(data from: Afrobarometer, 2021)

6.5.2 Institutional Quality by Region

This section presents an overview of institutional quality across Nigeria's regions.

6.5.2.1 Perception of Corruption

The results of the Pearson's *chi²* test indicate that the perception of corruption varies across regions, as the p-value is less than 0.001, which is the significance level (see Table 6.3). In the north-central region, approximately 57% of people believe that corruption has increased significantly or slightly, while in the northeast region, this figure is 39%. Similarly, in the northwest region, it is 40%; in the southeast region, 73%; in the south-south region, 73%; and in the southwest region, it is 65%. On the other hand, those who think that corruption has decreased significantly and somewhat in the north-central region are approximately 27%, while in the northeast, this figure is 41%. In the northwest, the percentage is 30%; in the southeast, it is 11%; in the south-south, it is 15%; and in the southwest, it is 18%. This information is illustrated graphically in Figure 6.2

Nigeria has grappled with corruption for several decades, even during its military regime, and has made little progress in eradicating corrupt practices within the government. In 2020, Nigeria was ranked 145th in terms of the least corrupt out of 180 countries, with a corruption index score of 25 (Transparency International, 2024). The findings from the descriptive analysis indicate that corruption is pervasive across regions, although it appears to be lower in the northeast and northwest. As in previous years, a number of corruption cases were reported both before and after 2020, when the survey data used in the study were collected (EFCC, 2019; Onuah, 2022; Sa'id & Abas, 2022). An instance of this situation occurred when the Economic and Financial Crime Commission (EFCC) alleged that four government officials from the Kwara state were involved in money laundering, particularly concerning twenty million, three hundred thousand naira (EFCC, 2019).

In a similar vein, the government official responsible for Poverty Alleviation was recently apprehended and indicted for theft of twenty-four million USD. In addition, the individual transferred an excess of half a million USD to a private account. This sum was designated for vulnerable members of society who lacked the means to meet their basic needs. Instead of applying the funds for their intended use, the official diverted them to a personal account (Aradi, 2024). Similarly, the former governor of a state in Nigeria is currently evading capture. He is accused of misappropriating state funds, and towards the close of his administration, it is alleged that he transferred approximately eight hundred thousand USD

from the state treasury account to a bureau de change. This money was subsequently utilised to cover his children's tuition fees (Tolu-Kolawole, 2024).

The aforementioned national news articles illustrate the pervasive nature of corruption across various branches of the government. Numerous additional instances of unethical behaviour have occurred over the years. In a sense, this not only impacts the population's perception, but also highlights the institution's vulnerability. It is imperative that Nigeria take concrete actions beyond merely identifying corrupt practices and prosecuting these cases to deter corrupt officials.

6.5.2.2 Reporting Corruption

Achieving the eradication of corruption in Nigeria's current state presents a considerable challenge, as demonstrated by the descriptive statistics in Table 6.3, which indicate that the majority of individuals in each region, exceeding 80%, perceive themselves to be at risk of retaliation if they report corrupt practices. Figure 6.3 presents a visual representation of this result. Furthermore, the insignificant p-value of 0.434 suggests that fear of reprisal attacks following the reporting of corruption is homogeneous across all regions. This indicates that there is agreement among the populace regarding reporting corruption. However, this presents a difficulty in terms of holding leaders responsible for their wrongdoing. Perhaps Nigeria could benefit from learning from Singapore, which is one of the countries known as Asian tigers. Singapore gained independence from Great Britain in 1959 (Quah, 2016), a year prior to Nigeria's independence (Tignor, 1993), and has achieved considerable success in numerous aspects. Singapore has effectively combated corruption, attributing its success to its government's unwavering political will. This is evident in the allocation of ample budgets and personnel to the Corrupt Practices Investigation Bureau (CPIB), allowing it to enforce anti-corruption laws impartially, without regard to the offender's position, status, or political affiliation (Quah, 2016). Nigeria's EFCC, an equivalent of Singapore's CPIB, should be equally equipped to combat corruption in all its forms.

6.5.2.3 Support for Democracy

According to the results of the Pearson's chi^2 test presented in Table 6.3, it appears that the level of support for democracy varies across different regions, as indicated by the differing levels of confidence in democracy among the various regions. With the exception of the southwest region of Nigeria, which has a confidence level of approximately 62%, all other

regions have a support for democracy above 73%. This information is graphically presented in Figure 6.4. Notably, the southwest region of Nigeria has recently expressed a desire to secede from the country (Aliyu & Kaff, 2024). Future research could explore whether this desire is a factor in their lower preference for democracy. Nonetheless, a large swath of the Nigerian population views democracy as the best form of government. This is noteworthy given that Nigeria has only recently transitioned to democratic governance, having held successive elections for less than three decades since its return to democratic rule. Furthermore, it is important to highlight that military coups have recently reemerged in West and Central African countries, including Niger, Burkina Faso, Guinea, and Mali (Reuters, 2023).

The findings of this study highlight the importance of reciprocating citizens' trust and support for democracy. It is crucial that Nigerian leaders demonstrate their commitment to democracy by taking steps to resolve the significant societal challenges faced by citizens. The adoption of the message of reciprocal altruism could be deemed necessary for both Nigerian leaders and the general population. According to Levi (2017), the success and flourishing of societies depend on a substantial proportion of their constituents participating in reciprocal altruism. Reciprocal altruism provides insights into the development of ethical standards and social norms within a society. The promotion of reciprocal altruism is contingent upon a cultural framework that encompasses norms and regulations governing conduct, establishes the legitimacy of punishment for transgressions, and imparts accountability and fairness to its adherents. Additionally, giving and making sacrifices, which are fundamental aspects of altruism, play a crucial role in fostering cooperation, which in turn contributes to the development of successful and thriving communities (Levi, 2017).

Table 6.3 Institution by Region

	1. NC (N=231)	2. NE (N=272)	3. NW (N=392)	4. SE (N=168)	5. SS (N=224)	6. SW (N=312)	P -value
Perception of corruption							
Increased a lot	83 (35.9%)	62 (22.8%)	70 (17.9%)	105 (62.5%)	130 (58.0%)	107 (34.3%)	<0.001
Increased somewhat	48 (20.8%)	45 (16.5%)	86 (21.9%)	17 (10.1%)	33 (14.7%)	97 (31.1%)	
Stayed the same	37 (16.0%)	51 (18.8%)	111 (28.3%)	23 (13.7%)	24 (10.7%)	42 (13.5%)	
Decreased somewhat	53 (22.9%)	88 (32.4%)	100 (25.5%)	17 (10.1%)	33 (14.7%)	48 (15.4%)	
Decreased a lot	9 (3.9%)	23 (8.5%)	18 (4.6%)	2 (1.2%)	2 (0.9%)	7 (2.2%)	
Don't know	1 (0.4%)	3 (1.1%)	7 (1.8%)	4 (2.4%)	2 (0.9%)	11 (3.5%)	
Ordinary people can report corruption without fear							
Can report without fear	28 (12.1%)	38 (14.0%)	69 (17.6%)	20 (11.9%)	31 (13.8%)	46 (14.7%)	0.434
Risk retaliation	196 (84.8%)	227 (83.5%)	315 (80.4%)	145 (86.3%)	188 (83.9%)	252 (80.8%)	
Refused	0 (0.0%)	0 (0.0%)	1 (0.3%)	0 (0.0%)	1 (0.4%)	0 (0.0%)	
Don't know	7 (3.0%)	7 (2.6%)	7 (1.8%)	3 (1.8%)	4 (1.8%)	14 (4.5%)	
Support for democracy							
Doesn't matter	23 (10.0%)	20 (7.4%)	24 (6.1%)	25 (14.9%)	29 (12.9%)	45 (14.4%)	<0.001
Sometimes non-democratic preferable	35 (15.2%)	27 (9.9%)	58 (14.8%)	18 (10.7%)	28 (12.5%)	65 (20.8%)	
Democracy preferable	172 (74.5%)	224 (82.4%)	310 (79.1%)	123 (73.2%)	163 (72.8%)	192 (61.5%)	
Don't know	1 (0.4%)	1 (0.4%)	0 (0.0%)	2 (1.2%)	4 (1.8%)	10 (3.2%)	

Total sample: N = 1,599 | Note: using Pearson's chi^2 test across levels of region for corrup, corruptrt, and democracy
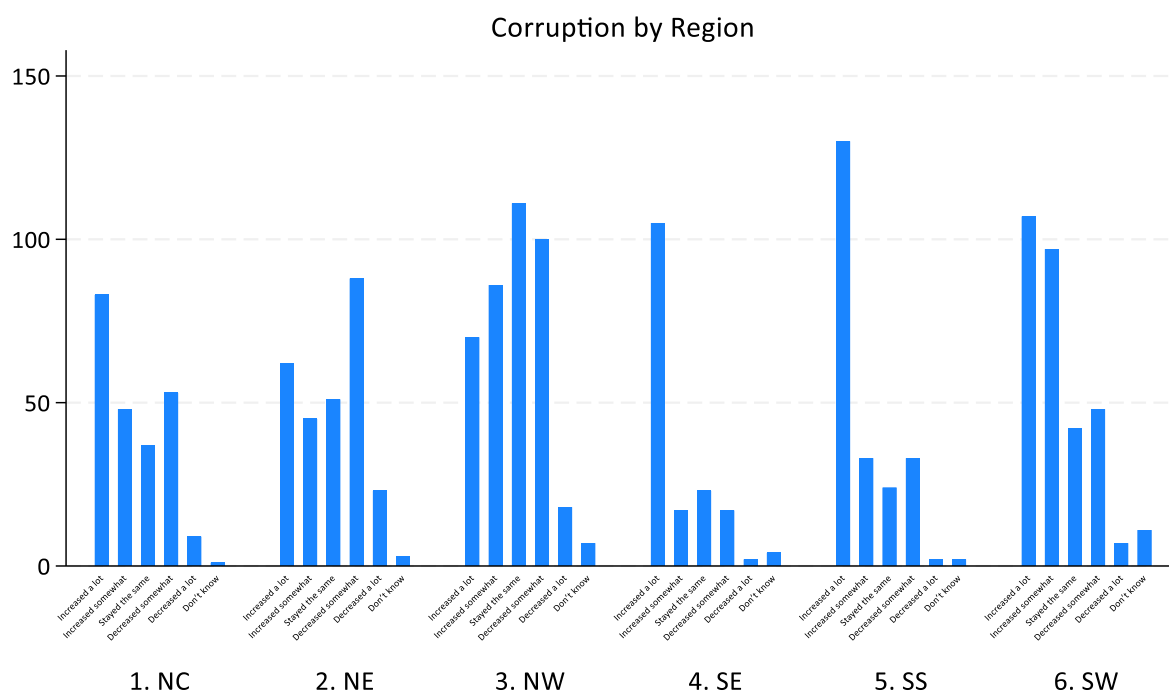
Figure 6.2 Level of Corruption
(Created with Stata, data from Afrobarometer (2024))
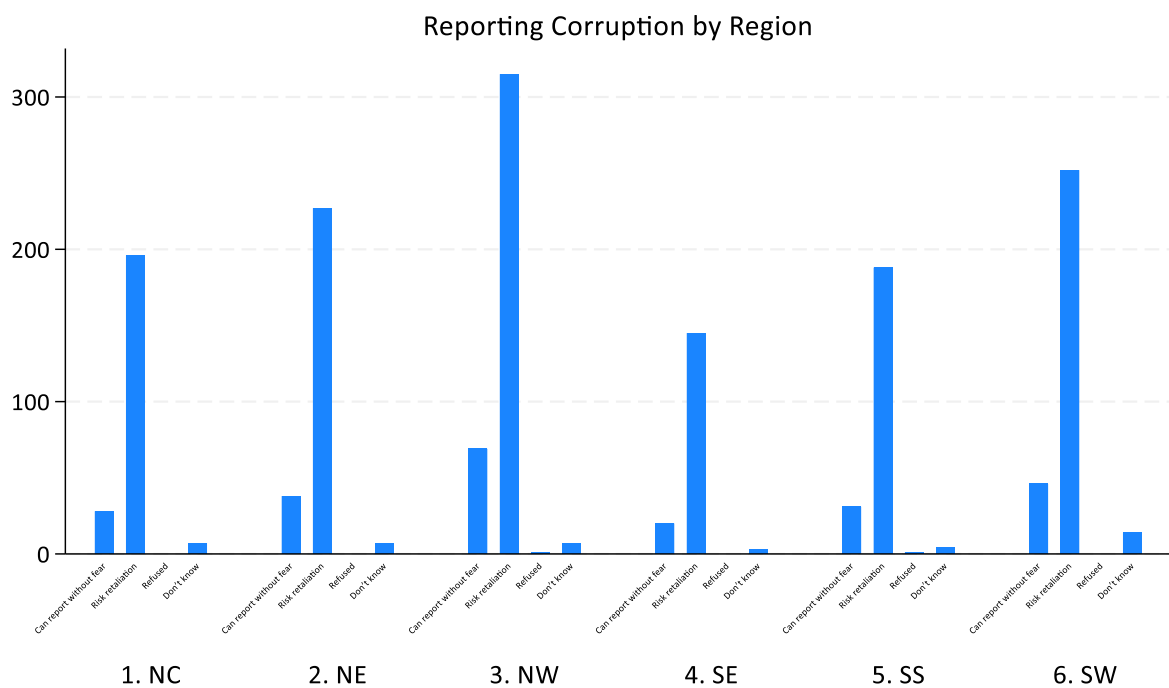
Figure 6.3 Reporting Corruption by Region
(Created with Stata, data from Afrobarometer (2024))

Support for Democracy by Region
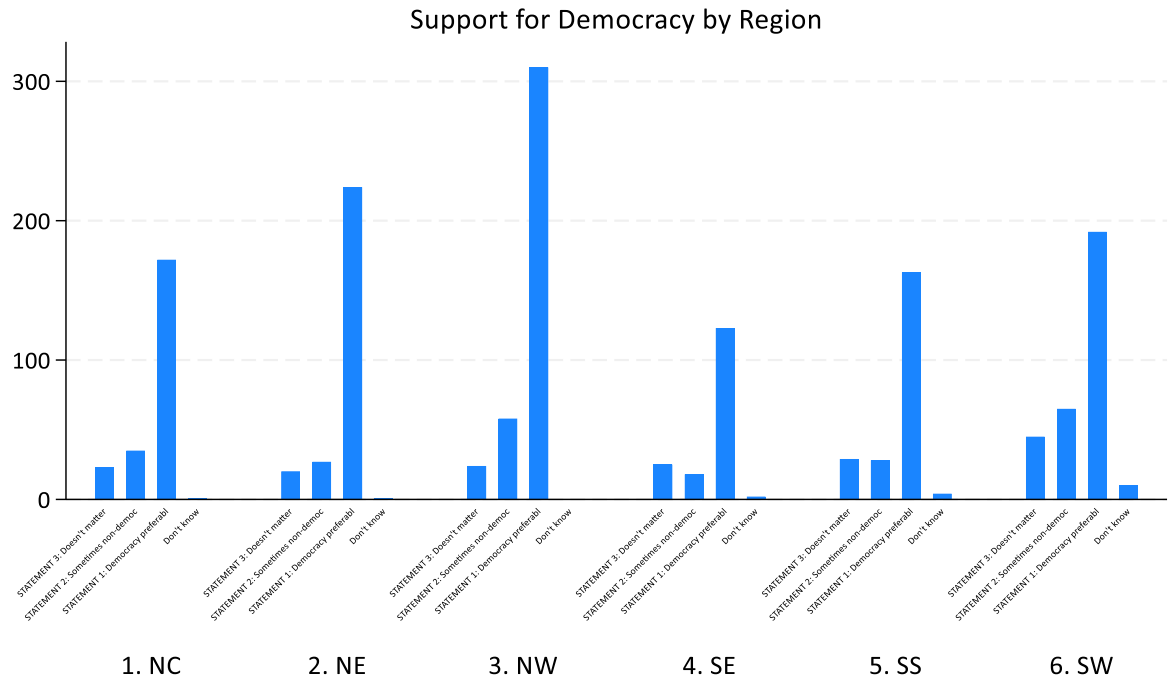
Figure 6.4 Support for Democracy by Region
(Created with Stata, data from Afrobarometer (2024))

6.5.3 Inequality by Region

This section presents an overview of income inequality across Nigeria. However, more in-depth analysis is required to gain a deeper understanding of this issue.

6.5.3.1 Income Gaps

The Pearson's *chi²* test outcome, shown in Table 6.4, indicates that income inequality differs among regions, as the p-value is less than 0.001. The north-central region displays strong consensus, with approximately 94% of the population believing that the government has handled poorly or very poorly income inequality. Similarly, in the northeast, 78% of respondents held the same view. In contrast, the northwest shows a lower score, with 61% of the respondents expressing dissatisfaction with the government's handling of income inequality. The southeast and south-south regions also displayed strong agreement, with 94% and 91% of the respondents, respectively, believing that the government has performed poorly or fairly badly in this regard. Finally, the southwest has a high percentage of dissatisfied residents, with 82% believing that the government has handled income inequality insufficiently. Figure 6.5 provides a visual representation of the findings. These scores illustrate that income inequality exists across the regions of the country, and that the populace holds the view that the government is not doing enough to address it.

6.5.3.2 Poverty Measure

Another measure of income inequality that is often considered is the prevalence of individuals who have gone without cash, which is similar to poverty headcount. This provides an indication of those who may be living below the World Bank poverty threshold of $2.15 per day. In the north-central region, 68% of respondents, in the north-east 72%, in the northwest 50%, in the southeast 68%, in the south-south 71%, and in the southwest 63% have either gone without cash several/many times, or always. Table 6.4 demonstrates that income disparities vary among regions, as the p-value is below 0.001, as shown in Figure 6.6. These estimates indicate that individuals residing in the northwestern region experience lower levels of poverty than those living in other regions. Conversely, the northeast region, which has been significantly impacted by terrorism, has the highest perceived poverty levels, followed by the south-south region, which has experienced Niger-delta insurgency over the years (Chukwurah et al., 2015; Dialoke & Edeja, 2017).

6.5.3.3 Standard of Living

Finally, the study evaluates the level of regional inequality using the standard of living perception metric. According to the Webster Dictionary, the standard of living refers to the basic requirements, amenities, or extravagances considered crucial for preserving an individual or a group's customary or appropriate standing or circumstances (Merriam-Webster, 2024). The results from Table 5.4 suggest that perception of standard of living vary among different regions, as the p-value is below 0.001. 83% of respondents living in north-central, 73% in north-east, 49% in north-west, 88% in south-east, 84% in south-south, and 82% in south-west, indicate that the Nigerian government's performance in improving the standard of living for its population across regions, with the exception of the north-west, has been poor or fairly poor. In the northwestern region, there is a divergence of opinion on the government's approach to issues concerning the standard of living. This is illustrated in Figure 5.7 which presents a visual representation of findings.

Table 6.4 Inequality by Region

	1. NC (N=231)	2. NE (N=272)	3. NW (N=392)	4. SE (N=168)	5. SS (N=224)	6. SW (N=312)	P-value
Handling narrowing income gaps							
Very badly	144 (62.3%)	119 (43.8%)	101 (25.8%)	130 (77.4%)	168 (75.0%)	198 (63.5%)	<0.001
Fairly badly	72 (31.2%)	92 (33.8%)	136 (34.7%)	28 (16.7%)	36 (16.1%)	57 (18.3%)	
Fairly well	14 (6.1%)	48 (17.6%)	125 (31.9%)	7 (4.2%)	12 (5.4%)	51 (16.3%)	
Very well	1 (0.4%)	3 (1.1%)	8 (2.0%)	2 (1.2%)	4 (1.8%)	3 (1.0%)	
Don't know	0 (0.0%)	10 (3.7%)	22 (5.6%)	1 (0.6%)	4 (1.8%)	3 (1.0%)	
How often gone without cash income							
Never	40 (17.3%)	41 (15.1%)	110 (28.1%)	16 (9.5%)	24 (10.7%)	59 (18.9%)	<0.001

Just once or twice	34 (14.7%)	34 (12.5%)	85 (21.7%)	38 (22.6%)	41 (18.3%)	56 (17.9%)
Several times	80 (34.6%)	95 (34.9%)	133 (33.9%)	43 (25.6%)	60 (26.8%)	105 (33.7%)
Many times	53 (22.9%)	60 (22.1%)	59 (15.1%)	45 (26.8%)	66 (29.5%)	37 (11.9%)
Always	24 (10.4%)	40 (14.7%)	4 (1.0%)	26 (15.5%)	32 (14.3%)	55 (17.6%)
Don't know	0 (0.0%)	2 (0.7%)	1 (0.3%)	0 (0.0%)	1 (0.4%)	0 (0.0%)

Handling improving living standards of the poor

Very badly	107 (46.3%)	108 (39.7%)	74 (18.9%)	118 (70.2%)	150 (67.0%)	175 (56.1%)	<0.001
Fairly badly	85 (36.8%)	90 (33.1%)	119 (30.4%)	29 (17.3%)	39 (17.4%)	82 (26.3%)	
Fairly well	37 (16.0%)	64 (23.5%)	145 (37.0%)	16 (9.5%)	32 (14.3%)	50 (16.0%)	
Very well	2 (0.9%)	5 (1.8%)	38 (9.7%)	2 (1.2%)	2 (0.9%)	5 (1.6%)	
Don't know	0 (0.0%)	5 (1.8%)	16 (4.1%)	3 (1.8%)	1 (0.4%)	0 (0.0%)	

Total sample: N = 1,599 | *Note: using Pearson's **chi²** test across levels of region for ing_gap, inc, and hd*

(data from: Afrobarometer, 2021)
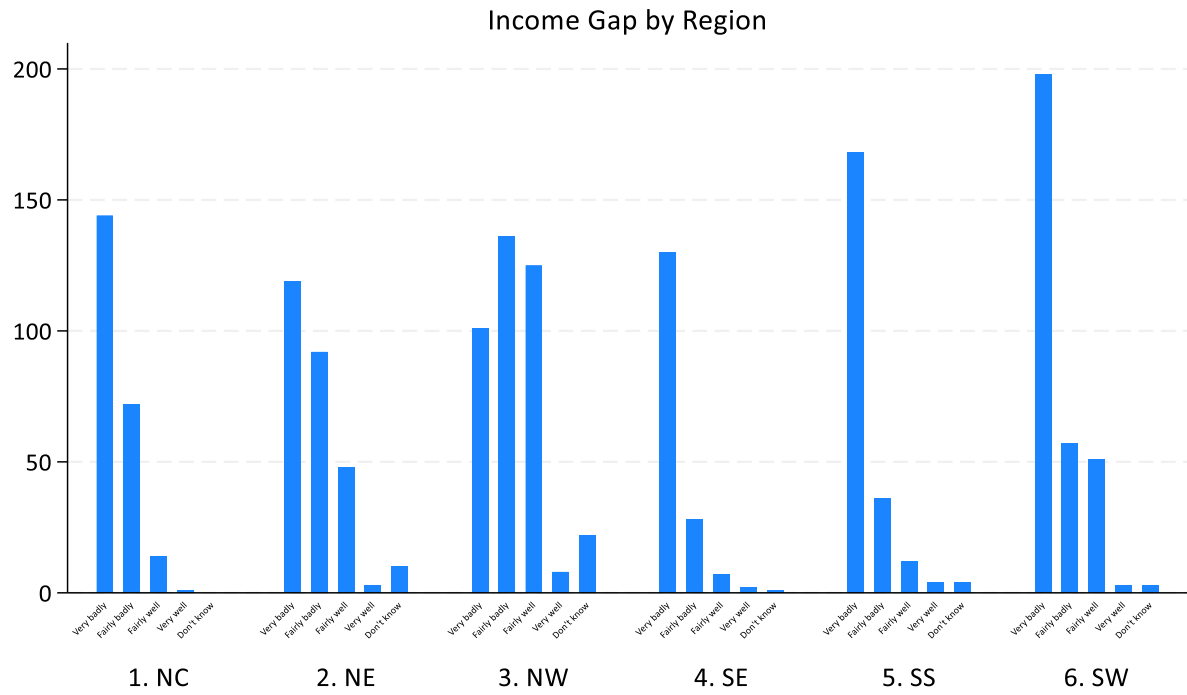
Figure 6.5 Income Gap by Region
(Created with Stata, data from Afrobarometer (2024))
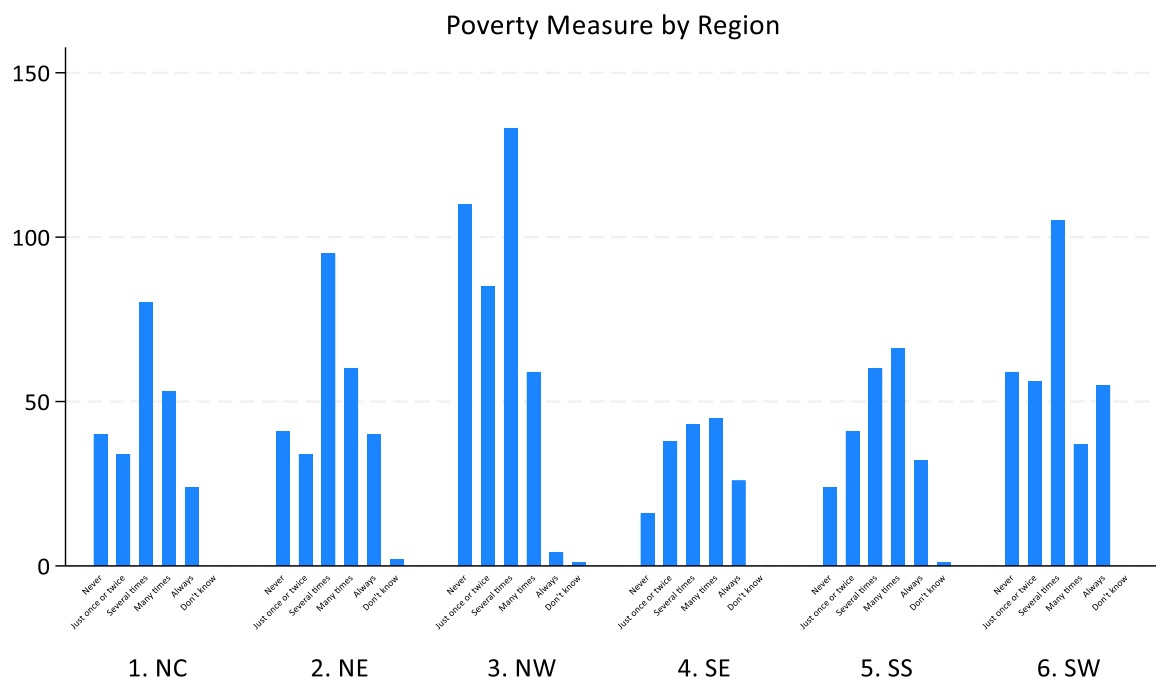
Figure 6-6 Figure 6.6 Poverty Measure by Region
(Created with Stata, data from Afrobarometer (2024))
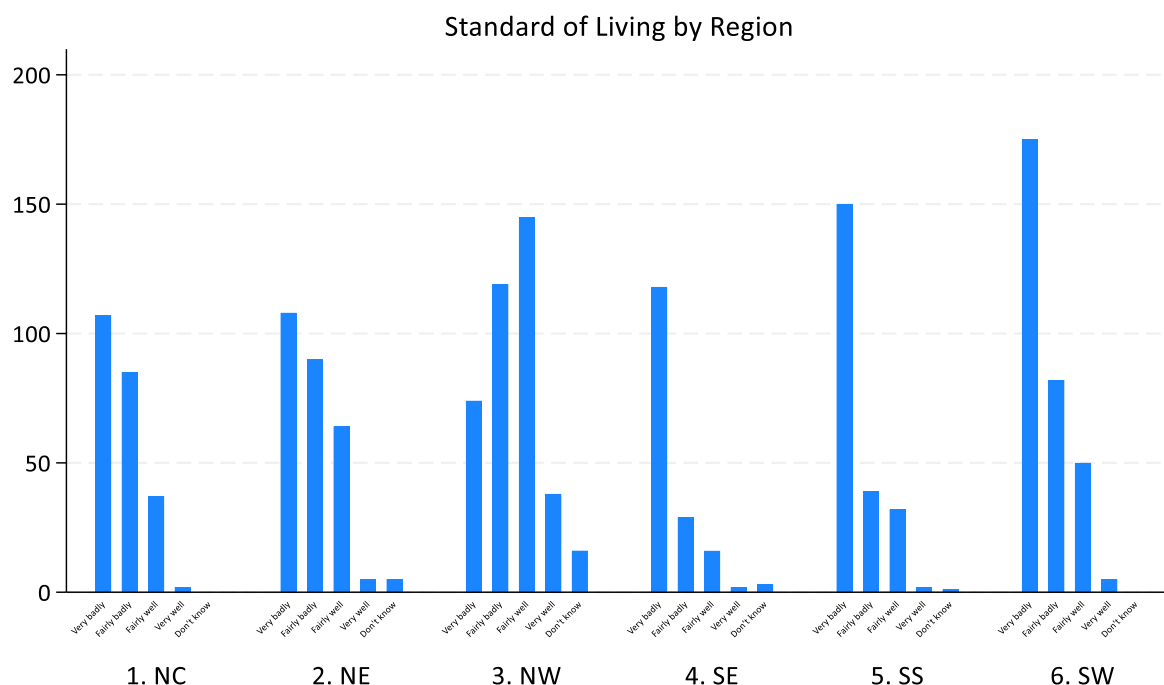
Figure 6.7 Standard of Living by Region
(Created with Stata, data from Afrobarometer (2024))

6.6   Policy Recommendation

The implication of the perception of corruption and inequality, as presented in this study's findings, is that the Nigerian government must confront these issues to prevent it from falling into an inequality trap. In a comparative analysis of 129 nations, Jong-Sung and Khagram (2005) contended that disparities encourage a norm of corruption as acceptable behaviour, and that corruption is likely to exacerbate or broaden existing inequalities. Furthermore, they argue that vicious circles of inequality-corruption-inequality are likely to emerge. Their findings also suggest that the impact of inequality on corruption is likely to be more pronounced in democratic countries. Uslaner (2008) also opined that economic inequality, in particular, creates a favourable environment for corruption to thrive, thus perpetuating a cycle of further inequalities, which can be referred to as an "inequality trap."

In the light of this, it is highly recommended that Nigerian leaders should live up to the definition of a good democracy. A good democracy is characterised by a sound institutional framework that ensures the rights and equality of its citizens by upholding the integrity and proper operation of its systems and processes (Munck, 2016). Nigerian leaders and citizens must exhibit greater altruism. Reciprocal altruism can help Nigeria resolve the challenges stemming from the greed. Furthermore, this can help mitigate the tragedy of the

common, which leads to depletion of the country's resources. By promoting altruistic behaviour, communal clashes, corruption, and inequality can be reduced. Additionally, altruism can aid in the development of lasting ethical principles that can drive progress in various aspects of Nigerian society (Phelps 1975; Onyeiwu 1997; Levi 2017).

6.7   Conclusion

The main objective of this study is to provide a thorough examination of the perceptions of the Nigerian population concerning institutional quality and inequality across different regions, which has been successfully accomplished. Institutional quality, measured by the level of corruption, freedom to report corruption, and democracy indicators, provides a view that seems to be corroborated by events in the national news and extant literature. Citizens across regions are still dissatisfied with how the government manages corruption. Similarly, most Nigerians fear reprisal attacks on reporting corruption. Finally, regarding the democratic form of government, Nigerians nationwide continue to express a preference for this system of governance. As it relates to inequality, it is measured by the government's handling of income inequality, presence of income poverty, and standard of living across various regions. The results suggest that the majority were dissatisfied with how the government has handled income inequality in the country, and a sizable portion of the population reported not having cash at some point. Meanwhile, a convincing majority, with the exception of the northwest, also believe that the government has not done enough to address the issue of a low standard of living across the country.

Furthermore, the results of this research indicate that, although democracy is the preferred form of government, the citizens of Nigeria have not yet enjoyed its benefits, as the government's handling of corruption and inequality issues has been met with a negative perception. Recommendations have been proposed to address issues of institutional quality and inequality.

Chapter 7 Conclusion and Policy Recommendation

This thesis presents five essays on income inequality and makes six significant contributions to academic literature. First, it examined the state of income inequality in Nigeria, providing valuable insights into this pressing issue. Furthermore, this study demonstrates that the Kuznets inverted U-curve holds for Nigeria. Second, low-income inequality does not necessarily signify an optimal standard of living. Third, it highlights the economic toll of terrorism among residents by assessing income inequality and poverty rates and finds that income inequality, as measured by the Gini coefficient, is low, but the poverty rate is high. Fourth, Covid-19 has a minimal effect on income inequality. Fifth, the authors show that financial inclusion can reduce income inequality. Finally, a considerable proportion of Nigerians, regardless of their regional ties, are discontented by the government's management of corruption and inequality. However, a sizable segment of the population expresses preference for democracy as the optimal form of governance. These contributions are based on detailed empirical analyses of time series data and household survey data of Nigeria.

Chapter 2 examines the empirical relationship between income inequality and Nigeria's economic growth. There is currently no consensus on the nature of this relationship in Nigerian literature. This study assessed whether an inverted U-shaped connection existed between these two variables, as predicted by the Kuznets hypothesis. This study employed an Autoregressive Distributed Lag (ARDL) model, and our findings indicate an inverted U-shaped relationship in the short run. This study further reveals that inflation and real exchange rates exhibit a statistically significant and negative correlation with income inequality in the long run. Likewise, evidence suggests that political stability has a statistically significant positive long-term correlation with income inequality, while in the short term it seems to improve income inequality in Nigeria. Additionally, the findings show that in the short run, real exchange rates reveal a statistically significant association that exacerbates income inequality.

Chapter 3 investigates the economic situations of households living in areas affected by terrorism. To achieve this, the study used measures of inequality, such as the Gini coefficient and the Lorenz curve. In addition, the authors assessed the poverty headcount ratio of the

population and utilised one-way ANOVA to test hypotheses. This study contributes to the literature by showing that income inequality in Northeast and Northwest Nigeria is lower than the national average. We also show that while the Gini coefficient (0.27) in the northeast and northwest jointly signifies a relatively equal society, however, poverty headcount presents a different perspective. The poverty headcount ratio for the northeast and northwest regions of Nigeria is 73%, which is substantially higher than the national average of 33.0% for the same year 2021. Although the northeastern and northwestern regions appear to be comparatively equal, they are mostly equally impoverished. This study also demonstrates that as the educational attainment of the household head increases, so does their income. Similarly, the findings show that male respondents have lower income inequality than female respondents, suggesting that women earn less income than men do.

Chapter 4 evaluates the economic effect of Covid-19 on income inequality in northeast and northwest Nigeria. Studies on the impact of Covid19 are still in their early stages. Furthermore, the study used the 2021 dataset from the Food and Agricultural Organization (FAO) and inequality measures such as the Gini coefficient and Lorenz curve. This study shows that income inequality increased among individuals who followed Covid-19 restrictions, those whose household heads became ill or passed away, and those experiencing other forms of economic shock. However, this increase was minimal.

Chapter 5 examines the effects of financial inclusion on income inequality using a sample of 999 Nigerian individuals surveyed in 2021. To accomplish this, the study used an ordered logistic regression model and inequality measures such as the Gini coefficient estimates and Lorenz curve analysis. Through ordered logistic regression analysis, the author shows that possessing a financial institution account and a mobile money account have a favourable influence on income levels. Those with financial and mobile accounts typically experience lower income inequality than those without them. Additionally, the Gini coefficient and Lorenz curve analysis demonstrated that financial inclusion positively affects individuals' incomes and promotes greater equality than those without financial access or services.

Finally, in Chapter 6, the author conducts a thorough examination of the perceptions of the Nigerian population concerning institutional quality and inequality in every region of the country. Descriptive statistics and Pearson's *chi²* tests were used for analysis. Based on

Pearson's *chi²* test results, this study shows that perceptions of institutional quality and inequality differ across regions. In addition, individuals from various regions are displeased with the government's handling of corruption. Furthermore, many Nigerians fear retaliation when reporting on corruption. Additionally, most Nigerians across the country still favour a democratic form of government. However, the results also indicate that the majority of the population is dissatisfied with the government's handling of income inequality in the country, and a considerable proportion reported experiencing a lack of cash at some point. Additionally, a considerable proportion of individuals believe that the government has not taken adequate measures to enhance their standard of living throughout the nation.

7.1 Policy Recommendation

Chapter 2: This study aimed to determine if there was an inverted U-shaped relationship between income inequality and economic growth, as suggested by the Kuznets hypothesis. The results indicated that in the short run, there was an inverted U-shaped relationship between the two variables. The Kuznets hypothesis posits that economic growth can initially exacerbate income inequality before eventually reducing it during the later stages of development (Kuznets, 1955). Based on these findings, it is strongly recommended that Nigeria implement relative pro-poor policies, such as improving economic opportunities for the poor, targeting subsidies more effectively, and continuing to promote financial inclusion strategies.

Chapter 3: The results of this study reveal that although the Gini coefficient (0.27) in the northeast and northwest regions suggests a relatively equal society, the poverty headcount ratio is 73%, which is significantly higher than the national average of 33.0% for the same year 2021. Moreover, this study highlights that the higher the educational attainment of the household head, the greater their income. Similarly, the findings indicate that male respondents experience lower income disparity than female respondents, suggesting that women generally earn less income than men. Based on these findings, it is thus recommended that Nigeria should prioritise the implementation of effective redistribution policies that can significantly reduce poverty, address gender income inequality, implement educational policies that promote equity, and resolve the challenges posed by terrorism in the northern region.

Chapter 4: This research indicates that income inequality grew among individuals who adhered to Covid-19 restrictions, those whose household heads became ill or passed away, and those facing other forms of economic shock. Nevertheless, this rise was relatively small. In the light of these findings, Nigeria needs to implement tailored interventions and policy measures to mitigate the impact of the pandemic on income inequality and the Nigerian economy as a whole, given that those who face other forms of economic shocks are more affected than others.

Chapter 5: As this research highlights, having financial and mobile accounts generally leads to lower income inequality compared to those without them. Furthermore, the Gini coefficient

and Lorenz curve analysis revealed that financial inclusion has a positive impact on individuals' incomes and promotes greater equality than those without access to financial services. Therefore, it is strongly recommended that the government continues to implement policies that promote financial inclusion among the general population. In addition, to mitigate disparities in income levels between rural and urban populations. Furthermore, targeted development policies should be implemented in rural areas, such as ensuring access to similar social amenities that are available in urban areas.

Chapter 6: According to the study's outcomes, opinions on institutional quality and inequality vary between regions. Moreover, individuals from diverse regions are discontent with the government's approach to corruption. Additionally, many Nigerians are apprehensive about facing retaliation when reporting on corruption. Furthermore, the majority of Nigerians across the country continue to support a democratic form of government. However, this study also reveals that the majority of the population is dissatisfied with the government's management of income inequality in the country, and a considerable proportion has experienced a shortage of cash at some point. Additionally, a considerable proportion of individuals believe that the government has not taken adequate steps to enhance their standards of living throughout the nation.

The findings of this study highlight the importance of reciprocating citizens' trust and support for democracy. It is crucial that Nigerian leaders demonstrate their commitment to democracy by taking steps to resolve the significant societal challenges faced by citizens. Furthermore, the implication of the perception of corruption and inequality, as presented in this study's findings, is that the Nigerian government must confront these issues to prevent the country from falling into an inequality trap. Considering these findings, it is strongly recommended that Nigerian leaders and citizens embrace the philosophy of reciprocal altruism. Reciprocal altruism can aid in resolving challenges in Nigeria caused by greed. Moreover, this could help to prevent the tragedy of the common, which results in the depletion of the country's resources. Altruistic behaviour can reduce communal clashes, corruption, and inequality, as well as foster the development of lasting ethical principles that can drive progress in various aspects of Nigerian society (Phelps 1975; Onyeiwu, 1997; Levi, 2017).

Chapter 8 Limitation and Suggestions for Further Research

This study had a few limitations, particularly in terms of the availability of data and missing observations.

In Chapter 1, the Gini coefficient and political stability variables were extrapolated because of missing data. The authors conducted an extrapolation using the last known values for missing year data points. Nonetheless, the authors conduct a post-estimation examination of the empirical results to validate results.

In Chapters 2 and 3, the researchers only had access to one-year survey data for estimation. Future studies should endeavour to use an annual time series to obtain a clearer picture of income inequality in northeast and northwest Nigeria.

Furthermore, in Chapter 3, the study faced a limitation in that some variables, such as anonymised data on individuals who have experienced Covid-19 related health issues, were not included in the FAO (2022) dataset. It is also essential to mention that the impact of Covid-19 may not be entirely evident until 2022 data are accessible. Thus, future research endeavours should assess this impact by incorporating data from 2022 and 2023.

Similarly, in Chapter 4, the study uses only one year of micro data to evaluate the effect of financial inclusion on income inequality. The researcher also faced a limitation in the income variable of the respondent, as only the income quintile was provided. Furthermore, the author would have estimated the poverty headcount in order to ascertain whether financial inclusion can actually reduce poverty. Future studies should strive to investigate this further and use annual time-series data as they become available.

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Appendix Chapter 2

2.A ARDL Cointegration Bounds Test

Pesaran/Shin/Smith (2001) ARDL Cointegration Bounds Test							
Linear equation: F = 9.547 | t = -5.082							
Critical Values (0.1-0.01), F-statistic, Case 3							
	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
	L_1	L_1	L_05	L_05	L_025	L_025	L_01	L_01
k_5	2.45	3.52	2.86	4.01	3.25	4..49	3.74	5.06
Critical Values (0.1-0.01), t-statistic, Case 3							
	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
	L_1	L_1	L_05	L_05	L_025	L_025	L_01	L_01
k_5	-2.57	-3.66	-2.86	-3.99	-3.13	-4.46	-3.43	-4.60

Appendix Chapter 3

3.A Lorenz Estimates – Income Quintile

inc_q	Coefficient	Std. err.	[95% conf. interval]	
0	0	(omitted)		
5	.0166708	.0001516	.0163736	.016968
10	.0333416	.0003032	.0327471	.0339361
15	.0500124	.0004548	.0491207	.0509041
20	.0666832	.0006063	.0654942	.0678722
25	.1	.002034	.0960116	.1039884
30	.1333416	.0019176	.1295814	.1371018
35	.1666832	.0018443	.1630669	.1702995
40	.2000248	.0018191	.1964578	.2035918
45	.2499876	.0033112	.2434949	.2564803
50	.3	.0030169	.2940843	.3059157
55	.3500124	.0027665	.3445878	.355437
60	.4000248	.0025726	.3949802	.4050693
65	.4666336	.0035361	.4596998	.4735674
70	.5333168	.0030322	.5273711	.5392625
75	.6	.0025728	.5949551	.6050449
80	.6666832	.0021863	.6623961	.6709703
85	.749938	.0022738	.7454794	.7543966
90	.833292	.0015159	.8303196	.8362644
95	.916646	.0007579	.9151598	.9181322
100	1	.	.	.

3.B Lorenz Estimates - Education

inc_q	Coefficient	Std. err.	[95% conf. interval]	
1				
0	0	(omitted)		
5	.0155876	.000156	.0152819	.0158934
10	.0311753	.0003119	.0305637	.0317869
15	.0467629	.0004679	.0458456	.0476803
20	.0753984	.0021762	.0711311	.0796657
25	.1065737	.0020437	.1025663	.1105812
30	.137749	.0019525	.1339204	.1415776
35	.1746182	.0039936	.1667873	.1824491
40	.2213811	.0036615	.2142015	.2285608
45	.2681441	.0033618	.261552	.2747362
50	.314907	.003104	.3088205	.3209936
55	.3651394	.0046728	.3559768	.374302
60	.42749	.0041274	.4193969	.4355832
65	.4898406	.0036075	.4827669	.4969143
70	.5521912	.0031258	.546062	.5583205
75	.6145418	.002703	.6092417	.6198419
80	.688247	.003119	.6821311	.694363
85	.7661853	.0023393	.7615983	.7707722
90	.8441235	.0015595	.8410655	.8471815
95	.9220618	.0007798	.9205328	.9235907
100	1	.	.	.
2				
0	0	(omitted)		
5	.0209581	.0013669	.0182778	.0236383
10	.0419162	.0027338	.0365557	.0472767
15	.0628743	.0041007	.0548335	.070915
20	.0838323	.0054675	.0731113	.0945533
25	.1047904	.0068344	.0913892	.1181917
30	.1257485	.0082013	.109667	.14183
35	.1497006	.0086755	.1326893	.1667119
40	.1916168	.0162705	.1597128	.2235207

45	.2335329	.0155089	.2031224	.2639435
50	.2754491	.0152076	.2456294	.3052688
55	.3173653	.0153935	.2871809	.3475496
60	.3652695	.0232601	.3196599	.410879
65	.4281437	.0205823	.3877849	.4685025
70	.491018	.0184354	.454869	.527167
75	.5538922	.0170213	.520516	.5872684
80	.6347305	.0197874	.5959306	.6735305
85	.7185629	.0154771	.6882146	.7489112
90	.8023952	.012138	.7785944	.826196
95	.8952096	.0068344	.8818083	.9086108
100	1	.	.	.
3				
0	0	(omitted)		
5	.0195807	.0004592	.0186803	.0204811
10	.0391614	.0009184	.0373606	.0409622
15	.0587421	.0013776	.0560409	.0614433
20	.0783228	.0018368	.0747212	.0819244
25	.0979035	.0022959	.0934015	.1024055
30	.1265823	.0060921	.1146366	.1385279
35	.1657437	.0057421	.1544843	.1770031
40	.2049051	.0055242	.1940729	.2157372
45	.2440665	.0054543	.2333715	.2547614
50	.2832278	.0055379	.272369	.2940867
55	.3249604	.0085081	.3082774	.3416435
60	.3837025	.0076547	.3686929	.3987122
65	.4424446	.0069711	.4287754	.4561138
70	.5011867	.006511	.4884197	.5139537
75	.5640823	.0077983	.548791	.5793736
80	.6424051	.0063302	.6299925	.6548176
85	.7207278	.0051065	.7107148	.7307409
90	.804193	.0045919	.7951891	.813197
95	.9020965	.0022959	.8975945	.9065985
100	1	.	.	.

4				
0	0	(omitted)		
5	.0211409	.0015192	.018162	.0241199
10	.0422819	.0030384	.036324	.0482397
15	.0634228	.0045576	.054486	.0723596
20	.0845638	.0060768	.072648	.0964795
25	.1057047	.007596	.09081	.1205994
30	.1268456	.0091152	.108972	.1447192
35	.1483221	.0119108	.1249669	.1716774
40	.190604	.0178014	.1556982	.2255098
45	.2328859	.0171733	.1992117	.2665601
50	.2751678	.017071	.2416942	.3086413
55	.3174497	.0175037	.2831276	.3517717
60	.3597315	.0184337	.3235858	.3958773
65	.4151007	.0219231	.3721129	.4580885
70	.4785235	.0198626	.439576	.517471
75	.5419463	.0187074	.5052639	.5786287
80	.6147651	.0201594	.5752357	.6542945
85	.6993289	.0157301	.6684845	.7301732
90	.7885906	.0127459	.7635978	.8135834
95	.8942953	.007596	.8794006	.90919
100	1	.	.	.
5				
0	0	(omitted)		
5	.0198482	.0008167	.0182467	.0214496
10	.0396963	.0016334	.0364935	.0428991
15	.0595445	.0024501	.0547402	.0643487
20	.0793926	.0032668	.072987	.0857983
25	.0992408	.0040835	.0912337	.1072479
30	.1190889	.0049002	.1094805	.1286974
35	.1520607	.009975	.1325012	.1716203
40	.191757	.00947	.1731877	.2103264
45	.2314534	.0092303	.2133542	.2495525
50	.2711497	.0092763	.2529603	.2893391

55	.310846	.009604	.2920139	.329678
60	.3631236	.013143	.3373523	.388895
65	.4226681	.0118231	.3994847	.4458515
70	.4822126	.0109015	.4608365	.5035887
75	.5488069	.0135213	.5222938	.5753201
80	.6281996	.0108883	.6068492	.6495499
85	.7075922	.0086966	.6905395	.7246448
90	.8015184	.008167	.7855043	.8175326
95	.9007592	.0040835	.8927521	.9087663
100	1	.	.	.

3.C Lorenz Estimates - Gender

inc_q	Coefficient	Std. err.	[95% conf. interval]	
1				
0	0	(omitted)		
5	.0212667	.0005895	.0201109	.0224226
10	.0425335	.0011789	.0402218	.0448452
15	.0638002	.0017684	.0603326	.0672678
20	.0850669	.0023579	.0804435	.0896904
25	.1063337	.0029473	.1005544	.1121129
30	.1276004	.0035368	.1206653	.1345355
35	.1488671	.0041263	.1407762	.1569581
40	.1857878	.0069259	.1722072	.1993685
45	.2283213	.0065733	.2154321	.2412105
50	.2708548	.0064209	.2582644	.2834452
55	.3133883	.0064829	.3006764	.3261002
60	.3559217	.0067533	.3426796	.3691639
65	.419516	.0087972	.402266	.4367659
70	.4833162	.007881	.4678627	.4987696
75	.5471164	.0072859	.5328299	.5614029
80	.6236869	.0082916	.6074284	.6399454
85	.7087539	.0064698	.6960677	.7214401
90	.7938208	.0051073	.7838062	.8038354
95	.8936663	.0029473	.8878871	.8994456
100	1	.	.	.
2				
0	0	(omitted)		
5	.0160417	.0001508	.015746	.0163375
10	.0320835	.0003016	.031492	.0326749
15	.0481252	.0004525	.0472379	.0490124
20	.0736397	.0021149	.0694928	.0777866
25	.1057231	.0019834	.1018341	.1096122
30	.1378066	.0018912	.1340982	.141515
35	.16989	.0018444	.1662735	.1735066
40	.2135889	.0035488	.2066303	.2205476

45	.2617141	.0032454	.2553504	.2680779
50	.3098393	.0029801	.3039958	.3156828
55	.3579645	.0027638	.3525451	.3633839
60	.4159008	.003998	.4080612	.4237403
65	.4800677	.0034833	.4732374	.4868979
70	.5442346	.0030018	.5383485	.5501207
75	.6084015	.0025722	.6033578	.6134451
80	.6791655	.0030165	.6732506	.6850803
85	.7593741	.0022624	.754938	.7638103
90	.8395827	.0015082	.8366253	.8425402
95	.9197914	.0007541	.9183127	.9212701
100	1	.	.	.

Appendix Chapter 4

4.A Lorenz Estimates – Income Quintile

inc_q	Coefficient	Std. err.	[95% conf. interval]	
0	0	(omitted)		
5	.0166708	.0001516	.0163736	.016968
10	.0333416	.0003032	.0327471	.0339361
15	.0500124	.0004548	.0491207	.0509041
20	.0666832	.0006063	.0654942	.0678722
25	.1	.002034	.0960116	.1039884
30	.1333416	.0019176	.1295814	.1371018
35	.1666832	.0018443	.1630669	.1702995
40	.2000248	.0018191	.1964578	.2035918
45	.2499876	.0033112	.2434949	.2564803
50	.3	.0030169	.2940843	.3059157
55	.3500124	.0027665	.3445878	.355437
60	.4000248	.0025726	.3949802	.4050693
65	.4666336	.0035361	.4596998	.4735674
70	.5333168	.0030322	.5273711	.5392625
75	.6	.0025728	.5949551	.6050449
80	.6666832	.0021863	.6623961	.6709703
85	.749938	.0022738	.7454794	.7543966
90	.833292	.0015159	.8303196	.8362644
95	.916646	.0007579	.9151598	.9181322
100	1	.	.	.

4.B Lorenz Estimates - Adherent to Covid-19 Measures

inc_q	Coefficient	Std. err.	[95% conf. interval]	
1				
0	0	(omitted)		
5	.0161624	.0002501	.0156719	.0166528
10	.0323247	.0005003	.0313438	.0333057
15	.0484871	.0007504	.0470157	.0499585
20	.0732103	.0034711	.066404	.0800167
25	.1055351	.0032604	.0991419	.1119282
30	.1378598	.0031165	.1317489	.1439707
35	.1701845	.0030487	.1642064	.1761626
40	.2070849	.0058059	.1957003	.2184694
45	.255572	.0052903	.2451984	.2659455
50	.304059	.0048366	.2945752	.3135429
55	.3525461	.0044636	.3437936	.3612986
60	.4090037	.0065795	.3961022	.4219052
65	.4736531	.0057188	.4624395	.4848668
70	.5383026	.0049113	.5286723	.5479329
75	.602952	.004188	.5947401	.611164
80	.6767528	.0050026	.6669434	.6865621
85	.7575646	.0037519	.7502076	.7649216
90	.8383764	.0025013	.8334717	.8432811
95	.9191882	.0012506	.9167359	.9216405
100	1	.	.	.
2				
0	0	(omitted)		
5	.0169281	.0001899	.0165558	.0173004
10	.0338562	.0003797	.0331116	.0346008
15	.0507843	.0005696	.0496674	.0519012
20	.0677124	.0007595	.0662232	.0692016
25	.0971989	.0025832	.0921335	.1022642
30	.1310551	.0024216	.1263068	.1358034
35	.1649113	.0023115	.1603787	.1694439
40	.1987675	.0022607	.1943346	.2032004

45	.2471615	.0042095	.2389073	.2554158
50	.2979458	.00383	.2904357	.305456
55	.3487302	.0035025	.3418624	.3555979
60	.3995145	.0032425	.3931564	.4058726
65	.4630812	.0044725	.4543113	.4718511
70	.5307937	.0038329	.523278	.5383093
75	.5985061	.0032453	.5921425	.6048696
80	.6662185	.0027435	.6608389	.671598
85	.7460784	.002848	.7404939	.7516629
90	.830719	.0018987	.826996	.834442
95	.9153595	.0009493	.913498	.917221
100	1	.	.	.

4.C Lorenz Estimates - Sickness or Death of Household Head

inc_q	Coefficient	Std. err.	[95% conf. interval]	
1				
0	0	(omitted)		
5	.0164955	.0001617	.0161784	.0168127
10	.0329911	.0003235	.0323568	.0336253
15	.0494866	.0004852	.0485352	.050438
20	.0687399	.0023159	.0641988	.073281
25	.101731	.0021589	.0974978	.1059641
30	.134722	.0020414	.1307192	.1387248
35	.1677131	.0019705	.1638492	.171577
40	.2035793	.003861	.1960085	.2111501
45	.2530659	.0035161	.2461713	.2599604
50	.3025524	.0032077	.2962626	.3088423
55	.352039	.0029474	.3462597	.3578184
60	.4051049	.0043377	.3965994	.4136104
65	.471087	.003774	.4636868	.4784872
70	.5370691	.0032415	.530713	.5434252
75	.6030512	.0027585	.5976422	.6084601
80	.6700895	.0032347	.6637467	.6764322
85	.7525671	.002426	.74781	.7573242
90	.8350447	.0016174	.8318734	.8382161
95	.9175224	.0008087	.9159367	.9191081
100	1	.	.	.
2				
0	0	(omitted)		
5	.0176282	.0004229	.0167989	.0184575
10	.0352564	.0008459	.0335978	.0369151
15	.0528846	.0012688	.0503966	.0553726
20	.0705128	.0016918	.0671955	.0738301
25	.0905449	.0058204	.0791319	.1019578
30	.1258013	.0054193	.1151748	.1364277
35	.1610577	.0051276	.1510033	.171112
40	.1963141	.0049644	.1865796	.2060486

45	.2331731	.0094518	.2146395	.2517067
50	.2860577	.0085668	.2692595	.3028559
55	.3389423	.0077886	.32367	.3542146
60	.3918269	.0071523	.3778025	.4058514
65	.4447115	.0066983	.4315773	.4578458
70	.5128205	.0083869	.4963751	.5292659
75	.5833333	.0070236	.569561	.5971056
80	.6538462	.005835	.6424046	.6652877
85	.7355769	.0063441	.723137	.7480168
90	.8237179	.0042294	.8154247	.8320112
95	.911859	.0021147	.9077123	.9160056
100	1	.	.	.

4.D Lorenz Estimates - Economic Shock

inc_q	Coefficient	Std. err.	[95% conf. interval]	
1				
0	0	(omitted)		
5	.0166365	.0001539	.0163348	.0169383
10	.0332731	.0003078	.0326696	.0338765
15	.0499096	.0004616	.0490044	.0508148
20	.0675016	.0022131	.063162	.0718412
25	.1007747	.0020607	.096734	.1048154
30	.1340478	.0019453	.1302333	.1378622
35	.1673209	.0018739	.1636464	.1709953
40	.2009555	.0036858	.1937281	.2081828
45	.2508651	.0033544	.2442875	.2574426
50	.3007747	.0030571	.2947803	.3067691
55	.3506843	.0028045	.3451852	.3561834
60	.4012653	.0041301	.3931669	.4093638
65	.4678115	.0035909	.4607703	.4748527
70	.5343577	.0030805	.5283173	.540398
75	.6009038	.0026157	.5957749	.6060327
80	.66745	.0022253	.6630865	.6718134
85	.7504519	.0023082	.7459259	.7549779
90	.8336346	.0015388	.8306173	.8366519
95	.9168173	.0007694	.9153086	.918326
100	1	.	.	.
2				
0	0	(omitted)		
5	.0175	.0008539	.0158256	.0191744
10	.035	.0017078	.0316512	.0383488
15	.0525	.0025617	.0474769	.0575231
20	.07	.0034156	.0633025	.0766975
25	.0875	.0042695	.0791281	.0958719
30	.11625	.0109637	.0947518	.1377482
35	.15125	.0102174	.1312153	.1712847
40	.18625	.009717	.1671965	.2053035

45	.22875	.019367	.1907742	.2667258
50	.28125	.01757	.2467979	.3157021
55	.33375	.0159829	.3024101	.3650899
60	.38625	.0146739	.3574767	.4150233
65	.43875	.013723	.4118413	.4656587
70	.508125	.0167609	.4752594	.5409906
75	.578125	.0140017	.5506698	.6055802
80	.65	.0137965	.6229473	.6770527
85	.7375	.0128086	.7123844	.7626156
90	.825	.008539	.8082562	.8417438
95	.9125	.0042695	.9041281	.9208719
100	1	.	.	.

Appendix Chapter 5

5.A Survey Method

In economies where face-to-face surveys were conducted, primary sampling units were identified during the initial stage of sampling. These units are often stratified according to population size and geography, and clustering is accomplished through one or more sampling stages. When population information is available, sample selection is based on probabilities proportional to the population size; otherwise, simple random sampling is utilised. Respondents were randomly chosen from the selected households, and each eligible household member was recorded. The handheld survey device then selected the household members to be interviewed. In economies with traditional phone-based surveys, the selection of respondents follows the same procedure as in previous years, using either random digit dialling or a nationally representative list of phone numbers. In most economies with high mobile phone and landline penetration, a dual sampling frame is employed (Development Research Group, 2022).

5.B Summary of Predicted Values

Variable	Obs	Mean	Std. dev	Min	Max
p01ologit	999	0.154777	0.070984	0.041570	0.325303
p02ologit	999	0.174394	0.046234	0.067534	0.251212
p03ologit	999	0.197223	0.019463	0.117944	0.215262
p04ologit	999	0.222913	0.034836	0.137919	0.257337
p05ologit	999	0.250694	0.09808	0.096532	0.542903

5.B.1 Income Quintile

Within-economy Household Income Quintile			Freq.	Percent	Cum.
1	Poorest	20%	160	16.02	16.02
2	Second	20%	148	14.81	30.83
3	Middle	20%	178	17.82	48.65
4	Fourth	20%	205	20.52	69.17
5	Richest	20%	308	30.83	100
	Total		999	100	

5.C Lorenz Estimates - Financial Institution Account

inc_q	Coefficient	Std. err.	[95% conf. interval]	
0				
0	0	(omitted)		
5	.0174051	.0004245	.0165721	.018238
10	.0348101	.0008489	.0331443	.036476
15	.0522152	.0012734	.0497164	.054714
20	.0696203	.0016978	.0662885	.072952
25	.1035262	.0057028	.0923354	.114717
30	.1383363	.0054043	.1277312	.1489415
35	.1731465	.0052281	.1628871	.1834059
40	.2079566	.0051866	.1977787	.2181345
45	.2448011	.009258	.2266338	.2629684
50	.2970163	.0084044	.280524	.3135085
55	.3492315	.0076681	.334184	.3642789
60	.4014467	.0070858	.3875418	.4153515
65	.454792	.0099482	.4352703	.4743138
70	.5244123	.0084978	.5077367	.5410879
75	.5940325	.0071572	.5799877	.6080774
80	.6636528	.0060002	.6518784	.6754272
85	.7389241	.0063669	.7264301	.751418
90	.8259494	.0042446	.81762	.8342787
95	.9129747	.0021223	.90881	.9171393
100	1	.	.	.
1				
0	0	(omitted)		
5	.0136809	.0002138	.0132613	.0141005
10	.0273619	.0004276	.0265227	.028201
15	.0455437	.0032693	.0391281	.0519593
20	.0729055	.0030186	.0669819	.0788291
25	.1076203	.0063964	.0950683	.1201724
30	.1486631	.0059072	.1370712	.160255
35	.1897059	.0054496	.179012	.2003998
40	.2345811	.0085117	.2178782	.251284

45	.2893048	.0077369	.2741224	.3044872
50	.3440285	.0069808	.3303298	.3577273
55	.3987522	.0062504	.3864868	.4110177
60	.4534759	.0055558	.4425736	.4643783
65	.5211676	.0074837	.5064819	.5358532
70	.5895722	.0064146	.5769845	.6021599
75	.6579768	.0053455	.6474871	.6684666
80	.7263815	.0042764	.7179896	.7347733
85	.7947861	.0032073	.7884922	.80108
90	.8631907	.0021382	.8589948	.8673866
95	.9315954	.0010691	.9294974	.9336933
100	1	.	.	.

Lorenz Contrast Estimates - Financial Institution Account

inc_q	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
0						
0	0	(omitted)				
5	.0037241	.0004753	7.84	0.000	.0027915	.0046568
10	.0074483	.0009505	7.84	0.000	.005583	.0093136
15	.0066715	.0035086	1.90	0.058	-.0002135	.0135566
20	-.0032853	.0034634	-0.95	0.343	-.0100816	.003511
25	-.0040941	.0085695	-0.48	0.633	-.0209104	.0127222
30	-.0103268	.0080063	-1.29	0.197	-.0260379	.0053844
35	-.0165594	.0075519	-2.19	0.029	-.0313788	-.00174
40	-.0266245	.0099675	-2.67	0.008	-.0461841	-.0070649
45	-.0445037	.0120652	-3.69	0.000	-.0681798	-.0208277
50	-.0470122	.0109254	-4.30	0.000	-.0684517	-.0255728
55	-.0495208	.0098928	-5.01	0.000	-.0689338	-.0301077
60	-.0520293	.0090042	-5.78	0.000	-.0696986	-.03436
65	-.0663755	.0124488	-5.33	0.000	-.0908043	-.0419467
70	-.0651599	.0106471	-6.12	0.000	-.0860531	-.0442667
75	-.0639443	.0089331	-7.16	0.000	-.081474	-.0464145
80	-.0627287	.0073682	-8.51	0.000	-.0771876	-.0482698
85	-.055862	.0071291	-7.84	0.000	-.0698518	-.0418723
90	-.0372414	.0047527	-7.84	0.000	-.0465678	-.0279149
95	-.0186207	.0023764	-7.84	0.000	-.0232839	-.0139574
100	0	(omitted)				

5.D Lorenz Estimates - Mobile Money Account

inc_q	Coefficient	Std. err.	[95% conf. interval]	
0				
0	0	(omitted)		
5	.0155015	.0002387	.0150331	.0159699
10	.0310029	.0004774	.0300661	.0319397
15	.0465044	.0007161	.0450992	.0479096
20	.0694729	.0033812	.0628377	.0761081
25	.1004758	.0031503	.0942938	.1066579
30	.1314788	.0029786	.1256337	.1373238
35	.1659407	.00615	.1538723	.1780091
40	.2124451	.0056225	.2014118	.2234784
45	.2589495	.0051408	.2488614	.2690375
50	.3054539	.004719	.2961935	.3147142
55	.35959	.0071287	.3456011	.373579
60	.4215959	.0062881	.4092565	.4339353
65	.4836018	.005485	.4728384	.4943651
70	.5456076	.0047384	.5363092	.554906
75	.6124634	.0059674	.6007534	.6241734
80	.6899707	.0047739	.6806027	.6993387
85	.767478	.0035804	.760452	.774504
90	.8449854	.0023869	.8403014	.8496694
95	.9224927	.0011935	.9201507	.9248347
100	1	.	.	.
1				
0	0	(omitted)		
5	.0122977	.0003093	.0116908	.0129047
10	.0313916	.004671	.0222255	.0405577
15	.0588997	.0099432	.0393878	.0784116
20	.0957929	.0092433	.0776544	.1139313
25	.1326861	.0085867	.1158361	.1495361
30	.1770227	.0138804	.1497845	.2042608
35	.2262136	.0127662	.2011619	.2512653
40	.2754045	.0116768	.2524907	.2983184

45	.3245955	.0106198	.3037559	.3454351
50	.3851133	.0154647	.3547663	.4154603
55	.4466019	.0139182	.4192896	.4739142
60	.5080906	.0123717	.483813	.5323682
65	.5695793	.0108253	.5483364	.5908222
70	.631068	.0092788	.6128598	.6492762
75	.6925566	.0077323	.6773831	.7077301
80	.7540453	.0061859	.7419065	.7661841
85	.815534	.0046394	.8064299	.8246381
90	.8770227	.0030929	.8709533	.8830921
95	.9385113	.0015465	.9354766	.941546
100	1	.	.	.

Lorenz Contrast Estimates - Mobile Money Account

inc_q	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
0						
0	0	(omitted)				
5	.0032037	.0003907	8.20	0.000	.0024371	.0039704
10	-.0003887	.0046953	-0.08	0.934	-.0096025	.0088252
15	-.0123953	.0099689	-1.24	0.214	-.0319577	.0071672
20	-.02632	.0098423	-2.67	0.008	-.0456339	-.007006
25	-.0322102	.0091463	-3.52	0.000	-.0501585	-.014262
30	-.0455439	.0141964	-3.21	0.001	-.0734021	-.0176856
35	-.0602729	.0141703	-4.25	0.000	-.08808	-.0324658
40	-.0629594	.0129599	-4.86	0.000	-.0883912	-.0375276
45	-.065646	.0117986	-5.56	0.000	-.0887989	-.0424931
50	-.0796594	.0161686	-4.93	0.000	-.1113878	-.0479309
55	-.0870119	.0156376	-5.56	0.000	-.1176983	-.0563255
60	-.0864947	.013878	-6.23	0.000	-.1137282	-.0592612
65	-.0859775	.0121355	-7.08	0.000	-.1097916	-.0621634
70	-.0854603	.0104187	-8.20	0.000	-.1059054	-.0650153
75	-.0800932	.0097672	-8.20	0.000	-.0992599	-.0609266
80	-.0640746	.0078138	-8.20	0.000	-.0794079	-.0487413
85	-.0480559	.0058603	-8.20	0.000	-.0595559	-.036556
90	-.0320373	.0039069	-8.20	0.000	-.0397039	-.0243706
95	-.0160186	.0019534	-8.20	0.000	-.019852	-.0121853
100	0	(omitted)				

5.E Lorenz Estimates - Income Quintile

inc_q	Coefficient	Std. err.	[95% conf. interval]	
0	0	(omitted)		
5	.0149104	.0002041	.01451	.0153109
10	.0298209	.0004082	.0290199	.0306218
15	.0447313	.0006122	.0435299	.0459328
20	.0715224	.002853	.0659238	.077121
25	.1013433	.002665	.0961136	.106573
30	.1311642	.0025295	.1262005	.1361278
35	.1734179	.0051837	.1632457	.1835901
40	.2181493	.0047481	.2088318	.2274667
45	.2628806	.0043552	.2543342	.271427
50	.3116418	.0067446	.2984065	.3248771
55	.3712836	.0060142	.3594817	.3830855
60	.4309254	.0053088	.4205077	.4413431
65	.4905672	.00464	.481462	.4996724
70	.5526866	.0061224	.5406723	.5647008
75	.6272388	.005102	.6172269	.6372507
80	.701791	.0040816	.6937815	.7098005
85	.7763433	.0030612	.7703362	.7823504
90	.8508955	.0020408	.8468908	.8549003
95	.9254478	.0010204	.9234454	.9274501
100	1	.	.	.

5.F Lorenz Estimates - Education

inc_q	Coefficient	Std. err.	[95% conf. interval]	
1				
0	0	(omitted)		
5	.0181122	.0006261	.0168835	.019341
10	.0362245	.0012523	.0337671	.0386819
15	.0543367	.0018784	.0506506	.0580229
20	.072449	.0025046	.0675341	.0773638
25	.0909864	.0026463	.0857935	.0961793
30	.1272109	.0081162	.1112842	.1431376
35	.1634354	.0076735	.1483773	.1784934
40	.1996599	.0074182	.1851028	.2142169
45	.2358844	.0073698	.2214224	.2503463
50	.2848639	.0128206	.2597055	.3100224
55	.3392007	.0116262	.316386	.3620154
60	.3935374	.0106315	.3726748	.4144
65	.4478741	.0098966	.4284535	.4672948
70	.5091837	.0125941	.4844696	.5338977
75	.5816327	.0105306	.560968	.6022973
80	.6540816	.0087018	.6370058	.6711575
85	.7283163	.0093922	.7098856	.7467471
90	.8188776	.0062615	.8065904	.8311647
95	.9094388	.0031307	.9032952	.9155824
100	1	.	.	.
2				
0	0	(omitted)		
5	.0143904	.0002157	.0139671	.0148137
10	.0287809	.0004314	.0279343	.0296274
15	.0458333	.0032196	.0395154	.0521513
20	.0746142	.002986	.0687546	.0804738
25	.1033951	.0027998	.0979009	.1088893
30	.1402006	.0059077	.1286076	.1517936
35	.1833719	.005431	.1727144	.1940294
40	.2265432	.0049928	.2167456	.2363408

45	.271142	.0078651	.2557079	.286576
50	.3287037	.007088	.3147945	.3426129
55	.3862654	.0063332	.3738374	.3986934
60	.4438272	.0056097	.432819	.4548353
65	.5013889	.0049311	.4917123	.5110654
70	.568287	.0064711	.5555884	.5809856
75	.6402392	.0053926	.629657	.6508214
80	.7121914	.0043141	.7037256	.7206571
85	.7841435	.0032356	.7777942	.7904928
90	.8560957	.002157	.8518628	.8603285
95	.9280478	.0010785	.9259314	.9301643
100	1	.	.	.
3				
0	0	(omitted)		
5	.0117647	.000543	.0106992	.0128302
10	.0352941	.0072506	.021066	.0495223
15	.0588235	.0068333	.0454143	.0722328
20	.0941176	.015351	.0639936	.1242417
25	.1352941	.0261475	.0839837	.1866046
30	.1823529	.0241053	.1350501	.2296557
35	.2352941	.035294	.1660352	.304553
40	.2941176	.0325791	.2301863	.3580489
45	.3529412	.0298641	.2943375	.4115449
50	.4117647	.0271492	.3584886	.4650408
55	.4705882	.0244343	.4226398	.5185367
60	.5294118	.0217194	.4867909	.5720326
65	.5882353	.0190044	.550942	.6255286
70	.6470588	.0162895	.6150932	.6790245
75	.7058824	.0135746	.6792443	.7325204
80	.7647059	.0108597	.7433954	.7860163
85	.8235294	.0081448	.8075466	.8395122
90	.8823529	.0054298	.8716977	.8930082
95	.9411765	.0027149	.9358489	.9465041
100	1	.	.	.

Lorenz Contrast Estimates - Education

inc_q	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
2						
0	0	(omitted)				
5	-.0037218	.0006623	-5.62	0.000	-.0050214	-.0024222
10	-.0074436	.0013245	-5.62	0.000	-.0100428	-.0048445
15	-.0085034	.0037275	-2.28	0.023	-.015818	-.0011888
20	.0021652	.0038973	0.56	0.579	-.0054827	.0098131
25	.0124087	.0038525	3.22	0.001	.0048488	.0199686
30	.0129897	.0100386	1.29	0.196	-.0067095	.0326889
35	.0199365	.009401	2.12	0.034	.0014886	.0383845
40	.0268833	.0089419	3.01	0.003	.0093362	.0444305
45	.0352576	.0107784	3.27	0.001	.0141068	.0564085
50	.0438398	.0146495	2.99	0.003	.0150924	.0725872
55	.0470648	.0132393	3.55	0.000	.0210847	.0730448
60	.0502897	.0120207	4.18	0.000	.0267011	.0738784
65	.0535147	.0110571	4.84	0.000	.0318169	.0752126
70	.0591034	.0141594	4.17	0.000	.0313178	.0868889
75	.0586065	.0118311	4.95	0.000	.03539	.0818231
80	.0581097	.0097125	5.98	0.000	.0390505	.0771689
85	.0558272	.0099339	5.62	0.000	.0363335	.0753209
90	.0372181	.0066226	5.62	0.000	.0242223	.050214
95	.0186091	.0033113	5.62	0.000	.0121112	.025107
100	0	(omitted)				
3						
0	0	(omitted)				
5	-.0063475	.0008288	-7.66	0.000	-.0079739	-.0047212
10	-.0009304	.0073579	-0.13	0.899	-.0153692	.0135085
15	.0044868	.0070868	0.63	0.527	-.0094199	.0183935
20	.0216687	.015554	1.39	0.164	-.0088537	.052191
25	.0443077	.0262811	1.69	0.092	-.0072648	.0958803
30	.0551421	.0254349	2.17	0.030	.00523	.1050541
35	.0718587	.0361185	1.99	0.047	.0009818	.1427357

40	.0944578	.0334129	2.83	0.005	.0288901	.1600255
45	.1170568	.03076	3.81	0.000	.0566951	.1774186
50	.1269008	.0300241	4.23	0.000	.0679831	.1858184
55	.1313876	.0270593	4.86	0.000	.078288	.1844871
60	.1358743	.0241818	5.62	0.000	.0884214	.1833273
65	.1403611	.0214269	6.55	0.000	.0983142	.1824081
70	.1378752	.0205903	6.70	0.000	.0974699	.1782804
75	.1242497	.0171803	7.23	0.000	.090536	.1579634
80	.1106242	.0139159	7.95	0.000	.0833164	.1379321
85	.0952131	.0124318	7.66	0.000	.0708175	.1196086
90	.0634754	.0082879	7.66	0.000	.0472117	.0797391
95	.0317377	.0041439	7.66	0.000	.0236058	.0398695
100	0	(omitted)				

5.G Lorenz Estimates - Gender

inc_q	Coefficient	Std. err.	[95% conf. interval]	
1				
0	0	(omitted)		
5	.0160767	.0003588	.0153727	.0167807
10	.0321534	.0007175	.0307454	.0335614
15	.0482301	.0010763	.0461181	.0503421
20	.0659292	.0051519	.0558194	.076039
25	.0980826	.0047843	.0886942	.107471
30	.130236	.0045018	.121402	.13907
35	.1623894	.0043211	.1539099	.1708689
40	.2044248	.0085497	.1876473	.2212023
45	.2526549	.007798	.2373526	.2679571
50	.300885	.0071299	.2868937	.3148762
55	.349115	.0065711	.3362204	.3620097
60	.4081121	.009485	.3894992	.426725
65	.4724189	.0082469	.4562356	.4886022
70	.5367257	.0070835	.5228254	.5506259
75	.6010324	.0060381	.5891836	.6128813
80	.6784661	.0071751	.6643861	.6925461
85	.7588496	.0053813	.7482896	.7694096
90	.839233	.0035875	.832193	.846273
95	.9196165	.0017938	.9160965	.9231365
100	1	.	.	.
2				
0	0	(omitted)		
5	.0141174	.0002391	.0136481	.0145866
10	.0282347	.0004783	.0272962	.0291733
15	.0470913	.0035331	.0401581	.0540244
20	.075326	.0032809	.0688877	.0817643
25	.1035607	.0030828	.0975112	.1096102
30	.1427783	.0064866	.1300494	.1555072
35	.1851304	.0059635	.173428	.1968328
40	.2274824	.0054845	.2167199	.2382449

45	.2770311	.0086545	.260048	.2940142
50	.3335005	.0077976	.3181989	.3488021
55	.3899699	.0069667	.3762988	.403641
60	.4464393	.0061723	.4343271	.4585516
65	.5058927	.0083699	.489468	.5223174
70	.5764794	.0071742	.5624011	.5905577
75	.6470662	.0059785	.6353343	.6587981
80	.717653	.0047828	.7082674	.7270385
85	.7882397	.0035871	.7812006	.7952789
90	.8588265	.0023914	.8541337	.8635192
95	.9294132	.0011957	.9270669	.9317596
100	1	.	.	.

Lorenz Contrast Estimates - Gender

inc_q	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
2						
0	0	(omitted)				
5	-.0019593	.0004312	-4.54	0.000	-.0028054	-.0011133
10	-.0039187	.0008623	-4.54	0.000	-.0056108	-.0022265
15	-.0011388	.0036934	-0.31	0.758	-.0083865	.0061089
20	.0093968	.0061079	1.54	0.124	-.002589	.0213826
25	.0054781	.0056915	0.96	0.336	-.0056905	.0166467
30	.0125423	.0078957	1.59	0.112	-.0029516	.0280363
35	.022741	.0073645	3.09	0.002	.0082894	.0371926
40	.0230577	.0101576	2.27	0.023	.0031249	.0429905
45	.0243762	.0116494	2.09	0.037	.0015161	.0472363
50	.0326155	.0105659	3.09	0.002	.0118817	.0533494
55	.0408549	.0095767	4.27	0.000	.022062	.0596477
60	.0383272	.0113165	3.39	0.001	.0161203	.0605341
65	.0334738	.0117502	2.85	0.004	.0104159	.0565317
70	.0397538	.0100819	3.94	0.000	.0199696	.059538
75	.0460338	.0084971	5.42	0.000	.0293594	.0627081
80	.0391869	.0086231	4.54	0.000	.0222655	.0561083
85	.0293902	.0064673	4.54	0.000	.0166991	.0420812
90	.0195934	.0043115	4.54	0.000	.0111327	.0280542
95	.0097967	.0021558	4.54	0.000	.0055664	.0140271
100	0	(omitted)				

5.H Lorenz Estimates - Residence

inc_q	Coefficient	Std. err.	[95% conf. interval]	
1				
0	0	(omitted)		
5	.016129	.0004023	.0153395	.0169186
10	.0322581	.0008047	.030679	.0338371
15	.0483871	.001207	.0460185	.0507557
20	.06926	.0057202	.058035	.0804849
25	.101518	.0053345	.0910498	.1119862
30	.1337761	.0050487	.1238688	.1436834
35	.1660342	.0048802	.1564575	.1756109
40	.2068311	.0095298	.1881303	.2255319
45	.2552182	.0086901	.2381652	.2722712
50	.3036053	.0079456	.2880133	.3191973
55	.3519924	.0073254	.3376175	.3663673
60	.4108159	.0106932	.3898322	.4317997
65	.4753321	.0093079	.4570668	.4935973
70	.5398482	.0080068	.524136	.5555603
75	.6043643	.0068383	.5909453	.6177834
80	.6774194	.0080469	.6616286	.6932101
85	.7580645	.0060352	.7462214	.7699076
90	.8387097	.0040234	.8308143	.8466051
95	.9193548	.0020117	.9154071	.9233025
100	1	.	.	.
2				
0	0	(omitted)		
5	.014351	.000232	.0138957	.0148064
10	.0287021	.000464	.0277915	.0296127
15	.0438589	.0034924	.0370055	.0507123
20	.072561	.0032317	.0662192	.0789028
25	.1012631	.0030202	.0953363	.1071898
30	.1372387	.006377	.1247248	.1497526
35	.1802918	.0058585	.1687954	.1917882
40	.2233449	.0053802	.2127871	.2339028

45	.2679443	.0084389	.2513842	.2845043
50	.3253484	.0075988	.310437	.3402598
55	.3827526	.0067816	.3694447	.3960605
60	.4401568	.0059969	.4283889	.4519247
65	.4977134	.0058931	.4861492	.5092777
70	.5694686	.0069607	.5558094	.5831279
75	.6412239	.0058006	.6298412	.6526066
80	.7129791	.0046405	.7038729	.7220853
85	.7847343	.0034803	.7779047	.7915639
90	.8564895	.0023202	.8519365	.8610426
95	.9282448	.0011601	.9259682	.9305213
100	1	.	.	.

Lorenz Contrast Estimates - Residence

inc_q	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
2						
0	0	(omitted)				
5	-.001778	.0004645	-3.83	0.000	-.0026894	-.0008666
10	-.003556	.0009289	-3.83	0.000	-.0053788	-.0017331
15	-.0045282	.0036951	-1.23	0.221	-.0117794	.0027229
20	.003301	.00657	0.50	0.615	-.0095915	.0161935
25	-.000255	.0061302	-0.04	0.967	-.0122845	.0117746
30	.0034626	.0081336	0.43	0.670	-.0124984	.0194235
35	.0142577	.0076249	1.87	0.062	-.000705	.0292203
40	.0165138	.0109437	1.51	0.132	-.0049615	.0379891
45	.012726	.0121134	1.05	0.294	-.0110445	.0364966
50	.0217431	.0109943	1.98	0.048	.0001686	.0433177
55	.0307602	.0099826	3.08	0.002	.011171	.0503494
60	.0293409	.01226	2.39	0.017	.0052826	.0533991
65	.0223813	.0110166	2.03	0.042	.000763	.0439997
70	.0296204	.0106094	2.79	0.005	.0088011	.0504398
75	.0368595	.0089671	4.11	0.000	.019263	.054456
80	.0355597	.009289	3.83	0.000	.0173314	.053788
85	.0266698	.0069668	3.83	0.000	.0129986	.040341
90	.0177799	.0046445	3.83	0.000	.0086657	.026894
95	.0088899	.0023223	3.83	0.000	.0043329	.013447
100	0	(omitted)				